

Honda, Chika; Ohkusa, Yasushi

**Working Paper**

## Horizontal inequity in health care utilization in Japan

ISER Discussion Paper, No. 561

**Provided in Cooperation with:**

The Institute of Social and Economic Research (ISER), Osaka University

*Suggested Citation:* Honda, Chika; Ohkusa, Yasushi (2002) : Horizontal inequity in health care utilization in Japan, ISER Discussion Paper, No. 561, Osaka University, Institute of Social and Economic Research (ISER), Osaka

This Version is available at:

<https://hdl.handle.net/10419/92699>

**Standard-Nutzungsbedingungen:**

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

**Terms of use:**

*Documents in EconStor may be saved and copied for your personal and scholarly purposes.*

*You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.*

*If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.*

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/merorrhagia, 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 physician (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 severe 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  $i$ th 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

$$\begin{aligned}
 D_i^* &= \alpha_0 + \sum_j^{\mathcal{A}} \alpha_{A_j}^j A_i^j + \sum_j^{\mathcal{AG}} \alpha_{AG_j}^j A_i^j G_i + \alpha_G G_i + \sum_l^{\mathcal{H}} \alpha_{H_l}^l H_i^l + \sum_m^{\mathcal{S}} \alpha_S^m S_i^m + \varepsilon_i \\
 D_i &= \begin{cases} 1 & \text{if } D_i^* > 0 \\ 0 & \text{otherwise} \end{cases} \quad (1)
 \end{aligned}$$

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-<sup>1)</sup>.

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

$$2 \frac{\mu_i^+}{\mu^+ \sigma_R} = \alpha_0 + \alpha_1 R_t \quad (2)$$

where the subscript  $i$  indicates the individual of the  $i$ th SEG, which means  $i$ th smallest amount of income adjusted for household structure, and  $\mu_i^+$  is the demand for medical care. Adjustment for demographic characteristics for  $\mu_i^+$  and  $\mu^+$  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  $i$ th person.

$\mu^+$  is the average of  $\mu_i^+$  over persons,  $R_i$  is the cumulative proportion up to the  $i$ th person in order of income adjusted for household structure, and  $\sigma_R$  is its variance. The estimated  $\alpha_1$  is the Concentration Index of the demand for medical care. Similarly, the Concentration Index of needs is defined by replacing  $\mu$  by  $n$ , which is a measure of needs.

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

$$Var(\text{Concentration Index}) = \frac{1}{10} \left\{ \sum_{t=1}^{\infty} f_t a_t^2 - (1 + \text{Concentration Index})^2 \right\} \quad (3)$$

$$a_t = \frac{\mu_i^+}{\mu^+} (2R_{i-1} - \text{Concentration Index}) + 2 - q_{i-1} - q_i \quad (4)$$

$$q_i = \frac{1}{\mu^+} \sum_{s=1}^{\infty} \mu_s^+ f_s$$

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

$$2\sigma_R^2 \left( \frac{\mu_i^+}{\mu^+} - \frac{n_i^+}{n^+} \right) = \beta_0 + \beta_1 R_i \quad (5)$$

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

The estimated coefficient of  $\beta_1$  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  $\beta_1$  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)<sup>2</sup>). 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 Perspective* Oxford 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   |
| <i>p</i> -value       | ≤0.001   | ≤0.001   | ≤0.001   | ≤0.001   | ≤0.001   |
| Log-likelihood        | -35802   | -33753   | -32997   | -34801   | -36053   |
| Pseudo R <sup>2</sup> | 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    |
| <i>p</i> -value       | ≤0.001   | ≤0.001   | ≤0.001   | ≤0.001   | ≤0.001   |
| Log-likelihood        | -35268   | -33310   | -32563   | -35560   | -34324   |
| Pseudo R <sup>2</sup> | 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    |
| <i>p</i> -value       | ≤0.001   | ≤0.001   | ≤0.001   | ≤0.001   | ≤0.001   |
| Log-likelihood        | -42829   | -40246   | -39366   | -41708   | -43138   |
| Pseudo R <sup>2</sup> | 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    |
| <i>p</i> -value       | ≤0.001   | ≤0.001   | ≤0.001   | ≤0.001   | ≤0.001   |
| Log-likelihood        | -42220   | -39746   | -38871   | -42572   | -41116   |
| Pseudo R <sup>2</sup> | 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    |
| <i>p</i> -value       | ≤0.001   | ≤0.001   | ≤0.001   | ≤0.001   | ≤0.001   |
| Log-likelihood        | -48550   | -45452   | -44421   | -47221   | -49081   |
| Pseudo R <sup>2</sup> | 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    |
| <i>p</i> -value       | ≤0.001   | ≤0.001   | ≤0.001   | ≤0.001   | ≤0.001   |
| Log-likelihood        | -47867   | -44889   | -43858   | -48434   | -46588   |
| Pseudo R <sup>2</sup> | 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 bound | 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 bound | 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 Concentration Curve of Utilization minus Needs in 1992 -:SAH, ---:Symptoms,....:Both

