Discussion Paper No. 478

IS THERE ANY SUBSTITUTION BETWEEN MEDICAL SERVICES AND OVER-THE-COUNTER MEDICATIONS IN THE CASE OF THE COMMON COLD? –ANALYSIS BASED ON AN ORIGINAL SURVEY–

Masako Ii
and
Yasushi Ohkusa

April 1999

The Institute of Social and Economic Research
Osaka University
6-1 Mihogaoka, Ibaraki, Osaka 567-0047, Japan

17 May 1999

Is There Any Substitution Between Medical Services and Over-the-Counter Medications in the Case of the Common Cold? -Analysis Based on an Original Survey- *)

Masako Ii

Yokohama National University

and

Yasushi Ohkusa

Osaka University

Abstract

This article examines choice of health care in Japan when patients suffer from relatively minor illnesses. Data was obtained from Basic Survey on People's Life for 1986, 1989, 1992 and 1995. Patients' heath information enable authors to make a distinction between acute and chronic illnesses, and mild and serious illnesses. Authors exclude acute and serious illnesses from the analysis and define minor illnesses if illness is not chronic or not serious. Empirical results show that in the case of these minor illnesses, price sensitivities (changes in the probability due to price change) for the medical service are between 0.144 $\sim$ 0.149. Authors also estimate price sensitivities for medical service demand separately for 43 symptoms. Among these symptoms, for almost half of the symptoms, estimated price sensitivities are below 1.

JEL Classifications:I11,I12,I31

Keywords: Minor illnesses, medical service demand, medical insurance system, Over-the-Counter Medication

Correspondence: Yasushi Ohkusa, Osaka University, Institute for Social and Economic Research, 6-1 Mihogaoka, Ibaraki, Osaka, Japan

tel: 06-6879-8566 fax: 06-6878-2766

e-mail: ohkusa@iser.osaka-u.ac.jp

1 Introduction

Japan's health care system has been relatively successful. Gross health indicators are the best in the world: the infant mortality rate is 0. 46 per cent of live births and the life expectancy is 75.9 years for males and 81.8 years for females (World Bank, 1998).

There is universal coverage with virtually unlimited access to all health care facilities. As a ratio of national income in Japan, national medical costs were 7.28 per cent in 1993. This figure is a little more than half of the same ratio in the United States. However, in 1997, national medical costs exceeded 28 trillion yen (about 230 billion US dollars) and continue to rise by at least one trillion yen every year.

There are at least three factors in this expenditure growth. The first factor is the ageing population. The rate at which the Japanese population is ageing is much faster than in other industrial nations. This is expected to contribute to a continued rise in medical care costs.

The second factor is the high utilization of hopitals. In Japan there is little functional differentiation between clinics and hospitals, and their boundary is further blurred because a third of the clinics have a small number of beds (the distinction is primarily legal in that facilities with more than 20 beds are designated as hospitals, whereas those having fewer than 20 are called clinics). Neither is there much differentiation between acute and long-term care (Ikegami,1992). The price of all providers (hospitals and clinics) is uniform, assuming that their quality is the same. However, patients are increasingly turning away from clinics in favour of hospitals because of their perceived higher quality. As a result, there are long queues for outpatients' visits and waiting lists for admissions to hospital. This situation is difficult to reverse because "freedom of choice" is regarded as the cardinal principle in the delivery of health care in Japan.

The third factor is the high per capita costs for medications. Most physicians in clinics do their own dispensing and hospital-based doctors dispense from the institution's pharmacy.

The government sets no limits on the quantity of medications dispensed. Market prices are surveyed periodically by the government and reimbursement prices are accordingly adjusted. However, providers continue to make profits because competition leads to a new round of price-cutting. They maintain that they need this margin to offset the relatively low reimbursement rates for the medical procedures they provide. Therefore, doctors have an incentive to over-prescribe. Patients' medical insurance covers medication costs, giving them a price incentive to favour prescribed products.

The health care reform plan proposes to increase the coinsurance rate for relatively minor illnesses as well as for prescribed medications for these minor illnesses. Minor illnesses are illnesses such as common cold and diarrhea, which are curable by standard treatment with reasonable cost. Their treatment has several options including medical services provided by hospital or clinic. Therefore, the effect anticipated of an increase in the coinsurance rate on national medical costs is not clear. If patients are not sensitive to a price change, an increase in the coinsurance rate may not have an appreciable effect on national costs. On the other hand, if patients are sensitive to a price increase, they may choose other options and decide to seek medical services less frequently. An increase in the coinsurance rate will then decrease the national medical costs.

