HEALTH CARE UTILISATION IN KEDAH: A MICROECONOMETRIC ANALYSIS

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Abstract: While the government has made various efforts to upgrade health care facilities in Malaysia, these advances will only benefit the people if the facilities or services are utilised by those in need. This issue has highlighted the importance of the equity concept in health care utilisation. This study aims to identify the existence of income-related inequity and determine the effect of the availability of health facilities in determining health care utilisation in the state of Kedah. A microeconometric analysis is used in this study, specifically the probit and count data models. We use multistage cluster sampling in selecting the sample for the study. All individuals aged 18 and above from selected households are interviewed. From the analysis it suggests that, beside health status, some socioeconomic factors are significant in determining health care use. However, there is no evidence of income-related inequity in health care utilisation in the area of study. The results also suggests that those live in the less developed district are less likely to utilise health care compared to those from developed district. This indicates that the availability of health facilities may somewhat induce the likelihood or frequency of health care use. Findings from this study may provide some information for policy analyst in designing an equitable health and health care policy for the well-being of the *rakyat* (people).

Keywords: income-related inequity; count data model, health care; microeconometric; well-being

INTRODUCTION

In achieving a high-income nation status, Malaysia has underlined new policy directions and strategies in the 10th Malaysia Plan [1]. In order to achieve a sustainable economic and social development, the government believes that more attention should be given to improve the quality of life of the *rakya*t (people). One of the efforts to improve the people's quality of life is to upgrade the overall standard of health services, so that the benefits can be enjoyed by all levels of society, whether from urban or rural areas. Better health services will improve access to health facilities, hence improve the health status. While the government has made various efforts to upgrade health care services in Malaysia, these advances will only benefit the country as a whole if the services have been utilised by those in need. This emphasises the importance of the concept of equity in health care utilisation. The government has continually sought to improve the standard of health services in Malaysia as one of the measures to increase the welfare of the *rakyat*. For example, as to increase the health services coverage, a total of RM637 billion has been allocated to build new health centres like rural clinics, community health clinics and clinics 1Malaysia under the 10th Malaysia Plan. These are among the measures taken by the government to improve health state of the people, but the question now is that, do the current services have been utilised by the right person?, or are there any other factors, other than health conditions, that have affected health care consumption? Ideally, health care should be consumed based on 'need', not other socio-economic factors [2,3]. The health system must not be exploited by the healthy 'well-off' or educated group, especially for public health care.

As in other sectors, the health care sector faces the economic problem of scarce resources. Therefore,

determining the determinants of health care demand by the population is essential in distributing these scarce resources based on the objectives of health policies. These determinants might also have different impacts depending on which health care system is in place in the country under consideration [4-6]. Health systems vary between publicly financed national health services, national health insurance systems and private insurance systems. Thus, the determinants of health care demand might also vary between countries which mean they require country-specific analysis to determine them. Therefore, studies on factors that affect health care utilisation in Malaysia are vital in order to examine the issue of equity in health care system. The main purpose of this study is to enhance understanding on issues concerning the equity of health care utilisation within the context of Malaysia. The specific objectives of this study are to (1) identify the existence of income-related inequity in health care utilisation, and (2) establish the effect of health care availability on health care use, specifically in the state of Kedah.

RESEARCH METHODS

Research framework

The Grossman model (GM) for health care demand is used as a foundation of our empirical analysis (see [7] for detail discussion). Within the household production framework, GM treats an individual as a sole decision-maker in determining the amount of health care used. Ones derive utility based on the intertemporal utility function which depends on the total consumption of healthy time and total consumption of other goods. Health in this model is discussed in the light of human capital theory where health capital is subject to depreciation overtime. The stock of health, however, can be improved via investment activities such as consuming medical care and healthy food, engaging in healthy lifestyle and avoiding health-damaging activities such as drinking (alcohol) and smoking that can decrease the capital. Many studies on health and health care demand have referred to GM as a foundation to their development of theoretical or empirical investigations [7-11]. For the empirical work in this study, the health care utilisation framework by Aday and Andersen [12] will be employed. The framework provides a useful guide in understanding the important variables in utilisation process. The utilisation of care that will be focused in this study is doctor visit (for outpatient care). Independent variables are divided into three main groups that we will discuss later in this section. In identifying the influence of these variables on health care use, microeconometric methods will be employed. The empirical specification will be presented in section 3.

