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The Role of Economic Factors in the Choice of Medical Providers in Rwanda

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Abstract: The purpose of this paper is to investigate the role of economic factors in choosing alternative service providers and to recommend suitable measures that could be taken to improve the use of health services in Rwanda. The study uses a multinomial logit framework and employs the Integrated Household Living Conditions Survey (EICV2) conducted in 2005 by the National Institute of Statistics of Rwanda (NISR). To handle the problem of endogeneity, we estimate a structural model. The results indicate that health insurance is an important factor in the choice of health facilities. User fees are major financial barriers to health care access in Rwanda. The results suggest that as household income increases, patients shift from public to private health facilities where quality is assumed to be high. A number of policy recommendations emerge from these findings. First, as insurance is an important factor in choosing a health care facility, policies that reduce health care costs to patients would substantially increase the use of health services. Second, since an increase in income allows the patient to shift to private facilities, the government should consider subsidizing private health facilities to enable access to care in private sector facilities by low-income households. Finally, since distance affects access to health care in Rwanda, there is a need to improve geographical accessibility to health facilities across regions by upgrading and expanding transportation and health infrastructures.

Keywords: *Health, Price, Insurance, Service Multinomial*

1. Introduction

Health seeking behaviour is based on a number of dimensions. First, there is a choice of whether or not to seek formal medical care followed by the choice of what kind of health care a patient wishes to receive. Second, having made these choices, patients choose the type of provider facility to visit; public or private (Mwabu, 1986). Analysing the demand for health care by only focusing on whether or not a sick individual seeks formal health care can lead to an incomplete analysis of the demand function because it does not consider valuable information related to the choice of a health service provider. This suggests that a clear understanding of health seeking behaviour can be obtained when in addition to identifying the factors influencing demand for health care, the determinants of choice of a health facility are examined. While some of these input decisions might be based on recommendations made by physicians, such recommendations may be altered by the level of expected price, income, insurance and other individual characteristics. Most of the studies on demand for health care focused on the quantity of health care (see Mocan et al., 2004; Hotchkiss et al., 2004; Feng et al., 2008; Lépine and Nestour, 2008; Hahn, 1994). To our knowledge, there are no studies in Rwanda that have been done to determine factors influencing the choice of a health facility. The available evidence on demand for health care by Jayaraman et al., (2008) and Shimeles (2010) focused on the decision to use maternal health care services and the effects of community-based health insurance schemes (CBHIs) at the district level. For countries in which estimates related to the choice of health facilities exist, research results provide conflicting evidence as to the effect of price, income and insurance across providers (Muriithi, 2013; Kaija and Okwi, 2011). This paper aims at filling the gap in knowledge by examining the role of economic factors in the choice of alternative health facilities in Rwanda.

Identifying the determinants of facility choice is necessary so as to establish a complete picture of health seeking behaviour by patients at different stages of the care decision process (Mwabu, 1986). In Kenya, Muriithi (2013) found that more than 70 percent of the respondents did not seek health care from government health facilities despite the fact that these facilities were the closest to them. Moreover, the

private health facilities visited were more expensive than the closest, public health facilities. Thus, information on facility choice can help a lot in explaining health service utilization in Rwanda. This paper provides the evidence. In addition, most of the studies on demand for health care have not controlled for endogeneity of health insurance. Greene (2007) stated that failure to address this problem leads to biased estimates and this statement has been supported by some empirical evidence. Rosenzweig and Schultz (1982), for example documented that failing to take into account the interaction between variables leads to misleading results and consequently wrong policy recommendations. Hunt-McCool et al. (1994) pointed out that ignoring endogeneity leads to misleading estimates, which in turn can affect the impact of related health care financing policies. In a more recent study, Mwabu (2008a) reported that endogeneity-related issues of simultaneity and measuring errors lead to wrong estimates. A common conclusion of these studies is that inappropriate policy making is most likely when endogeneity is not considered. So, this paper addresses this estimation problem, providing rigorous evidence on the determinants of choice of health service providers that policy-makers can use to improve health service utilization across all the regions in Rwanda.

2. Literature Review

Mwabu (1986) documented the choice of health care provider as being based on utility maximization theory where the decision maker chooses the health facility that provides the highest utility. The choice made is not directly based on the alternative facility, but rather on the characteristics or attributes of the alternative (Luce, 1959). In practice, however, utility from any alternatives is driven by economic and other factors, and the determination of which factor is or is not important in explaining the choice is an empirical matter. Several studies have examined the role of price of health care in the choice of alternative providers (Sahn et al., 2003; Akin et al., 1998). Their findings confirmed that if we control for quality of care, the price plays a significant role in the choice of service providers. However, the magnitude was found to be very small especially for public facilities. For instance, doubling the price of public facilities was to induce a decline in the probability of their use by 0.10 while doubling the price of private clinics was accompanied by a large increase in the use of public clinics.Similar findings were reported by Mwabu et al. (1993) where a 10 % increase in the price of public health facilities reduced demand by only 1% while increasing the price of private facilities by 10 % caused a decline of visits to private facilities by more than 15 %. Ssewanyana et al. (2004) documented that the low responsiveness to prices for choosing public health facilities suggests that increasing user fees could generate more revenue for public health care providers without significantly reducing demand. Comparable results were reported byMuriithi (2009) who found user fees to be significantly correlated with the use of alternative health facilities.

However, studies related to the effect of price on the choice of service providers were inconclusive because some of them reported an insignificant price effect. Kaija and Okwi (2011) found, for instance, that the effect of price on the choice of any health facility was insignificant. This finding was attributed to the information asymmetry between consumers and providers where consumers often do not have enough information to make their own decisions but have to rely on prescriptions by physicians. The insignificant price results were in line with studies by Lacroix and Alihonou (1982) and Akin et al. (1998), who found the price to have little effect on the choice of providers. Given the conflicting results on the role of price on health care choices, more investigation needs to be conducted. The role of income in choosing alternative choices has been highlighted by many authors. Heller (1982) showed that the choice of service providers was inelastic to income. In addition, the choice of service provider among low-income earners and high-income individuals differed significantly. An increase in household-income level was associated with a reduction in seeking treatment from public health facilities and consequently an increase in demand for private health services. Such behaviour is quite rational given that it is well known that with higher incomes, access to high quality service in private facilities becomes possible. Similar findings established that pregnant women from wealthy households were more likely to deliver a child at hospital assisted by medical personnel (Jayaraman et al., 2008).If the results above imply that household income is an important factor in explaining the choice of service delivery; other studies moderated the effect of income on health seeking behaviour. Lindelow (2002) reported an insignificant difference between the poor and non-poor on the choice of alternative health facilities. This was explained by the complex way through which the income variable is measured in the model. Income proxied by total expenditure is first entered directly in the model, but also through income-

price interaction, and finally, through opportunity cost of time. Since the role of income differed across studies and services provider, more studies are needed.

