Health Demand: Empirical Study of Effective Urban Households Demand in Indonesia

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Abstract

BACKGROUND: Grossman's health demand model recognizes medical price as a determinant of the estimation model. This article aims to examine the role of medical expenses in health demand by utilizing the number of sick and disturbed days obtained from Susenas, a survey on the expenditure of household food and non-food consumption conducted by the Central Bureau of Statistics to measure health demand and health insurance (HI) as a medical price in a reduction model. HI can replace medical expenses because those who have HI face relatively low medical costs and face lower medical prices than those without HI.

AIM: This paper aims to examine the role of medical costs in the demand for health among urban households.

METHODS: Using the ordinary least squares (OLS) estimation technique for 6642 households, this was obtained through three stages: First, using 71,932 sample households of Susenas that relied fully on the Susenas sampling method by BPS; second, find households that have experienced health problems during the past 6 months; and third, find households that have health expenditures of 24,341. Furthermore, the estimation model is based on 6642 households identified to be in urban areas using the OLS estimation method.

RESULTS: The health demand estimation model that can be used to determine the behavior of health demand among urban households is limited to households with formal primary school education levels. Taking advantage of certain wages, age, cigarette expenditure, and sports expenses, it was found that the number of sick days and felt disturbed in the household group that had HI was 5.68 days relatively greater than those without HI. However, expanding to higher education and older age was found to be 1.47 days and 1.57 days. Aging tends to decrease good health and HI tends to increase it.

CONCLUSIONS: It was found that health stocks differed between insured households and households without HI in those with aging. A health financing policy through HI is needed that favors the aging and low-income population.

Introduction

Health economics has developed into an area of study through the role of population productivity [1] [2] and workers [3], [4]. It is believed that productivity among residents can be in an actual condition if equal access to health can be maintained [5], [6].

The terminology of economics has begun to be applied in examining the behavior of health demand facing the law of demand as stated in the household production theory developed by Becker [7] and forms the basis of the health demand model within the health investment framework. This theory suggests that health can be generated through the consumption of health and medical inputs to accumulate overtime to create a stock of health [8]. However, with aging, the health stock faces a depreciation which forces the health stock to decrease. Therefore, time is an important part of the supply of health. Time is a limited resource and reflects the movement of the age, so it is allocated in such a way as to give the best benefit in the formation of health stocks.

Efforts to collect health stocks and curb the rate of depression are inseparable from wages' variations and availability. At high salaries, the ability to manage and maintain health stocks tends to be greater; on the contrary, it is relatively small for those who have low wages [9]. This is not the case when taking into account medical prices, which vary; somewhat higher prices have corrected the ability to collect and maintain health stocks through medical efforts, the medical ability is reduced for those with high wages but faces relatively high medical prices.

As the view Grossman [9] regarding health investment which is based on the neoclassical viewpoint, investment is made when the results exceed the costs incurred. When the investment is made in the form of medicine, the rational consideration is to compare the benefits obtained from changes in health stocks due to medical conditions with the investment cost in the form of medical prices [10], [11]. As is customary with the law of demand for normal goods, the price has the effect of reducing the quantity demanded. For health commodities, prices are postulated to have a negative impact– that is,

higher prices will reduce the amount of medication required – through the demand for medical care inputs. An increase in medical expenses (ceteris paribus) weakens medical care's purchasing power and thus tends to decrease the amount of medical care requested. Conversely, relatively lower prices for medical care will strengthen purchasing power and increase the amount of medical care requested.

Efforts to prove the link between medical prices and medical care have been carried out in various studies. Several researchers do not apply medical expenses directly, but rather the opportunity cost of medical treatment such as insurance, distances, and travel costs [12], [13], [14]. They face the problem of price variability in empirical studies, so applying for insurance and ownership as an alternative expose those who are insured to meet relatively low medical prices. Distance to medical care reflects the cost of obtaining medical care, so applying further spread to medical care will be subject to high medical costs. Likewise, with travel costs, the greater the proportion of travel costs to get medical care in the total health costs will face high medical prices.

