WELFARE EFFECTS OF HEALTH INSURANCE IN NIGERIA

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ABSTRACT

The lower cost of health care services made possible by health insurance may lead to moral hazard. Moral hazard creates inefficiency in the health insurance market and loss in welfare. This paper investigates moral hazard and welfare effects of health insurance in Nigeria. A health care utilization model was estimated for moral hazard in the demand for health care using a generalized method of moments. Marshallian, Hicksian and Nyman's estimates were used to determine the welfare effects of health insurance. Moral hazard in health insurance was evident in the value of price elasticity of demand for medical care consumption in health insurance, social and private health insurance with coefficients of 0.16, 0.14 and 0.0001 respectively. There were welfare gains (efficient moral hazard) from the Marshallian (85.8%), Hicksian (87.5%) and Nyman's (87.3%) estimates against welfare loss (inefficient moral hazard) of -14.2%, -12.5% and -12.7%. Health insurance increased overall welfare in spite of the moral hazard. Therefore, government should, through appropriate policies, encourage the expansion of health insurance in Nigeria.

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1. Introduction

Literature has conventionally been concerned about two issues caused by information advantage in the insurance market. The first is adverse selection which refers to individuals buying health insurance as a result of anticipated health care induced by the likelihood of health risk (Buchmueller et al., 2005; Doiron, Jones and Savage, 2008). The second issue is the direct price effect of health insurance which is referred to as moral hazard. That is, health insurance reduces the effective price of health care, other things being equal, the insured tend to use more health care. For example, individuals who are indifferent between using and not using a certain medical service at uninsured rates will tend to use it if they have insurance. Moral hazard is an excess demand for health investment as a result of having health insurance. By distorting the effective price of health care to the insured users, health insurance leads to the overutilization of health care services (Amaghionyeodiwe, 2009). Health insurance encounters the problems of adverse selection and moral hazard whether it runs publicly or privately, and this leads to inefficiencies in the health insurance market.

Newhouse (1993) and Nyman (1999a; 1999b; 1999c; 2001; 2003a) observed that the concern about moral hazard brought about changes in the estimates of the value of health insurance over three historical periods. The first period was from 1944 to 1968 when the demand for health insurance was analysed as the demand for certainty where health insurance was assumed to have a positive value. The second period was from 1969 to around 1999 when a preoccupation with moral hazard prevailed due to the recognition that health insurance does not pay off by transferring income in a lump sum but by reducing the price of health care services. The economic analysis of the welfare implication of this is that the fall in the direct price of health care due to the purchase of health insurance allows consumers to purchase more health care than they could have purchased at the normal market price— this is the moral hazard. The third period was from 2000 and was characterized by arguments that challenged the earlier understanding of the welfare implication of moral hazard. The analysis here assumed that people buy health insurance to obtain additional income when ill. The insurance contract obliges the insurance company to transfer income from the many who pay into the pool and remain healthy to the few who become ill enough to need medical care. This analysis suggests that within the price

reduction is an income transfer from those who are healthy to those who are sick. The income transfer provides additional health expenditure considered welfare-decreasing under the previous moral hazard model. Hence, the portion of moral hazard related to income transfer was re-categorized as welfare increasing. The income elasticity of demand for health care was neglected until de Meza (1983) observed that an insurance claimant receives the equivalent of an income transfer from the insurance pool and if the claim exceeds the insurance premium, the net increase in income to the claimant shifts the demand curve for health care services outward, reducing the deadweight loss and increasing consumer surplus (Eisenhauer, 2006).

In many low-income countries, health insurance covers mostly formal sector employees, while about 90% of the total population is without health insurance. For example, employer-based health insurance is mostly used in Nigeria and only about 2% of economically active men and 1% of economically active women are covered by this type of insurance (Lammers & Warmerdam, 2010). The majority of people who are most in need of health care services are without health insurance. Despite lack of coverage for many people and high out-of-pocket expenditure which impoverishes many people, public policies are still used to reduce the rapid expansion of health insurance to people in developing countries due to insurance-induced distortion of health care consumption (the so-called moral hazard). This even occurs without adequate empirical evidence in the literature on health care consumption behaviour of the insured in developing countries (Hidayat & Pokhre, 2010). Therefore, this study examined the existence of moral hazard in the demand for health care given health insurance coverage and its welfare effects in Nigeria. The rest of the paper is structured as follows: section 2 discusses health insurance in Nigeria; section 3 provides a literature review. Section 4 contains the methodology; section 5 contains a discussion of results; and section 6 concludes the paper.

2. Health Insurance in Nigeria

The specific types of insurance coverage for women and men by background characteristics as of 2013 in Nigeria are presented in tables 1 and 2. The tables show that individuals are covered by employer-based health insurance, mutual health organization/community-based health insurance or privately purchased commercial insurance. From the tables, about 98.2% of women and 97.0% of

men have no health insurance coverage. Among all categories of insurance, employer-based is generally used and about 2.4% of men and 1.4% of women are covered by this type of insurance. The tables further show that 96.7% of women and 95.0% of men; 99.3% of women and 98.5% of men have no health insurance in urban and rural areas respectively, while mutual or community health insurance accounts for less than 2% for men and women of different age groups (NPC & ICF Macro, 2014).

Table 1. Percentage Distribution of Women Aged 15-49 by Type of Health Insurance Coverage, according to Background Characteristics, Nigeria, 2013

Background Characteristics	Employer-based Insurance	Mutual health organization/ Community-based insurance	Privately purchased commercial insurance	Other	No health insurance	Number of women
Age						
15-19	0.7	0.1	0.0	0.0	99.1	7,820
20-24	1.1	0.4	0.3	0.0	98.3	6,757
25-29	1.2	0.2	0.3	0.0	98.3	7,145
30-34	2.1	0.2	0.2	0.0	97.5	5,467
35-39	2.1	0.3	0.2	0.1	97.4	4,718
40-44	2.0	0.3	0.2	0.1	97.5	3,620
45-49	1.3	0.2	0.1	0.0	98.4	3,422
Residence						
Urban	2.7	0.3	0.4	0.0	96.7	16,414
Rural	0.5	0.2	0.1	0.0	99.3	22,534
Zone						
North Central	1.8	0.6	0.2	0.0	97.4	5,572
North East	1.5	0.1	0.2	0.0	98.3	5,766
North West	0.5	0.1	0.0	0.0	99.4	11,877
South East	1.3	0.3	0.5	0.0	97.9	4,476
South South	2.5	0.4	0.5	0.1	96.6	4,942
South West	1.8	0.1	0.2	0.1	97.8	6,314
Education						
No education	0.1	0.1	0.0	0.0	99.8	14,729
Primary	0.5	0.1	0.1	0.0	99.4	6,734

Background Characteristics	Employer-based Insurance	Mutual health organization/ Community-based insurance	Privately purchased commercial insurance	Other	No health insurance	Number of women
Secondary	1.4	0.3	0.3	0.0	98.1	13,927
More than secondary	8.6	0.9	0.9	0.2	89.4	3,558
Wealth quintile						
Lowest	0.0	0.0	0.0	0.0	100.0	7,132
Second	0.0	0.0	0.0	0.0	99.9	7,428
Middle	0.4	0.1	0.1	0.0	99.3	7,486
Fourth	1.2	0.2	0.2	0.0	98.3	7,992
Highest	4.6	0.7	0.5	0.1	94.1	8,910
Total	1.4	0.2	0.2	0.0	98.2	38,948

Source: NPC & ICF Macro, 2014.

