Thammasat Review of Economic and Social Policy
Volume 2, Number 1, January - June 2016

Income Elasticity for Medical Care Services: An Empirical Study in Thailand

Kaewkwan Tangtipongkul
Assistant Professor
Faculty of Economics
Thammasat University
Bangkok, Thailand
kaewkwan@econ.tu.ac.th

ABSTRACT

The objective of this paper is to investigate the potential household income effect on public and private health care choices for outpatient and inpatient services. A multinomial logit model on choice of health care services is estimated using the Health and Welfare Survey 2006 data from Thailand with information on the number of hospitals and doctors in each province. The results indicate that an increase in monthly household income has an impact on the likelihood of healthcare utilization. Income elasticity for outpatient services is approximately 0.17 and 0.21 at clinics and private hospitals respectively. Income elasticity for inpatient services is approximately 0.10 at public provincial hospitals and 0.25 at private hospitals. The positive income elasticity indicates that services at these healthcare providers are a necessity. In contrast, income elasticity is approximately -0.13 and -0.20 for outpatient and inpatient services at public district hospitals. This suggests that district hospitals may be an inferior good. This implies that patients from wealthier families are more likely to visit private hospitals or public provincial hospitals. The Universal Coverage or Gold Card beneficiaries show a positive statistically significant probability of visiting public district hospitals for outpatient and inpatient services. From the policy perspective, Universal Coverage or Gold Card plan should be designed for segments of population below a certain income level. The government can use funds that made available by the decreased number of Universal Coverage or Gold Card beneficiaries to raise the capitation rate or hire additional medical staff at district hospitals.

Keywords: Income elasticity of demand, outpatient, inpatient, health insurance, Thailand

JEL Classification: I11, I13

1. Introduction

The high cost of outpatient and inpatient services is a barrier to affordable healthcare in developing countries especially among the low and middle income population. People in the low income group are less likely to gain access to quality healthcare. It is an important issue that the government improves the healthcare policy for needy households. Although there is increasing literature about health policy and its determinants, there are few studies that mention this issue in Thailand. As a result, there is limited information for the policy maker to evaluate and improve the existing healthcare policy. The objective of this study is to investigate the potential household income effect on public and private healthcare choices for outpatient and inpatient services. This study mainly shows that outpatient and inpatient service choices can be explained by household socioeconomic characteristics and the availability of health insurance.

High outpatient and inpatient service costs compel the government to develop a policy or a program to alleviate high healthcare expenses. Thailand is an example of a lower-middle income country that introduced universal healthcare coverage in 2001. The universal coverage allows the insured to pay a minimal fee of 30 Baht for each visit to the public health centers and district hospitals. Healthcare policy decisions often raise the following important questions: Is household demand for medical care responsive to financial resources and its time cost? Is the demand for outpatient and inpatient health services elastic to household income? How can the government provide and finance medical service access to all population? How can the government promote equal access to medical care for the least well-off segment of the population? These questions are important for the policy maker to evaluate the funding plans from taxation for the program. The setting up of hospital

facilities and medical faculty in each region throughout the country should also be evaluated.

To examine the relationship of income on demand for outpatient and inpatient services, this study uses the Health and Welfare Survey 2006. The survey provides information about the health and economic status of households. In addition, I combined this data set with information on the number of hospitals and doctors in each province. With the multinomial logit model of outpatient and inpatient service choices, the results indicate that the elasticity of income shows that the district public hospital is an inferior good, while other public and private hospitals are a normal good. This implies that the change of monthly household income has an impact on the choice of outpatient and inpatient services.

This finding will be beneficial not only for the government, as a policy maker to design an appropriate healthcare policy, but also as a major contribution in the long run because the analysis includes the household socioeconomic factor, types of morbidity, and health insurance information needed to analyze the determinants of outpatient and inpatient services in Thailand. All of these factors may affect the decision-making of households as well as that of the government. The existing literature only focuses on the policy and descriptive statistics with limited analysis using econometric tools.

This paper is organized as follows: Section 2 discusses the literature review. Section 3 introduces the public health programs in Thailand. Section 4 describes the theoretical model, empirical strategy, and data. Section 5 discusses empirical results. The last section discusses the policy implication and concludes the paper.

2. Literature Review

Demand for medical care in developing countries has received a lot of attention due to the local populations' limited facility access, higher mortality rates, and insufficient healthcare knowledge. By identifying important factors which influence an individual's decision in healthcare choices, policy makers can use this information to construct policy that is suitable for the target population.

In previous literature on the demand for healthcare, economic factors such as income and medical services fees show the contradictory effects on the likelihood of healthcare. There appears to be a positive statistically significant income effect on the decision to seek healthcare in urban China (Mocan, Tekin, & Zax, 2004), rural Benin (Bolduc, Lacroix, & Muller, 1996), and outpatient and inpatient services in Iran (Kermani, Ghaderi, & Yousefi, 2008). An increase in income also appears to promote the substitution of private healthcare for public healthcare for Malaria fever treatment in Nigeria (Anyanwu, 2007) and outpatient services in Nigeria (Akin, Guilkey, & Denton, 1995) and Malaysia (Heller, 1982). Chernichovsky and Meesook (1986) state that income has a qualitative effect on healthcare decisions toward more sophisticated practitioners and services in Indonesia. However, some evidence shows that income has insignificant effect on childbirth and delivery decisions in the Philippines (Schwartz, Akin, & Popkin, 1988) and curative healthcare choices in Mozambique (Lindelow, 2005).

Another important economic factor is price, i.e. the medical service fees. Several studies show that introduced fee in public facilities reduced healthcare utilization in Cambodia (Jacobs & Price, 2004), Niger (Meuwissen, 2002), Kenya (Mwabu, Mwanzia, & Liambia, 1995), Papua-New Guinea (Thomason, Mulou, & Bass, 1994), Zambia (Van der Geest, Macwangi, Kamwagna, Mulikelela, Mazimba, & Mwangelwa,

2000), rural Ghana (Waddington & Enyimayew, 1990), urban Iran (Kermani et al., 2008), urban Pakistan (Alderman & Gertler, 1989), rural India (Borah, 2006), and Indonesia (Chernichovsky & Meesook, 1986). In addition, other studies find that demand become less price elastic as income rises in the Philippines for child healthcare (Ching, 1995), rural area of Ethiopia (Asfaw, Braun, Klasen, 2004), Kenya (Mwabu, Wangombe, & Nganda, 2003), China (Mocan, et al., 2004), urban Peru (Gertler, Locay, & Sanderson, 1987), and Peru and Cote d'Iviore for both children and adult healthcare (Gertler & van der Gaag, 1990). On the other hand, some evidence support that demand for outpatient and inpatient cares is insensitive to change in price (Heller, 1982; Akin et al., 1986).

There are also non-economic factors that influence healthcare choices, including traveling time, level of education, and the quality of the facilities and medical staff. Longer distances from home to the healthcare providers weaken the demand for healthcare services in Malaysia (Heller, 1982), modern healthcare services in Nigeria (Amaghionyeodiwe, 2008), child curative care in two rural Thanas of Bangladesh (Levin, Rahman, Quayyum, Routh, & Khuda, 2001), and child healthcare in the Philippines (Ching, 1995). However, Borah (2006) confirms that when health status is poor, the distance becomes less significant in adult medical decisions in rural India. Anyanwu (2007) also finds that travel time costs have an insignificant effect on demand for public healthcare in Nigeria.

Level of education is also an important determinant of healthcare decisions. Bolduc et al. (1996) find that having more than primary education increases the probability of seeking care at the hospital in rural Benin. The mother's education is significant in choice of child delivery method in the Bicol region of the Philippines (Akin, et al., 1986) and Turkey (Celik & Hotchkiss, 2000). Lindelow (2005) confirms that the higher levels of education are associated with a fall in

the probability of homecare and a rise in the probability of seeking care at a hospital or healthcare facility in Mozambique. Mwabu, Ainsworth, and Nyamete (1995) also suggest that government healthcare facilities are likely to be chosen over self-treatment among patients with more schooling.

Another non-economic factor is the quality of healthcare. This encompasses facilities, doctors, medical staff, operation hours, and availability of drugs as important factors in the choice of healthcare. Existing literature shows that the quality of healthcare has a positive effect on the demand for healthcare in Kenya (Mwabu, Ainsworth, & Nyamete, 1995) and the Cebu region of the Philippines (Schwartz et al., 1988). Akin et al. (1995) state that Nigerian people appear to prefer healthcare facilities with greater over availability of drug choice, better physical conditions, and higher per capita spending on care. The previous literature suggests that both economic and non-economic factors have influence over the demand for healthcare. There are still a limited number of studies on demand for outpatient and inpatient healthcare services in Thailand.

The healthcare choice model is a categorical discrete model. There are several estimation models that are broadly used in previous literature including the multinomial logit model (Akin et al., 1986; Kermani et al., 2008; Lindelow, 2005; Asfaw et al., 2004), the nested multinomial logit model (Gertler et al., 1987; Gertler & van der Gaag, 1990; Levin et al., 2001), the multinomial probit (Akin et al., 1995), and the mixed multinomial logit (Akin, Guilkey, Hutchinson, & McIntosh, 1998; Borah, 2006; Schwartz et al., 1988; Ching, 1995). In my study, I use the multinomial logit model due to the structure and availability of the data.

3. Public Health Programs in Thailand

Following the public health policy reform in 2001, the Thai public health insurance program now consists of three schemes as shown in Table 1. First, the Civil Servant Medical Benefit Scheme (CSMBS) insures government employees, retirees, and their dependents. CSMBS beneficiaries receive free access to admission and ambulatory services with free choice of providers that are paid by Fee-for-Service (Limwattananon, Tangcharoensathien, & Prakongsai, 2005). CSMBS funding comes from general tax. Second, Social Security Scheme (SSS) insures private sector employees. SSS beneficiaries receive free access to admission and ambulatory services only at registered hospitals that are paid by capitation (Limwattananon et al., 2005). SSS funding comes from mandatory social security taxes on employees and employers, and government contributions. Third, Universal Coverage or the Gold Card plan is for the rest of the population. Universal Coverage or Gold Card plan funding is derived from government tax revenue.

The introduction of Universal Coverage (UC) or Gold Card plan is expected to reduce the barrier to healthcare access and make healthcare more affordable. The Gold Card plan is categorized into two groups. The first group of Gold Card beneficiaries includes elders, children under the age of 12, monks, and disabled persons, who are exempted from a co-payment of 30 Baht per visit. The second group of Gold Card beneficiaries includes the rest of the Thai population, who are required a co-payment of 30 Baht (equivalent to $0.70) per visit at registered healthcare institutions (Suraratdecha, Saitanu, & Tangcharoensathien, 2005). The program covers outpatient and inpatient services at public healthcare centers or district hospitals close to home. Public health centers cater to populations of 1,000 - 5,000 at the sub-district level.

Table 1 Health insurance schemes

Scheme	Target population	Coverage	Source of funding	Payment method
1. Civil Servant Medical Benefit Scheme (CSMBS)	Government employee, retiree, and dependents	6 million, 10%	General tax, non-contributory	Fee-For-Service (FFS) reimbursement model
2. Social Security Insurance (SSS)	Private sector employee	8 million, 13%	Payroll tax tripartite contribution	Capitation inclusive outpatient and inpatient
3. Universal Coverage (UC) or Gold Card plan	Rest of population	47 million, 74%	General tax, non-contributory	Capitation outpatient, prevention and health promotion; Global budget and Diagnostic-Related-Groups (DRG) for inpatient

Source: Tangcharoensathien, Prakongsai, Limwattananon, Patcharanarumoi & Jongudomsuk (2007)

Three to five health workers provide basic curative, preventive and health promotion services at public health centers (Tangcharoensathien, Limwattananon, & Prakongsai, 2007). District hospitals cover populations of 10,000 - 50,000 with the number of beds ranging from 10 - 150. At district hospitals with 30 - 60 beds, there are three to five physicians, two to three pharmacists, a dentist, and 20 nurses providing curative, preventive, and health promotion services (Tangcharoensathien et al., 2007). Public health and medical staff usually consist of recent medical graduates who received government funding during their study in medical college. The Universal Coverage or Gold Card plan coverage by capitation rate from 2002 to 2005 is distributed in Table 2.

The distribution of the beneficiaries of these three public health schemes according to household income level using HWS 2006 data is illustrated in Figure 1. The graph indicates that the beneficiaries of the Gold Card plan are mostly in the low income quartile. In addition to analyzing the income effect on choice of healthcare, I investigate whether the availability of health insurance has an impact on an individual's decision on the choice of healthcare. The following section describes the theoretical model of the study.