Other studies have examined the role of non-monetary factors in determining the choice of health care providers (Acton, 1975 and Mwabu, 1989). Both studies used a utility maximization model to develop predictions for free and non-free care in New York and Kenya, respectively. The results showed that non-monetary factors such as distance to health care from home, a proxy for the price of health care, influence the choice of alternative health facilities. In support of this view, Awoyemi et al. (2011) reported a negative and significant effect of the distance to hospital from the area of residence on the utilization of both public and private hospitals. The results implied that the longer the distance to the hospital from home, the less the utilization of private hospitals and the more people living in rural areas would show preference for no-care or self-treatment. The results were consistent with the findings by Ssewanyana et al. (2004) who found a negative effect of distance to health service provider suggesting that the probability of seeking care from any formal provider decreases with distance. However, Mwabu, et al. (2003) found distance to have little effect on demand for health care services. The plausible reason for this finding was that majority of people reported residing within three kilometres of a health facility suggesting that health facilities in the study area were accessible to the population. Individual and household characteristics play an important role in choosing the service providers (Lindelow, 2002). Research has shown that household characteristics such as age influence the choice of service providers. Old age tended to be associated with a decrease in the probability of seeking care from a public hospital or health post. Relative to the category of children under the age of 5 years, the group aged 50 years and above were found to be less likely to seek care from private clinics but was more likely to obtain care from public clinics and hospitals (Kaija and Okwi, 2011). Other studies showed that old age tended to be associated with an increase in the probability of seeking care from a traditional medical practitioner and a decrease in the probability of care being sought at a hospital (Lindelow, 2002). The research showed that the most important effect was the shift away from consultation at a health post to no-consultation as age increased.

Research has reported inconclusive evidence for the gender effect (Ssewanyana et al., 2004; Mwabu et al., 1993; Sahn et al., 2003; Hutchinson, 1999). Although distance and user fees reduced access to health care, men were less constrained by distance than women. Males were less likely to seek care from public facilities relative to no-care, and the researcher considered that the differences in education were the main reason (Wong et al., 1987). In most studies, relative to the self- treatment option, females were more likely to seek care from public health facilities compared to men who had a high probability of seeking care from private health facilities. Men's demand for private health care increased with age, reflecting that as men age they encounter increasingly serious illnesses that can only be treated by the better equipped private facilities. As with females, the probability of men seeking government health care started to decline as they aged (Lawson, 2004). In some other studies however, the gender effect on alternative choices was ambiguous leading to a narrowing of the gap of gender disparities. There was no evidence of gender differences in health care seeking (Ssewanyana et al., 2004). Gender disparities were also examined for children. The findings were such that if income plays an important role in raising the health care demand for children, boys were more likely to seek care when in richer households and less care when in poorer households than girls (Ssewanyana et al., 2004).

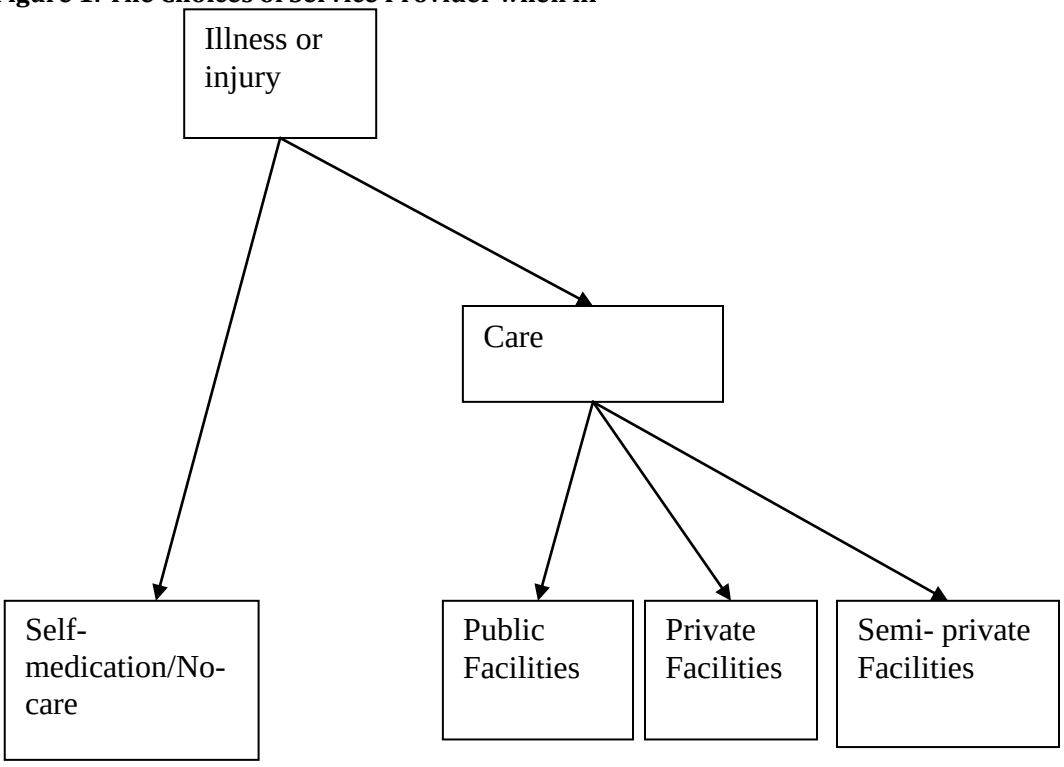
Other studies have included the household size in the determinants of choice of service providers (Sahn et al., 2003). The effect of household size on the choice of alternative providers was found to be significant. The negative effect of household size confirmed the notion of competition for resources in larger households. Individuals from large-size households were less likely to choose private health facilities probably due to high costs. Households with a large number of people are financially limited and thus not likely to seek care from private clinics due to high costs and instead rely on self-treatment at home. Results from empirical studies on choice of service providers have differed in several ways. Some of the studies reviewed found a statistically significant or insignificant positive relationship between income and choosing alternative facilities. The results discussed above show inconsistency in terms of the effect of price, income and other variables. Because no-consensus has emerged, this paper seeks to present new evidence of the role of economic factors on the choice of service providers in Rwanda. In addition, most of the studies on choice of health provider did not address the endogeneity and heterogeneity issues.