Table 2. Percentage Distribution of Men Aged 15-49 by Type of Health Insurance Coverage, according to Background Characteristics, Nigeria, 2013

Background Characteristics	Employer-based Insurance	Mutual health organization/ Community-based insurance	Privately purchased commercial insurance	Other	No health insurance	Number of men
Age						
15-19	0.6	0.1	0.1	0.2	99.1	3,619
20-24	1.0	0.3	0.2	0.3	98.1	2,892
25-29	1.8	0.3	0.1	0.1	97.7	2,757
30-34	3.5	0.6	0.0	0.1	95.9	2,414
35-39	3.5	0.4	0.3	0.1	95.8	2,175
40-44	4.4	0.4	0.4	0.0	94.8	1,777
45-49	4.5	0.4	0.2	0.0	94.9	1,724
Residence						
Urban	4.1	0.5	0.4	0.0	95.0	7,611
Rural	1.1	0.2	0.1	0.0	98.5	9,748
Zone						
North Central	3.4	1.0	0.1	0.4	95.2	2,685
North East	1.6	0.3	0.1	0.5	97.6	2,515

Background Characteristics	Employer-based Insurance	Mutual health organization/ Community-based insurance	Privately purchased commercial insurance	Other	No health insurance	Number of men
North West	1.0	0.2	0.1	0.0	98.7	5,185
South East	2.1	0.1	0.1	0.0	97.6	1,686
South South	3.5	0.3	0.2	0.0	96.0	2,445
South West	4.1	0.1	0.3	0.0	95.4	2,843
Education						
No education	0.0	0.0	0.0	0.0	100.0	3,685
Primary	0.5	0.2	0.0	0.0	99.3	2,907
Secondary	1.8	0.2	0.1	0.1	97.8	8,218
More than secondary	10.1	1.5	0.9	1.7	86.8	2,486
Wealth quintile						
Lowest	0.0	0.0	0.0	0.0	100.0	2,862
Second	0.1	0.1	0.0	0.0	99.7	2,992
Middle	1.0	0.1	0.1	0.1	98.6	3,338
Fourth	1.8	0.4	0.1	0.1	97.6	3,835
Highest	7.1	0.8	0.5	0.3	91.3	4,332
Total	2.4	0.3	0.2	0.1	97.0	17,359

Source: NPC & ICF Macro, 2014.

Full operation of social health insurance in Nigeria began in 2006 for formal sector employees (Lawanson, 2008). The social health insurance scheme is made up of compulsory and voluntary contributions designed along three streams of programmes for different sets of participants: Formal Sector Programme (FSP), Informal Sector Programme (ISP) and Vulnerable Groups Programme (VSP). The formal sector programme is compulsory for formal sector workers (public and private) and is made up of two types of programmes; social health insurance (SHI) and private health insurance (PHI). Public sector workers operate only under the SHI while private-sector workers have the option of choosing either to operate under SHI or PHI. The informal sector programmes are of two types viz. Work-based Health Insurance (WBHI) and Community-based Health Insurance (CBHI). Membership of WBHI consists of individuals with common economic interests residing in rural or urban areas while membership of CBHI

comprises people in the same location and who enrolled in a Mutual Health Association (MHA) that can be registered at the local government area (LGA) and have at least 500 financial members. The vulnerable group programme covers the permanently physically challenged, the aged, prisoners, and children under five years as well as pregnant women who are not covered by other schemes. The informal sector employees, foreigners in Nigeria or persons with temporary residency status and Nigerians in the diaspora are covered through the Voluntary Contributory Social Health Insurance Programme (VCSHIP).

Contributions to the National Health Insurance Scheme (NHIS) are earnings-related. The employer pays 10% while the employee pays 5%, representing 15% of the employee's basic salary. The employer may decide to pay the entire contribution. This is contrary to private health insurance practice in which premium payment is based on the individual health status or perceived need for medical care. By the existing contractual agreement between employers and employees, especially in the organized private sector (OPS), an employer may undertake extra contributions for additional cover to the benefits package. The number of participants enrolled under the NHIS has increased from less than 20 at inception in 2006 to more than two million as at June 2013. A total of 272,068 civil servants (principal and dependants) were registered under the scheme in 2007 (NHIS, 2007). The number of enrollees from 2005 to 2007 was around 1,881,426 (NPC & ICF Macro, 2014) and this number had increased to 2,349,363 as at June 2013; giving a growth rate of 24.9% from 2007 to 2013. Using the 2006 census figures (NPC & ICF Macro, 2014), this is only about 1.7% of the total population in Nigeria.

3. Review of Literature

Three attributes complicate the estimation of the interdependent demands for health insurance and health care. First, insurance is not evenly distributed and may be endogenous to the health care choice leading to potential biases in the estimation of health care demand if left uncontrolled. Second, the differences in health care use across insurance regimes cannot be addressed with a single parameter because insurance may modify the relationship between socio-economic variables and health care use by providing access to an entirely different system of care. Third, the use of health care is discrete and non-negative in the form of a count of services over some time (Koc, 2005).

Therefore, the endogeneity of health insurance complicates the estimation of the relationship between insurance and health care use. These complexities arise due to the underlying behaviours driving health care utilization which may have implications for the choice of the most appropriate model (Vera-Hernandez, 1999; Waters, 1999). Therefore, choosing a model appropriate for estimating health care demand is a difficult process, and is poorly documented in the health economics literature (Hidayat and Pokhrel, 2010). However, Jones (2000) and Vera-Hernandez (1999) argue that when a dependent variable takes only non-negative integer values, the family of count data models provides suitable estimation techniques.

Cutler and Zeckhauser (2000) argued that two types of behavioural changes may result from insurance on the demand side. These are ex-ante and ex-post moral hazards. Ex-ante moral hazard is the reduced consumption of preventive care or changes in lifestyle that results when an individual is insured, thereby increasing the probability of requiring more expensive curative services. Ex-post moral hazard refers to increased consumption of health services once an individual falls ill. Ex-post moral hazard is the context within which the interrelationship of health insurance and health care demand is studied. Various estimates of moral hazard are based on the elasticity of demand for health care by the insured. According to Rossett and Hung (1973), an estimate of elasticities from an analysis of the 1960 survey of consumer expenditure by the Bureau of Labour Statistics in the United States shows that the demand for health insurance was inelastic (an indication of moral hazard in health insurance). Pauly (2006) estimated a large deadweight loss due to moral hazard and Liu, Nestic and Vukina (2012) observed the presence of positive moral hazard effects in Croatia. Cameron et al. (1988) also concluded that health status is more important in determining utilization levels than the choice of insurance plan.