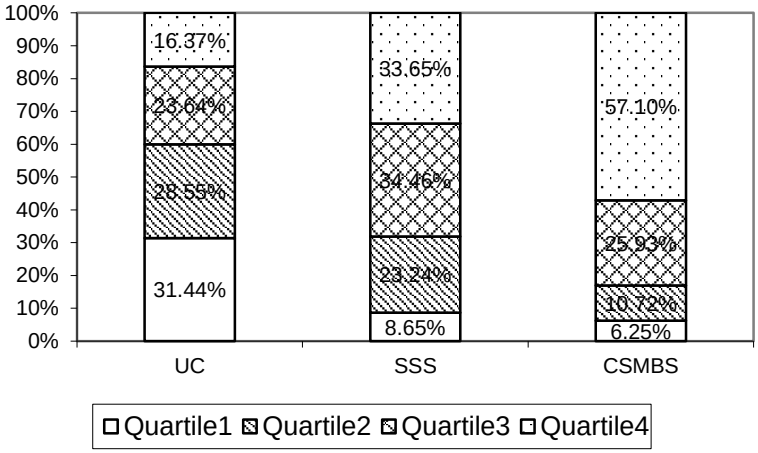
Table 2 Capitation rate for Gold Card plan: Baht per capita from 2002 to 2005

	2002	**2003**	**2004**	**2005**
Outpatient	574	574	488	533
Inpatient	303	303	418	435
Prevention and health promotion	175	175	206	210
Accident and Emergency	25	25	20	25
High cost services	32	32	66	99
Pre-hospital care	-	10	10	10
Capital replacement	93	83	85	77
Adjusted for remote areas	-	-	10	7
No fault liability payment	-	-	5	0

Capitation Baht	1,202	1,202	1,309	1,396

Source: Tangcharoensathien, Prakongsai, Limwattananon, Patcharanarumoi and Jongudomsuk (2007)

Figure 1 Scheme beneficiaries by household income quartiles, 2006



Source: NSO Health and Welfare Survey 2006

4. Theoretical, Empirical Strategy and Data

4.1. Theoretical Model

It is assumed that an individual will seek treatment from healthcare providers when he or she experiences the need for medical service by virtue of being ill or pregnant. It is assumed that an individual will choose the healthcare providers that yield him or her maximum expected utility. Based on Mwabu et al. (1995), the direct utility derived by individual *i* from the choices of treatment by healthcare providers *j*, conditional upon seeking treatment, is expressed as equation (1)

$$U_{ij} = U_{ij}(h_{ij}, c_{ij}) \quad (1)$$

where U_{ij} is the direct conditional utility which an individual *i* expects from visiting healthcare provider *j*. h_{ij} is the expected health status improvement for individual *i* after receiving treatment from healthcare provider *j*. c_{ij} is the consumption of other goods unrelated to healthcare affected by the choice of healthcare *j* and the related monetary (cash price) and non-monetary (time price) costs of treatment by healthcare provider *j*.

The expected improvement in health status h_{ij} is a function of the choice of healthcare provider (Y_j) and conditional upon household and individual characteristics (X_i). The presentation of this general form is shown by equation (2). The healthcare choices are different in terms of price, quality, and time needed to access, that may heterogeneously vary for each individual.[1] Therefore, an individual will maximize the utility from the choice of healthcare and its consumption, subject to budget constraint (3). Note that the choice of healthcare is the discrete-choice variable, therefore the matrix form between price and choice is an appropriate way to structure the model.

$$U_{ij} = U_{ij}(h_{ij}(Y_{ij}), c_{ij} \mid X_{ij}) \quad (2)$$

$$PY + c = M \quad (3)$$

[1] If we assert the healthcare choice as a function of price, the empirical strategy should consider the price as an endogenous variable. The variation of price may come from the direct price of healthcare, government subsidy, insurance coverage, opportunity cost from waiting time and transportation cost.

Equation (3) represents the budget constraint where M is household income, c is consumption, Y is a vector of healthcare service by a specific provider, and P is a vector of healthcare service price. For simplicity, the price of consumption is normalized to one.

This study attempts to explain the choice of healthcare. The modified reduced form of a system demand equation of healthcare choice is from Akin et al. (1986)[2] with the incorporation of health insurance as shown in equation (4). The optimal choice is a function of exogenous price of healthcare and income conditional upon the individual and household characteristics. The following section describes the empirical strategy.

$$Y_{ij} = Y_{ij}(p_{ij}, M_i; X_i) \qquad (4)$$

4.2. Empirical Strategy

I use the multinomial logit model to estimate healthcare provider choices for outpatient and inpatient services. The choice of healthcare providers includes different levels of public and private providers. When an individual is sick, he or she faces J healthcare options. The individual must decide which provider to obtain healthcare services from which

[2] A system of demand equations by Akin et al. (1986) is $Q_{ij} = f_{ij}(p_{pu_j}, p_{pr_j}, p_{tr_j}, t_{pu_j}, t_{pr_j}, t_{tr_j}, Y_j, Z_j)$, where Q_{ij} is whether medical service i is used by individual j, p is a vector of facility level cash prices (visit price, drug cost, and transportation cost) associated with each service, t is a vector of facility level time costs (waiting time and transportation time) associated with each services, Y_j is household income for the individual j. Z_j is a vector of control variables for individual j. Medical service i includes public modern, private modern, traditional and no care.

facility in order to maximize his or her utility in equation (5). The derivation on a multinomial logit is referred from Greene (2003).

Assuming that the individual i^{th} is sick, he or she is faced with *J* choices. Suppose that his or her utility choice *j* is shown by (5)

$$U_{ij} = x_i' \beta_j + \varepsilon_{ij} \qquad (5)$$

where x_i represents the individual, household and demographic characteristics and the disturbance term ε_{ij}.

If an individual chooses choice *j*, indicating that U_{ij} will provide the maximum utility among the *J* utilities, then the statistical model is shown by the probability choice *j* is chosen is illustrate by equation (6).

$$prob(U_{ij} > U_{ik}) \quad \forall j \neq k \qquad (6)$$

The model operates under the assumption of a distribution of disturbance. McFadden (1973) has shown that *J* disturbance has a type I extreme value (Gumbel) distribution if and only if the *J* disturbance are independent and identically distributed as shown in (7)

$$F(\varepsilon_{ij}) = \exp(-e^{-\varepsilon_{ij}}) \qquad (7)$$

A multinomial logit model estimates a set of probability for the J choice for a decision maker with characteristics x_i. I normalized $\beta_0 = 0$ (base outcome). The probability must sum up to one, so we only need $J-1$ parameter to determine the J probability. The probability of choosing *j* under a multinomial

logit is shown by equation (8). The probability of choosing *j* when *j* is zero is illustrated by equation (9).

$$prob(Y_i = j \mid x_i) = \frac{e^{\beta_j' x_i}}{1 + \sum_{k=1}^{j} e^{\beta_k' x_i}} \quad for \quad j = 0, 2, ...J, \beta_0 = 0 \quad (8)$$

$$prob(Y_i = 0 \mid x_i) = \frac{1}{1 + \sum_{k=1}^{j} e^{\beta_k' x_i}} \quad (9)$$

Equation (10) shows that the J log-odds ratio can be computed. When k is zero, then J log-odd ratios is shown by equation (11).

$$\ln\left[\frac{P_{ij}}{P_{ik}}\right] = x_i'(\beta_j - \beta_k) \quad (10)$$

$$\ln\left[\frac{P_{ij}}{P_{ik}}\right] = x_i'\beta_j \quad (11)$$

According to the independence of disturbances in equation (5), it assumed that the odds ratio P_j / P_k does not depend on other choices. However, it is not a practical assumption from a behavior perspective.

To estimate a multinomial logit model, Newton's numerical algorithm method is used to solve the log-likelihood function. Equation (12) shows the derivation on the log-likelihood for each individual *i*. If alternative *j* is chosen, $d_{ij} = 1$ otherwise $d_{ij} = 0$, for $J - 1$ possible outcomes. The derivatives of equation (12) have the characteristic form as presented in equation (13).

$$\ln L = \sum_{i=1}^{n} \sum_{j=0}^{J} d_{ij} \ln prob(Y_i = j) \quad (12)$$

$$\frac{\partial \ln L}{\partial \beta_j} = \sum_{i} (d_{ij} - P_{ij}) x_i \quad (13)$$

The marginal effects of the characteristics on the probabilities are shown in equation (14).

$$\delta_j = \frac{\partial P_j}{\partial x_i} = P_j \left[\beta_j - \sum_{k=0}^{J} P_k \beta_k \right] = P_j \left[\beta_j - \bar{\beta} \right] \quad (14)$$

Therefore, every sub-vector of β enters every marginal effect, through the probabilities and the weighted average that shows in δ_j. The estimation of the marginal effect parameters are used to answer the empirical objective of this study. The following section describes data.

4.3. Data

The data in the empirical analysis is based on Health and Welfare Survey (HWS) 2006. This survey was conducted by the National Statistical Office in Thailand during the period January to July 2006. The sample was geographically stratified to ensure representation at provincial levels. The full sample consists of 74,057 individuals from 22,517 households. The survey contains information on demographic characteristics, economic status, and health information. Due to the construction of survey questionnaires, healthcare expenditure is only available on individuals who reported having been sick for outpatient service four weeks prior to the interview and individual who reported for inpatient service 12 months prior to the interview. The analysis consists of two parts, which are

outpatient and inpatient services. The outpatient services refer to the 11,690 sub-sample of individuals that reported having been sick in the four weeks prior to the interview.[3] The inpatient services refer to the 4,762 sub-sample of individuals that reported receiving inpatient care within the 12 months prior to the interview.[4]

Approximately 17% of respondents self-reported report being sick for outpatient services within four weeks prior to the interview. In Figure 2, Panel A shows the percentage breakdown of the respondents according to demographics such as monthly household income group, gender, and living area, while Panel B shows types of morbidity. Unlike existing literature which suggest that higher income groups are more likely to self-report, in Panel A of Figure 2 suggests no significant income differences in self-reported information in this sample. However, women and individuals who live in the municipal area are more likely to report being sick. In addition, Panel B of Figure 2 reports types of morbidity. Diseases of the respiratory system show the highest percentage of morbidity as presented in Panel B of Figure 2.

Approximately 6% of respondents self-reported receiving inpatient care services in 12 months prior to the interview. In Figure 3, Panel A shows the percentage breakdown of the respondents according to demographics such as monthly household income group, gender, living area, while Panel B shows types of morbidity. There are no significant income, gender and living area differences in self-reported information.

[3] Individuals who have negative monthly household income are not included in the sub-sample. In addition, individuals who report seeking care at home, traditional medicines and others are not included in the sub-sample.

[4] Individuals who have negative monthly household income are not included in the sub-sample. Individuals who did not report specific type of hospitals are also not included.

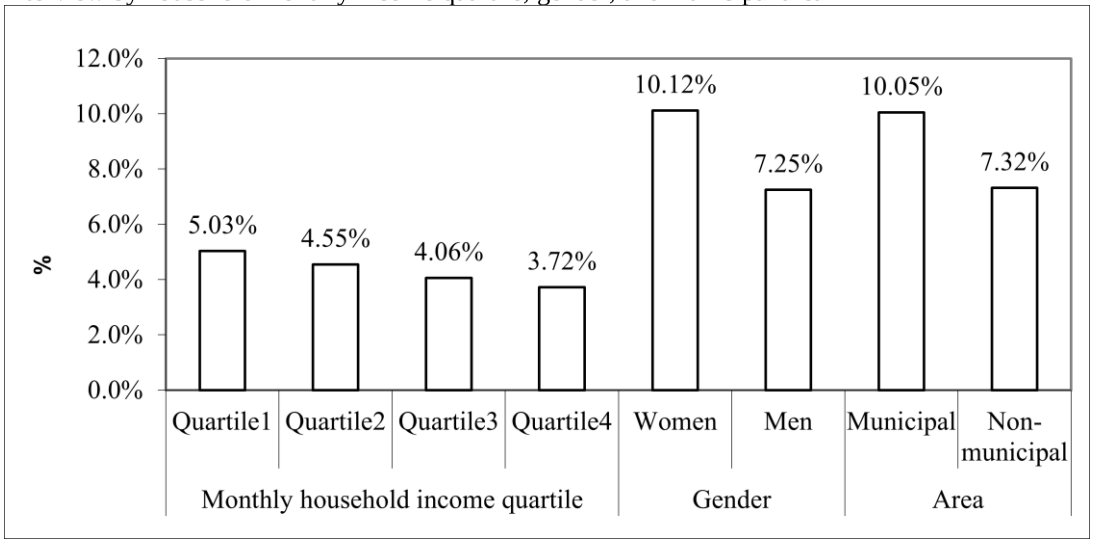
Conditions related to childbirth, diseases of digestive system, and diseases of the respiratory system constitute a higher percentage of morbidity as shown in Panel B of Figure 3.