When patients suffer from minor illnesses they face three options in this research: they can consult a doctor, purchase over-the-counter (OTC) medications or do nothing. The price sensitivity, therefore, may be relatively high, but this has to be tested empirically[1)].

In the United States, where extensive research on health economics is undertaken, only a few studies focus on demand for medical services related to minor illnesses or on the substitution between prescribed and OTC medications (Stuart and James, 1995; Fillenbaum, et al., 1995). Of these few studies, particular attention is paid to the research of Leibowitz (1989) because of its originality and, most of all, its research design. The research was part of the study referred to as the Health Insurance Experiment (HIE) that Newhouse (1993) and others at the RAND institute initiated in 1971, and that lasted for about 10 years. HIE

is a longitudinal study that experimentally altered the medical care cost-sharing faced by families. Between November 1974 and February 1977, HIE assigned families to insurance plans that differed in the amount of cost-sharing. According to this study, under a free plan (defined as no out-of-pocket cost to the family), compared to a 95 per cent coinsurance plan (families paid 95 per cent of their medical expenses), the demand for medical services increased by about 20 per cent. The spending on medical services under the free plan was 50 per cent more than that of the 95 per cent coinsurance plan. This means the price sensitivity (change in the probability due to price change) of medical service was , on average, 0.21.

Using the HIE, Leibowitz (1989) focused on minor illnesses and analysed the substitution between prescribed and OTC medications. Her empirical results did not support the expectation that people assigned less generous insurance for prescription drugs substitute OTC for prescriptions. Although the price sensitivity/price elasticity was not accounted for in either study, Newhouse (1993) indicated that, in the case of influenza, price sensitivity was around unity. This suggests that for minor illnesses, the demand for medical services is relatively sensitive to price.

In Japan, there are only a few studies that estimate the demand for medical services. Among these studies, Yamada (1997) used hospital-based data to estimate the demand for medical services. Without the use of a household-based survey, he was not able to analyse patients' preferences, decisions and behaviour regarding medical services.

Ii and Ohkusa (1998a) were the first to attempt an estimation of the demand for medical services related to minor illnesses. They modelled explicitly the incidence of minor illnesses and, using micro household data, measured the price sensitivity of the demand for medical care for minor illnesses in Japan. Their data, from the Basic Survey on People's Life (BSPL), were not experimentally or extensively collected like the data in the HIE. However, the sample size in the BSPL - about 600,000 - is much larger compared to that of the HIE, which is about 2,000. BSPL includes household and individual characteristics such as

gender, age, income and assets, and detailed health information. Their results show that the price sensitivity for medical services was 0.208, which is comparable to that for the United States, and that medical services and OTC medications are substitutes.

This paper, using patients' heath information, defines minor illnesses and estimates price sensitivity for these minor illnesses. The data set also includes detailed information on subjective symptoms. Authors also estimate price sensitivty for medical service demand separately for 43 symptoms. Empirical results show that in the case of these minor illnesses, the price sensitivity for the medical service are between $0.144 \sim 0.149$.

Section 2 presents this study's major hypotheses. Section 3 describes the data. The empirical model is explained in Section 4. Empirical results are given in Section 5. A summary and conclusion are given at the end.

2 Hypotheses

Risk aversion and uncertainty about future health events create a demand for medical insurance. However, once insurance is in place, moral hazard leads to over-utilization of medical care. This phenomenon may be more serious in the case of relatively minor illnesses. There is no reason for rates of insurance to be the same for different types of health care. In this section, the effects on national medical costs and patients' consumer surplus are analysed under an assumed scenario where the new medical insurance reforms exclude minor illnesses from insurance coverage.

Under the universal medical insurance plan, there is a gap between the price a patient faces and the price a society faces. Figure 1 shows the market for medical services. The vertical axis shows social costs of medical services and the horizontal axis shows quantities of medical services. In our model, quantity is measured by the proportion of patients who visited doctors out of the total number of patients. The supply curve (SS) is horizontal in the short run. This reflects the fact that, in Japan doctors cannot refuse patients' treatment

and cannot increase prices in times of high demand. Queuing is the rationing device used to limit demand. The value of waiting time is part of the implicit price.