Other estimates of moral hazard in health insurance are based on a comparison of individuals with and without coverage using observational data from population-based surveys. In such data, insurance coverage is not randomly assigned; rather it is the outcome of demand and supply factors, including individual preferences and health status (Buchmueller et al., 2005). In the 1970s, a large study used cross-sectional data or cross-sectional time-series data to estimate the elasticity of demand for health care (Cutler & Zeckhauser, 2000). Among these are Feldstein (1971) who used microdata on hospitals in a time

series regression to estimate the elasticity of demand for health care. All these studies, according to Cutler and Zeckhauser (2000), suffered from two major difficulties. The first is that the generosity of health insurance at an individual level might be endogenous. Generous insurance might boost the utilization of health care services or alternatively, the areas where people demand more health care, may also be areas where people demand more health insurance. Hence, estimates of the effect of insurance on utilization may be biased due to self-selection and unobserved heterogeneity. Separating these two effects required an instrument for the rate of insurance coverage. Second, the studies failed to distinguish between average and marginal co-insurance rates. Most studies related health care spending to average co-insurance rates rather than marginal co-insurance rates as predicted by the theory for data reason.

In addressing the problem of unobserved heterogeneity, the RAND Health Insurance Experiment (HIE) in the United States estimated the price elasticity of demand of -0.2 for outpatient services with the submission that as the rate of cost-sharing fell, per capita out-of-pocket payments increased (Manning et al., 1987). Also, Koc (2005) examined the effect of insurance on the demand for health care among consumers of similar health (called the health-specific moral hazard effect) with an endogenous switching model for count data to deal with the endogeneity of insurance. The results indicate that the moral hazard effect for physician visits is high at relatively high levels of health, whereas the effect for hospital nights and hospital admissions is low at relatively higher levels of health. The evidence suggests that efficient and inefficient moral hazard may exist and may depend on the type of health care service. Hidayat and Pokhrel (2010), on the selection of appropriate count data model for modelling health insurance and health care demand in Indonesia, found that 63% increase in the average number of public visits by the beneficiaries of mandatory insurance for civil servants and individual's decision to make the first contact with private providers is affected by private insurance membership.

According to Hausman (1981) knowledge of the uncompensated (Marshallian) demand function can be an exact measure of the welfare effects caused by changed prices and the welfare effects can be expressed either in terms of compensating variation (CV) or equivalent variation (EV). However, this approach must be modified in application to health insurance because consumers paid (premium) with the hope of enjoying reduced prices in the

period of illness. Nyman and Maude-Griffin (2001), however, suggested that the Hicksian demand can be used in describing the welfare implications of an exogenous change in price. Hence, they employed the Marshallian demand function and Hicksian demand function to generate a new demand function for evaluating the welfare effects of the health insurance contract that pays off with a reduction in price and estimated welfare loss as a deviation from the observed Marshallian demand curve in the new demand function. This deviation depends on four parameters which are coinsurance rate, the Marshallian price elasticity of demand for medical care, the share of spending devoted to medical care in the typical ill household and the income elasticity of demand for medical care of the ill household (Nyman & Maude-Griffin, 2001). Focusing on ex-post moral hazard, Pauly (1968) estimated a large deadweight loss due to moral hazard and suggested raising the co-insurance rate to curtail inefficiency due to moral hazard.

Nyman and Maude-Griffin's (2001) estimates of relative welfare loss show that if the co-insurance rate falls from l to 0.31 exogenously, consumption of medical care would be 12.4% greater. The magnitude of welfare loss would reflect this 12.4% increase in consumption measured by Marshallian demand. The pure price effect would result in a 4.0% increase in consumption after removing the Hicksian income effect. This increase is only 32% of the increase estimated from the Marshallian demand, thus, only 32% of the welfare loss is estimated using Marshallian demand while the remaining 68% is the income transfer effect. Finally, if an individual were required to purchase the price decrease, consumption would be 3.7% greater than original consumption, moral hazard would be only 30% of Marshallian moral hazard and the welfare loss would be 30% of the Marshallian welfare loss as implied by Pauly's (1968) analysis. And for a sufficiently strong response, the overall effect of insurance may be an increase in economic efficiency.

4. Methods

4.1 Theoretical framework

This study adopted the contract theory (Bolton & Dewatripont, 2005) as the theoretical framework in which it was assumed that individuals seeking to enter into a health insurance contract are not selected at random and individual characteristics, such as health status, may influence the decision to enter into a

contract, thus creating a self-selection bias. This means that individuals with low expectations about their future health status may have an incentive to select insurance coverage. It is further assumed that under uncertainty, risk-averse individuals demand risk-bearing goods, such as health insurance, to safeguard their income against possible shocks. Health is assumed to be a choice variable because it is a source of utility. Individuals value health, with health care as a means of producing health. Therefore, individuals first choose their insurance and then choose their health care utilization when ill. The related uncertainty under this scenario concerns future health status at the time the insurance policy is chosen. Also, insurance is purchased because the expected value of the additional health care and other consumer commodities if ill exceeds the expected cost of paying the insurance premium if healthy. Therefore, an uncompensated (i.e. Marshallian) demand function can be used to measure the welfare effects caused by price change (Dong, 2013). This can be expressed either in terms of compensating variation (CV) or in terms of equivalent variation (EV). The Hicksian demand describes the welfare implications of an exogenous change in price. However, the demand analysis originated from the work of Nyman (1999c) which can be used in evaluating the welfare effects of an insurance contract that pays off with a reduction in price. Therefore, an individual's response to becoming insured is described by the Marshallian demand function for medical care thus:

$$M_d = D(P_m, Y', \sigma) \tag{1}$$

where:

M_d = number of times of medical care consumption
P_m = price of medical care
Y' = consumer's income after paying a premium
σ = co-insurance rate which represents the probability of illness

Insurance contracts that pay off by reducing price create moral hazard through price and income transfer effects, but only the price effect has welfare loss implications. The size of the income transfer depends on σ (interpreted as the probability of illness). Illnesses with high probabilities would be associated with a small income transfer effect and those with small probabilities are

associated with a large income transfer effect. If the probability is sufficiently small, it would appear as if there were no decrease in consumption at all due to paying the premium and that the consumer is responding as if there were an exogenous fall in price. This is the conventional interpretation of moral hazard, but the underlying mechanism by which the additional consumption occurs (a purchased lower price and an income transfer) has different welfare implications (Nyman, 1999c).