Opportunity cost is also used differently, namely, by taking advantage of household members' type of work. The work is considered capable of reflecting the potential income received at the job concerned [15], [16]. Health problems lead to reduced productive days and a loss of potential income so that the type of occupation can recognize medical prices.

This paper appreciates health insurance (HI) as a guide to medical prices as a consideration [9]. Total the household level, health financing, in addition to household sources such as out-of-pocket (OP) and private HI, also comes from government financing in the form of public insurance. Private insurance financing tends to limit health facilities' use according to the agreement; this scheme does not cover the entire scope of health problems. On the other hand, public insurance financing tends to encourage the behavior of using health facilities excessively. Hence, the type of insurance a household has will differentiate the demand for medical care, as evidenced by Vo and Hoang Van [17]. This paper aims to examine the role of medical costs in the demand for health among urban households.

Methods

This research uses the ordinary least squares (OLS) estimation method, which is applied to the data of 6642 households living in urban areas due to the 2016 Susenas by BPS. Starting with health demand, health depreciation, and health investment [9], then

placing traditional medicine in health investment and including cigarette consumption (CC) and sports activity as variables that determine health depreciation into the model [18]. Next, adjusting the least cost equilibrium health investment, resulting in a reduced form of health demand, and adding (N) to the portion εV as a marker that factors other than age also influence health depreciation, namely, CC and sports activities. The adjustment process for the health stock is formulated in the following equation.

$$\ln H_i = \alpha_i\, \varepsilon \ln W_i - \alpha_i\, \varepsilon \ln P + r_H\, \varepsilon E - \tilde{\delta}\, \varepsilon i - \varepsilon \ln \delta_0 - \varepsilon V(N) \qquad (1)$$

A literature review confirmed that wages, medical prices, education, and age were consensus variables in estimating health demand. Some researchers have found wages have a positive effect on health demand – this positive effect is that wages increase the health stock [13], [14], [19], [20], [21], [22], [23]. In contrast to Gupta and Grave [24] who found the effect was not significant. In this study, wages were determined to have a positive effect on health demand.

The positive effect of income on health demand is not evident in the findings Wagstaff [23] but negatively affects wages as the explanatory variable. These results indicate that there is multicollinearity between the two, as evidenced by eliminating wages that have changed the income coefficient to be positive [12], [19], [22], [23]. This proof ensures that income functions identically with wages; that is, it boosts the health stock. Despite this, other researchers such as Zhao [14] and Khanam *et al.* [25] found that influence was not significant.

Family size negatively affects health demand, as found by Grossman, [9], Zhao [14], Shehzad [21], Geda and Simeles [26]. Their findings indicate that family size has the potential to reduce the stock of good health because a large number of families have the potential to reduce an individual's ability to obtain the necessary health stock. Although, 2006 and 2007, Shehzad [21], Zhao [14], found it insignificant because the effects of income and family size were trade-offs. In this study, per capita, household income was not included in the model. The economic capacity of the household was shown by the wage of the head of the family.

Health demand represents a function of the wage rate (W), the price of medical care (P) – in this case, HI – and education (E), age (Age), CC, sports (S), and region (R) which is treated as a control variable. The effort to investigate the effect of the education variable (E), which consists of seven levels and region (R) consisting of rural-urban areas and East-West Indonesia, applies the Chow test to rewrite the health demand equation follows:

$$\ln H_i = \alpha_i\, \varepsilon \ln W_i - \alpha_i\, \varepsilon \ln P + r_H\, \varepsilon E - \tilde{\delta}\, \varepsilon i - \varepsilon \ln \delta_0 - \varepsilon V(N) \qquad (2)$$

Based on this equation, the form of each explanatory variable's relationship to health demand is stated as follows:

$$\frac{\partial \ln H}{\partial \ln W} = \beta_{11} > 0; \frac{\partial \ln H}{\partial HI} = \beta_{12} > 0; \frac{\partial \ln H}{\partial Age}$$

$$= \beta_{13} < 0; \frac{\partial \ln H}{\partial lnCC} = \beta_{14} < 0; \frac{\partial \ln H}{\partial lnS} = \beta_{15} > 0$$

The actual demand model is derived from a structural equation; its application in the health demand model uses a reduction form so that the estimation can be done using the OLS method. The structure of health demand reduction that has been stated earlier in Equation (2) has the following names and definitions.