The utilization of outpatient and inpatient services likely depends on determinant factors such as income, education and health insurance. Several proxy variables have been used to represent income variable including annual household income (Schwartz et al., 1988), household consumption expenditure (Chernichovsky & Meesook, 1986), per capita household consumption (Lindelow, 2005), household monthly income (Heller, 1982; Ching, 1995; Anyanwu, 2007; Amaghionyeodiwe, 2008), and per capita household income (Akin et al., 1995; Anyanwu, 2007). This empirical study uses household monthly income in the estimation.

The analysis focuses on three types of explanatory variables: individual, household, and hospitals in each province. Among the individual level variables, I use a monthly household income. A monthly household income is a summation of average monthly income, income in kind from rental estimated of free occupied house, unpaid goods and services, unpaid food and beverages, and all other average monthly receipts. I control for individual age, squared of age, head of household education, types of morbidity and types of health insurance. Head of household education is generated as a dummy variable and classified into four groups: (i) head of household with primary schooling, (ii) head of household with lower secondary schooling, (iii) head of household with upper secondary schooling, and (iv) head of household with college level.

Figure 2 Percentage of respondents self-reported being sick in four weeks prior to the interview

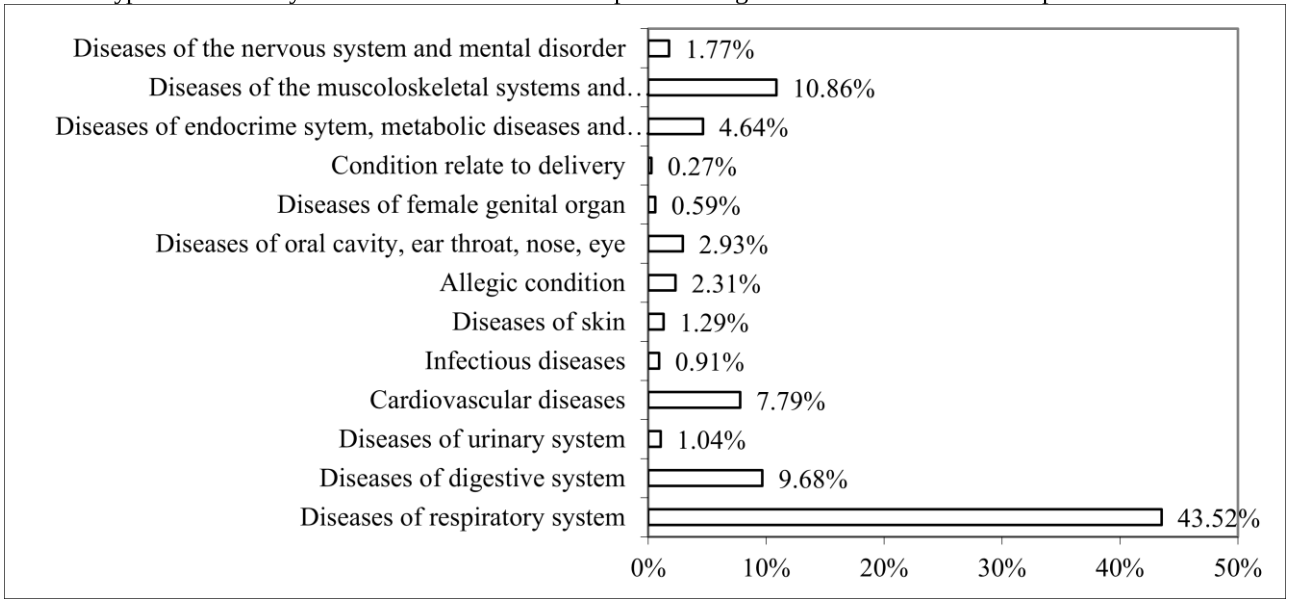
Panel A Percentage of respondents who self-reported being sick within the four weeks prior to the interview by household monthly income quartile, gender, and municipal area



Note: The value on the graph is based on the percentage of respondents who self-reported being sick within four weeks prior to the interview on the full sample. The value of household income in the 1st quartile is 7,277 Baht, 2nd quartile is 13,033 Baht, and 3rd quartile is 24,233 Baht.

Figure 2 Percentage of respondents self-reported being sick in four weeks prior to the interview

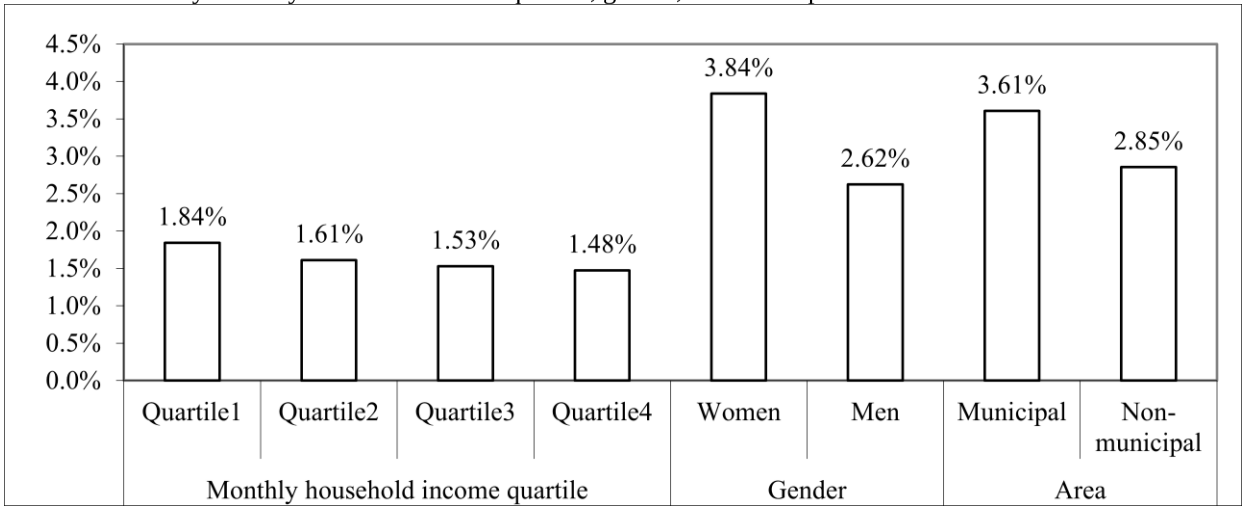
Panel B Types of morbidity from individuals who self-reported being sick within the four weeks prior to the interview



Source: NSO Health and Welfare Survey (2006)

Figure 3 Percentage of respondents self-reported receiving inpatient care service within the 12 months prior to the interview

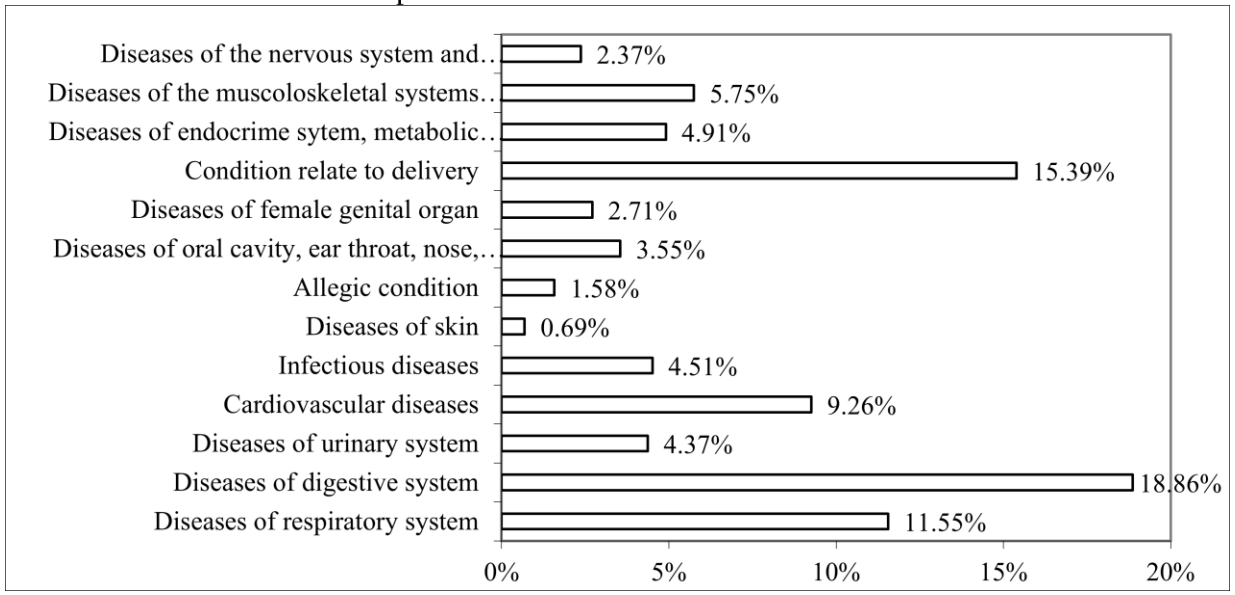
Panel A Percentage of respondents who self-reported receiving inpatient care services within the 12 months prior to the interview by monthly household income quartile, gender, and municipal area



The value on the graph is based on the percentage of respondents who self-reported receiving inpatient care services within the 12 months prior to the interview on the full sample. The value of household income in the 1st quartile is 7,277 Baht, 2nd quartile is 13,033 Baht, and 3rd quartile is 24,233 Baht.

Figure 3 Percentage of respondents self-reported receiving inpatient care service within the 12 months prior to the interview

Panel B Types of morbidity from individuals who self-reported receiving inpatient care services within the 12 months prior to the interview



Source: NSO Health and Welfare Survey (2006)

Types of morbidity is the symptom self-reported by the patient, which is generated as dummy variable and classified into 12 groups: (i) diseases of the respiratory system, (ii) diseases of the digestive system, (iii) diseases of the urinary system, (iv) cardiovascular diseases, (v) infectious diseases, (vi) diseases of the skin, (vii) allergic conditions, (viii) diseases of the oral cavity, ear, throat, nose, eye, (ix) diseases of female genital organs, (x) conditions related to childbirth, (xi) diseases of the endocrine system, metabolic diseases and nutritional system, and (xii) diseases of the musculoskeletal system and connective tissue. I control for types of morbidity because different symptoms may lead to different decisions on choice of healthcare providers.

Types of health insurance is also generated as dummy variable and classified into four groups: (i) Universal Coverage or Gold Card beneficiary Type I, (ii) Universal Coverage or Gold Card beneficiary Type II, (iii) Other public health insurance beneficiary such as CSMBS and SSS, and (iv) Private health insurance beneficiary. Household demographic variables include family size and living area. Living area consists of region and municipal area. Municipal area indicates urban area in Thailand. I also include information of hospitals in each province including the number of doctors, number of public, and private hospitals in each region.

Table 3 presents the description of explanatory variables and choices of outpatient and inpatient services. Table 4 presents descriptive statistics of explanatory variables and choices of outpatient services as dependent variables. Table 5 presents descriptive statistics of explanatory variables and choices of inpatient services as dependent variables.