Data

This study concentrates on health care utilisation in the state of Kedah. The multistage cluster sampling technique is employed in selecting the sample for the study. All districts in Kedah were first divided into two clusters – developed and less developed. The division is based on economic activities of the population. If the majority of the people in that particular district engage in industrial and service sectors, the district is classified as developed while if a majority of the population depends on agriculture, it is categorised as less-developed. Then, one district was randomly selected from each cluster, which gives us Kubang Pasu (developed) and Padang Terap (less developed). The survey is conducted between the month of May and June 2011. A total of 205 households are surveyed. All household members aged 18 and above are interviewed using an administered questionnaire. From the 205 households, a total of 502 individuals were successfully interviewed. However, due to missing values in variables used in the analysis, only 497 individuals are left in the sample.

Selection of variables

In this study, the utilisation of doctor services (outpatient services) is used as a proxy of demand. The exploratory variables are divided into three main categories based on Aday & Anderson framework [12]. These three categories are known as *predisposing*, *enabling* and *need* factors. The selection of variables is also based on the systematic review done by Shamzaeffa [13]. Predisposing factors consist of inherent factors that exist within individuals and other socioeconomic factors that we assume exist prior to illness. In this study, the predisposing factors are age, gender, education level and economic activity. The engagement in exercise activities and smoking behaviour are also included in this category as a proxy of individual attitude towards health care seeking behaviour. They measure, controlling for other factors, the direct effect of individuals' attitudes toward health care. Those who exercise are presumed to be among those with positive attitudes towards health and health care, and those who smoke are the opposite.

Other factors, which include individual, family and community resources that are able to influence health care use are categorised as enabling factors. Marital status, income, medical insurance, district and over-the-counter (OTC) market for health services are included in this category. The marital status are considered as an enabling factor here rather than a predisposing factor because of its ability to explain the role of partners as a source of alternative care to formal care; or it can be treated as a source of moral support to individual to seek care.

Table 1: Summary statistics of Dependent Variables (DV) and Independent Variables (IV)
N=497

DV	Definition	Mean	Std. Dev	Min	Max
DOCVIS	1 if had utilised doctor services in the last one month before the interview, 0 otherwise	0.245	0.431	0	1
N_DOCVIS	Number of doctor utilisation in the last one month before the interview	0.404	0.992	0	12
IV					
I. Predisposing factors					
AGE	Age in year	40.757	14.388	18	95
AGESQ	Square of age in year	1867.7	1317.7	324	9025
MALE	1 if gender is male, 0 if female	0.485	0.500	0	1
EDU2	1 if has formal primary or secondary education, 0 otherwise	0.616	0.487	0	1
EDU3	1 if has certificate, STPM, diploma or equivalent, 0 otherwise	0.221	0.416	0	1
EDU4	1 if has degree and above, 0 otherwise	0.107	0.309	0	1
WORK_GOV	1 if work in public sector, 0 otherwise	0.221	0.416	0	1
WORK_PVT	1 if work in private sector, 0 otherwise	0.191	0.394	0	1
WORK_OTHER	1 if retired altogether, student or unemployed, 0 otherwise	0.348	0.477	0	1
SMOKER	1 if smoker, 0 otherwise	0.274	0.446	0	1
EXERCISE	1 if does not exercise 2 if exercise <= than 2 hours per week 3 if exercise between 2-4 hours per week 4 if exercise more than 4 hours per week	2.334	1.202	1	4
II. Enabling factors					
MARRIED	1 if married, 0 otherwise	0.732	0.443	0	1
WIDOW	1 if widowed, 0 otherwise	0.058	0.235	0	1
DIVORCED	1 if divorced or permanently separated, 0 otherwise	0.006	0.078	0	1
INCOME	Log of household income / number of household's member	5.969	0.973	0	8.112
INSURANCE	1 if has medical insurance, 0 otherwise	0.264	0.441	0	1
DIST_PT	1 if lives in Padang Terap, 0 Kubang Pasu	0.288	0.453	0	1
OTC	1 if buys medicines from over-the-counter market	0.292	0.455	0	1
III. Need factors					
SAH_AVRG	1 if assessed health status as average, 0 otherwise	0.239	0.427	0	1
SAH_POOR	1 if assessed health status as poor, 0 otherwise	0.060	0.238	0	1
LONG_ILL	1 if has any longstanding health problem, 0 otherwise	0.233	0.423	0	1
LIMIT_ACT	1 if has any activity cut-down due to health problem, 0 otherwise	0.157	0.364	0	1