Suppose DD refers to the demand for patients without medical insurance and $D'D'$ for patients with medical insurance. Suppose further that the current price level is given by AO so that the current quantity consumed in the market by patients without medical insurance is given by QO. Hence, total expenditure on the commodity is given by the area of the rectangle $AOQH$. However, if the market demand curve is actually equal to DD, then some consumers would be willing to pay more for some units of the commodity than the market price AO. The total amount that consumers would be willing to pay is equal to the rectangle $AOQH$ plus the triangle GHA, that is, the consumer surplus.

Under a medical insurance plan, the patient is on the demand curve $D'D'$ and increases his demand from QO to $Q'O$. Since a coinsurance is BO, he pays $BOQ'F$ and the government pays $ABFE$. The consumer surplus increases by $ABFH$ and the national medical costs increase by $HQQ'E$. If an increase in consumer surplus ($ABFH$) is greater than the increase in national medical costs ($HQQ'E$), then medical insurance is beneficial to consumers. In order to measure the effect of a rise in the coinsurance rate on national medical costs, a demand function for medical services needs to be estimated.

The demand for medical services by a patient i suffering from a minor illness at period t depends on the price of the medical service or coinsurance, $p_{i,t}^M$, the price of a close substitute such as OTC medications p_t^O , income $I_{i,t}$, the opportunity cost to visit a doctor $C_{i,t}$, and other variables that affect the demand for medical services $Z_{i,t}$. Therefore, the demand for medical services is expressed as $d(p_{i,t}^M, p_t^O, I_{i,t}, C_{i,t}, Z_{i,t})$. The variable $Z_{i,t}$ includes health capital, employment status, and attitudes toward medical services.

In this paper, the hypotheses to be tested are that: 1) medical services are normal goods in an economic sense and 2) medical services are substitutes for OTC medication. Using the above notations, these hypotheses can be expressed as $\frac{\partial d}{\partial p_{i,t}^M} < 0, \frac{\partial d}{\partial p_t^O} > 0, \frac{\partial d}{\partial I_{i,t}} > 0, \frac{\partial d}{\partial C_{i,t}} <$

$0, and \frac{\partial d}{\partial Z_{i,t}} < 0$, that is, an increase in coinsurance decreases the demand for medical care, an increase in the price of OTC medications increases the demand for medical care, an increase in income level increases the demand for medical care, an increase in the time cost decreases the demand for medical care, and, finally, an increase in health capital decreases the demand for medical care. When relatively healthy persons suffer from an illness they are more likely to recover sooner. Therefore, the marginal cost in receiving medical services is considered to be low.

3 Data

The data for this research were obtained from Basic Survey on People's Life for 1986, 1989, 1992, and 1995 by the Ministry of Health and Welfare, Japan. The questionnaire for this survey consists of three sections: household, health, and income and saving. All the households answered the household and health sections while only a sixth of the households answered the income and saving section. The survey covered all the 47 prefectures in Japan. Among these prefectures, 2,000 areas were randomly chosen, and within the chosen areas, all the households were surveyed.

Although the data are not panel since areas were randomly chosen each time, this data set provides rich information especially on income and consumption, job status, the type of medical insurance, and health condition. The analysis focuses on those between 22 and 59 years old, neither hospitalized nor permanently bed-ridden[2)], and who suffer from a minor illness.

The variables used in this analysis are age, gender, symptoms (period, seriousness), type of occupation (managerial position, government employee, employee at the large, or medium-sized enterprise, non-regular worker), labor income, per capita household income minus own labor income, net financial asset, real asset (tax payment on tangible asset), and medical insurance enrollment (type, insured or dependent).

Testing the hypothesis stated in the previous section requires information on the prices of medical services, $p^M_{i,t}$. These price data are not available from the survey. However, everyone answers the type of medical insurance (National Health Insurance or Employees' Insurance) and their insurance status (insurer or dependent) in the questionnaire. Under the Japanese health insurance system for self-employed persons, pensioners and their dependents (National Health Insurance), coinsurance rate is 30 percent for both in-patient and out-patient care. Under the insurance system for employees (Employees' Insurance), coinsurance rate is 10 percent of the medical costs. For their dependents, coinsurance rate is 20 percent for inpatient care and 30 percent for outpatient care.