Table 3 List of detailed description of dependent and independent variables

Variables	Description
Dependent variables (Choice of health care) Multinomial outcome	
Public health centers	Visit public health centers within village
District hospital	Visit district hospitals or community hospitals
Provincial hospitals, University hospitals and other public hospitals	Visit provincial hospitals, university hospital, or other government hospitals
Clinics	Visit clinics- Clinics are small private owned health centers that are spread throughout all regions. Majority of the clinics are owned by doctors.
Private hospital	Visit private hospitals
Drugs	Taking drugs without doctor consultation
Independent variables	
North$^{\Psi}$	Living in the north region
Northeast$^{\Psi}$	Living in the northeast region
South$^{\Psi}$	Living in the south region
Bangkok$^{\Psi}$	Living in Bangkok
Municipal area$^{\Psi}$	Living in the municipal area
Male$^{\Psi}$	Gender of individual observation (Male=1, otherwise=0)

Continued on the next page

Table 3 (continued)

Variables	Description
Independent variables	
Widowed, Divorced, and Separated$^{\Psi}$	Marital status including widowed, divorced, and separated (Individual who reports with widowed, divorced or separated =1, otherwise =0)
Married$^{\Psi}$	Marital status (married =1 , otherwise=0)
Family size	Number of family members in the household included servant
Age	Age (years)
Age-squared	Age squared (years)
Primary education level$^{\Psi}$	Head of household with primary schooling (between grade one to grade six)
Lower secondary education level$^{\Psi}$	Head of household with lower secondary schooling (between grade seven to grade nine)
Upper secondary education level$^{\Psi}$	Head of household with upper secondary schooling (between grade ten to grade twelve)
College level$^{\Psi}$	Head of household with college level
Income	Monthly household income (Baht) (Summation of all average money income per month, income in kind from rental estimated of free occupied house (include own house), unpaid of goods and services, unpaid food and beverage, and sum of average all other money receipt per month)

Continued on the next page

Table 3 (continued)

Variables	Description
Independent variables	
Gold Card plan Type I$^{\Psi}$	Gold Card health insurance type I status, refers to Gold Card beneficiaries including elders, children under the age of 12, monks, and a person who is disabled. They are exempted from a co-payment of 30 Baht per visit at eligible public health care provider.
Gold Card plan Type II$^{\Psi}$	Gold Card health insurance type II status refers to the rest of the population who registered. They are required a co-payment of 30 Baht per visit at eligible public health care provider.
Other public scheme$^{\Psi}$	Other public health insurance status including CSMBS and SSS
Private health insurance$^{\Psi}$	Private health insurance status
Diseases of the respiratory system$^{\Psi}$	Dummy variable for individual who reports with diseases in respiratory system (bronchial asthma, bronchitis, coughing, cold, tonsillitis, chest pain, esophagus cancer, lung cancer, pneumonia, pulmonary TB)
Diseases of the digestive system$^{\Psi}$	Dummy variable for individual who reports with diseases in digestive system (diarrhea, constipation, food poisoning, gastritis, hepatitis, inflammatory bowel disease, appendicitis and others)
Diseases of the urinary system$^{\Psi}$	Dummy variable for individual who reports with diseases in urinary system (kidney disease, cystitis, kidney cancer and others)

Continued on the next page

Table 3 (continued)

Variables	Description
Independent variables	
Cardiovascular diseases$^{\Psi}$	Dummy variable for individual who reports with cardiovascular diseases (hypertension, coronary heart disease, and others)
Infectious diseases$^{\Psi}$	Dummy variable for individual who reports with infectious diseases (malaria, hemorrhagic fever, measles, chicken pox, diphtheria, whooping cough, herpes simplex, rabies, aids, typhoid, TB, meningitis unspecified, herpes simplex, and others)
Diseases of the skin$^{\Psi}$	Dummy variable for individual who reports with skin diseases (skin disease, athlete's foot, and others)
Allergic conditions$^{\Psi}$	Dummy variable for individual who reports with allergic condition (sinusitis, food allergic, and others)
Diseases of the oral cavity, ear, throat, nose, eye$^{\Psi}$	Dummy variable for individual who reports with diseases of oral cavity, ear, throat, nose, eye (gingivitis, ear infection, glaucoma, eye infection, hemorrhagic conjunctivitis, and others)
Diseases of female genital organs$^{\Psi}$	Dummy variable for individual who reports with diseases of female genital organ
Condition relate to childbirth$^{\Psi}$	Dummy variables for individual who reports with condition relate to child delivery and prenatal care

Continued on the next page

Table 3 (continued)

Variables	Description
Independent variables	
Diseases of the endocrine system, metabolic diseases and nutritional system$^{\Psi}$	Dummy variable for individual who reports with diseases of endocrine system, metabolic diseases and nutritional system (diabetes, goiter, anemia, malnutrition disease and others)
Diseases of the musculoskeletal system and connective tissue$^{\Psi}$	Dummy variable for individual who reports with diseases of musculoskeletal system and connective tissue (backache, arthritis, gout, aching, and others)
Number of public hospitals	Number of public hospitals in each province in year 2002
Number of private hospitals	Number of private hospitals in each province in year 2002
Total number of hospitals	Total number of public and private hospitals in each province in year 2002
Number of doctors	Number of doctors in each province in year 2002

Note $^{\Psi}$ indicates the binary variable (dummy variable).

Table 4 List of descriptive statistics of dependent and independent variables for outpatient services

Variables	Mean (Standard Deviation)						
	Drugs	Public health centers	District hospitals	Provincial hospitals, University hospitals and other public hospitals	Clinics	Private hospitals	Total
Independent variables							
North[ψ]	0.3402	0.3853	0.2632	0.2304	0.3013	0.1447	0.2988
	(0.4739)	(0.4868)	(0.4404)	(0.4212)	(0.4589)	(0.3522)	(0.4578)
Northeast[ψ]	0.2086	0.2649	0.3864	0.2397	0.2575	0.1596	0.2634
	(0.4064)	(0.4415)	(0.4870)	(0.4270)	(0.4373)	(0.3666)	(0.4405)
South[ψ]	0.1161	0.1162	0.1255	0.1719	0.1571	0.1255	0.1358
	(0.3203)	(0.3205)	(0.3314)	(0.3774)	(0.3639)	(0.3317)	(0.3425)
Bangkok[ψ]	0.0515	0.0056	0.0009	0.0492	0.0342	0.2213	0.0386
	(0.2211)	(0.0744)	(0.0299)	(0.2163)	(0.1817)	(0.4155)	(0.1926)
Municipal area[ψ]	0.6038	0.2858	0.5452	0.7111	0.6200	0.7681	0.5788
	(0.4892)	(0.4519)	(0.4981)	(0.4534)	(0.4855)	(0.4225)	(0.4938)
Male[ψ]	0.4477	0.4339	0.4031	0.4240	0.3871	0.4553	0.4200
	(0.4973)	(0.4958)	(0.4906)	(0.4943)	(0.4872)	(0.4985)	(0.4936)
Widowed, Divorced, and Separated[ψ]	0.1412	0.1481	0.1907	0.1986	0.1399	0.1191	0.1582
	(0.3483)	(0.3553)	(0.3929)	(0.3991)	(0.3470)	(0.3243)	(0.3649)
Married[ψ]	0.5606	0.4075	0.5214	0.4988	0.4252	0.4596	0.4892
	(0.4964)	(0.4915)	(0.4997)	(0.5002)	(0.4945)	(0.4989)	(0.4999)
Family size	3.4270	3.8630	3.7328	3.7029	3.8152	3.6766	3.6799
	(1.6149)	(1.7258)	(1.7149)	(1.8116)	(1.6892)	(1.7418)	(1.7060)
Age	40.0095	35.1620	43.1592	44.0722	34.4836	34.8021	39.0336
	(20.6255)	(26.8396)	(24.6451)	(24.4172)	(25.3942)	(22.9289)	(24.3059)

Continued on the next page

Table 4 (continued)

Variables	Mean (Standard Deviation)						
	Drugs	Public health centers	District hospitals	Provincial hospitals, University hospitals and other public hospitals	Clinics	Private hospitals	Total
Age-squared	2,026.0380 (1,713.3590)	1,956.2290 (2,082.6790)	2,469.8300 (2,029.9780)	2,538.1880 (2,047.7970)	1,833.7570 (1,917.9780)	1,735.8060 (1,836.5440)	2114.348 (1944.03)
Primary education level◢	0.6022 (0.4895)	0.7503 (0.4329)	0.7193 (0.4494)	0.5554 (0.4971)	0.5919 (0.4916)	0.4213 (0.4943)	0.6265 (0.4837)
Lower secondary education level◢	0.1094 (0.3122)	0.0647 (0.2460)	0.0670 (0.2501)	0.1034 (0.3045)	0.0915 (0.2884)	0.1085 (0.3114)	0.0907 (0.2872)
Upper secondary education level◢	0.1030 (0.3040)	0.0501 (0.2182)	0.0684 (0.2524)	0.0971 (0.2962)	0.1204 (0.3255)	0.1234 (0.3293)	0.0941 (0.2919)
College level◢	0.0881 (0.2835)	0.0202 (0.1406)	0.0495 (0.2169)	0.1582 (0.3650)	0.1108 (0.3139)	0.2298 (0.4211)	0.0932 (0.2907)
Income	16,843.2200 (17,268.4800)	11,163.1300 (15,162.7700)	13,638.1600 (16,451.1700)	21,544.7200 (24,407.4600)	21,906.4900 (39,879.3200)	38,594.0600 (81,375.3700)	18,271.6500 (30,354.9100)
Gold Card plan Type I◢	0.2843 (0.4511)	0.6127 (0.4873)	0.4606 (0.4986)	0.3157 (0.4649)	0.3568 (0.4792)	0.2085 (0.4067)	0.3394 (0.4735)
Gold Card plan Type II◢	0.4534 (0.4979)	0.3053 (0.4607)	0.3621 (0.4807)	0.2702 (0.4442)	0.3501 (0.4771)	0.2745 (0.4467)	0.3667 (0.4819)
Other public scheme◢	0.2153 (0.4111)	0.0716 (0.2579)	0.1691 (0.3749)	0.3991 (0.4899)	0.2411 (0.4278)	0.42766 (0.4953)	0.2705 (0.4443)
Private health insurance◢	0.0312 (0.1738)	0.0104 (0.1016)	0.0108 (0.1034)	0.0143 (0.1188)	0.0381 (0.1915)	0.1255 (0.3317)	0.0466 (0.2108)

Continued on the next page

Table 4 (continued)

Variables	Mean (Standard Deviation)						
	Drugs	Public health centers	District hospitals	Provincial hospitals, University hospitals and other public hospitals	Clinics	Private hospitals	Total
Diseases of the digestive system$^{\psi}$	0.0763 (0.2655)	0.0953 (0.2937)	0.1206 (0.3257)	0.1009 (0.3013)	0.0894 (0.2854)	0.1574 (0.3646)	0.0968 (0.2957)
Diseases of the urinary system$^{\psi}$	0.0013 (0.0356)	0.0042 (0.0645)	0.0179 (0.1329)	0.0280 (0.1651)	0.0061 (0.0776)	0.02128 (0.1445)	0.0104 (0.1016)
Cardiovascular diseases$^{\psi}$	0.01304 (0.1134)	0.0737 (0.2614)	0.1354 (0.3422)	0.1582 (0.3650)	0.0605 (0.2385)	0.0829 (0.2761)	0.0779 (0.2681)
Infectious diseases$^{\psi}$	0.0016 (0.0398)	0.0090 (0.0947)	0.0175 (0.1313)	0.01301 (0.1136)	0.0089 (0.0939)	0.0064 (0.0797)	0.0091 (0.0948)
Diseases of the skin$^{\psi}$	0.0095 (0.0972)	0.0125 (0.1112)	0.0144 (0.1191)	0.0131 (0.1136)	0.01531 (0.1228)	0.01489 (0.1213)	0.0129 (0.1129)
Allergic conditions$^{\psi}$	0.0184 (0.1346)	0.0083 (0.0910)	0.0144 (0.1191)	0.0274 (0.1633)	0.03597 (0.1862)	0.0489 (0.2159)	0.0231 (0.1502)
Diseases of the oral cavity, ear, throat, nose, eye$^{\psi}$	0.0229 (0.1496)	0.0174 (0.1307)	0.0351 (0.1840)	0.0455 (0.2084)	0.0281 (0.1654)	0.0340 (0.1815)	0.0293 (0.1688)
Diseases of female genital organs$^{\psi}$	0.0028 (0.0534)	0.0049 (0.0696)	0.0036 (0.0599)	0.0199 (0.1398)	0.0043 (0.0652)	0.0021 (0.0461)	0.0059 (0.0766)
Condition relate to childbirth$^{\psi}$	0.0003 (0.0178)	0.0021 (0.0456)	0.0045 (0.0669)	0.0025 (0.0499)	0.0032 (0.0565)	0.0085 (0.09196)	0.0027 (0.0514)

Continued on the next page

Table 4 (continued)