The district variable acts as a proxy for health care supply. The district of Kubang Pasu has been categorised as developed, which may reflect greater health care availability than Padang Terap. The OTC are services that may act as a substitute or complementary to doctor visits.

The last category according to Aday & Anderson's framework is the need factors. Factors that represent the need for medical care may include the perceived need by individuals or evaluated needs by medical provider. Need factors used in this study comprises three self-reported health conditions, i.e. self-assessed health, longstanding health problems and activities cut-down in the last two weeks before the interview due to health problems (including temporary health problems or injuries). The definition and summary statistics of each variable is explained in Table 1.

EMPIRICAL SPECIFICATION

The analysis is divided into two parts. The first part employs the probit model and the second part utilises the count data approach.

Probit model

The probit model is used to explain whether or not someone visits a doctor, represented by variable DOCVIS. For notational convenience, y_i is used to represent DOCVIS for every individual.

Suppose is an unobserved variable that reflects utility of utilising health care. Given the set of individual characteristics, , the index function model is given by $y_i^* = x_i'\beta + u_i,\ i = 1...N$ and $u_i \sim \mathrm{N}(0,1)$ (1)

We can only observe dependent variable y_i that linking to y_i^* by

$$y_i = \begin{cases} 1 if\ y_i^* > 0 \\ 0 if\ y_i^* \le 0 \end{cases}$$

The probability density function is

$$\begin{aligned} \Pr(y_i = 1) &= \Pr(y_i^* > 0) = \Pr(x_i'\beta + u_i > 0) \\ &= \Pr(u_i > -x_i'\beta) = \Phi(x_i'\beta) \end{aligned} \quad (2)$$

where $\Phi(.)$ is the standard normal cumulative distribution function.

Count model

Count model is used to model the number of visit to health care which in this study would be the number of doctor visit, N_DOCVIS. The empirical model for health care demand, Y, is specified as below:

$$\mathrm{E}(Y = y_i | x_i) = \exp(x_i'\beta), \quad i = 1...N \quad (3)$$

where is the realised demand for health care for individual i and is a vector of characteristics of individual i, assumed to be exogenous, that determine . Since the dependent variable is restricted to non-negative integer values, count data models are required. The most popular of these models are the Poisson and Negative Binomial (NB) models. Suppose the number of occurrences for , given , is Poisson distributed with density:

$$f(y_i | x_i) = \frac{e^{-\lambda_i} \lambda_i^{y_i}}{y_i!} \qquad y_i = 0,1,2..,$$

(4)

with the consequence that

$$\mathrm{E}(y_i | x_i) = \lambda_i = \exp(x_i'\beta) = \mathrm{V}(y_i | x_i) \quad (5)$$

Eq. 5 shows the equality of the conditional mean and conditional variance (equidispersion). Count data may turn out to be overdispersed, of which the restrictive assumption of the Poisson model that its mean equals variance is violated. In the case of overdispersion, the NB model could be used as an alternative to the Poisson model. Suppose, for every individual *i*, we introduce the random term that may cause by specification error or unobserved heterogeneity, ε_i, into the conditional mean function of the Poisson model as the following

$$\begin{aligned} \mathrm{E}[y_i | x_i, \varepsilon_i] &= \exp(x_i'\beta + \varepsilon_i); & y_i &> 0,1,2.... \\ &= \lambda_i \upsilon_i; & \lambda_i &= \exp(x_i'\beta) \text{ and } \upsilon_i = \exp(\varepsilon_i) \end{aligned}$$

(6)