Moreover, prices of OTC medications, p^O_t, are not available. Year dummy is used since everyone faces the same price within the same year. Also, prefecture dummy represents the regional variations such as competition among pharmacies or attitude toward OTC medications.

Income variables $I_{i,t}$ include own labor income, total household income net of own labor income, net financial asset, and real asset. For time cost, the employment status is used. For example, when a patient holds managerial position, he or she has a higher time cost compared to those who do not hold such a position. When a patient holds only a short time contract, he or she might have a lower time cost.

Except for the 0.6 percent of the population receiving public health care assistance, all Japanese are mandatorily covered by National Health Insurance or Employees' Insurance plans. Therefore, in either plan, patients without jobs face a coinsurance rate of 30 percent.

Patients who are not employed face higher coinsurance rate but lower time costs of demand for medical services than patients with jobs. Therefore, in the following analysis, there is a need to distinguish whether the change in demand comes from different level of time costs or different level of coinsurance rates. In the next section, the authors separately estimate the demand for the whole sample - both workers and non-workers - and the demand only for those who have jobs - workers.

Sample size for the workers is 60,487. Sample size for both employed and not-employed is 86,065. The first half of table 1 shows the sample statistics for workers. It reveals the following characteristics: 33 percent sought medical service, 30 percent purchased OTC, and 37 percent did nothing. The average age is 43.4 years, and 43 percent of the patients are female. On average, the patients stay in bed for 0.45 days. Less than four percent of the workers hold managerial positions. Among patients, 6.4 percent work as government employees, 12.7 percent work for the large enterprises those which have 1,000 or more employees, and 16.3 percent work for the medium-sized enterprises those which have 100 to 999 employees. About seven percent are non-regular employees whose employment period is from one to 12 months. The average annual labor income is 1.31 million yen, other income is 0.32 million yen, and net financial asset is 1.84 million yen. For 59 percent of the patients, coinsurance rate is 10 percent. Of the total sample, 70.3 percent have jobs. The second half of table 1 shows the sample statistics for the total population, both workers and non-workers. In this sample, a proportion of the female is higher at 57 percent compared to that in the workers only sample. For the 42 percent of the patients, coinsurance rate is 10 percent, and only 70 percent are workers. Therefore, it is not surprising that average annual labor income is only 0.31 million yen while other income is 0.48 million yen, higher than that for workers.

4 Estimation Model

The dependent variable takes three values: $T_{i,t} = 1$ if a patient demands medical services[3)], $T_{i,t} = 2$ if a patient demands OTC, and $T_{i,t} = 0$ in other cases. Independent variables are age $A_{i,t}$, gender ($G_{i,t} = 1$ if female, $G_{i,t} = 0$ if male) his or her own labor income $I_{i,t}$, per capita household income net of own labor income, $\check{I}_{i,t}$ net financial asset $F_{i,t}$, real asset (fixed property tax payment) $R_{i,t}$, Employment status dummy ($W_{i,t} = 1$ 1 if a patient is employed and $W_{i,t} = 0$ if otherwise), type of occupation ($J^M_{i,t} = 1$ if holds managerial

position, $J^M_{i,t} = 0$ otherwise, $J^G_{i,t} = 1$ if works as a government employee, $J^G_{i,t} = 0$ otherwise, $J^L_{i,t} = 1$ if works for a large enterprise, $J^L_{i,t} = 0$ otherwise, and $J^M_{i,t} = 1$ if employed by a medium-sized enterprise, $J^M_{i,t} = 0$ otherwise) , length of employment ($J^P_{i,t} = 1$ if employment period is from one to 12 months, $J^P_{i,t} = 0$ otherwise), coinsurance rate $P_{i,t}$, and prefecture and year dummy variables. Since there is no information on OTC prices, prefecture dummy is used as a proxy for the OTC price.

