Discussion Paper No. 561

HORIZONTAL INEQUITY IN HEALTH CARE UTILIZATION IN JAPAN

Chika Honda
and
Yasushi Ohkusa

January 2002

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

22 January , 2002

Horizontal Inequity in Health Care Utilization in Japan

Chika Honda

Yao Public Health Center, Osaka Prefecture

and

Yasushi Ohkusa

Institute of Social and Economic Research, Osaka University

Abstract

International comparisons of horizontal inequity in health have recently become one of the most pertinent issues in health economics. Japan has not been included in these international comparisons. This omission is rectified in this paper, which focuses on Japan. Moreover, we consider its dynamics over six years from 1992 to 1998. The dynamics has never considered in this fields. In a rigorous international comparison, we cannot find any horizontal inequity in health in Japan and almost similar to Belgium.

JEL Classifications:

Keywords: Horizontal Inequity, Japan, International Comparisons, Concentration Index, Needs

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

Tel:81-6-6879-8566 Fax: 81-6-6878-2766

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

1 Introduction

Inequity in health has recently become one of the most pertinent and relevant issues in health economics and health policy. Much research on methodology and on international comparisons has been carried out by Wagstaff, Doorslaer and Paci (1989), Wagstaff, Paci and Doorslaer (1991), Doorslaer and Wagstaff (1992), Wagstaff and Doorslaer (1993), Wagstaff and Doorslaer (1994), Doorslaer, Wagstaff et al. (1997, 2000), and Kakwani, Wagstaff and Doorslaer (1997). In particular, research on horizontal inequity has been done by Doorslaer, Wagstaff et al. (2000), and most recently, by Wagstaff and Doorslaer (2000).

Eleven OECD countries were studied on the basis of reasonably comparable definitions. Unfortunately, Japan has been excluded in all previous studies. This paper adds Japan to the current list of countries studied. It adopts the same or comparable definitions of social and economic conditions, health, and estimation methods as other studies. In addition, this paper provides some evidence on the dynamics of inequity, which has not been investigated fully in other studies.

Before considering the measurement of health, the institutional background in Japan is summarized. In 1961, Japan completed compulsory public health insurance and coverage for all residents. In 1998 (which our paper covers), a new law was introduced, requiring co-insurance rates of 20% for the employed, and 30% for others, such as the self-employed and dependents. For people over 70 years of age, the co-payment rate is 10%, and is limited to approximately 4000 yen (about US$36 in 2001 prices) per month. However, big firms sometimes subsidize their employees by reducing their co-payments to less than the legal requirement. If very poor people cannot pay the premiums, medical services are provided as welfare. Thus, everybody can enjoy accessing to medical services in Japan, even though there may be exceptional cases.

The public health insurance system provides reimbursement on a fee-for-service (FFS)

basis. Although the government controls the price of treatment and drugs almost every year, it cannot directly control the choice of treatment and/or drugs, unlike the Utilization Review at HMO. The insurer cannot control the budget ex ante like NHS and sickness benefits.

There is no regulation of the medical services chosen by patients, as in the gatekeeper in NHS or difference coverage in HMO. The co-insurance rate is the same for services provided in hospitals or clinics (either public or private), but congestion may implicitly impose an opportunity cost. Of course, the number of beds is strictly regulated, but provision of outpatient services are virtually unregulated.

Although private insurance exists it plays only a minor role, because public insurance has such a comprehensive coverage of medical services. Shigeno (2000) shows that private insurance appears to complement public insurance only through its income effect. Hence, private insurance in Japan is very different from that in the USA and in European countries, and this is why it is usually excluded in health economics research of international comparisons.

2 Data

The Comprehensive Survey of Living Standards in Japan (CSLSJ) has been conducted every three years since 1986. The purpose of this survey is to investigate health, medical services, pensions, welfare, incomes, and other factors affecting living standards. Questionnaires consist of four parts: family, individual, income, and savings. The number of subjects, sampled randomly, in the family and individual parts are approximately 780,000 individuals (280,000 families), and the number for the income and savings surveys is approximately 120,000 individuals (40,000 families). The data used in this study are for 1992, 1995, and 1998.

Symptoms and diseases are surveyed in great detail, though there are minor differences

among years. For example, in 1998, symptoms are listed as fever, fatigue, sleeplessness, irritation, failing memory, headache, dizziness, bleary eyes, difficulty in seeing, tinnitus, difficulty in hearing, palpitation, difficulty in breathing, chest pain, coughs and sputum expectoration, the sniffles, noisy breathing, retching, diarrhoea, constipation, appetite loss, stomach ache, haemorrhoids, toothache, dental problems, difficulty in chewing, rash, itching, stiff shoulder, back pain, arthralgia, impairments of hands and feet, numbness, frigid hands and feet, foot oedema, dysuria, frequent urination, incontinence, paramecia/merorrhalgia, broken bones and sprains, wounds, and other symptoms. Respondents indicate the symptoms they have, but the survey does not collect information about whether respondents have considered seeing a doctor, or information concerning the seriousness of the symptoms.

The wording of CSLSJ for outpatient utilization is "Do you currently go to visit to phisician (general practitioner)?" Respondents indicate the diseases which apply to them and which they concern the most, and their duration. However, it does not provide any information about the number or frequency of visit to the doctor, or medical expenditure.

Note that the CSLSJ asks about the current situation with regard to symptoms and diseases, whereas surveys in other countries define duration explicitly, and do not necessarily ask about the current situation. Hence, we know only whether they suffered from some symptoms or visit a doctor due to some diseases, and we do not know how long and how sever it is except for the longest consulting in the disease. This undefined reference period may be the most important difference from the survey in the other countries and we have to remind it to understand the below analyses. Moreover, symptoms and diseases in the CSLSJ include those other than chronic and/or severe illnesses, whereas other countries limit questions to chronic or severe illnesses that disrupt daily activity.