3. Data and Methodology

The data used in this paper is drawn from the Integrated Household Living Conditions survey (EICV2) conducted in 2005 by the National Institute of Statistics of Rwanda (NISR). This nationally representative survey collected data from 7,620 households and 34,819 individuals. Data were collected at the household and the individual level. The EICV2 aimed at enabling the government to assess the impact of the different implemented policies and programs in improving the living conditions of the population in general. The survey covered all the 30 districts in Rwanda and collected data on a wide spectrum of socioeconomic indicators: labour, housing, health, agriculture, debt, livestock, expenditure and consumption in different areas, regions and locations in the country. Household level information included consumption expenditures on health and out of pocket expenditure for health care services (consultation; laboratory tests; hospitalization; and medication costs). Individual level information included socio-economic indicators and insurance status. There were also a number of community variables such as distance to the nearest health facility. In order to estimate the choice of service providers we constructed a sub-sample for choice of service providers. We considered this data set, although collected in 2005, as suitable for capturing the demand effects because household dynamics and responses do not change too frequently.

In this paper, we assume that an individual selects a service provider conditional on having decided to seek formal health care. The framework is based on Gertler and Sanderson (1987) and Ssewanyana et al. (2004) where the decision to choose an alternative facility is influenced by economic and other factors. Because the choice of health service provider is a discrete type of decision, probabilistic choice models are a better theoretical representation for estimating choice of service provider (McFadden, 1981). The assumption is that in the event of illness, a household's decision to seek medical treatment for a sick member can be viewed as being influenced by the household's own characteristics and attributes of the available health care providers.

Figure 1: The Choices of Service Provider when ill



Source: Researcher's own construction

Based on the data set, the choice structure in Rwanda comprises four choices of health care providers; public providers, private providers, semi-private providers and self-medication. When ill or injured, an individual

chooses whether or not to seek health care and once the decision is made, the patient chooses one of the four available alternatives as shown in Figure 1. The alternatives might include self-care, no-care, pharmacy, public clinics/hospitals, private hospitals/clinics, semi-private hospitals/clinics and others. In this study visits are limited to one consultation only. If several consultations were made in the last 15 days, answers referred to the last consultation. Because the number of observations in some cases was small, the alternatives were grouped into four options: (1) Self-medication including no-care, pharmacy/drug shop and traditional healers (See Odwee et al, 2006; Kaija and Okwi, 2011; Lawson, 2004); (2) Public facilities including all government health providers; hospital, clinics, dispensaries and health centres; (3) Private facilities; privately owned hospital, clinics, dispensaries and health centres; and (4) Semi-private facilities owned by private companies but subsidized by the government. This last group includes the faith-based facilities run by religious organizations such as the Catholic Church, Protestant churches or others.

The patient chooses the provider option that maximizes his/her utility given the individual's illness, the economic actors (fee charged by a particular provider and the level of income) and considering the type of insurance. With some modifications, the utility function of the choice model is expressed as in Ssewanyana et al. (2004) as follows:

$$U_{ij} = U_{ij}(H_{ij}, E_{ij}) \quad (1)$$

Where H_j is the level of health expected by individual i after being treated by jth service provider (or treatment in jth place); E_j are expenditures in all other goods given that the jth choice is made. The consumer decides first to demand care against no-care. Conditional on this decision, the individual chooses the provider expected to yield the highest satisfaction. Supposing that there are J+1 feasible alternatives (where j = 0, alternative being self-care or no-care), then, the unconditional utility maximization will be given by:

$$U^* = \max\ (U_o, U_1 \ldots, U_j) \quad (2)$$

Where U* is the highest level of utility the individual can obtain. This is obtained by comparing the different utility levels obtainable from each alternative facility, varying from 0 to j. Based on equation (1); the health production function can be formulated as:

$$H_{ij} = h(S_i, Q_j) + \varepsilon_{ij} \quad (3)$$

where H_{ij} is the improvement in health by individual i after being treated by the jth provider, which is a function of economic factors, income and price; individuals characteristics including age, sex, education etc.; and household level factors including insurance and household size,. S_i represents specific factors related to a provider such as qualified health staff, Q_j represents unobservable heterogeneity characteristics at individual, household and facility level, while ε_{ij} is the error term. In the case of the self-medication option, H_{ij} is equal to zero because we assume that there is no improvement in health status for those who do not consume health services.

After consulting jth provider, the disposable income by the individual ith is a function of her/his individual income, B_i; and the charge, C_j, that she/he pays at the jth provider representing both direct costs such as user fees and indirect costs such as transportation cost to the health facility from home. The relationship is expressed as:

$$Di_{ij} = f(B_i - C_j) \quad (4)$$

The equation states that the individual ith disposable income D_{ij} when jth provider is chosen is a function of the individual income B_i and the direct and indirect charges C_j at the jth provider. Substituting equations (4) and (3) into (1) gives the conditional utility function expressed as:

$$U_{ij} = h_{ij}(S_i, Q_j) + f(B_i - C_j) + \varepsilon_{ij} \quad (5)$$

The equation says that the maximum utility by individual i is obtained by choosing the j[th] service provider taking into consideration the individual budget (income), direct costs such as charges by the provider and the indirect costs such as the transportation costs. The other variables in equation (5) are explained as in equations (3-4). Noting the deterministic part of equation (5) as V_{ij}, the equation can further be expressed as:

$$U_{ij} = V_{ij} + \varepsilon_{ij} \quad (6)$$

Where the i[th] individual chooses the j[th] health service provider from which he/she expects to get the greatest level of utility. Any service provider is chosen if the expected utility is higher than the satisfaction that could be derived from all other service providers. Then, an individual chooses the alternative that maximizes the welfare utility which also reflects his/her future health state. He or she chooses an alternative from a set of j's, $j \in J = \{0,1,...,m\}$ where 0 is no-care (self-medication) and j=1… m are the other choice alternatives. The provider j will be chosen by individual if:

$$U_{ij} > U_{ik} \text{ Where } j \neq k \text{ and j, k} \in \text{J} \quad (7)$$