We estimate:

$$
\begin{aligned}
T^{j*}_{i,t} &= \alpha^j_0 + \alpha^j_A A_{i,t} + \alpha^j_{A^2} A^2_{i,t} + \alpha^j_G G_{i,t} + \alpha^j_I \log I_{i,t} + \alpha^j_{\check{I}} \log \check{I}_{i,t} + \alpha^j_F F_{i,t} + \alpha^j_R R_{i,t} \\
&+ \alpha_W W_{i,t} + \sum_k \alpha^j_k J^k_{i,t} + \alpha^j_p P_{i,t} + \sum_{k=1}^{47} \beta^j_k Area^k_{i,t} + \sum_{t=1}^{3} \gamma^j_t Year^t_{i,t} + \varepsilon^j_{i,t} \quad (j = 0, 1, 2) \\
T_{i,t} &= \begin{cases} 1 & \text{if } T^{1*}_{i,t} > T^{2*}_{i,t} and T^{1*}_{i,t} > T^{0*}_{i,t} \\ 2 & \text{if } T^{1*}_{i,t} < T^{2*}_{i,t} and T^{2*}_{i,t} > T^{0*}_{i,t} \\ 0 & \text{otherwise} \end{cases} \qquad (1)
\end{aligned}
$$

by using multinomial probit estimation method is used (Daganzo, 1979) [4]. Because the probability of choosing j adds up to 1, we can estimate the differences in probability. Here, we set $j = 0$, the choice of "do nothing", as the basis for comparison. The error term, $\varepsilon^j_{i,t} (j = 0, 1, 2)$, is a random variable and Ω follows a three-dimensional normal distribution. Since the error terms in the estimation also redefined by the difference from $\varepsilon^0_{i,t}$ and $\varepsilon^j_{i,t} (j = 1, 2)$, and normarizing the (1,1) element be 1, its variance-covariance matrix should be

$$
\begin{bmatrix} -1 & 1 & 0 \\ -1 & 0 & 1 \end{bmatrix} \Omega \begin{bmatrix} -1 & 1 & 0 \\ -1 & 0 & 1 \end{bmatrix}' = \begin{bmatrix} 1 & \rho \\ \rho & \sigma \end{bmatrix}. \qquad (2)
$$

The estinmation procedure is BHHH method with grid research over ρ and σ. This procedure is as accurate as Keane(1992) has shown.

5 Estimation Results

The data set includes detailed information on the type of illness, therefore it allows the authors to distinguish whether an illness is acute or chronic, and mild or serious. Authors

exclude acute and serious illnesses from the analysis and define that a patient suffers from a minor illness if he reports at least one of the following illnesses: hypertension, hypotension, common cold, gastritis, decayed tooth, gingivitis, autonomic nerve, troubles with eyes or ears, nasal catarrh, skin trouble, neurosis, osteoporosis, or women's diseases. If a patient does not see a doctor and does not know a type of illness he suffers from, it is also defined as a minor illness.

Tables 2 and 3 show the determinants of the workers' demand for medical services and OTC when they suffer from minor illnesses as defined above. Sample size is 40,895. The first columns show marginal effects. These effects tell how a unit change in explanatory variable changes probabilities of choosing medical services or OTC. For example, a probability of choosing medical service is 4.7 percent higher, and of choosing OTC 3.1 percent lower for government employees than for others.

Other studies have found that females demand medical care more than males do (Leibowitz, 1989; Ii and Ohkusa, 1998). However, when analyses are focused on the case of minor illnesses, not on illnesses in general, there seems to be no clear gender differences in the demand behavior.

Coinsurance rate is significantly positive. This implies that a demand curve is downward sloping, and increasing coinsurance rate from 10 to 30 percent, medical demand decreases by 2.98 percent. This means, on average, price sensitivity is 0.149 for workers. US data show that the lowest estimate of the price sensitivity of medical service in general is 0.21, which is equivalent to our estimate[5)]. However, in the US, a price sensitivity of medical service for minor illnesses (influenza) is around 1 and much larger than ours [6)].

Tables 4 and 5 show estimation results for the total sample. All of them in the sample suffer from the minor illnesses as defined above. The sample size is 57,521. Increasing coinsurance rate from 10 to 30 percent, medical demand decreases by 2.88 percent, therefore, on average, price sensitivity is 0.144.

The data set also includes detailed information on subjective symptoms. Authors esti-

mate price sensitivities for medical service demand separately for the following 43 symptoms: fever, languidness, insomnia, headache, dizziness, sluggishness, numbness, mucus, dimness of sight, pain in ear, ringing in ear, toothache, bleeding gums, nasal congestion, running nose, soar throat, cough, phlegm, wheezing, palpitation, short of breath, pain in chest, nausea, diarrhea, constipation, heartburn, indigestion, diminished appetite, stomachache, hemorrhoid, eruption, pruritus, pain in urination, frequent urination, incontinence of urine, morning sickness, menstrual irregularity, vaginal discharge, incised wound, sprain, stiff shoulders, backache, and arthralgia [7)]. Among these symptoms, for almost half of the symptoms, estimated price sensitivities are below 1. For example, a price sensitivity for workers is 0.55 for fever, 0.27 for sore throat, and 0.25 for stomachache. These results are almost the same as the total sample.