Subjective health evaluation responses range from excellent to good, fair, poor, and very poor. However, there is a problem with this question. Unlike in many countries, such as the USA and the UK, respondents in Japan are not asked to evaluate their health in relation to people of a similar age. This difference may affect the results and may introduce some

inconsistency in the international comparisons. In fact, Honda and Ohkusa (2001) found that, on the basis of this question, subjective health evaluation in Japan is very different from that in the USA and the UK. Such discrepancies are unavoidable in international comparisons. Therefore, comparisons should be interpreted carefully.

The sample used in the following analysis are limited for the age of 16 or older, but the original surveys cover persons over six years of age, and those who are not hospitalized or in residential care. This should be mentioned for international comparisons.

With income, as in the Dutch and U.S. survey, the survey provides the exact amount of their household's income as well as details of income sources.

3 The Measurement of Horizontal Inequity

In measuring horizontal inequity, three aspects need to be clarified, i.e. definition of demand for medical care; definition of needs; and estimation methods. Definitions and estimation methods used in this paper are as follows. Social and economic groups (SEG) are defined by household disposable income per equivalent adult as in previous studies.

3.1 Definition of Demand for Medical Care

Several definitions of demand for medical care are employed in existing studies: for instance, medical expenditure (Doorslaer, Wagstaff et al., 2000), visits to a doctor (Doorslaer, Wagstaff et al., 2000, or Doorslaer, Koolman and Puffer,2001), and hospitalizations (Doorslaer, Wagstaff et al., 2000). While medical expenditure and hospitalizations are not available from CSLSJ, visits to a doctor can be used as a measure of demand for medical care.

3.2 Definition of Needs

Concerning the definition of needs, existing studies use incidences of chronic illness (Doorslaer and Wagstaff(1992)), and self-assessment of health (Doorslaer, Wagstaff et al.(1997)). Con-

versely, Doorslaer, Wagstaff et al.(2000) define the needs as the estimated demand for medical care which is explained by self-assessment of health (SAH) and/or chronic illness in addition to demographic characteristics such as age and gender. Although CSLSJ does not isolate chronic illness, it does survey symptoms as already explained. Moreover, it also provides information on self-assessment of health. Hence we define the needs as the estimated demand for outpatient services of the ith rank in income person D_i whether they go to visit the physicians. The employed explanatory variable are age A_i, gender G_i, self-assessment of health H_i and/or symptoms S_i. Thus the estimated equations in the full version is

$$\begin{aligned} D_i^* &= \alpha_0 + \sum_j \alpha_A^j A_i^j + \sum_j \alpha_{AG^j} A_i^j G_i + \alpha_G G_i + \sum_l \alpha_H^l H_i^l + \sum_m \alpha_S^m S_i^m + \varepsilon_i \\ D_i &= \begin{cases} 1 & \text{if } D_i^* > 0 \\ 0 & \text{otherwise} \end{cases} \end{aligned} \tag{1}$$

where the superscript indicates the dummy variables. Age dummy represents from 15 to 98 years old by each age. Since self-assessment of health is classified by 5 categories, there are four dummies for it. Dummies for symptoms are defined separately for each symptom. Note that diseases are not used as explanatory variables because these are reported in the CSLSJ for those who visit a doctor and thus their D_i should be always one. In that case, it is perfect prediction and thus these explanatory variables cannot be identified.

Alternatively, we modified the above equation as using the number of symptoms suffered from instead of symptom dummies, and/or broader categorized in age as Doorslaer, Wagstaff et al.(2000),i.e. 15-24, 25-44,45-64,65-74 and 75-[1)].

The estimation procedure is heteroscedasticity consistent probit. The predicted probability $\Phi(\hat{D}_i)$ is the needs n in the following procedures.

3.3 Estimation Method

First, the Concentration Index for medical care or needs should be defined following Kakwani, Wagstaff and Doorslaer (1997) as

$$2\frac{\mu_i^+}{\mu^+\sigma_R} = \alpha_0 + \alpha_1 R_t \tag{2}$$

where the subscript i indicates the individual of the ith SEG, which means ith smallest amount of income adjusted for household structure, and μ_i^+ is the demand for medical care. Adjustment for demographic characteristics for μ_i^+ and μ^+ is made by using the average health condition that applies to the people of the same age (9 categories spanning 10 years), gender, and other demographic characteristics as the ith person.

μ^+ is the average of μ_i^+ over persons, R_i is the cumulative proportion up to the ith person in order of income adjusted for household structure, and σ_R is its variance. The estimated α_1 is the Concentration Index of the demand for medical care. Similarly, the Concentration Index of needs is defined by replacing μ by n, which is a measure of needs.

Following Wagstaff and Doorslaer(2000), its variance is adjusted for

$$\begin{aligned} Var(\text{Concentration Index}) &= \frac{1}{10}\{\sum_{t=1}^{10} f_i a_i^2 - (1+\text{Concentration Index})^2\} && (3)\\ a_t &= \frac{\mu_i^+}{\mu^+}(2R_{i-1} - \text{Concentration Index}) + 2 - q_{i-1} - q_i && (4)\\ q_i &= \frac{1}{\mu^+}\sum_{s=1}^{i} \mu_s^+ f_s \end{aligned}$$

The horizontal inequity measure is obtained by using the following estimation method.

$$2\sigma_R^2\left[\frac{\mu_i^+}{\mu^+} - \frac{n_i^+}{n^+}\right] = \beta_0 + \beta_1 R_i \tag{5}$$

$$
\begin{aligned}
Var(\text{Horizontal Inequity}) &= \frac{1}{N}\left(\frac{1}{N}\sum_{i=1}^{N}(a_i^{\mu}-a_i^{n})^2 - \text{Horizontal Inequity}^2\right) \qquad (6)\\
a_i^{\mu} &= \frac{\mu_i^{+}}{\mu^{+}}(2R_i - 1 - \text{Concentration Index for } \mu) + 2 - q_{t-1}^{\mu} - q_i^{\mu}\\
q_i &= \frac{1}{\mu^{+}}\sum_{s=1}^{i}\mu_s^{+} f_s\\
a_i^{n} &= \frac{n_i^{+}}{n^{+}}(2R_i - 1 - \text{Concentration Index for } n) + 2 - q_{t-1}^{n} - q_i^{n}\\
q_i &= \frac{1}{n^{+}}\sum_{s=1}^{i} n_s^{+} f_s
\end{aligned}
$$

The estimated coefficient of β_1 is interpreted as horizontal inequity (Wagstaff, Doorslaer et al.(2000), Doorslaer, Wagstaff et al.(2000)).