Variables	Mean (Standard Deviation)						
	Drugs	**Public health centers**	**District hospitals**	**Provincial hospitals, University hospitals and other public hospitals**	**Clinics**	**Private hospitals**	**Total**
Diseases of the endocrine system, metabolic diseases and nutritional system$^{\Psi}$	0.0060 (0.0775)	0.0257 (0.1584)	0.1107 (0.3138)	0.0890 (0.2849)	0.0274 (0.1633)	0.0447 (0.2068)	0.0465 (0.2105)
Diseases of the musculoskeletal system and connective tissue$^{\Psi}$	0.1183 (0.3229)	0.0959 (0.2946)	0.1044 (0.3058)	0.1096 (0.3125)	0.1115 (0.3148)	0.0809 (0.2729)	0.1086 (0.3111)
Number of public hospitals	14.1924 (8.4908)	13.3867 (6.8175)	13.9253 (6.4372)	14.0785 (8.5182)	13.62649 (7.79089)	19.4702 (13.1083)	14.1031 (8.1055)
Number of private hospitals	7.4391 (18.9982)	3.3776 (7.0392)	2.8426 (3.8912)	7.2484 (18.5708)	5.6588 (15.7212)	23.6766 (34.5073)	6.2644 (16.6303)
Total number of hospitals	21.8626 (26.0618)	17.0647 (11.8110)	16.9546 (8.7983)	21.3892 (25.5436)	19.5751 (21.8347)	43.1787 (46.4961)	20.5816 (23.0370)
Number of doctors	456.1949 (1,314.6400)	188.9624 (463.9377)	150.7058 (225.0355)	441.0841 (1,285.3930)	343.3636 (1,083.8790)	1,511.2150 (2,434.2060)	378.4685 (1,147.1730)
Number of observation	3,145	1,438	2,223	1,606	2,808	470	11,690

$^{\Psi}$ is dummy variable

Table 5 List of descriptive statistics of dependent and independent variables for inpatient services

	Mean (Standard Deviation)			
Variables	**District hospitals**	**Provincial hospitals, University hospitals and other public hospitals**	**Private hospitals**	**Total**
Independent variables				
North[ψ]	0.2865 (0.4523)	0.2674 (0.4427)	0.2387 (0.4266)	0.2705 (0.4443)
Northeast[ψ]	0.3344 (0.4719)	0.2403 (0.4273)	0.1889 (0.3917)	0.2684 (0.4432)
South[ψ]	0.1299 (0.3363)	0.1479 (0.3551)	0.1201 (0.3253)	0.1371 (0.3440)
Bangkok[ψ]	0.0011 (0.0334)	0.0306 (0.1724)	0.1215 (0.3269)	0.0325 (0.1775)
Municipal area[ψ]	0.4437 (0.4969)	0.6127 (0.4872)	0.4275 (0.4951)	0.5577 (0.4967)
Male[ψ]	0.4075 (0.4915)	0.3982 (0.4896)	0.4275 (0.4951)	0.4059 (0.4911)
Widowed, Divorced, and Separated[ψ]	0.1678 (0.3738)	0.1716 (0.3771)	0.1420 (0.3493)	0.1659 (0.3720)
Married[ψ]	0.5674 (0.4956)	0.5996 (0.4901)	0.5476 (0.4981)	0.5800 (0.4936)
Family size	3.9326 1.6814	3.9427 (1.8028)	3.8082 (1.7438)	3.9196 (1.7497)
Age	40.9286 (24.3168)	42.4389 (22.7008)	40.0337 (23.2199)	41.5249 (23.4092)
Age-squared	2,266.1290 (2,102.0140)	2,316.1660 (2,010.7320)	2,141.0700 (1,984.8420)	2,272.2020 (2042.3800)
Primary education level[ψ]	0.7179 (0.4501)	0.6004 (0.4899)	0.5081 (0.5003)	0.6315 (0.4825)
Lower secondary education level[ψ]	0.0803 (0.2718)	0.1077 (0.3100)	0.1229 (0.3287)	0.0995 (0.2994)
Upper secondary education level[ψ]	0.0629 (0.2430)	0.0945 (0.2926)	0.1157 (0.3201)	0.0857 (0.2799)
College level[ψ]	0.0279 (0.1646)	0.1037 (0.3049)	0.1362 (0.3432)	0.0798 (0.2710)
Income	12,728.6000 (12,896.1700)	20,024.6800 (38,260.8600)	35,776.5500 (74,981.3700)	19,535.2600 (40,319.8200)
Gold Card plan Type I[ψ]	0.4303 (0.4953)	0.2998 (0.4583)	0.2328 (0.4229)	0.3394 (0.4735)
Gold Card plan Type II[ψ]	0.3963 (0.4893)	0.3527 (0.4779)	0.3353 (0.4724)	0.3667 (0.4819)

Continued on the next page

Table 5 (continued)

Variables	Mean (Standard Deviation)			
	District hospitals	**Provincial hospitals, University hospitals and other public hospitals**	**Private hospitals**	**Total**
Diseases of the respiratory system$^{\Psi}$	0.1460 (0.3532)	0.0867 (0.2814)	0.1318 (0.3385)	0.1155 (0.3197)
Diseases of the digestive system$^{\Psi}$	0.1962 (0.3972)	0.1654 (0.3716)	0.2459 (0.4309)	0.1886 (0.3912)
Diseases of the urinary system$^{\Psi}$	0.0390 (0.1937)	0.0473 (0.2123)	0.0439 (0.2051)	0.0437 (0.2044)
Cardiovascular diseases$^{\Psi}$	0.0953 (0.2937)	0.0932 (0.2908)	0.0835 (0.2768)	0.0926 (0.2899)
Infectious diseases$^{\Psi}$	0.0557 (0.2295)	0.0346 (0.1827)	0.0527 (0.2236)	0.0451 (0.2077)
Diseases of the skin$^{\Psi}$	0.0061 (0.0781)	0.0061 (0.0781)	0.0117 (0.1077)	0.0069 (0.0829)
Allergic conditions$^{\Psi}$	0.0173 (0.1303)	0.0127 (0.1119)	0.0219 (0.1467)	0.0157 (0.1245)
Diseases of the oral cavity, ear, throat, nose, eye$^{\Psi}$	0.0178 (0.1324)	0.0521 (0.2222)	0.0264 (0.1603)	0.0355 (0.1850)
Diseases of female genital organs$^{\Psi}$	0.0151 (0.1218)	0.0354 (0.1849)	0.0307 (0.1728)	0.0271 (0.1624)
Condition relate to childbirth$^{\Psi}$	0.1460 (0.3532)	0.1829 (0.3867)	0.0776 (0.2677)	0.1539 (0.3609)
Diseases of the endocrine system, metabolic diseases and nutritional system$^{\Psi}$	0.0563 (0.2306)	0.0455 (0.2085)	0.0425 (0.2018)	0.0491 (0.2162)
Diseases of the musculoskeletal system and connective tissue$^{\Psi}$	0.0468 (0.2113)	0.0661 (0.2485)	0.0571 (0.2322)	0.0575 (0.2329)
Number of public hospitals	13.6873 (6.7042)	13.2398 (7.7167)	16.96925 11.48762	13.9433 (8.1224)
Number of private hospitals	2.9721 (4.3146)	5.5719 (14.9498)	14.89898 27.48863	5.9303 (15.4068)
Total number of hospitals	16.8256 (9.4622)	18.9786 (21.0256)	31.92972 37.47274	20.0249 (21.7177)
Number of doctors	16.8255 (9.4622)	324.8280 (1,028.8250)	922.4217 1922.918	347.9372 (1059.3430)
Number of observations	1,794	2,285	683	4,762

$^{\Psi}$ is dummy variable

5. Empirical Results

Table 6 and Table 7 present the results from the estimation of the multinomial logit with two specifications. Specification (1) is that the results do not include health insurance variables. Specification (2) is that the results include health insurance variables as control variables. Table 6 provides estimates of the demand for outpatient services. Table 7 provides estimates of the demand for inpatient services. The full marginal effect estimation outcome results are presented in Appendix A (available in the online version). The coefficient for each variable indicates how a change in these variables affects the probability of choosing a particular type of healthcare provider. The following discussion will highlight the impact of these variables on the demand for healthcare.

5.1. Monthly household income

There is a significant difference on the elasticity between specifications (1) and (2). In specification (1) the demand for all type of healthcare except taking medicine without doctor consultant shows significant income elasticity. The results from specification (2) suggest that by adding health insurance variables as control variables, income elasticity reduces for all healthcare choices. Specification (1) is more likely to have omitted variables bias. The following paragraph is the analysis on income elasticity of demand for outpatient and inpatient services under specification (2).

The results suggest that the income elasticity of demand is negative at the district hospitals for both outpatient and inpatient services. The income elasticities are approximately -0.1259 and -0.1982 for outpatient and inpatient services, respectively, at the district hospitals. This suggests that district hospitals may be an inferior good. As monthly household income increases, there are lower percentages of propensity to

choose the district hospitals. On the other hand, the income elasticity of demand for other government hospitals and private healthcare providers, including clinics and private hospitals are positive, suggesting a normal good. The income elasticity for outpatient is 0.0994 at public provincial hospitals, university hospitals, and other public hospitals. The income elasticities for outpatient services are 0.1655 and 0.2055 at clinics and private hospitals respectively. The income elasticities for inpatient services are 0.2502 at private hospitals and 0.1037 at public provincial hospitals, university hospitals, and other government hospitals. As monthly household income increases, there are higher percentages of propensity to choose private healthcare providers for outpatient and inpatient services.

5.2. *Living in a municipal area*

A municipal area can be described as an urban area in Thailand. The result suggests that patients living in a municipal area are less likely to visit public health centers and public district hospitals for outpatient and inpatient services. They are more likely to visit public provincial hospitals, other government hospitals, or private hospitals. The higher propensity to select healthcare providers may due to the accessibility.

5.3. *Types of health insurance*

Specification (2) includes health insurance variables. There are four health insurance categories: Gold Card plan Type I, Gold Card plan Type II, other public health insurance, and private health insurance. Gold Card Type I and Gold Card Type II beneficiaries appear to have similar propensities in their choice of healthcare providers for outpatient and inpatient services. For outpatient services, Gold Card beneficiaries are

more likely to visit to public health centers and public district hospitals. For inpatient services, they are more likely to visit district hospitals. Beneficiaries with other public health insurance including CSMBS or SSS are more flexible in their choice of healthcare providers compared to Gold Card beneficiaries. They are more likely to visit provincial hospitals, other government hospitals and private hospitals for outpatient service. Beneficiaries with private health insurance are more likely to visit private hospitals for outpatient and inpatient services.

5.4. *Head of household schooling*

Head of household schooling is categorized into four groups: (i) head of household with primary schooling, (ii) head of household with lower secondary schooling, (iii) head of household with upper secondary schooling, and (iv) head of household with college level. Under specification (2), the findings suggest that heads of household with at least secondary education level are less likely to visit public health centers for outpatient services. Head of household with college level are more likely to visit provincial hospitals, university hospitals, and other public hospitals.

5.5. *Types of morbidity*

The most common disease for outpatient services is respiratory diseases. Under specification (2), the findings suggest that patients with respiratory system diseases are more likely take drugs without doctor consultation, visits public health centers, or private clinics for outpatient services. Patients with diseases of the urinary system have positive statistically significant on their propensity to visit public provincial hospitals, university hospitals, or other government hospitals. Patients with allergic conditions have positive

statistically significant on their propensity to visit private clinics.

For inpatient services, patients with respiratory system diseases are more likely to visit public district hospitals. Patients with diseases of the female genital organs or diseases of the oral cavity, ear, throat, nose or eyes are more likely to visit public provincial hospitals, university hospitals, and other government hospitals. Provincial hospitals, university hospitals or other public hospitals provide more extensive medical facility and staffs with specialized medical skills than public health centers and district hospitals.