The explicit form of equation (1) in an exponential form gives an estimable equation for the demand for health care services for a given choice of insurance that depends on the future health state and the insurance choice. Therefore, unconditional insurance choice, the demand for health care services can be written as a non-linear equation of the form:

$$E\left[m_i(s)\right] = \exp(\eta P_m + \varepsilon Y^{'} + \sum_{j=1}^{J} \Phi_{ji} D_j + \alpha_i Z_i + \mu_2) \tag{2}$$

where:

(Z_i) is a vector of individual household characteristics that may be important in health care decision, like household size, education, marital status and employment status

(P_m) is the price of health care measured by the co-insurance rate multiplied by individual monthly total health expenditure,

$(Y^{'})$ is the income in time two (assume illness occurred in time two)

(D_j) are dummy variables for the insurance form (in our case the value of j is between 0 and 1 where 0 indicates non-insured and 1 indicates insured.

Individuals were categorized under social health insurance and private health insurance. The implication of this model is that from the derived demand equation, if the price of the health care services is lower, more of it will be demanded. Thus, we would expect that (Φ_{ji}) it is larger for the insurance policy (j) that is more generous. This is the well-known moral hazard effect of health

insurance and (μ_2) is the error term that represents other unobserved characteristics. Since equation (2) is an exponential equation, coefficients from this equation were interpreted as elasticity. Hence, if the coefficient of (P_m) is less than one (i.e. inelastic) it indicates the existence of a moral hazard. Three versions of equation (2) were estimated, viz. individual having health insurance or not, social health insurance and private health insurance. A priori price of health care services is expected to be negatively related to medical care utilization and positively related to health insurance decisions, income, age and level of education.

To obtain the welfare effects of moral hazard consumption, we estimate the moral hazard consumption as a percentage of original consumption using Marshallian, Hicksian and Nyman demand functions. Thus, the Marshallian estimate is:

$$\eta(\sigma-1) \tag{3}$$

Equation (3) is the price elasticity of demand for health care in the ill household multiplied by the proportion of the health expenditure paid by the insured in the sick period. The Hicksian estimate is:

$$\left[\theta\varepsilon(\sigma-1)+\eta(\sigma-1)\right] \tag{4}$$

Equation (4) is the share of spending devoted to medical care in the typical ill household multiplied by the income elasticity of demand for health care in the ill household and the proportion of health expenditures paid by the insured during the sick period plus the price elasticity of demand for health care in the ill household multiplied by the proportion of health expenditures paid by the insured during the sick period. While the Nyman's (2001) estimate is

$$\left[\theta\varepsilon(\sigma-1)+\eta(\sigma-1)\right]/\left[1+(1-\sigma)\theta\varepsilon\right] \tag{5}$$

Equation (5) is the share of spending devoted to medical care in the typical ill household multiplied by the income elasticity of demand for health care in the ill household and the proportion of health expenditure paid by the insured during the sick period plus the price elasticity of demand for health care in the ill household multiplied by the proportion of health expenditure paid by the insured

during the sick period divided by payment by the insurance company during the sick period multiplied by the share of spending devoted to medical care in the typical ill household and the income elasticity of demand for health care in the ill household plus one. Residuals from equations (3), (4) and (5) are income transfer effects which represent efficient moral hazard and welfare increasing if greater than the values from equations (3), (4) and (5) and welfare decreasing if less (Nyman, 1999a, 1999b, 2003b, 2005, 2006).

4.2 Design and setting of the study

4.2.1 *Population of the Study and Sampling Design*

The data for the study was collected using a purposive sampling survey carried out from September to October 2012 in the six geo-political zones in Nigeria**.** The six geo-political zones in Nigeria are: South-West, South-East, South-South, North-West, North-East, and North-Central. One state with a large presence of formal sector workers was chosen from each zone. This choice was based on the fact that the formal sector workers are the most covered by health insurance presently in Nigeria. Lagos State was chosen in the South-West, Imo in the South-East, Rivers in the South-South, Kaduna in the North-West, Adamawa in the North-East and Abuja in the North-Central. The survey for the study was conducted in hospitals, government parastatals, private companies, and households. The target population used in the study comprised formal sector employees (private or public) and informal sector workers with or without health insurance coverage.

4.2.2 *Instrument for Data Collection*

The tool used for this study is a self-designed 48-item questionnaire containing questions regarding respondent household's socio-demographic characteristics, health insurance status, health status, health care expenditures, and health care utilization. A total of 500 copies of the questionnaire were administered in each state which brings the total number to 3000. The survey for the study was conducted using trained enumerators. The facilities used in each state were teaching hospitals, health centres that serve as providers to NHIS in Nigeria and other health centres with health insurance facilities. Government parastatals, private sector establishments, and households were also used. The facilities used

were: University of Lagos Medical Centre, Lagos University Teaching Hospital (LUTH), Lagos State University Teaching Hospital (LASUTH), Lagoon Hospital, Apapa in the South-West; Imo University Teaching Hospital (IMSUTH) and Holy Rosary Hospital, Emekuku in the South-East; University of Port Harcourt Teaching Hospital, Cottage Hospital/Comprehensive Health Centre and Okrika General Hospital in the South-South; Ahmadu Bello University Teaching Hospital, Zaria; 345 Nigerian Airforce Hospital, Kaduna North and Al-Mansu Specialist Hospital, Kaduna South in the North-West; Federal Medical Centre, Yola and Adamawa Hospital in the North-East and Gwarimpa General Hospital, National Hospital, Clean Bill Health Services Limited and Abuja University Teaching Hospital in the North-Central. The government parastatals used were the State Government Secretariat, Federal Government Secretariat, private companies and banks, and randomly selected households in each state.

4.2.3 *Administration of the Instrument*

The questionnaire was distributed based on ease of access to the respondents; 300 copies were used for facilities, 100 for government parastatals and the final 100 for households in each state. The medical officers in each facility and the head of all government and private sector establishments used were approached and their cooperation was solicited. The questionnaires were administered through the medical officers to those who visited the facilities during the survey period and while the enumerators administered questionnaires to staff in government and private establishments. The record officers in the health facilities were entrusted with ensuring the copies of the questionnaire were properly filled and collecting them for onward transfer to the enumerators. The enumerators assisted in supervising the households' respondents and double-checked the completed copies of the questionnaire for consistency. Table 3 shows the description of the variables used in the analysis.

Table 4 shows the summary of the statistics of the variables employed in the analysis. It shows that about 90.9% of the respondents were covered by NHIS, 6.2% had private company health insurance and about 2.9% were covered by personal health insurance. The monthly income of the respondents ranged from ₦1000 ($6.25 at 2012 exchange rate of ₦160 to $1) to ₦3,000,000 ($18,750) with the average monthly income at ₦68,860 ($430.4).