6 Concluding Remarks

In this paper, using data from Basic Survey on People's Life, the price elasticity of demand for medical services in case of relatively minor illnesses is estimated. The data set includes detailed information on the type of illness, therefore it allows the authors to define minor illnesses in more accurate manner. With this definition, authors obtain the price sensitivity around 0.144-0.149.

In the sample, 32 percent sought medical services, therefore, the estimated price sensitivity suggests that if the new medical insurance reform plan should exclude minor illnesses from the insurance coverage, almost half of the patients - 13.5 percent point - may stop seeking medical services. The data set also includes detailed information on subjective symptoms. Authors are able to estimate price sensitivity for medical service demand separately for 43 symptoms. Estimation results show that among these symptoms, for almost half of the symptoms, estimated price sensitivities are below one.

These results are, however, obtained from a household survey, including medical infor-

mation, which was conducted on a given day. Therefore, extreme care must be exercised in interpreting the results. Ideally, longitudinal survey will improve the results. This is the subject matter of further investigation.

Footnote

*) This research has benefited from a research meeting called "Social Welfare and Economics". We would like to acknowledge the comments of the participants at the meeting, particularly Masahiro Toriyama and Maki Yoshida of the Nomura Research Institute and Makoto Satito, Yasushi Iwamoto, and Kotaro Hitomi from Kyoto University and other seminar participants at Miyatsu conference. The views expressed herein are the authors' own and do not reflect that of their institutional affiliations. We would also like to acknowledge the assistance provided by Kazuko Matsumoto.

1) Surprisingly, there is no documentation which explains the amount of national medical costs spent on relatively minor illnesses because nationwide surveys are done only on particular days. For example, the Ministry of Health and Welfare conducts a patient survey on June 1 of every year, and a hospital and clinic survey on October 1 of every year. These surveys, conducted in summer or fall, will not give us a reliable estimate on medical cost used, for example, for cold or flu. A rough estimate shows that about half of the total medical cost is for the outpatients. Out of these costs however, no information is given on the shares of the cost for minor illnesses or for chronic diseases including geriatric diseases. Therefore, in this paper, using an estimate of the price sensitivity of medical demand for minor illnesses, we can only measure a reduction in medical cost by proportion, not by value. Medical cost used for minor illnesses should be also estimated by research.

2) If a patient is bed-ridden for more than a month, then we define the patient as permanently bed-ridden.

3) Note that the data are not panel.

4) Multinomial logit is easier to estimate than multinomial probit. But in multinomial logit, odds ratio have to be independent of the other alternatives. Hausman-McFadden (1984) test suggests that if a subset of the choice set is truly irrelevant, omitting the choice set in our model $T_{i,t} = 0$, from the model will not change parameter estimates systematically. Hausman-Mcfadden test statistics for workers are 124.12 and for the whole sample 156.84. With the degree of freedom, 64 and 63, respectively, chi-squared test rejects the null hypothesis of independence with 99 percent probability. Therefore, we are not able to use multinomial logit model.

5) Our estimate is obtained from a one-day survey for the patients who reported illness on the particular day, while in the US, the estimate is from a longitudinal, one-year survey.

6) There is no account on the price sensitivity or price elasticity of medical service for minor illnesses in either Newhouse (1993) or Leibowits (1989). This price sensitivity is inferred from their tables.

7) Estimation results can be obtained from authors upon request.

References

[1] Keans,M.(1992),"A Note on Identification in the multinominal Probit Model," *Journal of Business and Economic Statistics*, 10, pp.193-200.

[2] Daganzo,C.(1979),*Multinominal Probit: The Theory and Its Application to Demand Forecasting*,Academic Press.

[3] Fillenbaum G., J. T. Hanlon, E. H. Corder, T. Ziqubu-Page, W. E. Wall, Jr. and D. Brock. (1993),"Prescription and Nonprescription Drug Use among Black and White Community Residing Elderly,"*American Journal of Public Health*,83,pp.1577-1582.