4 Empirical Results

Summary statistics are shown in Table 1. Almost 30% of individuals suffered some symptoms or were outpatients. The per capita income adjusted for the number of adults in the household is about 3.2-3.7 million-yen (about US$2,700-3,000) per year, and this increases a little over the six years. Even the smallest sample year has more than 70,000 samples.

Table 2's show the estimation results for "Needs" in several specifications. Each table has ten specifications, i.e. age (classes or dummies) or health condition (using SAH, using information of symptoms (list of dummies or the number of symptoms) , or using both as explanatory variables, for three years. Namely, the upper panels show the results in the case of age classes and the lower panels show the case of age dummies. The first to third column in both panels indicate the results of SAH only, dummies for symptoms only, and both of them, respectively. The results in the case of using the number of symptoms instead of symptom dummies are summarized in the fourth and fifth columns. Note that these numbers are the estimated coefficients and not the marginal effects, and thus it cannot be interpreted directly. Obviously, almost all explanatory variables are significant and Wald

statistics show they fit very well. Moreover, pseudo R^2's are very high despite of large sample.

Table 3 indicates the distribution of outpatient utilization in the actual and the predicted "Needs" in the many specifications in Table 2's. These numbers imply that there are not substantial differences in the pattern of the outpatient utilization over six years. Namely, the utilization rate is the highest in the top income group and the lowest in the middle income group. On the other hand, the distribution of the estimated "Needs" with age classes does not fit well and shows the positive relationship with income monotonically. Conversely, if we use the age dummies instead of age classes, it fits very well. In other words, differences in age is much more informative than the adopted classes for their "Needs."

The horizontal inequity measures are displayed in Figures 1, 2, and 3 for the three years in the case of Needs defined by the first three columns in the upper panel in the three Table 2's. The solid line is horizontal inequity defined only by SAH, the dotted line is horizontal inequity defined only by dummies of symptoms, and the dashed line indicates the horizontal inequity defined by the both in eq. (1). Three figures exhibit the same pattern. Namely, the solid lines deviate at most by 1% at 0.6-0.7 income classes and tend to be pro-poor, which means over the 0% line. The dotted lines do not deviate by 0.2% and show the particular pattern. These two types of lines are calculated by using SAH. Conversely, the broken lines, which do not adjusted for SAH, indicate heavily pro-rich inequity. It reaches about 6% at maximum in the 0.3-0.4 income classes. This suggests Needs definition without SAH does not seems to be reliable.

While figures provide much information about horizontal inequity, the empirical results should confirm and test it. Table 4 summarizes the empirical results of β_1 in eq. (3), and Table 5 summarizes horizontal inequity adjusted for regions. As figures indicate, there are significant pro-rich in the case of using age classes and without SAH. These are significant pro-rich inequity by 0.08 to 0.12. However, these inequities disappear by using SAH or age dummies. All other cases without such exceptional cases imply that the null hypothesis

of no inequity cannot be rejected. The most similar estimators with Doorslaer, Wagstaff et al.(2000) and Doorslaer, Koolman and Puffer(2001) are -0.0006, .0019 and -0.0009 in 1992, 1995 and 1998, respectively. Hereafter, these three figures would be thought of as the estimators of horizontal inequity in Japan.

Even though we controlled regions in eq.(3), there are no substantial change in the numbers. Namely, there are significant pro-rich in the case of using age classes and without SAH, and the similar figures for the previous studies are -0.0007, .0017 and -0.0005 for three years.

We can summarize our findings as follows: First of all, the null hypothesis of no inequity cannot be rejected. Secondly, there is not significant change in inequity over six years and no clear trend. Thirdly, the estimated horizontal inequity is heavily affected by the definition of "Needs." Especially, the omitting SAH contaminates the results heavily. It casts the difficulty of international comparison. Finally, regional adjustment in eq.(3) dose not affect the estimated inequity.

5 Concluding Remarks

Our findings are very straightforward. The null hypothesis of no inequity cannot be rejected and Japan would have enjoyed one of the greatest equity in health among OECD countries. In fact, these point estimator are larger than Spain(-0.0137), Ireland(-0.0098) and Italy(-0.0098) , less than Austria(0.0389), Portugal(0.0524), UK(0.0074), Canada(0.0072) and USA(0.0532)[2)]. It is almost the same as Belgium(-0.0001). Comparison with Belgium, the pro-rich inequity in Japan is larger than Belgium in 1995, but less in 1992 and 1998. The null hypothesis that horizontal inequity in Japan is different form Belgium is not rejected in the most detailed specifications.

However, we have to remind that the demand for outpatient services is defined whether they visit to physicians currently, but in the previous OECD studies, it is defined by

the number of visits to physicians (general practitioners) in a certain period (typically, one year). In other words, CSLSJ does not provide any information about the number of visits in a certain period in the past. It seems to be obvious to reduce the effects of income inequality for health care utilization and thus it makes inequity measures very small. Therefore, complete comparison with other OECD countries is remained for future research.

Since there is not other comparable Japanese data to other OECD countries, we will have to conduct a survey originally to obtain completely comparable data, for more rigorous comparison.

Acknowledgments

The data used in this paper have been obtained from one of the research meetings of the aging society, directed by Prof. Tachibanaki of Kyoto University, as one of the New Millennium Projects of the Economics and Social Research Institution, Cabinet Office of Japan. I would like to acknowledge fruitful discussions with anonymous referee, Prof.Doorslaer, Prof. Tachibanaki of Kyoto University and with other members of the research group. I also thank to assistance provided by Tomoko Nagase. Needless to say, all remaining errors are ours.

