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Estimating the Health Care Demand for Iran

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ABSTRACT

Background: When trying to estimate demand elasticity, it is important to first obtain an appropriate estimation of the demand function. One of the best methods for estimating the demand for healthcare services that is part of the household cost is the use of the almost ideal demand system (AIDS). The purpose of this study was to making better decisions when estimating the demand elasticity for healthcare services.

Methods: This research is a descriptive-analytic study. The statistical population of this study is the Iranian population for the years 1990 to 2011. The required data were collected from the Central Bank of the Islamic Republic of Iran. In this research, the demand for healthcare services was estimated using the AIDS model by the method of estimating seemingly unrelated regressions (SUR).

Results: According to the estimates, the income elasticity for the demand of healthcare services in the household budget is slightly larger than one and the self-priced elasticity is close to one and the cross elasticity between the change in house prices and the share of healthcare services is a negative value and close to zero and the cross elasticity between food prices and the share of healthcare services is positive and near zero and the cross elasticity between clothing prices and the share of health care services in the household budget is zero.

Conclusion: Since the income elasticity of demand for healthcare services is greater than one, it is necessary for the government to increase the share of health care budget so that low-income groups can use these services. Furthermore, the price elasticity of healthcare services is one; therefore, a steady rise in the price of health care services cannot lead to a sharp decline in using these services for households.

Key words: Demand for healthcare services, price elasticity of demand, income elasticity of demand, almost ideal demand system

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Introduction

Today, many of the key principles of microeconomics have been shaped or changed on the basis of demand surveys. Benefit analysis plays an important role in studying the new economy. One of the objectives for determining the demand in the healthcare sector is to know the factors that have a major effect on the use of healthcare services (1). Grassmann believes that the demand for healthcare services as a marginal good is only part of the motivation of individuals and in most cases this good is used as an input in investing into maintaining health. Therefore, the demand for these services is a derivative demand (2).

Fahimi (3), used the household budget information during the period of 1983 to 1992 to estimate the demand function for healthcare. In his study, drug treatment group was divided into four subgroups: physician visit, drug, laboratory, and hospital; and for each group, the demand function for the urban and rural household was estimated. The results of this research showed that first, as the necessity of demand for healthcare is reduced (higher income elasticity), the demand becomes more sensitive to prices and the effect of insurance induction is intensified simultaneously. Second, there is no proper substitute for doctor's visit, but in the case of laboratory services, one can victimize the diagnosis accuracy for cheaper treatment cost, and therefore, has a higher elasticity than price and ultimately the demand for treatment increases with the increase in the level of education of the community.

The almost ideal demand system (AIDS) is a special type of demand function that has unique features in the estimation of elasticity types and is vital for policy-making in different income groups. The almost idealized demand system was introduced for the first time in 1980 and was used to examine consumer's behavior in the UK (4). This study was the basis of all studies in the 1980s (5). According to United Nations human development reports, the share of health and treatment costs in gross domestic product of developed countries is often higher than in developing countries. This point shows the direct relationship between the human health and the level of economic development (6).

Since decision making on healthcare services is very important, and moreover, in the Islamic Republic of Iran, the increase in population and demand for healthcare and inadequate income sources in the healthcare sector in order to meet the increasing costs of healthcare led to serious problems and serious crises for the management of hospitals in the country. Government resources are also limited in helping the hospital and funding itself and it seems that there is no possibility of increasing it in short term. Therefore, on one hand, the treatment sector faces the challenge of lack of financial resources, and on the other hand, healthcare users are worried about the high costs of treatment (7).

Considering the role and importance of healthcare services in community health and the factors affecting the demand for healthcare services, the purpose of this study was to estimate the demand elasticity of healthcare services using the AIDS model, in order to make better decisions.

Materials and Methods

The present study is a descriptive-analytic study. The statistical population of the research is the Iranian population for years 1990 to 2011. The required data were collected from the Central Bank of the Islamic Republic of Iran. In this research, the demand for healthcare services was estimated using the AIDS model by the method of estimating seemingly unrelated regressions (SUR), one of the most common methods that consider the mutual effects of the sentences of disturbance of equations on each other. Household budget statistics are divided into eight general categories: (1) food, drinks and tobacco; (2) clothing and footwear; (3) house, fuel and lighting; (4) furniture and services used at home; (5) healthcare; (6) transport and communications; (7) recreations, entertainment and educational and cultural services; (8) diverse goods and services.