Equation (7) says that individual i will choose the health service provider j if and only if the expected utility from health service provided by the j[th] provider is strictly greater than the expected utility from any other health service providers. This means that the probability of a given medical care provider against all other providers is:

$$\begin{aligned} P_{MC} &= P(U_{MC} \geq U_{OTHER}) \\ &= P[V_{MC} + \varepsilon_{MC} \geq V_{OTHER} + \varepsilon_{OTHER}) \\ &= P[V_{MC} - V_{OTHER} \geq \varepsilon_{OTHER} - \varepsilon_{MC}] \quad (8) \end{aligned}$$

Where P_{MC} = probability of choosing a given medical care provider, U_{MC} = the utility from the visited medical provider and U_{OTHER}= the utility from all other medical providers. The equation says that a given medical care provider is chosen if the expected utility once visited is greater than the utility from any other health providers. For instance, an individual will choose a public health facility for treatment if

$$\begin{aligned} P_{PUB} &= P(U_{PUB} \geq U_{OTHERtype}) \\ &= P[V_{PUB} + \varepsilon_{PUB} \geq V_{OTHERTYPE} + \varepsilon_{OTHERTYPE}] \\ &= P[V_{PUB} - V_{OTHERTYPE} \geq \varepsilon_{OTHERTYPE} - \varepsilon_{PUB}] \quad (9) \end{aligned}$$

Where P_{UB} = probability of choosing a public medical care provider, and U_{OTHER} = the utility from all other medical providers. That is, a public health facility is chosen if the utility to be derived once visited is greater than the utility from any other type of service providers. Conversely, a private health facility will be chosen for treatment if the utility to be derived once visited is greater than the utility from any other type of health facilities. This is expressed as in equation 10:

$$\begin{aligned} P_{RI} &= P(U_{PRI} \geq U_{OTHERtype}) \\ &= P[V_{PRI} + \mu_{PRI} \geq V_{OTHERTYPE} + \varepsilon_{OTHERTYPE}] \\ &P[V_{PRI} - V_{OTHERTYPE} \geq \varepsilon_{OTHERTYPE} - \varepsilon_{PRI}] \quad (10) \end{aligned}$$

Where P_{RI} = probability of choosing a private medical care provider, U_{OTHER}= the utility from all other medical providers.

If in equation (10) $h(S_i, Q_j)$ is linear in S_i and Q_j, we can denote the coefficient vectors of S_i by δ_j and those for Q_j will be denoted by γ_j which might vary across alternative providers. To avoid responsiveness of prices being independent of income we consider a non-linear specification of $f(B_i - C_j)$ (See Gertler and

Sanderson, 1987; Gertler and Van der Gaag, 1990; Ssewanyana et al., 2004). As specified in Sahn et al. (2003) and Ssewanyana et al. (2004), we employ a quadratic utility function linear in health goods and quadratic in the logs of consumptions of non-health goods. This is given by:

$$f(B_i - C_j) = \phi_1 \ln(B_i - C_j) + \phi_2 [\ln(B_i - C_j)]^2 \quad (11)$$

Where ϕ_s are assumed to be equal across provider options. Sahn et al. (2003) showed further that the equation can be reduced to

$$f(B_i - C_j) \approx \kappa_1 [\ln(B_i) - C_j / B_i] + \kappa_2 [\ln(B_i)^2 - 2\ln(B_i)(C_j / B_i)] \quad (12)$$

The equation (12) shows that the functional form for prices and income is quadratic in the logs of net income. Given that ln (B_i) and ln $(B_i)^2$ are constant across provider options it is better to use the difference in utilities, V_{ij}-V_{i0}, where V_{i0} is a reference utility, which in this case refers to no-care and can be normalized to zero. Then, the equation to estimate is obtained by getting the difference in utilities as shown in equation (13) below

$$V_{ij} - V_{i0} = \delta S_i + \gamma Q_j + \kappa_1 (-C_j / B_i) - \kappa_2 [2\ln(B_i)(C_j / B_i)] \quad (13)$$

The empirical model commonly used in the literature to estimate the choice of health provider is a multinomial logit (see Li, 1996; Lawson, 2004). The problem with this model is that it imposes the property of independence of irrelevant alternatives (IIA), an assumption of no-correlation between the error terms of the different choices. The assumption of IIA states that the odds of facility type *i* being chosen over facility type *k* are independent of the available alternatives other than *i* and *k*. An interesting feature is that the odds of choosing a given alternative does not depend on how many alternatives there are in total because each alternative has its own value independent of the other alternatives. With this, we would expect that if there were three options, and one were removed, people would still choose among the remaining two in the same proportion as they did when there were three. The model cannot be appropriately applied when there are different degrees of substitutability or complementarily among the various choices. The alternative model in this case is the nested logit allowing the correlation of some of the choices.

However, given the nature of the choice structure in Rwanda and considering that the dataset used in this paper contains one-level with four choices of health care providers, self-treatment, public, private and semi-private, we cannot use the nested logit model[1]. Instead, we adopt the multinomial logit model to estimate the choice of service providers. This option is supported by McFadden (1981) who argued that the multinomial logit model should be used when outcome categories are plausibly independent for each one of the decision makers. In addition, the Hausman test for IIA showed that the four alternatives are independent[2] (See Appendix Table A3). Moreover, the test statistic cannot reject the null, i.e., the choice alternatives are uncorrelated (see also Hausman and McFadden, 1981). In estimating the choice model, we assume that each individual has four different providers available: the nearest public provider, the nearest private provider, the nearest semi-private provider and the self-medication alternative. Self-medication includes traditional healers, no-care as well as retail drug shops (Odwee et al., 2006). Given the assumption, the probability that the j^{th} provider is chosen given other providers is expressed as in Long (1997), Kaija and Okwi (2011) and Lawson (2004) as follows:

$$\Pr(Y_i = j / x_i) = \frac{\exp(x_i \beta_j)}{1 + \sum_{j=2}^{J} \exp(x_i \beta_j)}, \; j > 1 \quad (14)$$

[1] To be used, the nested logit model requires two-level subgroups with the possibility of correlation of different choice alternatives. For instance, the two levels would be public and private health providers (first level) and each one being divided into hospitals and clinics (second level).

[2] We conducted the test for IIA as reported in Ttable A3 in the Appendix. The test performed on the independence of the four alternatives was conclusive showing that the alternatives are independent.