Footnotes

1) Doorslaer, Wagstaff et al.(2000) and Doorslaer, Koolman and Puffer(2001) are correspondence to the case of broader age categories and symptoms dummies precisely.

2) These numbers in other OECD countries are cited from Doorslaer, Koolman and Puffer(2001) in the case of all physician visit as utilizatin and with region information.

References

[1] Doorslaer, E.V. and A. Wagstaff, 1992, Equity in the delivery of health care: Some international comparisons, Journal of Health Economics 11, 389-411.

[2] Doorslaer, E.V., A. Wagstaff et al., 1997, Income-related inequalities in health: Some international comparisons,Journal of Health Economics 16, 93-112.

[3] Doorslaer, E.V. and A. Wagstaff et al., 2000, Equity in the delivery of health care in Europe and the US,Journal of Health Economics 19, 553-583.

[4] Doorslaer, E.V., X.Koolman and F.Puffer,2001, Equity in the use of physician visit in OECD countries: has equal treatment for equal need been achieved ?, ECuity II project, WOrking Paper No.3.

[5] Gunji,A. 2001, Regional Variation in Medical Expenditure (in Japanese),Toyo-keizai-shinpousha.

[6] Honda, C. and Y. Ohkusa, 2001, International comparison of subjective health evaluation - USA, UK and Japan, ISER Discussion Paper No.546.

[7] Ii, M. and Y. Ohkusa, 2001, Estimating price sensitivity for the medical services in the case of minor ailments using information on illness and symptom, Japan Economic Review, forthcoming.

[8] Kakwani, N., A. Wagstaff and E.V. Doorslaer, 1997, Socioeconomic inequalities in health: Measurement, computation and statistical inference,Journal of Econometrics 77, 87-103.

[9] Shigeno, Y., 2000, The demand for private health insurance and public health insurance (in Japanese), The Quarterly of Social Security Research 36, 378-390.

[10] Wagstaff, A., E.V. Doorslaer and P. Paci, 1989, Equity in the finance and delivery of health care: Some tentative cross-country comparisons, Oxford Review of Economic Policy 5, 89-112.

[11] Wagstaff, A., P. Paci and E.V. Doorslaer, 1991, On the measurement of inequalities in health, Social Science and Medicine 33, 545-557.

[12] Wagstaff, A. and E.V. Doorslaer, 1993, Equity in the delivery of health care: Methods and findings, in: E.V. Doorslaer, A. Wagstaff and F. Rutten, eds.,Equity in the Finance and Delivery of Health Care: An International PerspectiveOxford University Press.

[13] Wagstaff, A. and E.V. Doorslaer, 1994, Measuring inequalities in health in the presence of multiple-category morbidity indicators, Health Economics 3, 281-291.

[14] Wagstaff, A. and E.V. Doorslaer(2000), Measuring and Testing for Inequalities in the Delivery of Health Care, Journal of Human Resources , pp.716-733.

Table 1: Summary Statistics

Year	1998		1995		1992	
	Average	Standard Deviation	Average	Standard Deviation	Average	Standard Deviation
Utilization	0.3156	0.4648	0.3271	0.4692	0.2996	0.4581
Adjusted Income	360.0	263.6	358.9	266.9	326.9	256.8
SAH						
Excellent	0.2527	0.1888	0.3127	0.2149	0.3374	0.2236
Good	0.1746	0.1441	0.1760	0.1450	0.1608	0.1349
Fair	0.4500	0.2475	0.4091	0.2417	0.3956	0.2391
Poor	0.1115	0.0991	0.0930	0.0844	0.0958	0.0866
Very Poor	0.0111	0.0110	0.0092	0.0091	0.0104	0.0103
female	0.5231	0.4995	0.5222	0.4995	0.5255	0.4994
No. of symptoms	1.3160	2.7617	0.9909	2.1125	0.8988	2.0748
35-44	0.1515	0.3586	0.0627	0.2425	0.0648	0.2462
45-64	0.3547	0.4784	0.3885	0.4874	0.3685	0.4824
65-74	0.1277	0.3337	0.1340	0.3407	0.1303	0.3366
75-	0.0737	0.2614	0.1185	0.3232	0.1330	0.3396
No. of Samples	71999		85526		99518	

Table 2-1: The Estimation Result for Need in 1998

Age Classes					
No. of Symptoms				.101***	.150***
SAH					
Good	.458***		.291***	.396***	
Fair	.593***		.367***	.495***	
Poor	1.40***		.811***	1.02***	
Very Poor	1.78***		1.10***	1.23***	
Age Class					
35-44	.250***	.283***	.263***	.239***	.268***
45-64	.718***	.714***	.695***	.683***	.712***
65-74	1.32***	1.25***	1.23***	1.25***	1.28***
75-	1.50***	1.40***	1.37***	1.40***	1.46***
Female	.177***	.159***	.161***	.141***	.143***
Female · Age Class					
35-44	-.182***	-.202***	-.206***	-.183***	-.178***
45-64	-.087***	-.101***	-.103***	-.087***	-.087***
65-74	-.077***	-.055***	-.075***	-.058***	-.036***
75-	-.103***	-.044**	-.078***	-.067***	-.034*
Constant	-1.72***	-1.56***	-1.80***	-1.70***	-1.35***
Symptom Dummies	No	Yes	Yes	No	No
Wald statistics	524202	207300	4135.15	101900	181816
p-value	$\leq$0.001	$\leq$0.001	$\leq$0.001	$\leq$0.001	$\leq$0.001
Log-likelihood	-35802	-33753	-32997	-34801	-36053
Pseudo R^2	0.1993	0.2451	0.2620	0.2217	0.1937

Age Dummies					
No. of Symptoms				.148***	.099***
SAH					
Good	.456***		.291***		.395***
Fair	.589***		.365***		.492***
Poor	1.40***		.814***		1.02***
Very Poor	1.77***		1.10***		1.22***
Female	-5.97***	1.73***	-5.52***	1.38***	1.27***
Constant	-1.67***	-1.55***	-1.75***	-1.33***	-1.64***
Symptom Dummies	No	Yes	Yes	No	No
Wald statistics	18500	70531	90521	7849.9	23021
p-value	$\leq$0.001	$\leq$0.001	$\leq$0.001	$\leq$0.001	$\leq$0.001
Log-likelihood	-35268	-33310	-32563	-35560	-34324
Pseudo R^2	0.2113	0.2551	0.2718	0.2047	0.2324

Note: These number are estimated coefficients and not marginal effects.