For each of the eight groups, an annual price index, which is the weighted average of the price of the subsections of that group, is calculated annually based on their significance in the consumer basket of households. Considering the importance of the first group and the healthcare group, which is the main purpose of this study, the aforementioned 8 groups were divided into five groups: (1) food, drinks and tobacco, (2) clothing and footwear, (3) house, fuel and lighting, (4) health and treatment, and (5) others, to estimate the demand function for healthcare services by this group and other groups.

In the first stage, the allocation of total costs or household expenditures among the major groups of household expenditures was examined. As a result of this, in the first model (AIDS) that was estimated, four equations were created for health, house, clothing, and food. Independent variables (prices) in these equations include the logarithm of the price index of each of the major groups of urban household budgets. In order to reduce the number of variables and also to use the price effect of other variables, the four price indices were first divided into the fifth price index group (other groups called pothers) and their logarithms were introduced as independent variables in the models. In addition, the total expenditure (m) as the total expenditure variable, which is a substitute for consumer income in this analysis, was divided into the total household cost index and the result of the division was considered as a logarithm and the resulting variable was introduced with the name "Lmp" in the models. In order to consider the continuity of consumer tastes in each step, the variable of the function is given to the models with an interruption.

The almost ideal demand system model: The almost ideal linear demand system is one of the most suitable models for examining demand. One of the advantages of this model, which makes it superior to other models of demand, is, its ability to test the theoretical properties of the demand, e.g. the homogeneity and symmetry towards the price variables, the relative assumptions and the divisibility of the demand for good shares, and the ease of access to price and income elasticity; moreover, its good behavior is as follows: t is the reason for data compatibility. AIDS is introduced for time.

$$W_{i} = \alpha i + \sum n\ \gamma_{ij} \log p_{j} + \beta_{i} \log (M/P)$$

where wi is the i-th goods budget, pi is the i-th goods price, m is the total household expenditure, and p is the total price index of the Translog.

For the elasticity of income and price demand in the model (AIDS), the following formulas were used:

$$E_{im} = 1 + \beta_{i} / W_{i}$$

$$E_{ij} = Yij\ /\ w_{ij \neq i}$$

$$E_{ii} = Y_{ii} / wi\ - 1$$

In the AIDS model, the expenditure shares were used for estimation and, with respect to these shares, the elasticity formulas used in the model are proven.

Results

The results of the model estimation are subsequently discussed.

First, the tests on the stationarity of variables were conducted. For all variables used in the model, using the Eviews software, the stationarity, trend and y-intercept of the variables were examined and the results of these tests are shown in Table 1.

The result of the model estimation is as follows:

Health= - 0.426 - 0.010 Lphealtho - 0.032 Lphouseo - 0.105 Lpclotho + 0.019 Lpfoodo + 0.078 Lmp + (9.00E – 0.5) Lhealth

$R^2 = 0.90$ $R^{2-} = 0.86$ DW = 2.31

House = 1.174 + 0.052 Lphealtho + 0.081 Lphouseo + 0.246 Lpclotho + 0.190 Lpfoodo + 0.004 Lmp – 0.029 Lhouse

$R^2 = 0.68$ $R^{2-} = 0.55$ DW = 1.81

Cloth = 0.324 – 0.043 Lphealtho + 0.008 Lphouseo + 0.197 Lpclotho – 0.025 Lpfoodo - 0.001 Lmp - 0.023 Lcloth

$R^2 = 0.978$ $R^{2-} = 0.970$ DW = 2.32

Food = (1.78 **E** - 13) – (1.95 **E** –14) Lphealtho – (1.61 E – 14) Lphouseo – (1.77 **E** - 14)

Lpclotho + (5.29 **E** - 14) Lpfoodo – (3.56 **E** -14)Lmp + 1 Lfood

$R^2 = 1$ $R^{2-} = 1$ DW = 1.75

According to the estimates, the income elasticity of demand for healthcare services in the household budget is slightly larger than one and its self-elasticity is close to one. Also, the elasticity of house demand in the household budget is slightly larger than one and its self-priced elasticity is close to one. The income elasticity of the clothing demand in the household budget is approximately close to one. And the self-priced elasticity of clothing is less than one. For instance, if prices increase by 10%, the demand for it is reduced by less than 10%. The income elasticity of the demand for food in the household budget is one, that is, as much as the income changes, the amount of demand will increase to the same extent. The self-priced elasticity of the demand for food in the household budget is one. The values of price and income elasticities demand of the major household budget groups are shown in Table 2.