[4] Hausman,J. and D.McFadden(1984), "Specification Tests for the Multinomial Logit Model,"*Econometrica*, 52, pp.1219-40.

[5] Ii,M. and Y.Ohkusa(1998), "Is There Any Subustitution Between Medical Services and Over-the-Counter Medications?", manuscript.

[6] Ikegami, N.(1992), "The Economics of Health Care in Japan," *Science*, 258,pp.614-618.

[7] Leibowitz,A.(1989),"Substitution Between Prescribed and Over-the-Counter Medecation," *?Medical Care*,27,pp.85-94.

[8] Newhouse, J.(1993),*Free For All*,Harvard University Press.

[9] Stuart, B. and G. James(1995),"Are Prescribed and Over-the-Counter Medecines Economic Substitutes? A Study of the Effect of Health Insurance on Medicine Choices by the Elderly,"*Medical Care*,33,pp.487-501.

[10] Yamada,T.(1997), "Iryo sabis no jyuyokannsru no suitei (Estimation of Demand for Medical Service)" (unpublished, in Japanese).

[11] World Bank(1998), *World Development Report*, Oxford University Press.

Table 1 : Descriptive Statistics

	Mean	Standard deviation	Minimum	Maximum
Workers Only (N=60,487)				
Medical service	.3285445	.469689	0	1
Over-the-Counter medication	.2999614	.4582456	0	1
Do nothing	.3714941	.4832093	0	1
Age	43.38016	10.48763	22	60
Length of stay-in-bed	.4517851	1.408925	0	10
Female	.4339566	.4956244	0	1
Managerial position	.0389613	.1935049	0	1
Government employee	.0640921	.2449196	0	1
Medium-sized enterprise	.1273265	.333342	0	1
Large enterprise	.1626855	.3690824	0	1
Non-regular employee	.0696458	.2545518	0	1
Labor income (in log)	4.875487	2.053332	0	9.30556
Other income (in log)	3.478245	2.011145	0	8.729397
Net financial asset	183.8823	973.8945	-2250	3250
Real asset (in log)	2.393375	2.571293	0	11.51293
Coinsurance rate (dummy)	.5877219	.49225	0	1

(continued(

(contiuned)

Both Workers and Non-Workers (N=86,065)				
Medical service	.3430768	.4747405	0	1
Over-the-Counter Medication	.297897	.4573375	0	1
Do nothing	.3590262	.4797185	0	1
Age	43.68973	10.74956	22	60
Length of stay-in-bed	.5215702	1.558349	0	10
Female	.5737092	.4945408	0	1
Managerial position	.0273913	.1632219	0	1
Government employee	.0450592	.2074355	0	1
Medium-sized enterprise	.0895153	.2854883	0	1
Large enterprise	.114374	.3182674	0	1
Non-regular employee	.0489636	.2157936	0	1
Labor income (in log)	3.427651	2.815468	0	9.30556
Other income (in log)	3.873235	1.864505	0	8.729397
Net financial asset	201.6496	978.447	-2250	3250
Real asset (in log)	2.319853	2.565762	0	11.51293
Employment status (dummy)	.7030376	.4569233	0	1
Coinsurance rate (dummy)	.4158438	.4928706	0	1

Note: (1) "Medical service", "Over-the-Counter Medication", and "Do nothing" are dummy variables which take the value of one if a patient chooses the choice, and 0 if otherwise.

(2) "Female" is a dummy variable which takes the value of one if a patient is female and 0 if male.

(3) "Managerial position", "Government", "Large enterprise", and "Medium-size enterprise" are dummy variables which take the value of one if a patient holds a managerial position, works at government, works at large enterprise with 1,000 or more employees, and works at medium-size enterprise with 100 to 999 employees, respectively.

(4) "Non-regular employee" is a dummy variable which takes the value of one if employment period is between one to 12 months.

(5) "Labor income", "Other income", "Net financial asset" and "Real asset (Tax payment on tangible asset)" are in 10,000 yen, in 1995 real term.

(6) "Coinsurance rate" is a dummy variable which takes the value of one if coinsurance rate is 10 percent (employees), and 0 if it is 30 percent.

(7) "Employment status" is a dummy variable which takes the value of one if a patient is employed and 0 if otherwise.