Table 3. Description of the Variables Used in the Analysis

Variable	Definition	Description
Dependent Variables		
MEDICONSUMP	Number of times of Consuming Health Care Services	Count
Independent Variables		
Married	Marital Status: Single = 1, Married = 2, Divorce/Separated = 3, Widowed =4	Categorical
Male	Gender Variable: Male =1, 0 otherwise	Dichtomous
Age	The age of the respondent as at the last birthday	Continuous
FMTYPE	Family Type: Monogamy = 1, Polygamy = 2	Categorical
FMHEAD	Head of the Family: Father = 1, Mother = 2	Categorical
FMHEDUC	Head of the Family Level of Education: No formal Schooling = 1, Primary Education =2, Secondary Education =3, Post-Secondary Education=4	Categorical
FMHOCC	Head of the Family Work: Government Worker=1, Formal Private Sector Worker=2, Trader=3, Transporter=4, Farmer=5, Self-Employed=6, Housewife=7, Unemployed=8, others =9.	Categorical
MEXPFD	Individual Monthly Expenditure on Food	Categorical
MEXPTC	Individual Monthly on Transport and Communication	Continuous
MEXPHLT	Individual Monthly Expenditure on Health	Continuous
MEXPORS	Individual Monthly Expenditure on Others	Continuous
MTOTAEXP	Individual Monthly Expenditure Total Expenditure	Continuous
GHSTATUS	General Health Status measured using twelve questions about the general well-being of the respondent where high score indicates bad health status.	Continuous
COINS	Co-insurance Rate Paid by the insured	Continuous
PRICEHC	Price of Health Care Computed as Coinsurance Rate Multiply by Health Exp.	
HINSTYPE	Health Insurance Type: NHIS =1, Personal Health Insurance =3	Dichotomous
MINCEMPL	Individual Monthly Income from Employment	Dichotomous
MINCGIFTS	Individual Monthly Income from Gifts	Continuous
MINCORS	Individual Monthly Income from Others	Continuous
MTINCO	Total Individual Monthly Income	Continuous
SICKINC	Individual Income During Sick Period	Continuous

Table 4. Summary Statistics of the Variables

Variables	Obs	Mean	Std. Dev.	Min.	Max.
Married1 Single	1051	0.4757	0.4997	0	1
Married1 Married	1051	0.4738	0.4996	0	1
Married3 Divorce/Separated	1051	0.0105	0.1018	0	1
Married4 Widowed	1051	0.0399	0.196	0	1
Male1 Male=1	1051	0.5119	0.5001	0	1
Male2 Female=1	1051	0.4881	0.5001	0	1
Age	1051	32.687	11.3344	16	80
FMTYPE1 Monogamy=1	1051	0.7431	0.4371	0	1
FMTYPE2 Polygamy=1	1051	0.2569	0.4371	0	1
FMHEAD1 Father = 1	1051	0.9125	0.2828	0	1
FMHEAD2 Mother = 1	1051	0.0875	0.2828	0	1
FMHEDUC1 No Formal Schl. =1(Father)	1051	0.0504	0.2189	0	1
FMHEDUC2 Primary Edu =1	1051	0.0428	0.2025	0	1
FMHEDUC3 Sec. Edu =1	1051	0.157	0.364	0	1
FMHEDUC4 Post Sec. Edu =1	1051	0.7498	0.4333	0	1
FMHOCC1 Govt. Worker=1	1051	0.5404	0.4986	0	1
FMHOCC2Form. Pvt Sec Worker=1	1051	0.1408	0.348	0	1
FMHOCC3 Trader=1	1051	0.0733	0.2607	0	1
FMHOCC4 Transporter=1	1051	0.0447	0.2068	0	1
FMHOCC5 Farmer=1	1051	0.0542	0.2266	0	1
FMHOCC6 Self-Employed=1	1051	0.1094	0.3123	0	1
FMHOCC7 Housewife=1	1051	0.0143	0.1187	0	1
FMHOCC8 Unemployed=1	1051	0.0076	0.087	0	1
FMHOCC9 Others=1	1051	0.0152	0.1224	0	1
MEXPFD	1051	18415.17	12204.4	100	100000
MEXPTC	1051	9626.948	7214.841	200	100000
MEXPHLT	1051	7173.292	6497.079	50	100000
MEXPORS	1051	9026.081	7569.926	100	120000
MTOTAEXP	1051	34784.7	25324.09	1500	400000
HINSTATUS1 Non-Insured=1	1051	0.3853	0.4869	0	1
HINSTATUS2 Insured=1	1051	0.6147	0.4869	0	1
HINSTYPE1 NHIS=1	646	0.9087	0.2883	0	1
HINSTYPE2 PRCHI=1	646	0.0619	0.2412	0	1

Variables	Obs	Mean	Std. Dev.	Min.	Max.
HINSTYPE3 PERHI=1	646	0.0294	0.1691	0	1
GHSTATUS	1051	1.0313	1.5832	0	8
COINS	1051	0.1051	0.0185	0.1	0.5
PRICEHC	1051	750.6553	690.2583	5.254	10508.2
MEDICONSUMP	1051	0.9058	1.4195	0	12
MINCEMPL	1051	70262.81	112392.4	100	3000000
MINCGIFTS	1051	10025.23	5640.674	200	75000
MINCORS	1051	11438.38	5833.999	300	100000
MTINCO	1051	68859.98	106055.3	1000	3000000
FSICKINC	646	85070.35	128961.4	4800	3007173

The average health care price was around ₦750 ($4.7) and the average general health status score was about 1.03. The average general health status score shows that the health status of respondents was relatively good. Other socio-demographic characteristics used are marital status which showed that about 47.6% were single, while 47.4% were married, 1.04% were divorced or separated and about 3.9% were widowed. Further, about 80.2% of the respondents had post-secondary education, 14.4% had secondary education, 3.3% had primary school certificate while about 2.9% of the respondents had no formal schooling. On respondents' occupation, 41.1% of the respondents were government workers, 35.4% were formal private-sector workers, 9% were traders, 5% were transporters, 1% each were either farmers or self-employed, 2% were housewives and 0.9% were unemployed. This shows that about 76.5% of the respondents were formal sector workers.

4.3 Estimation technique

4.3.1 *Model Selection*

Equation (2) was employed to estimate the relationship between the demand for medical care, the price of medical care and income (income during the sick period) of the insured. The variable capturing the demand for health care is the number of medical care consumption six months prior to the household survey. Therefore, the demand equation for medical care consumption given health insurance status, the dependent variable is in the form of count (i.e. 1, 2, 3-------,

∞) this motivates the use of the count data estimation model (Mullahy, 1986, 1997). In equation (2), the demand equation for medical care consumption given health insurance status, the dependent variable is in the form of count (i.e. 1, 2, 3--------, ∞) which motivates the use of the count data estimation model. Specification tests were employed to choose among the two classes of count data models. The first class is characterized by a primary equation with a discrete dependent variable which includes standard count data models such as restricted Poisson, negative binomial, zero-inflated negative binomial and hurdle models. The second class extends the features of the first class to accommodate endogenous regressors. This includes instrumental variables (IV) and generalized method of moments (GMM) techniques. Count data models were explored in the estimation of equation (2) with maximum likelihood techniques choosing robust standard error procedures in anticipation of the misspecification of the true (but unknown) population density. The endogeneity test was the first specification test carried out to choose between the first and second class of the count data models. An important problem of IV is that standard errors are inconsistent in the presence of unknown heteroskedasticity, thus yielding an invalid inference. But GMM estimators using orthogonality conditions to allow for efficient estimation in the presence of heteroskedasticity of unknown form do not share this weakness.