The cross elasticity between the change in house price and the share of health care services is negative and close to zero and the cross elasticity between food prices and the share of healthcare services is positive and near to zero and the cross elasticity between clothing prices and the share of healthcare services in the household budget is zero. Cross elasticity values between variables are shown in Table 3.

In addition, the declaration of Helsinki was considered for ethical issues.

Table 1. Stationarity based on the y-intercept and trend by ADF Test

Variable	T-Statistic	Probability	Stationarity
Cloth	-3.38	0.081	I (0)
Food	-0.84	0.937	I (1)
Health	-5.40	0.001	I (1)
House	-4.51	0.009	I (1)
Lcloth	-5.58	0.001	I (0)
Lfood	-5.84	0.001	I (0)
Lhealth	-2.41	0.36	I (1)
Lhouth	-4.30	-0.01	I (1)
Lmp	-3.65	0.05	I (1)
LpCloth	-3.80	0.003	I (1)
Lpfood	-4.68	0.009	I (1)
Lphealth	-7.60	0.000	I (0)
Lphouse	-5.31	0.002	I (1)

Table 2. Price and income elasticities demand of the major household budget groups.

Total group	Price elasticity	Income elasticity
Health	-1.001	1.014
House	-0.996	1.001
Clothes	-0.968	0.999
Food	-1.00	1.000

Table 3. The crossover elasticity values between the share of healthcare services and other variables

	House price	Food prices	Clothing prices
Share of healthcare services	-0.005	0.003	0

Discussion

Based on the results of this research, various types of price, income and cross elasticity between different expenditures of households in Iran were calculated in healthcare services as earlier shown.

Feldstein.(8), conducted one of the first studies on the price elasticity of demand for healthcare services during the years 1967 to 1985. The data used in this study was taken from the American Hospitals Association. He roughly estimated the elasticity of demand for healthcare (-0.5), which in this study the data are at hospital-level. The results of this study in relation to the elasticity of health demand are consistent with the present study.

NaciMocan et al. (9), used the Grossman model and cost data statistics to examine the demand for healthcare services in Chinese urban areas. The results of this study showed that the medical care and income elasticity are in good relation with the range of 0.28 to 0.32. Also, the price elasticity of medical care is estimated at the range of 0.66 to 0.88.

Royalty and Hagens . (10), analyzed the effect of premium and income on the demand of various complementary insurance using probit models. The results showed that the income elasticity obtained on the basis of the variable coefficient of labor wage is not significant in relation to the base medical insurances. Considering other benefits of insurance, including dental, ophthalmology, and long-term care services, the price elasticity was calculated to be

-0.167, 0.267, and - 0.468%, respectively, which showed an increased in each case of income elasticity. The amounts of elasticities obtained are not consistent with the present study.

Shakibayee et al.(7), estimated the elasticity of demand for healthcare services. They found that AIDS services using essential healthcare systems for all income groups is an essential good and has a complementary relationship with house and clothing. The price elasticity of low-income and high income groups is -0.52 and -0.62, respectively.

Mohammadi and Nowroozi.(11), in their research entitled "The Elasticity Test of Iran's Basic Goods Consumption Using the Nearly Ideal Demand Model" based on the demand system and the almost ideal demand function (AIDS), calculated the demand structure of the five main groups of goods and consumption services of the country, which include food and drinks, clothing and footwear, house, healthcare, and educational, cultural, and recreational services in the years 1965 to 2006 and the demand elasticities (income elasticity, price, and self-price) were also estimated. Income elasticities were positive for all groups of goods and services except for the educational services which was equal to or greater than one for other goods. The elasticities of the demand prices for all goods were negative as expected and among the five goods groups, food and health products, respectively, with price elasticities of -1.15 and -2.02, were considered among the elastic goods and they had the highest price elasticity. Finally, the cross elasticity of demand showed that foodstuff had a substitution relationship with health and recreation services and it has a complementary relationship with house and clothing .The results obtained in this study for some income elasticity and cross-elasticity are consistent with those achieved though the present study.