Ln H   =Natural logarithm of health: number of days lost due to illness and get annoyed, a healthy amount of time.

ln W   =The natural logarithm of the wage of the head of the household,

HI =Health insurance (yes = 1)

Age =Age of household head,

ln CC   =Natural logarithm of household CC expenditure,

ln S   =The natural logarithm of household sports expenses,

After estimating the parameters and standard error, the model is examined using the determination coefficient is usually predicted based on the F test. To test the effect of certain variables partially, the one-way t-test is used. The formally stated model in Equation (2) is not fully applied because education is an explanatory variable with seven categories; there will be seven demand models selected for a further explanation. The formulation of health requests is rewritten as follows:

$$lnH = \alpha_1 + \alpha_2 \ D_{HI} + \beta_1 \ lnW + \beta_2 \ Age + \beta_3 \ lnCC + \beta_4 \ lnS + u$$

This equation has determined the assumption of HIs effect on health demand with a certain level of education that is recognized based on the difference in the mean value of the intercept as follows:

1.   Mean demand for household health without HI ($D_{HI} = 0$)

$$E\left(H \setminus D_{HI} = 0, X_i\right) = \alpha_1 + \beta_i \sum_{i=1}^{4} X_i$$

2.   Mean demand for household health that has HI ($D_{HI} = 1$)

$$E\left(H \setminus D_{HI} = 1, X_i\right) = (\alpha_1 + \alpha_2) + \beta_i \sum_{i=1}^{4} X_i$$

The next application refers to the two models above. Suppose it is found that the coefficient of HI is statistically significant. In that case, it will be concluded that there is a difference in demand for health between households with HI and households without HI. Furthermore, an effort to recognize the applicability of the law of order in the demand model that applies medical prices in the form of HI ownership requires the ceteris paribus assumption – in this study, it is carried out by assigning certain values to wages, age, CC, and sports expenditures.

Findings

The empirical results of the estimation findings of the parameter estimation of the use of sick days and feeling disturbed as a measure of health demand are summarized in Table 1; the analysis is continued at a certain level of education selected based on the significance criteria of HI.

Based on these criteria, further analysis is aimed at the health demand for household groups with a primary education level in the family's head. At this level of education, the health demand model is reconstructed in the following formal form.

$$lnH_{PS} = 1.782 + 0.089D_{HI} - 0.018lnW + 0.004Age + 0.005 \ lnCC + 0.008lnS$$

Compiling the empirical results in their original form, then rearranging them into the following form.

$$H_{PS} = e^{1.782} \ W^{-0.018} \ CC^{0.005} \ S^{0.008} + 0.089D_{HI} + 0.004Age$$

Applying specific values: e is 2.71828; the mean wage of US$321.4 (equivalent to Rp. 4,500,000); mean cigarette expenditure of US$107 (equivalent to

Table 1: Summary of urban health demand models: Measurement of sick days and feeling disturbed