Where *i* refers to the individual in a household; j indexes the service provider (self-medication, public, private or semi-private and X_i are covariates including income, user fees, health insurance. β_j are the parameters to estimate. β_j is constrained to equal zero because one is the reference alternative ($\beta_1 = 0$). We use this model to test whether or not the effects of determinants (such as user fees, income, and insurance) differ across service providers. Marginal effects can be computed for all the independent variables in order to obtain probability that a particular provider or alternative will yield the greatest amount of utility. The marginal effect of a variable *x* on alternative *j* refers to a change in the probability of individual *i* choosing alternative *j* in response to a change in the variable *x*. This can be computed using the multinomial logit functional form as:

$$\frac{\partial \Pr(Y=1)}{\partial X_i} = \Pr(Y_j = 1)[\beta_{j,x} - \sum_{j=1}^{J} \beta_{j,x} \Pr(Y_j = 1),\ j > 1 \quad (15)$$

where β_{jk} are the alternative specific coefficients associated with variable *x*. In this case, we observe that the marginal effects depend on the values of all explanatory variables and the coefficients for each outcome.

Due to reverse causality, one of the independent variables, health insurance, is endogenous and the estimation has to address this problem. Endogeneity is due to the reverse causality between health insurance and demand for health care. So, in order to obtain unbiased and consistent estimates, instrumentation of the endogenous variable is required. The instrumental variable should be correlated with the endogenous regressors but unrelated directly to the dependent variable (Ajakaiye and Mwabu, 2007). Estimating the choice equation without taking into account this problem might result in biased estimates (Rosenzweig and Schultz, 1982). To address the problem of endogeneity of insurance, we used Waters (1999). A reduced-form of health insurance demand was estimated using logistic regression by including all independent variables in the demand equation and the instrumental variables. We then generated the predicted values and included them in the choice of provider's equation together with the actual observed values of the insurance variable. The decision rule is that in case the null hypothesis that the coefficient of the predicted values of health insurance is equal to zero is not rejected, there is no-strong correlation between the health insurance variable and the error-term. This would mean that, insurance is an exogenous variable (Waters, 1999). The instrumental variables included the employment status (employed or not employed) and the relationship to household head.

We tested for both the endogeneity of insurance and the validity of instruments. We carried out the test for endogeneity of health insurance by using the Durbin-Wu-Hausman test. The results showed that the Durbin-Wu-Hausman statistic values were significant at the 10 percent level. This result was further in favour of estimating structural rather than reduced form demand for choice of service providers. We also tested the impact of the instruments on the dependent variable. These were found to be insignificant. The strength of the instruments was tested by considering the impact of the instruments on the endogenous variable. As the coefficients of instruments were large and significant at the 1 percent level, the instruments were strong. In addition, we conducted the F-test to check the role of the instruments on the endogenous variable. While an F-statistic of at least 10 is recommended (Kioko, 2009; Staiger and Stock, 1997), the minimum Eigen value statistic for F-test was 97.2 suggesting that the null hypothesis of weak instrument had to be rejected. In addition, as we had two instruments and only one endogenous variable; there was then a possibility of over-identification of the structural model. This means that one or more instruments may be correlated with the stochastic error-term (Wooldrige, 2002). It was then necessary to test if the model was correctly specified and that the instruments are valid. We carried out the Sargan and Basmann tests of over-identifying restrictions. The Sargan test of over-identifying restrictions was (0.45036; p-value= 0.5732) while the Basmann test of over-identification restrictions was (0.45024; p-value = 0.5733). With these values, the results could not reject the null hypothesis of no-correlation and instead suggested that the instruments were valid and uncorrelated with the stochastic error-term.

4. Results and Discussion

The results of the study are presented in Table 1, which reports the parameter estimates of the role of economic and other factors on the choice of service providers and their z-statistics. The choice options are: self-medication, public provider, private provider and semi-public provider. Self-medication is the reference category. For the sake of space, other results such as marginal effects, first-stage regression and Hausman tests of IIA assumption for the choice of health provider are shown in the Appendix in Table A1, Table A2 and Table A3, respectively.

The results in Table 1 show that household income is significantly correlated with the probability of using the provider' services. For instance, income is positively related to choosing a private provider. Its coefficient is significant at the 1 percent level suggesting that while holding all other variables constant, if income increases by 1 Rwandan franc (FRW), the expected utility of choosing a private provider would increase by 0.0004. The reason for this correlation is that high income individuals perceive that public providers offer lower quality services while private providers offer better quality services. However, the coefficient of income for public provider was negative implying that the probability of seeking health care from public provider drops as income increases. The result finds support in Kaija and Okwi (2011) who showed that health seeking behaviour of low- and high-income individuals differs significantly. Insurance is an important factor explaining the choice of public and private treatment alternatives in Rwanda. The predicted values of insurance were included in the model to test for endogeneity in the model. As they were significant at the 5 percent level for both public provider and private provider and at 10 percent level for semi-private provider, treating insurance as exogenous would yield a correlation between the health insurance variable and the error-terms. This supports the need for estimating a structural model of choice of service providers rather than its reduced form. The finding is comparable to that of Jowett et al. (2004) who reported that individuals without or with less generous insurance coverage tended to use public providers to a far greater extent than those with a more generous insurance scheme.

Table 1: Multinomial Logit Model of Provider Choice Estimates (*z*-Statistics in parentheses)

Variables	**Public provider** (Coefficient estimates)	**Private provider** (Coefficient estimates)	**Semi-private provider** (Coefficient estimates)
Household income	-0.0003 (-2.67)**	0.0004 (3.01)***	-0.00026 (-0.52)
User fees	0.72 (6.70)***	-0.95 (-6.70)***	0.065 (0.34)
Quality of health care (=1 if medical specialist in the visited health facility exists, and 0 otherwise)	-0.209 (-2.73)**	0.409 (2.73)**	-0.169 (-0.84)
Insurance (=1)	0.34 (3.8)***	3.1 (4.3)***	0.345 (1.8)*
Predicted values of insurance	3.15 (2.66)**	3.435 (2.61)**	5.326 (1.91)*
Distance to the health facility	-0.31 (-2.36)**	-0.455 (-2.36)**	-0.956 (-4.06)***
Household size	0.035 (1.37)	-0.0357 (-1.37)	0.0403 (1.27)
Age	-0.009 (-2.48)**	0.009 (2.48)**	-0.007 (-1.39)
Transportation cost	0.00006 (1.16)	-0.00006 (-1.16)	0.00006 (1.12)
Primary (=1)	0.456 (2.9)**	0.011 (1.7)*	0.003 (0.96)
Secondary (=1)	0.675 (3.9)***	0.023 (4.7)***	0.764 (0.67)
Tertiary (=1)	0.0005 (0.9)	0.0002 (5.9)***	0.0005 (2.12)*
Male(=1)	-0.153 (1.22)	0.153 (1.22)	-0.031 (-0.18)
Urban (=1)	-0.82 (-3.22)***	0.821 (3.22)***	-0.85 (-2.69)**
Kigali region (=1)	-0.6166 (-2.74)**	0.8212 (2.74)**	-1.35 (-4.09)***