Arman et al.(5), estimated the demand function using the almost linear dynamic ideal demand system and the seemingly unrelated regression method in the period of 1982 to 2007 and seven income groups as a cross sectional study of household behavior by calculating the self and non-self priced elasticities and the price elasticities in low and high income groups in urban areas of Iran. In their study, five main tests including the homogeneity hypothesis, symmetry hypothesis, demand law, necessity of feed group, and the identicalness of non-self elasticity were conducted in different income groups. The results of the homogeneity test showed that the consumers of low-income group suffer a monetary illusion in consuming the good groups and are not sensitive to real incomes. Consumers of high-income groups also do not pay attention to their real income in the food and other groups, but pay attention to their

real income in the clothing and house group. The symmetry test showed the asymmetry in the model of consumption. The investigation of the demand law showed that the self-priced elasticities for all groups were negative. Income elasticity calculations showed that in the low-income group, the food and house group are necessary and the clothing and other group are luxury. While for the high income group, health, recreation and education group is more significant than the rest of the good groups and there are three groups of food, clothing and house, and the goods group of others is luxury. The study of non-self-priced elasticity shows that substitution and complementary vary for the same goods groups of different income groups.

Salarzehi et al.(12), in a research studied the model of consumption of Iranian urban households in the framework of Marshall, Hicks, and Allen elasticity tests using city budget data for urban households (1974-2007). In this study, the Marshall and Hicks cross-price elasticity were calculated and the results showed that according to the Marshall self-pricing elasticity values, the demand law is in all goods groups. Also, based on the elasticity of expenditures, food good and house groups are two essential goods groups and the groups of clothing, furniture, healthcare and transportation are known as luxury goods groups. The results of elasticity in this research are consistent with the present study.

Among the research constraints the following issues can be mentioned: Lack of studies similar to this research, lack of availability of some information and data used in the research, as well as lack of recent information and data.

Conclusion

The present study was conducted to investigate the effectiveness of variables on the demand for healthcare services. One of the most adequate methods for this assessment is to estimate the demand for healthcare services using the model of AIDS. Given the income elasticity of healthcare services, this service is considered to be a luxury service, because its income elasticity is 1.041. This means that each 1% change in consumer income increases the demand for healthcare services more than 1%. Also, the self-priced elasticity is a unit, that is, the percentage of increased price of healthcare services equals to the same percentage of reduction in the share of these services in the household budget. In other words, until the price of healthcare services increases or decreases, the rate of demand will change in the opposite direction.

The cross elasticity between house and the share of healthcare service prices showed that the goods and service complement each other, that is, increase in house costs can be accompanied by an increase in healthcare costs. In other words, if consumers have more house costs, for example, rent a more expensive home, they will be able to pay more for healthcare services and will have more willing to pay for these services.

Also, the cross elasticity between the price of food and the share of healthcare services shows that this product and service can be a successor to each other. This means that increasing food costs can improve the health of the household such that the household needs reduce to healthcare.

Cross elasticity between clothing prices and the share of healthcare services shows that these two variables are not related. Based on the results of the research calculations, cross elasticity between clothing prices and the share of healthcare services is obtained close to zero.

Since the income elasticity of demand for healthcare services is greater than one, it is necessary for the government to increase the share of health care budget so that low-income groups can use these services. Furthermore, the price elasticity of healthcare services is one; therefore, a steady rise in the price of health care services cannot lead to a sharp decline in using these services for households.

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Conflict of interests

The authors of the study state that there is no conflict of interests.

Authors' contributions

Baniasad M, horry Hr designed research; Baniasad M conducted research; Baniasad M and horry Hr analyzed data; Baniasad M wrote the paper. Baniasad M had primary responsibility for final content. All authors read and approved the final manuscript.

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