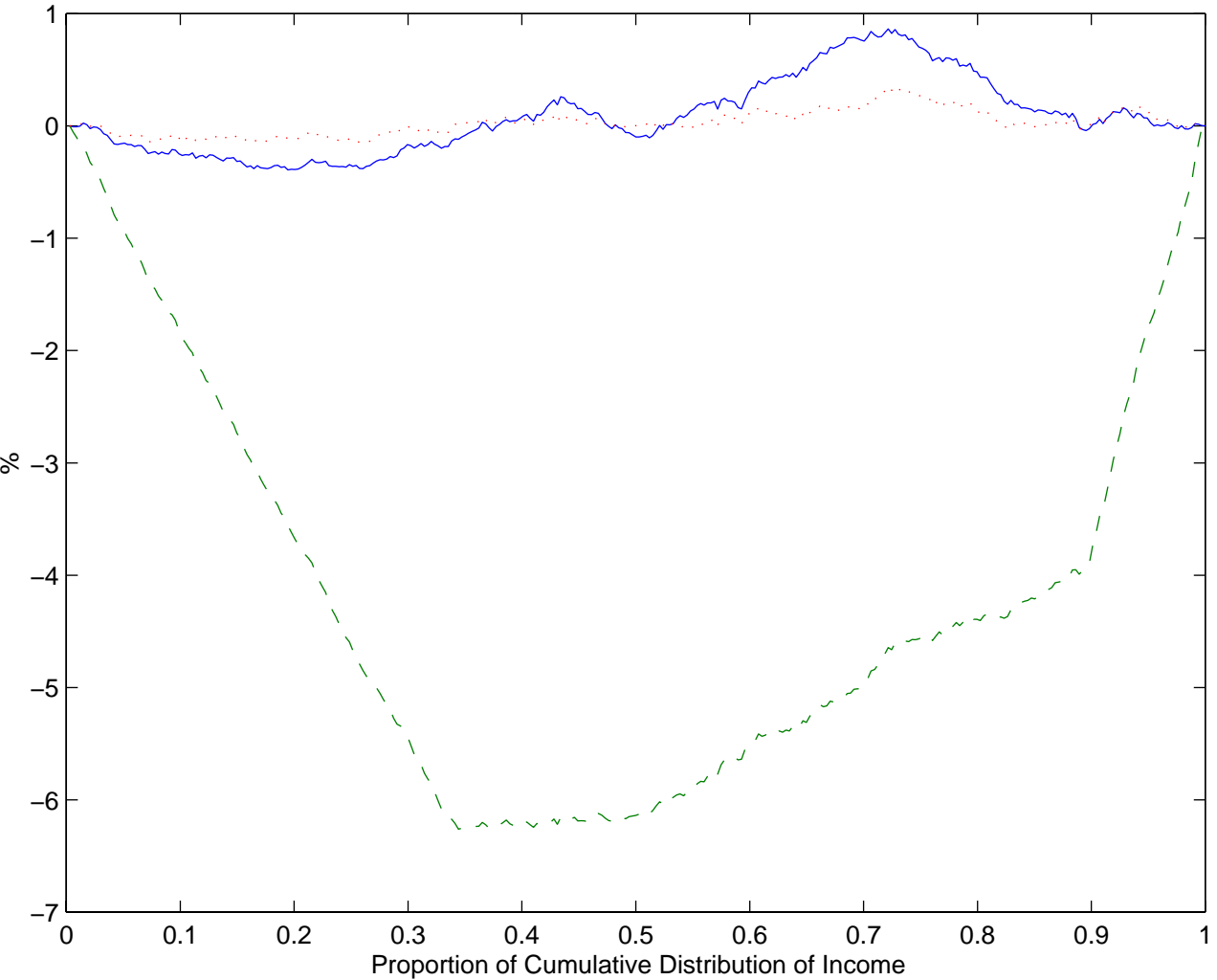




Fig.2 Concentration Curve of Utilization minus Needs in 1995 -.:SAH, ---:Symptoms,....:Both