Table 6 Demand for outpatient service

Outcome choice	Drugs		Public health centers		District hospitals		Provincial hospitals, University hospitals and other public hospitals		Clinics		Private hospitals	
Specification	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Income elasticity $\varepsilon = \frac{\partial y}{\partial x} \times \frac{x}{y}$	0.0405 (0.0343)	0.0191 (0.0337)	-0.3522*** (0.1139)	-0.2616** (0.1088)	-0.1643*** (0.0565)	-0.1259** (0.0531)	0.1428*** (0.0401)	0.0994** (0.0401)	0.2046*** (0.0348)	0.1655*** (0.0331)	0.2609*** (0.0414)	0.2055*** (0.0397)
The unit change in y associated with a proportionate change in x $\frac{\partial y}{\partial x} \times x$	0.0098 (0.0084)	0.0047 (0.0083)	-0.0572*** (0.0172)	-0.0418** (0.0165)	-0.0304*** (0.0103)	-0.0235** (0.0098)	0.0173*** (0.0049)	0.0116** (0.0047)	0.0546*** (0.0096)	0.0447** (0.0091)	0.0059*** (0.0011)	0.0043*** (0.0009)
Number of observation	11,690	11,690	11,690	11,690	11,690	11,690	11,690	11,690	11,690	11,690	11,690	11,690
Predicted probability	0.2422	0.2455	0.1625	0.1597	0.1847	0.1869	0.1211	0.1167	0.2670	0.2702	0.0225	0.0209
Mean of household income	16239.7	16239.7	16239.7	16239.7	16239.7	16239.7	16239.7	16239.7	16239.7	16239.7	16239.7	16239.7

Note the number in the parenthesis is a standard error.
*** Significant at 1% level ** Significant at 5% level * Significant at 10% level
Specification (1) excludes types of health insurance variables
Specification (2) includes types of health insurance variables

Table 7 Demand for inpatient service

Outcome choice	District hospitals		Provincial hospitals, University hospitals and other public hospitals		Private hospitals	
Specification	(1)	(2)	(1)	(2)	(1)	(2)
Income elasticity $\varepsilon = \frac{\partial y}{\partial x} \times \frac{x}{y}$	-0.2603*** (0.0627)	-0.1982*** (0.0567)	0.1204*** (0.0424)	0.1037*** (0.0396)	0.3756*** (0.0867)	0.2502*** (0.0807)
The unit change in y associated with a proportionate change in x $\frac{\partial y}{\partial x} \times x$	-0.1021*** (0.0233)	-0.0782*** (0.0217)	0.0596*** (0.0212)	0.0519*** (0.0199)	0.0425*** (0.0101)	0.0264*** (0.0087)
Number of observation	4,762	4,762	4,762	4,762	4,762	4,762
Predicted probability	0.3920	0.3947	0.4949	0.4999	0.1131	0.1054
Mean of income	17,518.30	17,518.30	17,518.30	17,518.30	17,518.30	17,518.30

Note the number in the parenthesis is a standard error.
*** Significant at 1% level ** Significant at 5% level * Significant at 10% level
Specification (1) excludes types of health insurance variables
Specification (2) includes types of health insurance variables

6. Conclusion and Policy Implications

This study estimates a demand model with multiple choices for healthcare services using HWS 2006 data from Thailand with information on the number of hospitals and doctors in each province. The alternatives for healthcare services include different levels of public and private healthcare providers. A multinomial logit demand function for outpatient and inpatient services is developed for individuals who demonstrate the need for medical services by virtue of being ill or pregnant. The outpatient service analysis refers to the 11,690 sub-sample of individuals who reported having been sick in the four weeks prior to the interview. The inpatient service analysis refers to the 4,762 sub-sample individuals who reported receiving inpatient care within the 12 months prior to the interview.

The empirical results show that the choice of outpatient and inpatient services can be explained by household socioeconomic characteristics and the availability of health insurance. Demand for healthcare services can be determined by household income. The evidence suggests that income elasticity of demand is different for public and private healthcare providers. The income elasticity of demand indicates that district hospitals are an inferior good for outpatient and inpatient services, while provincial hospitals, university hospitals, other government hospitals, clinics and private hospitals are a normal good. Changes in monthly household income have an impact on the demand for healthcare. District hospitals are generally categorized under the first level of secondary care and provide non-specialized care. As monthly household income increases, there are lower percentages of propensity to choose the district hospitals. The income elasticity coefficient suggests that the majority of patients at district hospitals are from the low income population.

The availability of health insurance in developing countries can prevent low income groups from falling into poverty moreover give the poor households' access to health care (Sidorenko & Butler, 2007). Many developing countries try to promote equity to the healthcare access by providing public health insurance. The introduction of Universal Coverage policy can reduce this barrier. Thailand is an example of a developing country that introduced the Universal Coverage policy known as the Gold Card plan in 2001. This plan aims to extend healthcare coverage to 18.5 million people who were previously uninsured (Towse, Mills, & Tangcharoensathien, 2004). Type of health insurance also influences the patient's choice of healthcare. Beneficiaries with private health insurance are more likely to visit either clinics or private hospitals for outpatient and inpatient services. CSMBS and SSI provide flexible healthcare provider choices to their beneficiaries. Beneficiaries with either CSMBS or SSS are more likely to visit provincial hospitals, other government hospitals or private healthcare providers for outpatient and inpatient services. Beneficiaries with Universal Coverage or Gold Card plan show a positive propensity to choose public health centers for outpatient services and district hospitals for inpatient services.

Analyzing income elasticity of demand for each healthcare option can help the policy maker to improve existing policies such as Universal Coverage or Gold Card plan. From the policy perspective, Universal Coverage or Gold Card plan should be designed for segments of population below a certain income level. The government can use funds that made available by the decreased number of Universal Coverage or Gold Card beneficiaries to raise the capitation rate or hire additional medical staff at district hospitals. With a higher capitation rate, the policy maker can either provide more flexible healthcare options which may reduce the referral process and transportation costs among

Universal Coverage beneficiaries. Another possible option is improving the prevention and promotional care program, which can encourage Universal Coverage beneficiaries to have more knowledge on how to prevent common diseases for their family. The government can increase spending on the supply side by hiring additional medical staff in district hospitals. This can reduce the waiting time and improve working conditions for medical staff in the hospital.

The limitation of this study is the price information in the HWS 2006 data. The only information related to medical price is the out-of-pocket healthcare expenses self-reported individuals who were sick or hospitalized. The out-of-pocket healthcare expenditure refers to the price with health insurance subsidization, so the estimation results may not capture the real price effect. Without healthcare prices from healthcare providers, we cannot use other estimation methods such as nested logit or mixed logit that require less restriction on flexible distribution of disturbance assumption.

Acknowledgements

The author thanks Professor Gerard Russo, Professor Sang-Hyop Lee, Professor Timothy Halliday, and Professor Sally Kwak for providing comments at University of Hawaii at Manoa. The author thanks the anonymous referees for useful comments and suggestions. The views expressed in this report, as well as any errors or omissions, are sole responsibility of the author.

References

Akin, J.S., Griffin, C.C., Guilkey, D.K., & Popkin, B.M. (1986). The demand for primary health care services in the Bicol region of the Philippines. *Economic Development and Cultural Change*, 755-781.

Akin, J.S., Guilkey, C.C., & Denton, E.H. (1995). Quality of services and demand for health care in Nigeria: a multinomial probit estimation. *Social Science and Medicine*, 40(11), 1527-1537.

Akin, J.S., Guilkey, C.C., Hutchinson, P.L., & McIntosh, M.T. (1998). Price elasticities of demand for curative health care with control for sample selectivity on endogenous illness: an analysis for Sri Lanka. *Economics of Health Care Systems*, 7, 509-531.

Alderman, H. & Gertler, P. (1989). The substitutability of public and private health care for the treatment of children in Pakistan. *LSMS Working paper Number 57.*

Amaghionyeodiwe, L.A. (2008). Determinants of the choice of health care provider in Nigeria. *Health Care Manage Sciences*, 11, 215-227.

Anyanwu, J.C. (2007). Demand for health care institutions' services: evidence from Malaria fever treatment in Nigeria. *Journal compilation*, 304-334.

Asfaw, A., Braun J., & Klasen S. (2004). How big is the crowding-out effect of user fees in the rural areas of Ethiopia? Implications for equity and resources mobilization. *World development*, 32(12), 2065-2081.

Bolduc, D., Lacroix, G., & Muller, C. (1996). The choice of medical providers in rural Benin: a comparison of discrete choice models. *Journal of Health Economics*, 15, 477-498.

Borah, B. (2006). A mixed logit model of health care provider choice: analysis of NSS data for rural India. *Health Economics*, 15(9), 915-932.

Celik, Y. & Hotchkiss D. (2000). The socio-economic determinants of maternal health care utilization in Turkey. *Social Science & Medicine*, 50, 1797-1806.

Chernichovsky, D. & Meesook, O.A. (1986). Utilization of health services in Indonesia. *Social Science and Medicine*, 23 (6), 611-620.

Ching, P. (1995). User fees, demand for children's health care and access across income groups: the Philippine case. *Social Science and Medicine*, 41(1), 37-46.

Gertler, P., Locay, L., & Sanderson, W. (1987). Are user fees regressive?: the welfare implication of health care financing proposals in Peru. *Journal of Econometrics*, 6, 291-304.

Gertler, P. & Van Der Gaag, J. (1990). The willingness to pay for medical care: evidence from two developing counties. *The John Hopkins University Press: Baltimore, MD.*

Green, W.H. (2003). *Econometric Analysis*. Prentice-Hall: Upper Saddle River, NJ.

Heller, P. (1982). A model of the demand for medical and health services in Peninsular Malaysia. *Social Science and Medicine*, 16, 267-284.

Health and Welfare Survey (2006). *The National Statistical Office Thailand*

Jacobs, B., & Price, N. (2004). The impact of the introduction of user fees at a district hospital in Cambodia. *Health Policy and Planning*, 19(5), 310-321.

Kermani, M., Ghaderi, H., & Yousefi, A. (2008). Demand for medical in the urban areas of Iran: an empirical investigation. *Health Economics*, 17, 849-862.

Levin, A., Rahman, M.A., Quayyum, Z., Routh, S., & Khuda, B. (2001). The demand for child curative care in two rural thanas of Bangladesh: effect of income and women's employment. *International Journal of Health Planning and Management*, 16, 179-194.

Lindelow, M. (2005). The utilization of curative healthcare in Mozambique: does income matter? *Journal of African Economies*, 14(3), 435-482.

McFadden, D. (1973). Conditional Logit analysis of qualitative choice behavior. *In Frontiers in Econometrics*, Zarembka P (ed.). Academic Press, NY.

Meuwissen, L.E. (2002). Problems of cost recovery implementation in district health care: A case study from Niger. *Health Policy and Planning*, 17(3), 304-313.

Mocan, H.N., Tekin, E., & Zax, J.S. (2004). The demand for medical care in urban China. *World Development*, 32(2), 289-304.

Mwabu, G., Ainsworth, M., & Nyamete, A. (1995). Quality of Medical Care and Choice of Medical Treatment in Kenya an empirical analysis. *Investment in women's human capital*. University of Chicago Press.

Mwabu, G., Wangombe, J., & Nganda, B. (2003). The demand for medical care in Kenya. *African Development Review*, 439-453.

Sidorenko, A. and Butler, J.R.G. 2007. Financing health insurance in Asia Pacific countries. *Asian-Pacific Economic Literature*. 21(1). pp. 34-54.

Suraratdecha, C., Saithanu, S. & Tangcharoensathien, V. (2005). Is universal coverage a solution for disparities in health care? Finding from three low-income provinces of Thailand. *Health Policy*, 73, 272-284.

Schwartz, J., Akin, J., & Popkin, B. (1988). Price and income elasticities of demand for modern health care: the case of infant delivery in the Philippines. *The World Bank Economic Review*, 2(1), 49-76.

Tangcharoensathien, V., Limwattananon, S., & Prakongsai, P. (2005). Equity in financing healthcare: impact of universal access to healthcare in Thailand. *EQUITAP Project: Working Paper # 16*.

Tangcharoensathien, V., Limwattananon, S., & Prakongsai, P. (2007). Improving health-related information systems to monitor equity in health: lessons from Thailand. *The Economic of Health Equity*, 222-246.

Tangcharoensathien, V., Prakongsai, P., Limwattananon, S., Patcharanarumol, W., & Jongudomsuk, P. (2007). Achieving universal coverage in Thailand: what lessons do we learn? *A case study commissioned by the Health Systems Knowledge Network*.

Thomason, J., Mulou, N., & Bass, C. (1994). User charges for rural health-services in Papua-New-Guinea. *Social Science & Medicine*, 39(8), 1105-1115.

Towse, A., Mills, A., and Tangcharoensathien V. 2004. Learning from Thailand's health reforms. *British Medical Journal*. v328(7431). pp. 103-105.

Van der Geest, S., Macwan'gi, M., Kamwanga, J., Mulikelela, D., Mazimba, A., & Mwangelwa, M. (2000). User fees and drugs: What did the health reforms in Zambia achieve? *Health Policy and Planning*, 15(1), 59-65.

Waddington, C. & Enyimayew, K.A. (1990). A price to pay, part 2: the impact of user charges in the Volta region of Ghana. *International Journal of Health Planning and Management*, 5, 287-312.