Variables	Public provider (Coefficient estimates)	Private provider (Coefficient estimates)	Semi-private provider (Coefficient estimates)
Southern region (=1)	0.16 (0.82)	-0.16 (-.82)	0.54 (2.37) **
Western region (=1)	-.1451 (-0.76)	0.145 (0.76)	0.82 (3.67)***
Northern region (=1)	-0.294 (-1.71)	0.29 (1.71)	-0.84 (-3.15)***
Married (=1)	0.146 (1.06)	-0.14 (-1.06)	0.141 (0.72)
Constant	1.116 (3.09)***	-1.11 (-3.09)***	0.49 (1.09)
Number of observations	5036	5036	5036
Durbin-Wu-Hausman chi-sq			0.006*
Sargan statistic (overid. of all instruments)			0.45036 (p = 0.5732)
Basmann statistic (overid. of all instruments)			0.45024 (p = 0.5733)
F(2,5036)			97.2
LR chi2(42)			1535.88***
Log likelihood			3602.8167

Note: ***, ** and * = significant at 1%, 5% and 10% level respectively.
Source: Researcher's own construction

The monetary price has a negative and significant impact on the choice of private health facilities. The result suggests that as the private hospital/clinic charges increase by 1FRW, the log odds of visits by patients reduce by 0.95 and these patients shift to self-medication. However, the coefficient on fees for public health facilities is unexpectedly positive indicating that the price charged by public health facilities is not enough to discourage patients since it remains affordable. The direct implication is that increasing user charges decreases the likelihood of seeking health care from a private health provider relative to self-medication. The findings were in line with Yoder (1989); Mwabu (1989); and Mwabu et al. (1993), who found negative user fees effects on health seeking behaviour. The distance to health care facilities from the area of residence seems to discourage the choice of public and semi-private health facilities. Thus, increasing distance induces an increase in the likelihood of a household member opting for self-treatment. The negative sign is not surprising since the distance to health care facilities is highly related to the transportation cost. Muriithi (2013) showed that an increase in distance induces a payment of some extra cost to travel to the source of treatment as opposed to seeking self-treatment. The results support the findings by Ssewanyana et al. (2004), Lawson (2004) and Awoyemi et al. (2011) who argued that distance reduces the probability of using distant service providers. However, the distance to a health facility from home is positively associated with the choice of a private health facility. This means that distance to private health providers is perceived to be associated with quality of health care. In this case, private health facilities although distant are chosen provided their quality services are perceived to be high. This result is in line with Bolduc et al. (1996) who showed that distance to health care facilities measured by travel cost was positively related with the probability of seeking health care at private facilities.

The results further showed that regions have an influence on the choice of service providers. For instance, the coefficient on the Kigali dummy relative to the East (base category) was positive and significant for the choice of private facilities, suggesting that living in Kigali as compared to the Eastern region increases the perceived treatment benefit of a private health provider. This result finds supports in Brown (2002) who noted that there were regional differences in probabilities of using health facilities. Age was found to have a positive effect on the choice of private health facilities in Rwanda. The results implied that as one ages, the relative chance of choosing a private health provider increases. The reason behind this is related to the ability to afford payment because income rises with age. The study did not find meaningful results relating to the effect of gender on the choice of health providers because all the three coefficients of gender were statistically insignificant. Similar findings were reported by Sahn et al. (2003) and Ssewanyana et al. (2004). Table A1 in the Appendix presents the marginal effects for the provider choice model. Considering the public treatment alternative, the results show that a 1 FRW increase in the price of health care is associated with a 0.49

decrease in the probability of choosing a provider. The results further show that a 1 FRW increase in fees would increase the probability of choosing the public service providers by 0.09. If this seems surprising, it shows that user fees is not a constraint to using health services from public institutions because they charge less as compared to the private ones. Further, living in urban areas as compared to rural areas increases the probability of choosing a private provider by 0.16. This is as expected because urban people earn higher incomes than their rural counterparts and can afford private health services.

5. Conclusion and Recommendations

The purpose of this study was to investigate the role of economic factors in choosing the alternative service providers and to recommend suitable measures that could be taken to improve the use of health services in Rwanda. These factors were investigated based on the theoretical relationships between health care usage and socio-economic factors. The data in this respect were collected from the Integrated Household Living Conditions Survey (EICV2) conducted in 2005 by the National Institute of Statistics of Rwanda (NISR) and were analyzed using a multinomial logit model. Three main conclusions arose from the analysis. The first main conclusion of the study is that when income emerged as an important determinant of the choice of service provider, the probability of seeking health care from a public provider dropped as income increased. This suggests that health seeking behavior of low- and high-income individuals differed significantly. The second main conclusion is that the distance to health care facilities from the area of residence discouraged the choice of public and semi-private health facilities in Rwanda. Thus, an increase in the distance to a health facility induced an increase in the likelihood of a household member opting for self-treatment. The third most important conclusion is that insurance was an important factor explaining the choice of public and private treatment alternatives in Rwanda. In other words, the total of the out-of-pocket payment required to access services mattered for the choice between public and private health care facilities. Related to this conclusion, the study found that monetary price had a significant and negative impact on the choice of private health facilities. The direct implication is that increasing user charges decreased the likelihood of seeking health care from private health providers.

Given the above results, a number of policy recommendations emerge from these conclusions. First, since an increase in income causes patients to shift to private facilities, the government should consider subsidizing private health facilities to enable access to care in the private sector by low-income households. The government should explore ways of implementing a voucher scheme system to boost rural incomes in specific regions in particular. Second, as insurance is an important factor in choosing a health care facility, policies that reduce health care costs at the time of need would substantially increase the use of health services. Finally, since distance affects access to health care in Rwanda, there is a need to improve geographical accessibility to health facilities across regions by upgrading and expanding transportation infrastructures such as roads, telecommunication, and other health infrastructures in different areas to make health care providers more accessible.