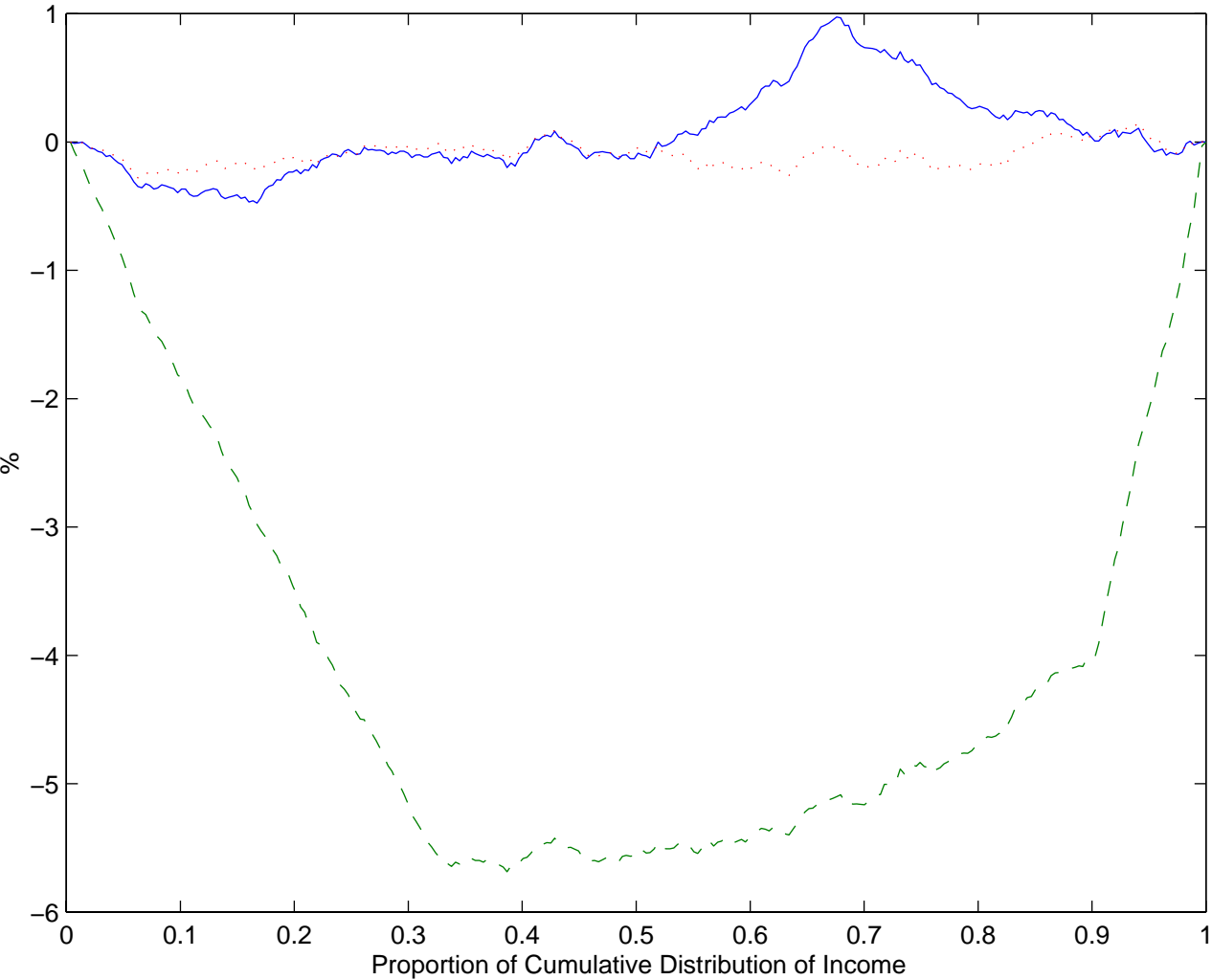


Fig.3 Concentration Curve of Utilization minus Needs in 1998 -:SAH, ---:Symptoms,....:Both