Conditional on x_i, and with some algebraic manipulations, Y has a negative binomial (NB) distribution with the density function given by

$$\Pr(y_i | x_i) = \frac{\Gamma(y_i + \psi_i)}{\Gamma(y_i + 1)\Gamma(\psi_i)} \left(\frac{\psi_i}{\lambda_i + \psi_i}\right)^{\psi_i} \left(\frac{\lambda_i}{\lambda_i + \psi_i}\right)^{y_i},$$

$$y_i = 0,1,2,.... \quad (7)$$

where $\Gamma(.)$, is a *gamma* function; the index $\psi_i = (1/\alpha)\lambda_i^k; \alpha > 0$ is an overdispersion parameter and *k* is a constant. The mean and variance functions are specified as

$$\mathrm{E}(y_i | x_i) = \lambda_i \quad \text{and} \quad \mathrm{V}(y_i | x_i) = \lambda_i + \alpha\lambda_i^{2-k}$$

(8)

There are two variance functions depending on *k*. If we set $k = 1$, the variance becomes proportional to the mean (known as the NB1 model) while by setting $k = 0$, the variance becomes a quadratic function of the mean (known as the NB2) model [14]. Both parameterizations are fitted and the log-likelihood are compared. The parameterization that yield the larger log-likelihood has been selected, which, in this case is NB1 specification. In order to test for overdispersion, the likelihood-ratio (LR) test is used by considering the proportional variance function of the negative binomial model. The null hypothesis would be no overdispersion, where α equals to 0. The NB model simplifies to the Poisson model if the null is not rejected. All models are estimated using STATA 11. Since errors may be correlated within household, the cluster-robust standard errors are used in all models.

RESULTS

Probit model

This section reports the result of the probit model for doctor visit (DOCVIS). From Table 2, it shows that all predisposing variables that include AGE, MALE, EDU2, EDU3, EDU4, WORK_GOV, WORK_OTHER, SMOKER and EXERCISE are not significant in determining the probability of DOCVIS. Except for marital status and income, other enabling factors are significant. Those who have insurance are more likely to visit a doctor than those without medical insurance protection. This might be because the insurance owners are risk averse and they tend not to delay visit when there are indications of health problems. The fact that owning a medical insurance has provided the insurance owners a 'shield' from any possibility of financial burden, may also increase their probability of doctor visit. The use of over-the-counter (OTC) market has complemented the probability of doctor visit. The positive relationship shows a good sign that OTC is not a substitute of a formal doctor visit. District variable which acts as a proxy for health care availability has also produced a significant effect. The negative effect of DISTRICT_PT suggests that those who live in Padang Terap district (less-developed district) are less likely to visit a doctor compared to those in Kubang Pasu district (developed district). This result suggests that the availability of health care provider may play an important role in determining use. All health variables are significant, at least at 5% significant level. Those who assessed their health as average or poor are more likely to visit a doctor. Other health related variables, which are LONG_ILL and LIMIT_ACT, also show a significant positive relationship with DOCVIS. Results are consistent with many studies, that health status is the most important determinant of health care use [15-17].

Count data model

Count data model is used for a count dependent variable, which in this study is represented by N_DOCVIS. The LR test is used in order test for overdispersion[1]. The null hypothesis would be the dispersion parameter α equals 0. At 1% critical value, the null is rejected. It suggests a strong rejection of Poisson model. Therefore, the NB model will be used for discussion in this section. Based on the NB model in Table 2, it shows that two predisposing variables – MALE and EDU2 are significant in determining the frequency of DOCVIS at 10% significant level. Males are found to utilise more doctor services compared to females. This result is not consistent with some studies that found the opposite effect [2,15,18]. It is believed that the exclusion of maternity and maternity related services in this study may somewhat influence the effect of gender in this study. Those with formal education had less doctor visit compared to those with no education. However, only EDU2 is significant. It supports the theoretical role of education in the Grossman theory of health, which suggests that the efficiency of producing health stock depends on education. People with education are believed to have higher productivity in producing better health, and thus require less health care.

Being divorced is found to reduce doctor visits compared to being single. The effect, however, may be influenced, by the small number of divorcee in the sample and all of them have had no visit within the reference period. Income shows no significant effect on the frequency of use. As in the probit model, the count model also reported the significant effect of INSURANCE and DIST_PT. Respondents with insurance are found to have more doctor visits compared to those without insurance, and it is believed that this is influenced by the *risk-averse* attitude of the insured. Those live in Padang Terap have lower use than those in Kubang Pasu. With the same direction as in the probit model, all health related variables are significant in influencing the frequency of doctor visits. Respondents who assessed their health as average or poor have utilised more doctor services than those who regard their health as good. The existence of long-standing illness and activities cut-down due to health problems has increased the number of use.