Table 2-2: The Estimation Result for Need in 1995

No. of Symptoms				.127***	.186***
SAH					
Good	.459***		.299***	.396***	
Fair	.566***		.351***	.464***	
Poor	1.39***		.812***	.999***	
Very Poor	1.82***		1.18***	1.32***	
Age Class					
35-44	.130***	.169***	.134***	.127***	.176***
45-64	.562***	.618***	.574***	.547***	.603***
65-74	1.12***	1.12***	1.07***	1.09***	1.16***
75-	1.38***	1.36***	1.29***	1.33***	1.43***
Female	.205***	.183***	.182***	.178***	.179***
Female · Age Class					
35-44	-.044	-.039	-.038	-.048	-.055
45-64	-.124***	-.150***	-.154***	-.132***	-.124***
65-74	-.147***	-.135***	-.151***	-.139***	-.118***
75-	-.136***	-.097***	-.117***	-.114***	-.088**
Constant	-1.59***	-1.50***	-1.69***	-1.60***	-1.32***
Symptom Dummies	No	Yes	Yes	No	No
Wald statistics	15632	19816	20328	15542	12743
p-value	$\leq$0.001	$\leq$0.001	$\leq$0.001	$\leq$0.001	$\leq$0.001
Log-likelihood	-42829	-40246	-39366	-41708	-43138
Pseudo R^2	0.1805	0.2300	0.2468	0.2020	0.1746

Age Dummies					
No. of Symptoms				.183***	.124***
SAH					
Good	.458***		.301***		.396***
Fair	.563***		.352***		.464***
Poor	1.39***		.817***		1.00***
Very Poor	1.81***		1.18***		1.31***
Female	.982**	.975	1.08	.856	.998
Constant	-1.28***	-1.24***	-1.39***	-1.04***	-1.28***
Symptom Dummies	No	Yes	Yes	No	No
Wald statistics	16565	20549	21059	13825	16493
p-value	$\leq$0.001	$\leq$0.001	$\leq$0.001	$\leq$0.001	$\leq$0.001
Log-likelihood	-42220	-39746	-38871	-42572	-41116
Pseudo R^2	0.1922	0.2395	0.2563	0.1854	0.2125

Table 2-3: The Estimation Result for Need with Age Classes in 1992

No. of Symptoms				.135***	.203***
SAH					
Good	.496***		.331***	.434***	
Fair	.635***		.403***	.532***	
Poor	1.46***		.810***	1.04***	
Very Poor	1.77***		1.02***	1.20***	
Age Class					
35-44	-.036	.033	-.024	-.042*	.033
45-64	.357***	.432***	.364***	.342***	.430***
65-74	.880***	.943***	.866***	.856***	.963***
75-	1.20***	1.24***	1.15***	1.16***	1.30***
Female	.123***	.127***	.119***	.104***	.109***
Female · Age Class					
35-44	.106***	.077**	.084**	.095***	.087***
45-64	-.026	-.058**	-.060**	-.047*	-.043*
65-74	-.071**	-.091***	-.096***	-.074**	-.063**
75-	-.085***	-.090***	-.099***	-.076**	-.057*
Constant	-1.56***	-1.46***	-1.65***	-1.56***	-1.28***
Symptom Dummies	No	Yes	Yes	No	No
Wald statistics	17904	23357	23975	17746	13875
p-value	$\leq$0.001	$\leq$0.001	$\leq$0.001	$\leq$0.001	$\leq$0.001
Log-likelihood	-48550	-45452	-44421	-47221	-49081
Pseudo R^2	0.1818	0.2341	0.2514	0.2042	0.1729

Age Dummies					
No. of Symptoms				.201***	.133***
SAH					
Good	.499***		.334***		.438***
Fair	.637***		.407***		.536***
Poor	1.46***		.820***		1.05***
Very Poor	1.76***		1.02***		1.19***
Female	.193	.195	-.601	-.384***	-.419
Constant	-1.23***	-1.20***	-1.34***	-1.01***	-1.24***
Symptom Dummies	No	Yes	Yes	No	No
Wald statistics	18855	24087	24681	15192	18781
p-value	$\leq$0.001	$\leq$0.001	$\leq$0.001	$\leq$0.001	$\leq$0.001
Log-likelihood	-47867	-44889	-43858	-48434	-46588
Pseudo R^2	0.1933	0.2435	0.2609	0.1838	0.2149