Appendix

The overall results on the multinomial logit estimation from specification (1) and (2) is as follows: Table A-1 presents the full results on the multinomial logit estimation of demand for outpatient service (reported by marginal effect) for specification (1) and (2), respectively. Table A-2 presents the full results on the multinomial logit estimation of demand for inpatient service (reported by marginal effect) for specification (1) and (2), respectively. The first specification does not include health insurance variables. I include health insurance variables as control variables for the second specification.

Table A-1

Demand for outpatient service (Reported by marginal effect)

	Marginal effect of variables for each choice of health care											
Outcome choice	**Drugs**		**Public health centers**		**District hospitals**		**Provincial hospitals, University hospitals and other public hospitals**		**Clinics**		**Private hospitals**	
Specification	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Income	6.04e-07	2.88e-07	-3.52e-06***	-2.57e-06**	-1.87e-06***	-1.45e-06**	1.06e-06***	7.15e-07**	3.36e-06***	2.75e-06***	3.61e-07***	2.64e-07***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Municipal area$^{\psi}$	0.0297***	0.0341***	-0.1106***	-0.1052***	-0.0226**	-0.0194*	0.0633***	0.0559***	0.0229*	0.0200	0.0173***	0.0145***
	(0.0114)	(0.0116)	(0.0105)	(0.0103)	(0.0097)	(0.0099)	(0.0092)	(0.0091)	(0.0122)	(0.0123)	(0.0046)	(0.0040)
Gold Card plan Type I$^{\psi}$		-0.0620**		0.1025***		0.1115***		-0.0164		-0.1282***		-0.0074
		(0.0273)		(0.0326)		(0.0324)		(0.0194)		(0.0260)		(0.0059)
Gold Card plan Type II$^{\psi}$		-0.0173		0.0317		0.0677**		-0.0219		-0.0570**		-0.0032
		(0.0275)		(0.0309)		(0.0322)		(0.0189)		(0.0269)		(0.0055)
Other public scheme$^{\psi}$		-0.0738***		-0.0678***		0.0305		0.1073***		-0.0176		0.0214**
		(0.0248)		(0.0239)		(0.0325)		(0.0284)		(0.0279)		(0.0097)
Private health insurance$^{\psi}$		0.1014***		-0.0045		-0.0586*		-0.0831***		0.0101		0.0347**
		(0.0436)		(0.0462)		(0.0347)		(0.0124)		(0.0393)		(0.0138)
North$^{\psi}$	0.0104	0.0088	0.0508***	0.0383**	0.0024	-0.0020	-0.0452***	-0.0383***	-0.0006	0.0084	-0.0177***	-0.0153***
	(0.0165)	(0.0167)	(0.0160)	(0.0156)	(0.0155)	(0.0157)	(0.0106)	(0.0106)	(0.0179)	(0.0184)	(0.0041)	.00387
Northeast$^{\psi}$	-0.0697***	-0.0723***	0.0195	0.0135	0.0464**	0.0438**	-0.0248*	-0.0217	0.0301	0.0359	-0.0015	0.0007
	(0.0203)	(0.0205)	(0.0202)	(0.0199)	(0.0211)	(0.0213)	(0.0143)	(0.0142)	(0.0238)	(0.0240)	(0.0067)	(0.0064)
South$^{\psi}$	-0.0679***	-0.0735***	-0.0328**	-0.0373	0.0141	0.0118	-0.0002	0.0068	0.0717*	0.0762***	0.0152*	0.0159*
	(0.0179)	(0.0179)	(0.0165)	(0.0162)	(0.0217)	(0.0218)	(0.0147)	(0.0149)	(0.0237)	(0.0239)	(0.0084)	(0.0082)
Bangkok$^{\psi}$	-0.2200***	-0.2246***	-0.1365**	-0.1465***	0.0227	-0.0505	-0.1374***	-0.1342***	0.5811	0.6605**	-0.1099***	-0.1047***
	(0.0634)	(0.0602)	(0.0648)	(0.0466)	(0.3997)	(0.2752)	(0.0219)	(0.0212)	(0.4261)	(0.3018)	(0.0268)	(0.0259)
Male$^{\psi}$	0.0478***	0.0489***	-0.0066	-0.0053	-0.0136	-0.0119	0.0031	0.0007	-0.0336**	-0.0339**	0.0029	0.0016
	(0.0127)	(0.0129)	(0.0109)	(0.0109)	(0.0118)	(0.0119)	(0.0098)	(0.0096)	(0.0135)	(0.0136)	(0.0032)	(0.0029)
Widowed, Divorced, and Separated$^{\psi}$	0.0079	0.0079	-0.0411*	-0.0349	-0.0187	-0.0149	-0.0247	-0.0267	0.0734**	0.0654*	0.0032	0.0031
	(0.0296)	(0.0299)	(0.0229)	(0.0239)	(0.0265)	(0.0275)	(0.0195)	(0.0182)	(0.0369)	(0.0367)	(0.0079)	(0.0073)
Married$^{\psi}$	0.0006	0.0038	-0.0166	-0.0040	-0.0027	0.0038	-0.0330*	-0.0418**	0.0457*	0.0349	0.0060	0.0032
	(0.0222)	(0.0225)	(0.0219)	(0.0223)	(0.0234)	(0.0241)	(0.0176)	(0.0166)	(0.0277)	(0.0276)	(0.0061)	(0.0055)
Family size	-0.0175***	-0.0189***	0.0056	0.0038	0.0039	0.0025	0.0029	0.0047*	0.0056	0.0076*	-0.0005	0.0003
	(0.0042)	(0.0042)	(0.0038)	(0.0038)	(0.0036)	(0.0036)	(0.0026)	(0.0026)	(0.0043)	(0.0043)	(0.0009)	(0.0008)

Continue on the next page

Table A-1 (continued)

Demand for outpatient service (Reported by marginal effect)

	Marginal effect of variables for each choice of health care											
Outcome choice	**Drugs**		**Public health centers**		**District hospitals**		**Provincial hospitals, University hospitals and other public hospitals**		**Clinics**		**Private hospitals**	
Specification	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Age	0.0139***	0.0129***	-0.0038***	-0.0015	-0.0031**	-0.0019	-0.0001	-0.0002	-0.0067***	-0.0086***	-0.0003	-0.0005
	(0.0013)	(0.0014)	(0.0011)	(0.0012)	(0.0012)	(0.0013)	(0.0009)	(0.0009)	(0.0014)	(0.0015)	(0.0004)	(0.0003)
Age-squared	-0.0002***	-0.0001***	0.0001***	0.00001	0.00003***	0.00002*	0.00001	0.00001	0.0001***	0.0001***	1.00e-06	4.01e-06
	(0.00001)	(0.00002)	(0.00001)	(0.00001)	(0.00001)	(0.00001)	(0.00001)	(0.00001)	(0.00001)	(0.00002)	(0.0000)	(0.0000)
Primary education level[ψ]	-0.0059	-0.0090	-0.0074	-0.0122	0.0031	-0.0009	0.0189	0.0210	0.0057	0.0124	-0.0144**	-0.0112**
	(0.0213)	(0.0216)	(0.0178)	(0.0177)	(0.0199)	(0.0203)	(0.0164)	(0.0159)	(0.0243)	(0.0242)	(0.0057)	(0.0051)
Lower secondary education level[ψ]	0.0196	0.0234	-0.0493**	-0.0431**	-0.0283	-0.0243	0.0590**	0.0428	0.0004	0.0048	-0.0015	-0.0037
	(0.0290)	(0.2967)	(0.0212)	(0.0217)	(0.0252)	(0.0259)	(0.0289)	(0.0267)	(0.0335)	(0.0336)	(0.0057)	(0.0048)
Upper secondary education level[ψ]	-0.0209	-00134	-0.0743***	-0.0688***	-0.0271	-0.0232	0.0531*	0.0336	0.0696*	0.0739**	-0.0004	-0.0022
	(0.0269)	(0.0277)	(0.0205)	(0.0211)	(0.0281)	(0.0287)	(0.0301)	(0.0271)	(0.0366)	(0.0368)	(0.0057)	(0.0049)
College level[ψ]	-0.0197	-0.0026	-0.1037***	-0.0714***	-0.0176	0.0161	0.1109***	0.0521*	0.0215	0.0064	0.0087)	-0.0005
	(0.0319)	(0.0341)	(0.0234)	(0.0297)	(0.0346)	(0.0407)	(0.0347)	(0.0289)	(0.0376)	(0.0378)	(0.0079)	(0.0055)
Diseases of the respiratory system[ψ]	0.0510***	0.0519***	0.0602***	0.0578***	-0.0717***	-0.0742***	-0.1201***	-0.1167***	0.0809***	0.0814***	-0.0003	-0.0002
	(0.0174)	(0.0177)	(0.0175)	(0.0174)	(0.0177)	(0.0179)	(0.0152)	(0.0149)	(0.0228)	(0.0229)	(0.0050)	(0.0047)
Diseases of the digestive system[ψ]	-0.1216***	-0.1227***	0.0048	0.0011	0.0370	0.0364	-0.0179	-0.0151	0.0564*	0.0617*	0.0413***	0.0387**
	(0.0169)	(0.0172)	(0.0229)	(0.0225)	(0.0241)	(0.0244)	(0.0168)	(0.0167)	(0.0315)	(0.0319)	(0.0142)	(0.0136)
Diseases of the urinary system[ψ]	-0.2097***	-0.2129***	-0.0442	-0.0527	0.0768	0.0653	0.1735***	0.1901***	-0.0403	-0.0313	0.0439	0.0417
	(0.0247)	(0.0246)	(0.0595)	(0.0557)	(0.0599)	(0.0586)	(0.0666)	(0.0686)	(0.0642)	(0.0664)	(0.0269)	(0.0272)
Cardiovascular diseases[ψ]	-0.2519***	-0.2547***	0.0143	0.0042	0.1089***	0.1049***	0.0533**	0.0579**	0.0492	0.0599	0.0262	0.0278*
	(0.0104)	(0.0106)	(0.0267)	(0.0256)	(0.0313)	(0.0314)	(0.0231)	(0.0237)	(0.0361)	(0.0369)	(0.0168)	(0.0168)
Infectious diseases[ψ]	-0.2146***	-0.2177***	0.0559	0.0521	0.1547**	0.1494**	-0.0416	-0.0358	0.0549	0.0589	-0.0094	-0.0069
	(0.0196)	(0.0200)	(0.0694)	(0.0691)	(0.0671)	(0.0671)	(0.0278)	(0.0286)	(0.0654)	(0.0682)	(0.0104)	(0.0105)
Diseases of the skin[ψ]	-0.1365***	-0.1371***	-0.0177	-0.0165	0.0529	0.0529	-0.0465*	-0.0505**	0.1407	0.1443*	0.0072	0.0069
	(0.0295)	(0.0305)	(0.0442)	(0.0443)	(0.0569)	(0.0577)	(0.0251)	(0.0233)	(0.0754)	(0.0764)	(0.0150)	(0.0139)
Allergic conditions[ψ]	-0.0973***	-0.0921**	-0.1190***	-0.1131***	-0.0497	-0.0455	0.0018	-0.0078	0.2293***	0.2308***	0.0350*	0.0277
	(0.0343)	(0.0368)	(0.0228)	(0.0237)	(0.0380)	(0.0389)	(0.0338)	(0.0290)	(0.0566)	(0.0579)	(0.0201)	(0.0177)
Diseases of the oral cavity, ear, throat, nose, eye[ψ]	-0.0948***	-0.0940***	-0.0529*	-0.0572*	0.0455	0.0431	0.0446	0.0426	0.0394	0.0483	0.0182	0.0172
	(0.0264)	(0.0273)	(0.0319)	(0.0300)	(0.0402)	(0.0405)	(0.0324)	(0.0318)	(0.0459)	(0.0462)	(0.0153)	(0.0154)

Continue on the next page

Table A-1 (continued)

Demand for outpatient service (Reported by marginal effect)