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References

Acton, J. P. (1975). Nonmonetary factors in the demand for medical services: Some empirical Evidence. *The Journal of Political Economy*, 83(3), 595-614.

Ajakaiye, O. & Mwabu, G. (2007). The demand for reproductive health services: An Application of Control function Approach. AERC, Nairobi.

Akin J. S., Guikey, D. K. & McIntosh, M. (1998). Price elasticities of demand for curative care with control for sample selectivity on endogenous illness: An analysis for Sri Lanka. *Health Economics,* 7(6), 509-531.

Awoyemi, T. T., Obayelu, O. A. & Opaluwa, H. I. (2011). Effect of distance on utilization of health care services in rural Kogi State, Nigeria. *Journal Human Ecology*, 35(1), 1-9.

Bolduc, D., Muller, C. & Lacroix, G. (1996). The choice of medical providers in rural Benin: A comparison of discrete choice models. *Journal of Health Economics,* 15, 477-498.

Brown, C. J., Pagán, J. A. & Rodríguez-Oreggia, E. (2002). Inequality in health care utilization in Mexico, Working Paper. Working Paper No2002-12.
Feng, J., Bei, Q. & Yangyang, Y. (2008). Wealth, education and demand for medical care. Evidence from rural China. *World* Scientific, 10, 215-30.
Gertler, P. & Sanderson, L. (1987). Are user fees regressive? The welfare implications of health care financing proposals in Peru. *Journal of Econometrics,* 36, 67-88.
Gertler, P. & Van der Gaag, J. (1990). *Willingness to pay for medical care: Evidence from two developing countries*, Johns Hopkins University Press, Baltimore, MD.
Greene, W. L. (2007). *Econometric Analysis.* New York: Macmillan.
Hahn, B. (1994). Health care utilization: The effect of extending insurance to adults on Medicaid or uninsured. *Medical Care,* 32(3), 227-239.
Hausman J. A. & McFadden, D. (1984). Specification tests for multinomial logit model. *Econometrica*, 52, 1219-1240.
Heller, P. (1982). A model of the demand for medical and health services in peninsular Malaysia. *Social Science and Medicine*, 16(3), 267–284.
Hotchkiss, D. P., Hutchinson, L., Malaj, A. & Berruti, A. (2004). Out-of-Pocket Payments and Utilization of Health Care Services in Albania: Evidence from Three Districts, Partners for Health Reform plus.
Hunt-McCool, J., Kiker, B. F. & Ng, Y. C. (1994). Estimates of the demand for medical care under different functional forms. *Journal of Applied Econometrics*, 9(2), 15-16.
Hutchinson, P. (1999). Health care in Uganda selected issues. World Bank Discussion paper No 404.
Jayaraman, A., Chadndrasekhar, S. & Gebreselassie, T. (2008). Factors affecting maternal healthcare seeking in Rwanda. *USAID*. Working Paper.
Jowett, M., Deolalikar, A. & Martinsson, P. (2004). Health insurance and treatment seeking behaviour: Evidence from a low-income country. *Health Economics,* 13, 845–857.
Kaija, D. O. & Okwi, P. O. (2011). Quality and demand for health care in Rural Uganda: Evidence from 2002/03 household survey, Economic Research Consortium, Nairobi. http://www.csae.ox.ac.uk/conferences/2007-edia-lawbidc/papers/428-kaija.pdf
Kabubo-Mariara, J., Mwabu, G. & Nd'enge, G. K. (2009). The consequences of fertility for child health in Kenya: Endogeneity, heterogeneity and the control function approach. African Economic Research Consortium, Nairobi. Report for AERC Collaborative Research Project on Reproductive Health, Economic Growth
Kioko, M. U. (2009). The Economic Burden of Malaria in Kenya: A Household Level Investigation. PhD Thesis, University of Nairobi.
Lacroix, G. & Alihonou, E (1982). An empirical model of primary health care demand in Benin. Working Paper, Laval University.
Lawson, D. (2004). A Microeconomic analysis of health, health care and chronic poverty. Unpublished, University of Nottingham.
Lépine, A. & Nestour, A. (2008). Health care Utilization in rural Senegal: The factors before the extension of health insurance to farmers. International Labour Office, Research Paper No.2.
Li, M. (1996). The demand for medical care: Evidence from urban areas in Bolivia. Living Standards Measurement Study Paper No. 12. World Bank, Washington D.C.
Lindelow, M. (2002). Health care demand in rural Mozambique: Evidence from 1996/97household survey. International Food Policy Research Institute (IFPRI), FCND Discussion Paper, No. 126.
Long, J. S. (1997). Regression models for categorical and limited dependent variables. Advanced Quantitative Techniques in the Social Sciences Number 7. Sage Publications: Thousand Oaks, CA.
Luce, R. D. (1959). Individual choice Behaviour: A theoretical analysis, New York, NY: John Willey and Sons.
McFadden, D. (1981). Econometric models of probabilistic Choice. In: Manski, C. and McFadden, D. (Eds). Structural Analysis of Discrete Data with Econometric Applications: Cambridge, MA: MIT Press.
Mocan, N. H., Tekin, E. & Jeffrey, S. Z. (2004). The demand for medical care in Urban China. W*orld Development,* 32(2), 289–304.
Muriithi, M. K. (2009). The demand for health Care in Nairobi Slum: The Role of Quality and Information. PhD Thesis, University of Nairobi.
Muriithi, M. K. (2013).The Determinants of health seeking behaviour in a Nairobi slum-Kenya. *European Scientific Journal*, 9(8), 151-164.