Variable	Level of education						
	Never attended school (NAS)	Not completed elementary school (NCES)	Primary school (PS)	Junior high school (JHS)	High school (HS)	Diploma	≥Bachelor
N	384	1208	1678	982	1788	158	444
Constant	1.56	1969	1782	1866	1391	1326	1719
t_constants	4418	10.495	11.009	9601	8897	2751	4022
Wage	−0.007	−0.014 *	−0.018 **	−0.013	−0.01	−0.004	−0.024
t_upah	−0.716	−1.868	−2.538	−1.543	−1.458	−0.181	−1.154
HI	0.041	−0.081	0.089 *	−0.091	0.048	−0.211	0.048
t_jamkes	0.408	−1.436	1.909	−1.469	1.041	−1.22	0.459
Age	0.006	0.003	0.004 **	0.008 ***	0.009 ***	0.012 **	0.003
age	1.418	1.361	2.024	3.677	4.562	2.399	0.726
Cigarettes	0.006	0.02 ***	0.005	−0.099	0.005	0.001	0.006
t_rokok	0.616	3.247	1.089	−1.404	1.076	0.059	0.673
Sports	−0.02	−0.012	0.008	−0.015	0.001	−0.002	−0.017
t_sport	−0.984	−1.087	1.041	−1.646	0.205	−0.136	−1.824
R2	0.013	0.013	0.010	0.030	0.013	0.053	0.016
F	1.020	3.286 **	3.246 **	6.019 ***	4.713 ***	1.693 *	1.412
DW	1979	1.972	1.992	1.966	1.991	1.871	2.076

Source: National Secondary Data in the form of Susenas. Results. Apply, (*): Significant at 90% level, (**): Significant at the 95% level, (***): Significant at the 99% level. Dependent variable: Sick days and feeling disturbed.

Rp. 1,500,000); a mean sports expenditure of US$45.7 (equivalent to Rp. 1,200,000); and mean age 45 years. The health demand model can be summarized so that it can be assumed that the mean day of sickness in the household group that has HI is 5.68 days. In comparison, in households without HI, it is 5.59 days, the two results are almost no different. $H_{PS} = 5.595871 + 0.089D_{HI}$

When developing an analysis that applies a mean older age, namely, 65 years, and in the household group with a junior high school education head of the household, the following model is found. Based on this model, it was found that the mean day of sickness in the household group with HI was 1.47 days, while in the group without HI, it was 1.57; this result is consistent with the theory that those who are insured will be healthier because they face lower medical costs so that better able to get medical treatment. These findings reinforce those differences in health stocks related to medical prices occur with aging, or in other statements, aging has indicated a depreciation of health.

$H_{PS} = 1.57022 - 0.091D_{HI}$

Such results are consistent with the empirical findings regarding insurance in health demand and corroborate empirical findings [12], [14]. Even though they use proxies for travel costs and the cost of flue treatment, medical prices have depressed the stock of good health.

The HI coefficient −0.089 and −0.091, respectively, shows that the group of households with HI has a mean day of sickness and feels relatively few disturbances than homes without HI, which only applies to the group with junior high school education. Although the difference is not significant, this situation has provided an initial indication of the role of HI in suppressing sick days and feeling disturbed so that HI for certain household groups can increase the good health stock.

Ichwan 2013 [27] using health time as a measure of health demand has found the opposite. HI has been proven to reduce health time in the household group with junior high school education. The coefficient of −0.036 confirms that the mean time to health of the household group with HI is relatively small compared to the household group's health without insurance. HI role anomaly can occur because, in urban areas, people with high health risk have somewhat higher accessibility at the Puskesmas, namely, a public health service place and its network, thus encouraging its use and being noted to use more. The probability of being healthy becomes relatively low. It ultimately has a low estimate of valuable time.

Based on these findings, the role of education cannot be concluded; the HI coefficient through measuring sick days and feeling disturbed varies according to education level. One absolute thing to get from this study is the small coefficient at all levels of education; it means that the demand for household

health netted in HI and households without HI is almost no different. However, the results obtained tend to be different when involving age; applying the model to the aging age group shows that differences in demand occur, especially in the PS education group. These findings provide a preliminary factual indication of the relationship between medical prices and healthy demand and reinforce demand laws for health commodities.

Conclusions

Wages and HI promote good health, especially HI plays a role in protecting health by reducing the actual expenditure of medical treatment from OP sources. Age which shows depreciation of health tends to reduce good health. CC and exercise are not shown to affect good health. Efforts to improve and manage good health require health financing policies through HI that favors the elderly and low-income groups to continue to have access to the medical services needed to maintain good health.

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