As a result, a heteroskedasticity test was performed on IV and GMM to choose between the two. However, an appropriate set of instruments is required to employ GMM and since there exists more than one endogenous variable (health insurance status and health status); tests of R^2 (adjusted and unadjusted), Partial R^2, Shea partial R^2 and Wald-test (of all instruments and excluded instruments) of the first stage regression on GMM were used to test the relevance, validity and orthogonality requirements of the instruments while Hansen's J-statistic was used for over-identifying restrictions. Figure 1 shows various tests for evaluating the overall specification of a model as proposed by Finkelstein & McGarry (2006). The figure indicates three main steps for choosing the most appropriate econometric technique among the six alternatives of two classes of the count data model.

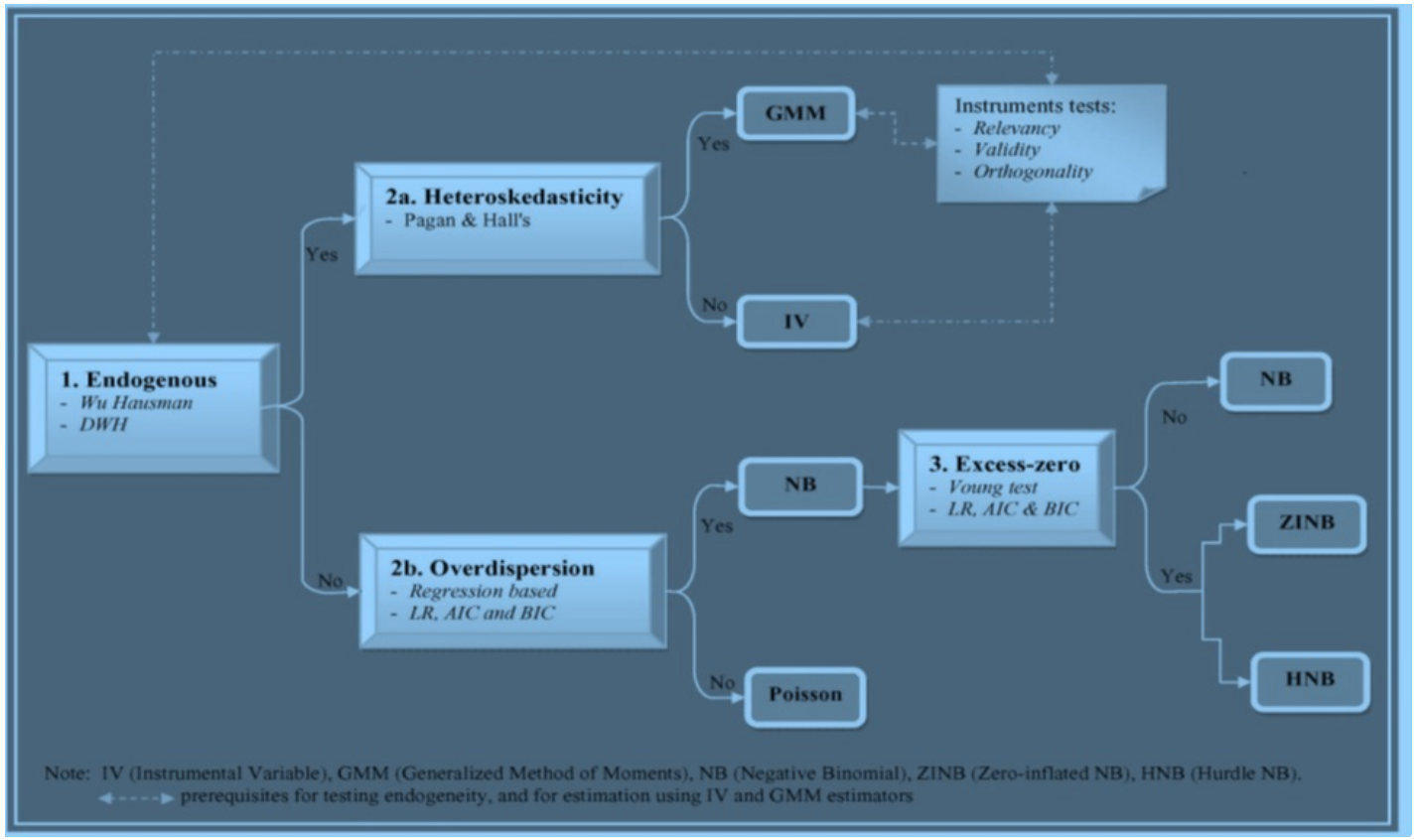

Figure 1. Framework to Select Econometric Techniques for Modeling the Interdependent of Health Insurance and Health Care Services.

Source: Hidayat & Pokhrel, 2010.

General health status and health insurance status are theoretically likely to be endogenous to the demand for medical care services, hence, the two variables constitute possible endogenous variables. As a result, endogeneity tests were first performed to choose between the first and second class of count data models. The endogeneity tests performed on instrumental variable (IV) estimation of medical care consumption with health insurance, social and private health insurance were significant at 1% level (table 5). The tests favoured the use of the second class of count data model (IV and GMM estimators) that accommodate endogenous regressors for equation (2). This is because IV and GMM allow consistent parameter estimates when unobserved heterogeneity is correlated with regressors (Jacobs, 2009).

Table 5. Endogeneity Test

Endogeneity Test	Medical Care Consumption					
	Health Insurance		Social Health Insurance		Private Health Insurance	
	Statistics	p-value	Statistics	p-value	Statistics	p-value
Wu-Hausman	F (2,1015) = 7.5202	0.001	F (2,1014) = 7.082	0.001	F (2,1014) = 6.841	0.001
Durbin Wu Hausman	$\chi2((2))$ = 15.346	0.001	$\chi2((2))$ = 14.465	0.001	$\chi2((2))$ = 13.979	0.001

The Pagan and Hall heteroskedasticity tests (Pagan & Hall, 1983) in table 6 were used to choose either IV or GMM estimator for reliability. The Pagan and Hall heteroskedasticity test statistics were done using fitted value and its square. Pagan and Hall's test in IV 2SLS and GMM estimates were $\chi2(2) = 10.975$ with p-value = 0.004 and ($\chi2(2) = 10.916$ with p-value = 0.004 for health insurance; $\chi2(2) = 15.406$ with p-value = 0.001 and $\chi2(2) = 12.404$ with p-value= 0.002 for social health insurance and $\chi2(2) = 19.765$ with p-value = 0.000 and $\chi2(2) = 16.669$ with p-value=0.000 for private health insurance. This indicates the presence of heteroskedasticity in all the estimates and suggests that GMM is more appropriate to estimate the determinants of the demand for medical care consumption given health insurance, social health insurance, and private health insurance in Nigeria.