Table 3: Utilization and Estimated Needs by Income Quantile

Age	No. of Symptoms	Year	Util./Needs	Bottom 20%	20-40%	40-60%	60-80%	Top 20%
		1998	Utilization	.278	.294	.184	.235	.569
		1995	Utilization	.269	.266	.195	.230	.539
		1992	Utilization	.248	.266	.175	.218	.505
Classes	No	1998	SAH	.114	.157	.294	.334	.513
			Symptoms	.161	.199	.287	.320	.444
			Both	.110	.161	.296	.335	.507
Classes	No	1995	SAH	.137	.192	.312	.344	.515
			Symptoms	.186	.224	.314	.332	.440
			Both	.135	.192	.319	.342	.507
Classes	No	1992	SAH	.127	.229	.328	.328	.547
			Symptoms	.183	.250	.346	.309	.468
			Both	.127	.227	.345	.316	.541
Classes	Yes	1998	Symptoms	.191	.210	.276	.300	.423
			Both	.113	.157	.294	.330	.511
Classes	Yes	1995	Symptoms	.210	.236	.295	.323	.424
			Both	.135	.191	.310	.346	.510
Classes	Yes	1992	Symptoms	.212	.258	.310	.316	.452
			Both	.126	.228	.321	.332	.545
Dummies	No	1998	SAH	.247	.268	.174	.218	.505
			Symptoms	.246	.267	.173	.218	.505
			Both	.246	.267	.173	.219	.505
Dummies	No	1995	SAH	.268	.269	.193	.231	.538
			Symptoms	.267	.268	.193	.231	.537
			Both	.267	.268	.193	.231	.537
Dummies	No	1992	SAH	.280	.292	.184	.234	.569
			Symptoms	.280	.291	.182	.234	.569
			Both	.280	.291	.182	.234	.569
Dummies	Yes	1998	Symptoms	.248	.265	.173	.219	.505
			Both	.248	.265	.173	.219	.505
Dummies	Yes	1995	Symptoms	.262	.281	.184	.231	.538
			Both	.262	.281	.185	.231	.538
Dummies	Yes	1992	Symptoms	.304	.265	.185	.234	.569
			Both	.304	.265	.184	.234	.569

Table 4: The Estimated Concentration Index, Horizontal Inequity and Their Confidence Interval

Age	No. of Symptoms	Year	Needs Def./CI	Estimator	95%CI lower boubd	95%CI upper bound
		1998	CI	.0007	-.0091	.0107
		1995	CI	.0075	-.0082	.0233
		1992	CI	.0064	-.0062	.0191
Classes	No	1998	SAH	-.0048144	-.0114498	.001821
			Symptoms	.0783489	.0724745	.0842234
			Both	-.0008935	-.0069083	.0051213
Classes	No	1995	SAH	-.0012385	-.0077185	.0052415
			Symptoms	.0825699	.0769057	.088234
			Both	.001905	-.0039076	.0077177
Classes	No	1992	SAH	-.0016404	-.0082949	.005014
			Symptoms	.0849225	.0792991	.0905459
			Both	-.0005696	-.0063858	.0052465
Classes	Yes	1998	Symptoms	.1118019	.1055935	.1180104
			Both	.0023189	-.0041148	.0087526
Classes	Yes	1995	Symptoms	.1120658	.1060572	.1180744
			Both	.0005353	-.005711	.0067816
Classes	Yes	1992	Symptoms	.1274143	.1214338	.1333948
			Both	.0024351	-.0038694	.0087396
Dummies	No	1998	SAH	.0008551	-.0044873	.0061976
			Symptoms	.0002563	-.0048394	.0053521
			Both	.0002635	-.0047627	.0052897
Dummies	No	1995	SAH	.0001678	-.0049554	.005291
			Symptoms	-.0004148	-.0052664	.0044368
			Both	-.0004874	-.0052775	.0043028
Dummies	No	1992	SAH	.0006951	-.004251	.0056413
			Symptoms	-.0002273	-.0049104	.0044558
			Both	-.0003296	-.0049545	.0042954
Dummies	Yes	1998	Symptoms	.0008852	-.004466	.0062364
			Both	.001191	-.0040259	.0064079
Dummies	Yes	1995	Symptoms	-.0007807	-.0058842	.0043228
			Both	-.0000584	-.0050583	.0049416
Dummies	Yes	1992	Symptoms	-.0001778	-.0051346	.0047791
			Both	.0002361	-.0046002	.0050724

Table 5: The Estimated orizontal Inequity and Their Confidence Interval, cotrolled with Regional Dummies

Age	No. of Symptoms	Year	Needs Def./CI	Estimator	95%CI lower boubd	95%CI upper bound
Classes	No	1998	SAH	-.0044354	-.0110766	.0022059
			Symptoms	.0787252	.0728414	.0846091
			Both	-.00056	-.0065829	.0054629
Classes	No	1995	SAH	-.0015081	-.0079876	.0049713
			Symptoms	.0824537	.0767899	.0881175
			Both	.0017665	-.0040452	.0075781
Classes	No	1992	SAH	-.0019883	-.0086423	.0046657
			Symptoms	.0847203	.0790964	.0903441
			Both	-.0007749	-.0065911	.0050413
Classes	Yes	1998	Symptoms	.1123355	.1061217	.1185492
			Both	.002791	-.0036468	.0092287
Classes	Yes	1995	Symptoms	.1120204	.1060145	.1180264
			Both	.0004334	-.0058099	.0066767
Classes	Yes	1992	Symptoms	.1271793	.121197	.1331616
			Both	.0022197	-.0040851	.0085245
Dummies	No	1998	SAH	.0015379	-.0038023	.0068781
			Symptoms	.000738	-.0043597	.0058357
			Both	.0008135	-.0042142	.0058412
Dummies	No	1995	SAH	.0003914	-.0047274	.0055102
			Symptoms	-.0003152	-.0051673	.004537
			Both	-.0003547	-.0051451	.0044357
Dummies	No	1992	SAH	.0010876	-.0038597	.006035
			Symptoms	.0003113	-.0043754	.0049981
			Both	.0001369	-.004492	.0047658
Dummies	Yes	1998	Symptoms	.0014243	-.0039275	.0067761
			Both	.0018136	-.0034037	.0070309
Dummies	Yes	1995	Symptoms	-.0005587	-.0056617	.0045443
			Both	.0001573	-.0048427	.0051573
Dummies	Yes	1992	Symptoms	.0002488	-.0047113	.005209
			Both	.0005927	-.0042472	.0054325