	Marginal effect of variables for each choice of health care											
Outcome choice	**Drugs**		**Public health centers**		**District hospitals**		**Provincial hospitals, University hospitals and other public hospitals**		**Clinics**		**Private hospitals**	
Specification	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Diseases of female genital organs$^{\psi}$	-0.1775*** (0.0291)	-0.1797*** (0.0288)	-0.0216 (0.0736)	-0.0249 (0.0748)	-0.0736 (0.0584)	-0.0761 (0.0577)	0.1961** (0.0883)	0.1981** (0.0921)	0.0963 (0.1029)	0.1022 (0.1063)	-0.0198*** (0.0039)	-0.0196*** (0.0029)
Condition relate to childbirth$^{\psi}$	-0.2399*** (0.0095)	-0.2429*** (0.0097)	-0.0520 (0.0763)	-0.0572 (0.0734)	0.3056* (0.1689)	0.3024* (0.1716)	-0.0346 (0.0519)	-0.0289 (0.0541)	-0.0190 (0.1792)	-0.0155 (0.1809)	0.0399 (0.0333)	0.0423 (0.0343)
Diseases of the endocrine system, metabolic diseases and nutritional system$^{\psi}$	-0.2576*** (0.0093)	-0.2614*** (0.0095)	-0.0599** (0.0244)	-0.0605** (0.0239)	0.2875*** (0.0421)	0.2907*** (0.0423)	0.0686** (0.0302)	0.0685** (0.0302)	-0.0537 (0.0362)	-0.0544 (0.0365)	0.0152 (0.0127)	0.0171 (0.0129)
Diseases of the musculoskeletal system and connective tissue$^{\psi}$	-0.0636*** (0.0195)	-0.0639*** (0.0198)	-0.0349* (0.0197)	-0.0373* (0.0193)	-0.0211 (0.0209)	-0.0220 (0.0213)	-0.0413*** (0.0143)	-0.0395*** (0.0139)	0.1424*** (0.0335)	0.1453*** (0.0338)	0.0186* (0.0106)	0.0175* (0.0098)
Number of public hospitals	-0.0054 (0.0041)	-0.0059 (0.0042)	-0.0011 (0.0033)	-0.0003 (0.0032)	0.0067 (0.0041)	0.0073* (0.0041)	0.0093** (0.0039)	0.0093** (0.0039)	-0.0103** (0.0042)	-0.0112*** (0.0043)	0.0008 (0.0018)	0.0007 (0.0018)
Number of private hospitals	-0.0039 (0.0047)	-0.0043 (0.0048)	-0.0047 (0.0038)	-0.0031 (0.0037)	0.0046 (0.0045)	0.0058 (0.0046)	0.0124*** (0.0042)	0.0121*** (0.0042)	-0.0151*** (0.0048)	-0.0166*** (0.0049)	0.0067*** (0.0019)	0.0062*** (0.0019)
Total number of hospitals	0.0006 (0.0038)	0.0009 (0.0039)	0.0039 (0.0029)	0.0033 (0.0029)	0.0003 (0.0039)	-0.0002 (0.0039)	-0.0098*** (0.0038)	-0.0099*** (0.0038)	0.0079** (0.0039)	0.0088** (0.0040)	-0.0029 (0.0018)	-0.0027 (0.0018)
Number of doctors	0.0001 (0.0001)	0.0001 (0.0001)	-3.01e-06 (0.0001)	-6.43e-06 (0.0001)	-0.0002*** (0.0001)	-0.0002 (0.0001)	0.00004 (0.0001)	0.0001 (0.0001)	4.10e-06 (0.0001)	3.23e-07 (0.0001)	0.0001*** (0.00002)	0.0001*** (0.00002)
Number of observation	11,690	11,690	11,690	11,690	11,690	11,690	11,690	11,690	11,690	11,690	11,690	11,690
Predicted probability	0 .2422	0.2455	0.1625	0.1597	0.1847	0.1869	0.1211	0.1167	0.2670	0.2702	0.0225	0.0209

Note the number in the parenthesis is a standard error.
*** Significant at 1% level ** Significant at 5% level * Significant at 10% level
$^{\psi}$ is dummy variable
Specification (1) excludes types of health insurance variables
Specification (2) includes types of health insurance variables

Table A-2

Demand for inpatient service (Reported by marginal effect)

	Marginal effect of variables for each choice of health care					
Outcome choice	**District hospitals**		**Provincial hospitals, University hospitals and other public hospitals**		**Private hospitals**	
Specification	(1)	(2)	(1)	(2)	(1)	(2)
Income	-5.83e-06***	-4.47e-06***	3.40e-06***	2.96e-06***	2.42e-06***	1.51e-06***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Municipal area$^{\psi}$	-0.1346***	-0.1238***	0.0820***	0.0816***	0.0526***	0.0422***
	(0.0196)	(0.0200)	(0.0206)	(0.0210)	(0.0133)	(0.0131)
Gold Card plan Type I$^{\psi}$		0.0727		0.0049		-0.0775***
		(0.0597)		(0.0593)		(0.0257)
Gold Card plan Type II$^{\psi}$		0.0735		-0.0374		-0.0360
		(0.0583)		(0.0574)		(0.0248)
Other public scheme$^{\psi}$		-0.0916*		0.0892		0.0024
		(0.0535)		(0.0543)		(0.0281)
Private health insurance$^{\psi}$		-0.2191***		-0.2248***		0.4438***
		(0.0545)		(0.0534)		(0.0601)
North$^{\psi}$	0.0443	0.0344	-0.0186	-.0148	-0.0256	-0.0195
	(0.0309)	(0.0311)	(0.0307)	(0.0311)	(0.0164)	(0.0169)
Northeast$^{\psi}$	-0.0025	-0.0108	-0.0765**	-0.0786**	0.0790***	0.0894***
	(0.0370)	(0.0377)	(0.0374)	(0.0380)	(0.0282)	(0.0285)
South$^{\psi}$	-0.0091	-0.0172	-0.0355	-0.0273	0.0446	0.0445
	(0.0354)	(0.0358)	(0.0357)	(0.0367)	(0.0276)	(0.0280)
Bangkok$^{\psi}$	0.4132	0.2928	-0.0943	0.0028	-0.3189***	-0.2956***
	(0.6353)	(0.7359)	(0.6363)	(0.7360)	(0.0416)	(0.0425)
Male$^{\psi}$	-0.0190	-0.0135	0.0395	0.0362	-0.0204	-0.0227*
	(0.0254)	(0.0259)	(0.0254)	(0.0258)	(0.0137)	(0.0135)
Widowed, Divorced, and Separated$^{\psi}$	0.0320	0.0321	-0.0243	-0.0299	-0.0077	-0.0022
	(0.0579)	(0.0597)	(0.0564)	(0.0577)	(0.0287)	(0.0291)
Married$^{\psi}$	0.0719	0.0800	-0.1001**	-0.1059**	0.0281	0.0259
	(0.0473)	(0.0491)	(0.0465)	(0.0481)	(0.0233)	(0.0236)
Family size$^{\psi}$	-0.0009	-0.0075	0.0086	0.0108	-0.0077*	-0.0034
	(0.0072)	(0.0072)	(0.0069)	(0.0071)	(0.0045)	(0.0043)

Continued on the next page

Table A-2 (continued)

Demand for inpatient service (Reported by marginal effect)

	Marginal effect of variables for each choice of health care					
Outcome choice	**District hospitals**		**Provincial hospitals, University hospitals and other public hospitals**		**Private hospitals**	
Specification	(1)	(2)	(1)	(2)	(1)	(2)
Age	-.0071***	-0.0066**	0.0066***	0.0075***	0.0005	-0.0008
	.0025)	(0.0026)	(0.0024)	(0.0026)	(0.0014)	(0.0015)
Age-squared	0.0001***	0.0001**	-0.0001**	-0.0001***	-0.00001	4.50e-06
	(0.00002)	(0.00003)	(0.00002)	(0.00003)	(0.00001)	(0.00002)
Primary education level[ψ]	-0.0097	-0.0203	0.0419	0.0355	-0.0321	-0.0153
	(0.0355)	(0.0368)	(0.0363)	(0.0371)	(0.0219)	(0.0218)
Lower secondary education	-0.1029**	-0.0953*	0.0961*	0.0978*	0.0069	-0.0024
level[ψ]	(0.0473)	(0.0494)	(0.0503)	(0.0518)	(0.0279)	(0.0272)
Upper secondary education	-0.0599	-0.0441	0.0686	0.0567	-0.0087	-0.0125
level[ψ]	(0.0548)	(0.0589)	(0.0558)	(0.0578)	(0.0252)	(0.0257)
College level[ψ]	-0.1973***	-0.1368**	0.2009***	0.1648***	-0.0036	-0.0279
	(0.0507)	(0.0604)	(0.0556)	(0.0615)	(0.0295)	(0.0239)
Diseases of the respiratory	0.1261***	0.1186**	-0.1459***	-0.1475***	0.0198	0.0289
system[ψ]	(0.0451)	(0.0466)	(0.0408)	(0.0416)	(0.0274)	(0.0299)
Diseases of the digestive	-0.0061	-0.0039	-0.0493	-0.0512	0.0553**	0.0551**
system[ψ]	(0.0373)	(0.0382)	(0.0361)	(0.0368)	(0.0261)	(0.0269)
Diseases of the urinary system[ψ]	-0.0639	-0.0669	0.0741	0.0723	-0.0102	-.0053717
	(0.0524)	(0.0538)	(0.0554)	(0.0568)	(0.0289)	.03051
Cardiovascular diseases[ψ]	0.0051	0.0069	-0.0022	-0.0107	-0.0029	.0036799
	(0.0504)	(0.0511)	(0.0485)	(0.0490)	(0.0299)	.03098
Infectious diseases[ψ]	0.0781	0.0673	-0.1286**	-0.1328**	0.0505	.0655163
	(0.0601)	(0.0608)	(0.0552)	(0.0555)	(0.0447)	.04803
Diseases of the skin[ψ]	0.0699	0.0942	-0.1817*	-0.1763	0.1118	.0821688
	(0.1239)	(0.1471)	(0.1092)	(0.1163)	(0.0924)	.11122
Allergic conditions[ψ]	0.0522	0.0707	-0.0356	-0.0551	-0.0166	-.0155936
	(0.0863)	(0.0914)	(0.0829)	(0.0856)	(0.0467)	.04842

Continued on the next page

Table A-2 (continued)

Demand for inpatient service (Reported by marginal effect)

	Marginal effect of variables for each choice of health care					
Outcome choice	**District hospitals**		**Provincial hospitals, University hospitals and other public hospitals**		**Private hospitals**	
Specification	(1)	(2)	(1)	(2)	(1)	(2)
Diseases of the oral cavity, ear, throat, nose, eye$^{\psi}$	-0.2389***	-0.2418***	0.2619***	0.2541***	-0.0231	-0.0122
	(0.0468)	(0.0467)	(0.0525)	(0.0528)	(0.0310)	(0.0321)
Diseases of female genital organ$^{\psi}$	-0.2064***	-0.2119***	0.2098***	0.2086***	-0.0034	0.0034
	(0.0545)	(0.0549)	(0.0645)	(0.0648)	(0.0389)	(0.0386)
Condition relate to childbirth$^{\psi}$	-0.0060	-0.0010	0.1018**	0.0869*	-0.0957***	-0.0859***
	(0.0482)	(0.0496)	(0.0480)	(0.0491)	(0.0149)	(0.0153)
Diseases of the endocrine system, metabolic diseases and nutritional system$^{\psi}$	0.1435**	0.1442**	-0.1743***	-0.1843***	0.0307	0.0402
	(0.0571)	(0.0563)	(0.0478)	(0.0482)	(0.0423)	(0.0438)
Diseases of the musculoskeletal system and connective tissue$^{\psi}$	-0.0778	-0.0695	0.0627	0.0559	0.0152	0.0135
	(0.0489)	(0.0504)	(0.0524)	(0.0529)	(0.0339)	(0.0341)
Number of public hospitals	0.0054	0.0048	0.0066	0.0063	-0.0119*	-0.0111
	(0.0089)	(0.0094)	(0.0091)	(0.0090)	(0.0070)	(0.0081)
Number of private hospitals	-0.0195**	-0.0188*	0.0066	0.0065	0.0129*	0.0123
	(0.0099)	(0.0104)	(0.0101)	(0.0101)	(0.0072)	(0.0081)
Total number of hospitals	0.0083	0.0084	-0.0098	-0.0093***	0.0015	0.0009
	(0.0085)	(0.0090)	(0.0087)	(0.0086)	(0.0069)	(0.0079)
Number of doctors	-0.0002	-0.0002	-0.00003	-0.00003	0.0003***	0.0003
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0001)	(0.0001)
Number of observation	4,762	4,762	4,762	4,762	4,762	4,762
Predicted probability	0.3920	0.3947	0.4949	0.4998	0.1131	0.1054

Note the number in the parenthesis is a standard error.
*** Significant at 1% level ** Significant at 5% level * Significant at 10% level
$^{\psi}$ is dummy variable
Specification (1) excludes types of health insurance variables
Specification (2) includes types of health insurance variables