Table 6. Pagan-Hall Test of Heteroskedasticity

	Medical Care Consumption					
	Health Insurance		Social Health Insurance		Private Health Insurance	
	Statistics	p-value	Statistics	p-value	Statistics	p-value
IV 2SLS	χ2((2)) = 10.975	0.004	χ2((2)) = 15.406	0.001	χ2((2)) = 19.765	0.000
GMM	χ2((2)) = 10.916	0.004	χ2((2)) = 12.404	0.002	χ2((2)) = 16.669	0.000

Tests of R^2 (adjusted and unadjusted), partial R^2, Shea Partial R^2 and Wald-test (of all instruments and excluded instruments) of the first stage regression on GMM estimates were employed to test the relevance, validity and orthogonality requirements of the instruments for choosing the appropriate set of instruments. The R^2 in table 7 shows that the models explained a reasonable proportion of the variation in medical care consumption.

Table 7. Tests for the Relevance of Instruments

Test Statistics	Medical Care Consumption					
	Health Insurance		Social Health Insurance		Private Health Insurance	
	General Health Status	Health Insurance Status	General Health Status	Health Insurance Status	General Health Status	Health Insurance Status
Unadjusted R2	0.3924	0.2086	0.3924	0.2445	0.3924	0.1133
Adjusted R2	0.3702	0.1797	0.3702	0.2146	0.3702	0.0809
Partial R2	0.3102	0.0269	0.3102	0.0168	0.3102	0.0431
Shea Partial R2	0.0762	0.0266	0.1513	0.0082	0.2680	0.0372
F-tests:						
Wald test(a)	17.68	7.21	17.68	8.17	17.68	3.50
Wald test(b)	75.92	4.66	75.92	2.89	75.92	7.60

F-test all instruments [(a)] F (37, 1013); [(b)] F-test excluded instruments F (6, 1013) *significant at 1%.

The values of partial R^2 and Shea-partial R^2 indicate that the models are well identified. The relevance of the instruments was also investigated using the F-test to determine whether the instruments were correlated with the potentially endogenous variable. The null hypothesis of the F-tests that the parameters of the co-variates were jointly equal to zero was rejected. This indicates that all the instruments were jointly significant with the GMM estimator.

The validity of the instruments was performed using Hansen's J-statistics for the over-identifying restrictions and C-statistics for the orthogonality condition. The null hypothesis of correct specification in demand for health insurance, social and private health insurance cannot be rejected. The values of the Hansen's J-statistic (GMM-estimates) in medical care consumption were 7.101 (p-value = 0.13067), 8.834 (p-value = 0.65390) and 8.210 (p-value = 0.84106) respectively. The value of C-statistics for the orthogonality condition of the instruments were 3.077 (p-value = 0.215), 5.078 (p-value = 0.152) and 4.402 (p-value = 0.111) which indicate that all instruments are exogenous. The specification tests suggest that the selected instruments (family head having post-secondary education; family head is a government employee; spouse of the family head is a government employee; having inherited disease; having a chronic disease) were appropriate to estimate the demand for medical care consumption. The number of times of medical care consumption entered equation (2) as a dependent variable to estimate the demand for medical care services. The result of the summary statistics in table 4 shows that the number of times of medical care consumption ranged from 0 to 12. The mean score was about 1 while the variance was about 2. The ratio between the variance and the mean score was 2.24. This indicates that the observed data is over-dispersed. Figure 2 further shows evidence of excess zero of the medical care consumption with a density of zero being 1.5. This motivates the count data estimation technique.

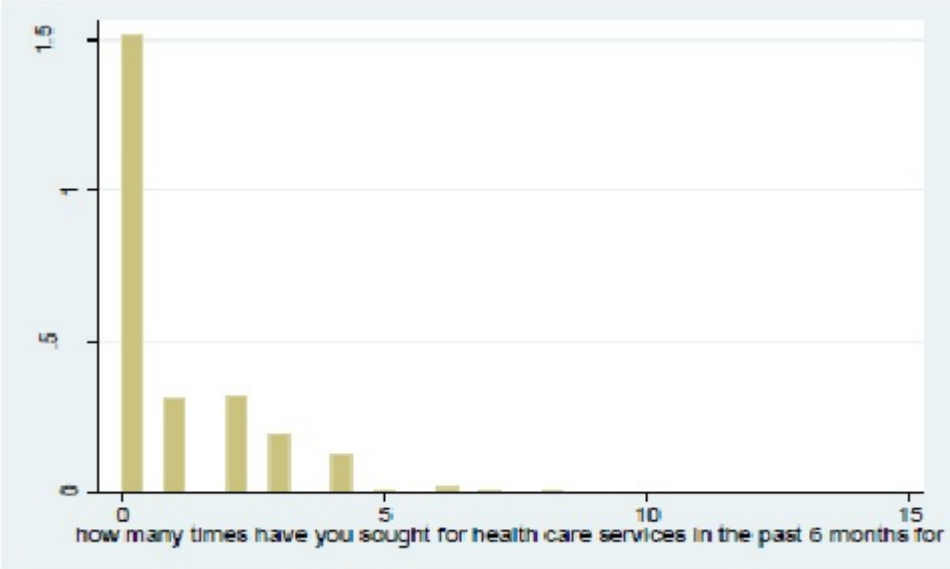

Figure 2. Number of Times of Consuming Health Care Services in the Past Six Months.

5. Results and Discussion

Table 8 shows the results of the demand for medical care services with health insurance, social and private health insurance using GMM estimation technique. The results show that individuals with bad health status with health insurance consumed more medical care. These results agreed with many empirical results (e.g. Nestic and Vukina, 2012; Cameron et al., 1988) that individuals with greater health care needs will demand more for health care services with health insurance. The price elasticities of demand for health insurance, social health insurance, and private health insurance are inelastic meaning that fall in price will reduce health care expenditures and elicit more consumption of health care services and even lead to over-consumption of health services (moral hazard). The income-medical care relationship shows that medical care services are an inferior good under health insurance and private health insurance and a normal good under social health insurance during the sick period. Hence, in the sick period, individuals under social health insurance will increase their consumption of health services due to the increase in income made possible by social health insurance in the sick period. The results further show that the married, and the divorced or separated individuals consumed more medical care with health insurance, social health insurance and less medical care under private health insurance, and the widowed consume less medical care.