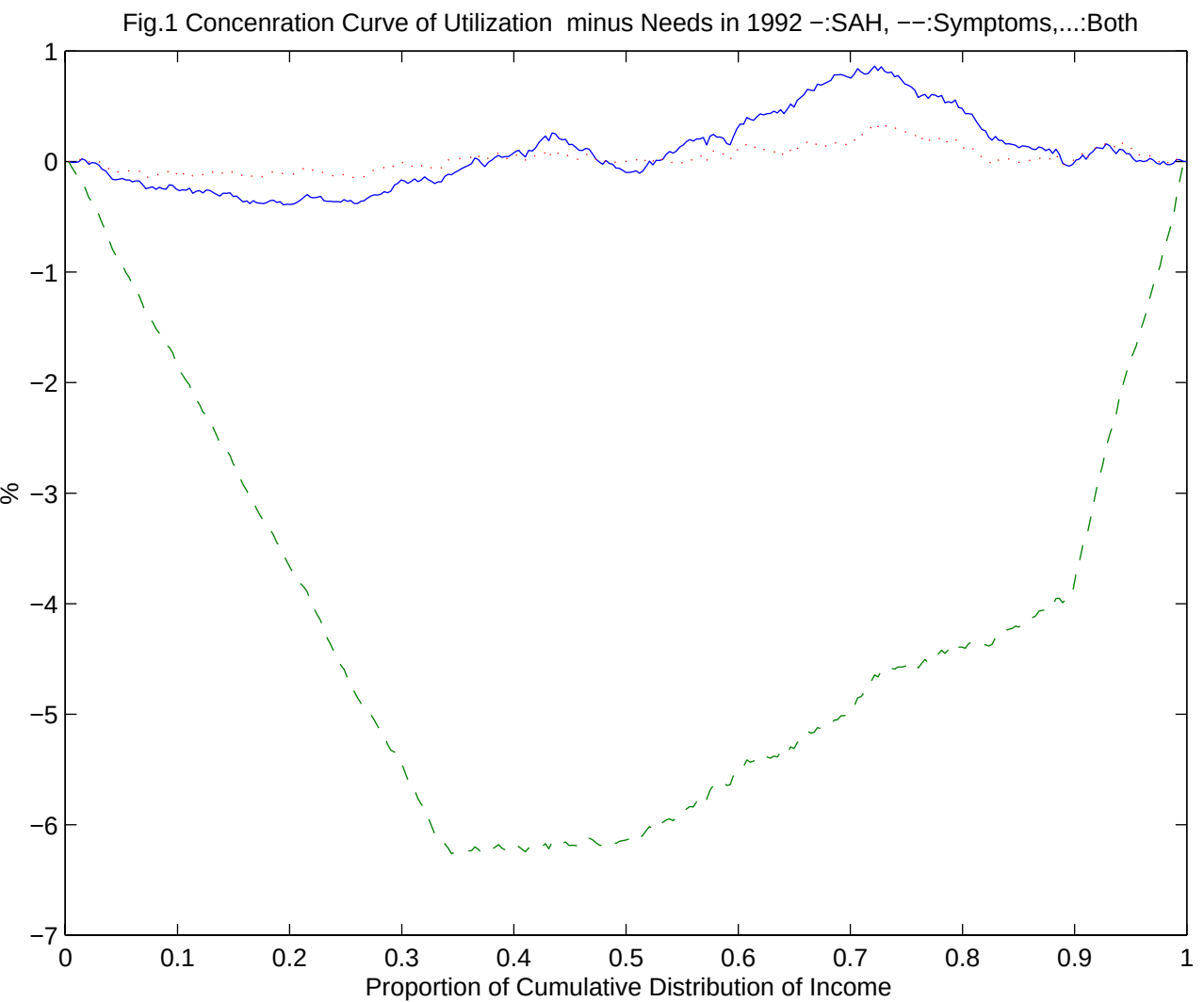
Fig.1 Concenration Curve of Utilization minus Needs in 1992 −:SAH, −−:Symptoms,...:Both
1
0
−1
−2
−3
−4
−5
−6
−7
%
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
Proportion of Cumulative Distribution of Income

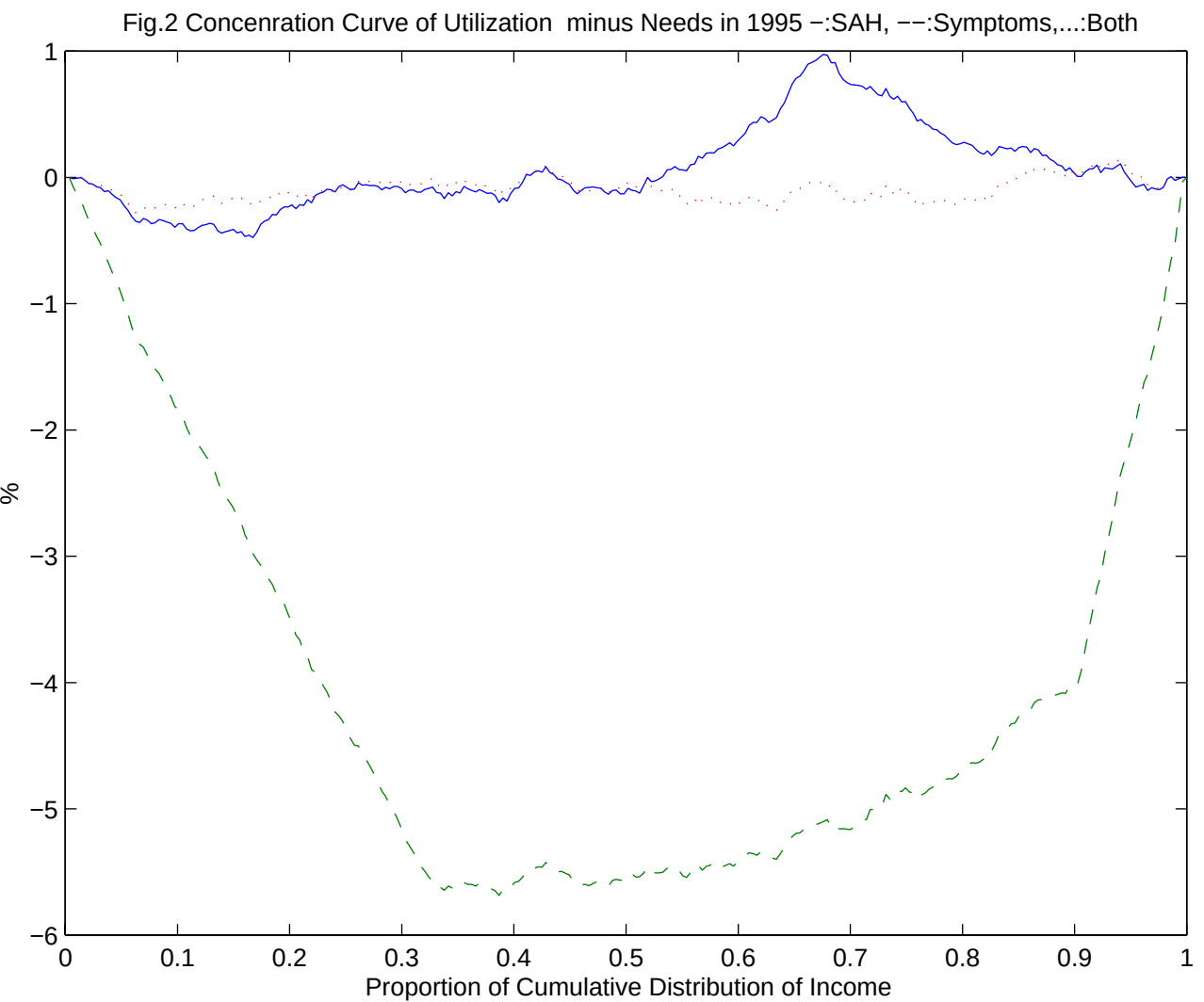
Fig.2 Concenration Curve of Utilization minus Needs in 1995 −:SAH, −−:Symptoms,...:Both
1
0
−1
−2
−3
−4
−5
−6
%
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
Proportion of Cumulative Distribution of Income