Mwabu, G. (1986). Health care decisions at the household level: Results of a rural health survey in Kenya. *Social Science and Medicine,* 22(3), 315-319.
Mwabu, G. (1989). Referral system and health care seeking behaviour of patients: An economic analysis. *World Development,* 17(1), 85-92.
Mwabu, G., Ainsworth, M. & Nyamete, A. (1993). Quality of medical care and choice of medical treatment in Kenya. An empirical analysis. *Journal of Human Resources,* 28(4), 283- 291.
Mwabu, G., Wang'ombe, J. B. & Nganda, B. (2003). The Demand for medical care in Kenya. African Development Bank, Oxford, OX4 2DQ, UK and 350 Main Street, Malden, MA02148, USA.
Mwabu, G. (2008) Health economics for Low-Income countries, in Schultz T.P. and J. Strauss (2008) eds., Handbook of Development Economics, Vol. 4, Chapter 53. Elsevier, Amsterdam; North-Holland
National Institute of Statistics of Rwanda (NISR). (2006). Integrated household living conditions survey in Rwanda (2005-2006), Kigali: *NISR*.
Odwee, J. A. O., Okurut, F. N. & Adebua, A. (2006). The determinants of health care demand in Uganda: The case study of Lira District, Northern Uganda. African Economic Research consortium Research Paper No 155, Nairobi.
Rosenzweig, M. R. & Schultz, T. P. (1982). The Behaviour of mothers as inputs to child health: The determinants of birth weight, gestation, and the rate of fatal growth. In: Fuchs, Victor R., ed., Economic aspects of health, Chicago: University of Chicago Press.
Sahn, D. E., Younger, S. D. & Genicot, G. (2003). The Demand for health care services in rural Tanzania. *Oxford Bulletin of Economics and Statistics,* 65(2), 241-259.
Shimeles, A. (2010). Community Based Health Insurance Schemes in Africa: The Case of Rwanda. African Development Bank group, Working Paper, No. 120.
Ssewanyana, S., Nabyonga, O. J., Kasirye, I. & Lawson, D. (2004). Demand for Health Care Services in Uganda, Implications for Poverty Reduction. Munich Personal RePEc archive, Unpublished.
Staiger, D. & Stock, J. H. (1997). Instrumental variables regression with weak instruments. *Econometrica,* 65(3), 557-587
Wong, E., Partin, B., Guilkey, D. & Akin, J. (1987). Accessibility quality of care and prenatal care use in the Philippines. *Social Science and Medicines*, 24 (11), 927-944
Waters, H. R. (1999). Measuring the impact of health insurance with a correction for selection bias--a case study of Ecuador. *Health Economics,* 8(5), 473-483
Yoder, R. (1989). Are people willing and able to pay for health services? *Social Science and Medicine*, 29(1), 35–42.

Appendix Tables

Table A1: Multinomial Logit Model of Provider Choice: Marginal Effects (*z*-Statistics in Parentheses)

Variables	Public provider	Private provider	Semi private provider
Household income	-0.0006 (-0.79)	0.0018 (0.03)	-0.002 (-0.07)
User fees	0.0916 (6.38)***	-0.0489 (-6.88)***	-0.229 (-2.04)**
Quality of health care (=1 if medical specialist in the visited health facility exists)	0.116 (3.25)***	0.07 (2.48)**	0.024 (0.61)
Distance to the health facility	-0.029 (-0.79)	-0.214 (-2.94)**	-0.299 (-3.53)
Household size	0.0024 (0.44)	-0.183 (-1.74)*	0.260 (1.69)*
Insurance (=1 if insured)	0.0035 (3.7)***	0.021 (1.78)*	0.0056 (2.41)**
Predicted values of insurance	0.0043 (4.1)***	0.0042 (1.95)*	0.0083 (2.6)**
Transportation cost	-0.009 (-3.03)***	0.0123 (4.19)***	-0.005 (-4.68)***
No education (=1)	0.033 (1.80)*	-0.0013 (-0.11)	0.82 (0.23)
Primary (=1)	0.065 (2.5)**	0.0004 (1.91)*	0.045 (0.78)
Secondary (=1)	0.005 (2.9)***	0.0041 (3.4)***	0.35 (0.97)

Variables	Public provider	Private provider	Semi private provider
Tertiary (=1)	0.031 (0.9)	0.051 (4.1)***	0.062 (3.5)*
Age	0.0016 (2.05)**	0.2057 (2.46)**	0.005 (4.7)***
Gender (=1 if male)	-0.034 (1.30)	0.036 (-1.05)	-0. 024 (-0.47)
Location (=1 if urban)	-0.06 (-2.54)**	0.159 (3.32)***	-0.07 (-1.20)
Kigali region (=1)	-0.011 (-0.77)	0.09 (3.51)***	-0.135 (-3.13)***
Northern region (=1)	-0.0004 (-0.05)	0.042 (2.41)**	-0.081 (-2.67)**
Marital status (=1 if married)	0.0191(0.81)	-0.0476 (-1.09)	0.017 (0.25)

Note: ***, ** and * = significant at 1%, 5% and 10% level respectively
Source: Researcher's own construction

Table A2: Determinants of the Demand for Insurance, First Stage Regression (Provider Choice)

Explanatory variables	Estimates	Standard errors	z-statistics
Household income	0.00023	0.00003	8.97***
User fees	-0.0173	0.0106	-1.36
Quality of health care (=1 if medical specialist in the visited facility exists)	0.0152	0.0068	2.23**
Distance to the health facility	-0.0605	0.0107	-5.61***
Household size	0.0142	0.0012	11.39***
Age	0.00063	0.00022	2.83 ***
Age squared	-0.0032	0.00075	-4.2***
Primary (=1)	0.00035	0.000087	4.0***
Employment status (=1 if employed)	0.006	0.0009	6.6***
Relationship to household head (=1 if spouse)	0.0002	0.00007	2.85**
Secondary (=1)	0.0078	0.0054	1.4
Tertiary (=1)	0.00092	0.001	0.92
Male (=1)	-0.00279	0.00589	-0.47
Urban (=1)	-0.0982	0.0137	-7.16 ***
Kigali (=1)	-0.0282	0.0114	-2.47 **
Southern (=1)	-0.0590	0.0088	-6.7 ***
Western (=1)	0.0582	0.00872	6.67***
Northern (=1)	0.063	0.0083	7.59 ***
Transportation cost	0.0045	0.00037	0.12
Marital status (=1 if married)	0.0942	0.0075	12.44
Constant	-0.359	0.0146	-24.63***
Number of observation=			5040
F(21, 32145) =			68.23***

Note: ***, ** and * = significant at 1%, 5% and 10% level respectively
Source: Researcher's own construction

Table A3: Hausman Test of IIA Assumption for the Choice of Health Provider (N=5036)

Omitted	Chi 2	DF	P>Chi2	Evidence
Self-medication	-232,000	28	1	for HO
Public	-240,000	25	1	for HO
Private	-25.07	28	1	for HO
Private semi-private	-274,000	32	1	for HO

Ho: Odds (outcome J versus outcome K) are independent of other alternatives