Table 2 : Marginal Effect for Medical Services (Workers Only)

Explanatory variables	marginal effect	t-value	Prob Value
Age	.0001615	0.331	0.741
Length of stay-in-bed	.0049182	1.994	0.046
Female	-.0030734	-0.333	0.739
Managerial position	.0070886	0.359	0.720
Government employee	.0461069	2.472	0.013
Medium-sized enterprise	.0109177	0.819	0.413
Large enterprise	.0210605	1.589	0.112
Non-regular employee	-.0104414	-0.654	0.513
Labor income (in log)	-.0034317	-1.440	0.150
Other income (in log)	.0014803	0.661	0.509
Net financial asset	5.75e-06	1.458	0.145
Real asset (in log)	-.0022794	-1.026	0.305
Coinsurance rate	.0298321	2.768	0.006

Note:

Number of observation is 40,895.

Marginal effects indicate discrete changes from 0 to 1 for dummy variables.

Pseudo R^2 is 0.2141. An estimated coefficient and t-value (in parenthesis) of ρ are 0.3343(2.7697) and of σ are 0.7384(4.3744).

An estimation equation includes a constant term, but in this table of marginal effect, a constant term cannot be defined.

Table 3 : Marginal Effect for Over-the-Counter Medication (Workers Only)

Explanatory variables	marginal effect	t-value	Prob Value
Age	.0009445	2.152	0.031
Length of stay-in-bed	.0023762	1.185	0.236
Female	-.0148858	-1.919	0.055
Managerial position	-.033997	-2.003	0.045
Government employee	-.0294592	-1.905	0.057
Medium-sized enterprise	.005575	0.490	0.624
Large enterprise	-.017644	-1.581	0.114
Non-regular employee	.0190208	1.424	0.154
Labor income (in log)	-.0019374	-0.973	0.330
Other income (in log)	-.0018038	-0.911	0.362
Net financial asset	-6.54e-06	-1.880	0.060
Real asset (in log)	-.0019862	-0.998	0.318
Coinsurance rate	-.0103842	-1.158	0.247

Note:

Number of observation is 40,895.

Marginal effects indicate discrete changes from 0 to 1 for dummy variables.

Table 4 : Marginal Effect for Medical Services (Both Workers and Non-Workers)

Explanatory variables	marginal effect	t-value	Prob Value
Age	.0002723	0.706	0.480
Length of stay-in-bed	.0038797	1.918	0.055
Female	-.007847	-0.914	0.361
Managerial Position	.0082478	0.430	0.667
Government employee	.0472706	2.573	0.010
Medium-sized enterprise	.0115126	0.873	0.383
Large enterprise	.0227414	1.794	0.073
Non-regular employee	-.010579	-0.656	0.512
Labor income (in log)	-.0041296	-1.806	0.071
Other income (in log)	.0013366	0.640	0.522
Net financial asset	3.06e-06	0.862	0.389
Real asset (in log)	-.0034369	-1.875	0.061
Employment status (dummy)	-.0232418	-1.974	0.048
Coinsurance rate	.0288198	2.873	0.004

Note:

Number of observation is 57,521.

Marginal effects indicate discrete changes from 0 to 1 for dummy variables.

Pseudo R^2 is 0.1669. An estimated coefficient and t-value (in parenthesis) of ρ are 0.3132(3.1765) and of σ are 0.6758(5.8765).

Table 5 : Marginal Effect for Over-the-Counter Medication (Workers and Non-Workers)

Explanatory variables	marginal effect	t-value	Prob Value
Age	.0008619	2.512	0.012
Length of stay-in-bed	.0023855	1.563	0.118
Female	-.0085012	-1.207	0.227
Managerial position	-.0352704	-2.130	0.033
Government employee	-.030698	-1.983	0.047
Medium-sized enterprise	.0057971	0.508	0.612
Large enterprise	-.0183217	-1.705	0.088
Non-regular employee	.0191237	1.431	0.152
Labor income (in log)	-.0012599	-0.656	0.512
Other income (in log)	-.002835	-1.507	0.132
Net financial asset	-2.52e-06	-0.814	0.416
Real asset (in log)	-.0008394	-0.545	0.586
Employment status	.0139663	1.328	0.184
Coinsurance rate	-.0097513	-1.182	0.237

Note: Number of observation is 57,521.

Marginal effects indicate discrete changes from 0 to 1 for dummy variables.

Figure 1　Health Service Market