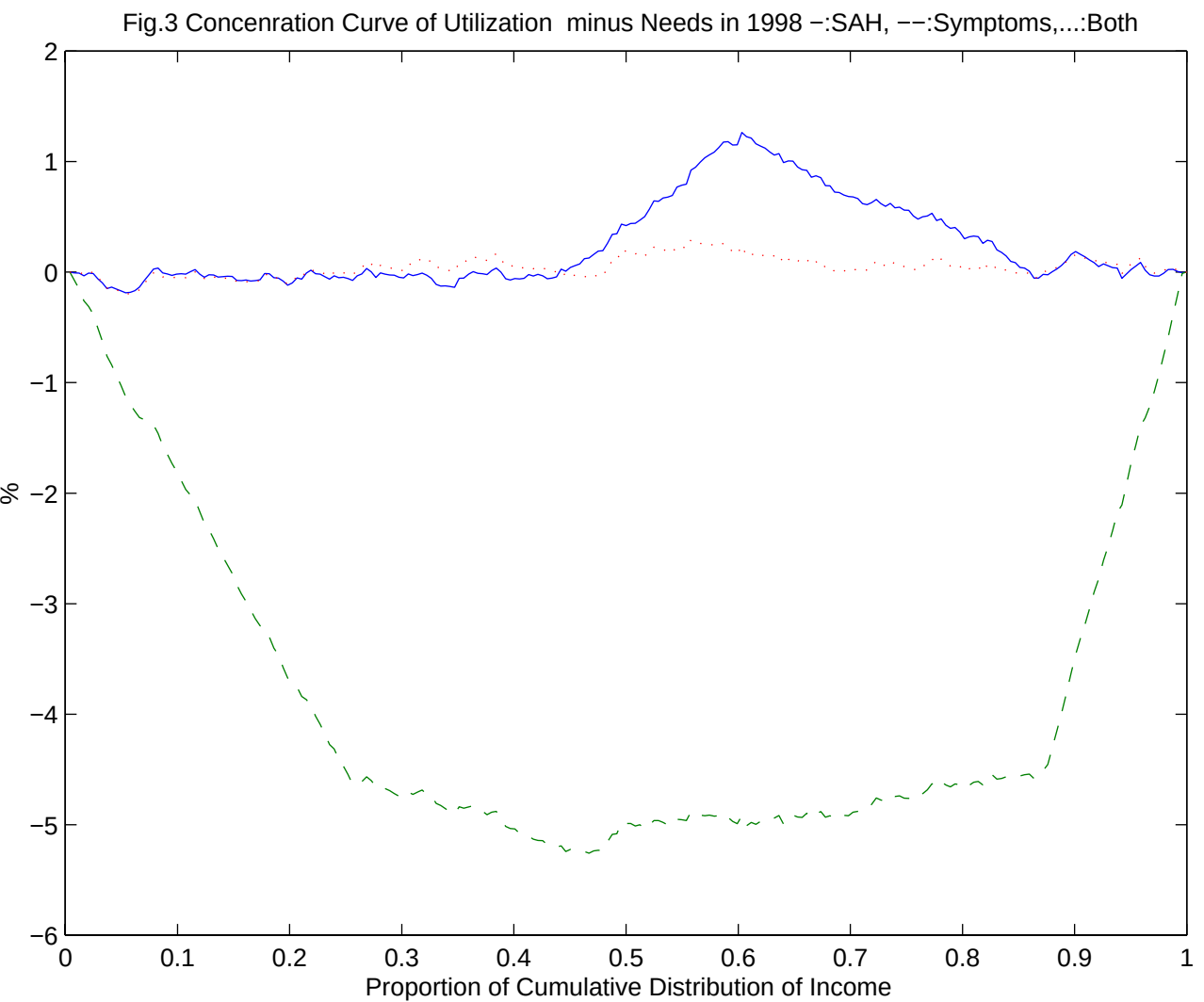
Fig.3 Concenration Curve of Utilization minus Needs in 1998 −:SAH, −−:Symptoms,...:Both
2
1
0
−1
−2
−3
−4
−5
−6
%
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
Proportion of Cumulative Distribution of Income