Table 8. GMM Estimation of the Determinants of the Demand for Medical Care Consumption

MEDICONSUMP	Health Insurance		Social Health Insurance		Private Health Insurance	
	Coeff[a]	(se)[b]	Coeff[a]	(se)[b]	Coeff[a]	(se)[b]
GHSTATUS	-0.0761	0.097	-0.1354**	0.0675	-0.1501**	0.0518
HINSTYPE	-1.6638	1.2914	-1.3014	1.2103	-2.5929	2.0121
InPRICEHC	0.1592	0.1018	0.1392	0.0968	0.0001	0.0728
InSICKINC	-0.0918	0.1633	0.0625	0.1278	-0.0926	0.1496
COSTRANS	0.0006	0.0006	0.0005	0.0006	0.0009***	0.0005
Single[R]						
Married2	0.0373	0.1696	0.0142	0.1653	-0.0902	0.1095
Married3	0.2728	0.7378	0.0425	0.6267	-0.4916	0.4282
Married4	-0.3349	0.3946	-0.3894	0.4086	-0.7621*	0.1669
Male[R]						
Male2	0.1881	0.1366	0.1977	0.1514	0.0155	0.0974
Age	0.0108**	0.0054	0.0118**	0.0051	0.0103**	0.0048
Monogamy[R]						
FMTYPE2	-0.0789	0.1461	-0.0433	0.1321	0.0569	0.1037
Father[R]						
FMHEAD2	-0.2988	0.2594	-0.2587	0.2611	-0.0132	0.1645
PostSecondary[R]						
FMHEDUC1	0.0329	0.2364	0.1436	0.2106	0.0846	0.2033
FMHEDUC3	-0.1569	0.1773	-0.1154	0.1934	-0.2295	0.1494
PostSecondary[R]						
SFMHEDUC3	0.0165	0.2282	0.0253	0.2341	0.2143	0.1549
PostSecondary[R]						
SFMHEDUC3	0.0165	0.2282	0.0253	0.2341	0.2143	0.1549
Govt-Worker[R]						
FMHOCC2	-0.0796	0.1425	-0.0952	0.1354	-0.0673	0.1293
FMHOCC3	-0.0723	0.2991	-0.1266	0.3324	0.0684	0.2336
FMHOCC4	0.1241	0.2841	-0.0122	0.2281	-0.1314	0.1929
FMHOCC5	0.2723	0.2401	0.3259	0.2392	0.1666	0.2353
FMHOCC6	0.3459***	0.184	0.2579	0.1667	0.3615**	0.1615
FMHOCC7	0.0527	0.3882	-0.024	0.3390	-0.1348	0.3217
PLACEACESS1	-1.2045**		-0.9402**	0.4760	-0.5697*	0.1729
PLACEACESS2	-1.3927*		-1.3335*	0.3545	-0.9603*	0.1403

MEDICONSUMP	Health Insurance		Social Health Insurance		Private Health Insurance	
	Coeff[a]	(se)[b]	Coeff[a]	(se)[b]	Coeff[a]	(se)[b]
PLACEACESS3	-0.4434**		-0.4115	0.2126	-0.2136**	0.096
PLACEACESS5	-0.2578		-0.1375	0.4954	0.2336	0.2698
PLACEACESS6	0.711		0.4478	1.0293	1.0256	1.1042
CONSTANT	2.16803		0.1855	1.4239	2.1286	1.9311
	$R^2 = 0.1614$		$R^2 = 0.2306$		$R^2 = 0.0586$	
No. of Observations	1051		1051		1051	

[a] Estimated parameters; *, **, and *** significant at 1%, 5%, and 10% level, respectively; [b] Robust standard errors; [R] Reference group.

Households with the head of household without formal schooling consumed more medical care under health insurance, social health insurance and private health insurance while households with the head having secondary school education were likely to consume less medical care when covered by health insurance and other types of health insurance. Also, households headed by a formal private sector worker was likely to consume more medical care with health insurance compared to other types of employment. The coefficients of the general health status and the price of medical care services given health insurance and different types of health insurance coverage presented in table 8 were reproduced in table 9 to estimate moral hazard in the demand for health care with health insurance.

Table 9. Moral Hazard in Health Insurance and Different Types of Health Insurance

Type of Health Insurance	General Health Status	Price of Health Care Services	Income During Sick Period
Health Insurance	-0.0761	0.1592	-0.0918
	(0.0970)	(0.1018)	(0.1633)
Social Health	-0.1354**	0.1392	0.0625
Insurance	(0.0675)	(0.0968)	(0.1278)
Private Health	-0.1501**	0.0001	-0.0926
Insurance	(0.0518)	(0.0728)	(0.1496)

*, **, and *** significant at 1%, 5%, and 10% level, respectively; Standard error in parentheses.

The key variable is the price of health care services and the decision is based on whether it is elastic or inelastic[1]. The absolute values of the coefficients of the price of the health care services with health insurance, social and private health insurance for GMM are 0.16, 0.14 and 0.0001 respectively. Since this indicates inelastic demand, it is evidence of moral hazard in medical care consumption given health insurance and different types of health insurance in Nigeria.

The welfare effects of health insurance were estimated using the Marshallian, Hicksian and Nyman's demand estimates. From the estimation of medical care consumption under health insurance, the estimate of the price elasticity of demand for medical consumption of the insured was 0.1592 (η = 0.1592), and the income elasticity of demand was -0.0918 (ε = -0.0918). The average coinsurance rate from the survey data was 0.11, i.e. σ = 0.119 (see table 4) and the average share of medical care spending on total spending was approximately 0.21 (θ= 0.21). Therefore, the price effect from the Marshallian demand estimate as shown in table 10 is -14.2%. This is an inefficient moral hazard.

Table 10. Welfare Effects of Health Insurance in Nigeria[2]

	Marshallian	Hicksian	Nyman
	GMM	GMM	GMM
Price Effect	-14.2%	-12.5%	-12.7%
Income-Transfer Effect	85.8%	87.5%	87.3%
Welfare Effect	Welfare Increasing	Welfare Increasing	Welfare Increasing

The income transfer effect which represents efficient moral hazard was 85.8%. From the Hicksian estimate, the price effect was -12.5% and the income effect was 87.5%. From Nyman's estimate, the price effect was -12.7% and the income effect was 87.3%. The results show that efficient moral hazard dominates the estimates of the welfare effects of health insurance in Nigeria. The major limitation for these estimations is that most countries with less developed

[1] If the coefficient of the price elasticity of health care services is inelastic, it indicates the presence of moral hazard. And it is inelastic if the absolute value of the coefficient of price elasticity of health care services is less than unity (i.e. < 1).

[2] This estimation is a compensating variation approach because it isolates the price effect of health insurance by eliminating the income transfer effect after the price decrease has occurred.

health insurance markets do not usually have national estimates of co-insurance rate and the average share of medical care spending on total spending. Since these estimates were absent in Nigeria, the best estimates of these were from the survey data.

6. Conclusion

This study examined moral hazard in demand for health care with health insurance and its welfare effects in Nigeria. The study shows that the price elasticities of demand for health care services given health insurance and different types of health insurance were inelastic. This is evidence of ex-post moral hazard in medical care consumption given health insurance. Also, the income elasticities of demand for health care services show that an increase in income during the sick period encourages an increase in the utilization of health care services under social health insurance. The welfare effects of health insurance measured by price effect and income transfer effect show that efficient moral hazard dominates inefficient moral hazard in all the three measures of the welfare effects of health insurance. This indicates that health insurance is welfare increasing despite the presence of moral hazard in Nigeria. Therefore, government should extend health insurance to accommodate more people in Nigeria.

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