[1] The LR statistics is obtain from $2(|LogL_{Poisson} - LogL_{NB}|) = 2(|-336.511-(-330.202)|) = 12.618$

Table 2: Probit and negative binomial estimates for doctor visits

N=497

	Probit		Negative Binomial	
	coef.	robust s.e	coef.	s.e
AGE	0.024	0.043	0.065	0.050
AGESQ	0.0001	0.000	-0.001	0.0004
MALE	-0.160	0.161	0.404*	0.230
EDU2	-0.247	0.320	-0.506*	0.272
EDU3	-0.179	0.354	-0.534	0.351
EDU4	-0.106	0.401	-0.322	0.472
WORK_GOV	-0.183	0.201	-0.195	0.292
WORK_PVT	-0.069	0.205	-0.137	0.276
WORK_OTHER	-0.374	0.249	-0.143	0.297
SMOKER	0.246	0.203	0.249	0.222
EXERCISE	0.027	0.064	-0.035	0.084
MARRIED	0.087	0.312	0.122	0.436
WIDOW	0.257	0.461	0.729	0.525
DIVORCED	(omitted)		-17.937***	0.830
INCOME	0.026	0.085	0.023	0.075
INSURANCE	0.431**	0.173	0.386*	0.213
DIST_PT	-0.444**	0.187	-0.419**	0.201
OTC	0.307*	0.170	0.225	0.197
SAH_AVRG	0.485**	0.195	0.552**	0.274
SAH_POOR	1.100***	0.325	1.600***	0.364
LONG_ILL	0.813***	0.192	0.540*	0.272
LIMIT_ACT	0.626***	0.194	0.680***	0.204
CONSTANT	-2.024	1.240	-3.524***	1.469
α			0.276	0.123
LogL	-204.021		-330.202	
Psuedo-R^2	0.261			

The symbols ***,** and * denote 1,5 and 10% level of significance, respectively

DISCUSSION AND CONCLUSION

This study has provided some evidence on equity aspect of health care utilisation in Kedah. Ideally, the utilisation of health care should not be influenced by socioeconomic factors, other than health condition. There are signs of inequity in health care utilisation if economic factors play a big role in determining it. The sample used in this study consists of 497 individuals aged between 18 - 95. The probit and count models are used in the analysis. From the analysis it suggests that, beside health status, some socioeconomic factors are significant in determining health care utilisation in Kedah. However, based on the models, there is no evidence that income-related inequity exists for doctor visit. Income level does not significantly influence the likelihood or frequency of doctor visit. The second objective is to determine the effect of health care availability on health care use. We use variable 'district' as a proxy for the level of availability of health care facilities. From the regression result, it suggests that those live in less developed district, in this case is Padang Terap, are less likely to utilise health care compared to those from developed district. This indicates that health facilities may induce the likelihood or of use. Although some socioeconomic factors have significantly influenced utilisation, health status remains the most important factors that influence the utilisation. One common finding of all models is the significant effect of health status on health care utilisation. Those who assessed their health status as poor or have had activities cut-down due to health problems are more likely to utilise health care than those who regarded themselves as having a good health status. Therefore, it is believed that the problem of hidden needs is not critical in our health system.

Findings from this study may provide some information for policy analysts who work closely with the policy makers in designing health and health care policy. Among significant factors that can be altered by public policy is the availability of health care services. It has been highlighted before that health facilities are important in determining utilisation. Therefore, in ensuring greater accessibility in less-developed area, the construction of more health care facilities with a new technology should be continually considered. It is also apparent in this study that health and other health related variables are the main influence of health care utilisation. Poor health status, for example, contributes to a higher probability and frequency of use. If the objective of the policy is to control health care use in the future, an overall improvement of health status of society is one of the options to contain future health care costs. Policy analysts may consider alternatives on how to improve health status through health, social or education policy that could promote good health.

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