A Log-Linear Analysis of Factors Affecting the Usage of Nigeria's National Health Insurance Scheme

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Abstract: Nigeria, in 1999, established the National Health Insurance Scheme (NHIS) with the primary goal of bringing health care closer to the greater mass of the populace. However, a decade after inauguration, the rate of participation has not been as high as anticipated. This study examines the extent to which any of six factors-income, occupation, gender, age group, marital status and family size-play an explanatory role in the slow pace of usage of the NHIS. The study confirms that these factors do enjoy some explanatory power. Policy recommendations to help repackage and redirect awareness about the scheme are made.

Key words: National health insurance scheme, income, occupation, gender, age group, marital status and family size

INTRODUCTION

Health spending as a proportion of Nigerian Government expenditure shrank from 3.5% in the early 1970s to <2% in the 1980 and 1990s (Ogunbekun, 2003). At the same period, the country's population continued to expand rapidly at an annual rate of 2.9% (Health Insurance Report, 2005). The result was that available health care resources-personnel, drugs and equipments-were insufficient to provide quality and equitable access to health care service. Inevitably crisis ensued in the health sector. As the crisis raged in the early 1990s many of the highly skilled health professionals, trained with local resources, emigrated to the Middle-East and to more developed countries in reaction to low wages and poor working conditions at home. Pauly *et al.* (2006) captured the pervasiveness of this phenomenon by noting that From Ghana to the Philippines, poor countries train the doctors and nurses who alleviate shortages in Australia, North America and Europe. And in what appears to underscore this point Pillay (2007) remarked that such loss of skilled intellectuals and technical labour can pose complex challenges especially, if source country is a developing country. In Nigeria, this trend is all too familiar as public hospitals have become less and less effective being, more and more, mere consulting centers, lacking in modern equipments, facilities and essential drugs. Perchance, going by the experience of other developed countries, health insurance may help in ameliorating the deteriorating health provision. Invariably however, it was found that coverage by private health insurance was

canty and almost totally restricted to employee medical benefit schemes (Ogunbekun, 2003). The continuous decline and the uncoordinated approaches in health care provision compelled the government, by decree No. 35 of 1999, to establish the National Health Insurance Scheme (NHIS) with the broad objectives of ensuring that every Nigerian has access to good health care service at affordable cost.

Many impediments and doubts trailed the launch of the scheme. One such issue is the uncertainty as to whether, there is adequate knowledge and capacity to operate an insurance based health system in an environment where, corruption and lack of transparency and accountability pervade (Health Insurance Report, 2005). Some of these issues were addressed by Ibiwoye and Adeleke (2008), who shown that in spite of these obstacles NHIS can thrive in Nigeria. Perceived low enrolment however, motivates this fresh investigation. The Lagos University, a supposedly enlightened community, is a case in point. Here, the Health Center incessantly calls members of the community to come and register for the NHIS. The response had been persistently low. It then calls to question that if it was so difficult to persuade the staff of the University to enroll for the scheme how much more difficult it would be to get the less enlightened members of the outside community to register. Would employees ever voluntarily heed the call? This study extends the earlier finding by examining the extent to which socio-demographic factors affect the usage of the NHIS in the hope that it will help to repackage and redirect awareness campaign about the scheme to the segment where, it is most required in a more effective manner.

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Literature survey: Health insurance as a means of promoting universal health coverage has attracted considerable interest in the past (WHO, 2004; Ellenbogen *et al.*, 1996; Wagstaff, 2002). Yet, the multi-dimensional nature of health insurance makes more studies on health insurance coverage and access necessary. Some of these dimensions are the belief about its value, perceived health status and such others like cost or availability of health insurance (Brown and Richard, 2000).

Many of the earlier studies have concentrated on developed economies where, the insurance system is well developed. Recently, however, we begin to see papers that address the use of health insurance as an option for financing and facilitating access to health care in developing economies. Notable among the recent researches is that of the Center for Development Research (Jutting, 2001) that examined the feasibility of health insurance scheme in rural areas in a number of developing countries including Senegal and Ghana in West Africa, Ethiopia in East Africa and Tanzania in Southern Africa. Other researches in similar vein include Korte *et al.* (1992), Carrin (2002), Pauly *et al.* (2006) and Janssens *et al.* (2009).

An overview of these researches reveals that 2 factors appear to be driving developing countries toward a health insurance option. One is the need to attract more resources to the health sector and another is their dissatisfaction with the existing services (Abel-Smith, 1992). Examining some of these works further can be illuminating. Pauly *et al.* (2006) provided some evidence of government limitation and failure in a number of developing countries, which is not unconnected to the high proportion of out-of-pocket expenditure by individuals in these countries. In Nigeria, for instance, 67% of Gross Domestic Product (GDP) for medical expenses is met out of out-of-pocket expenses. Pauly *et al.* (2006) argued that such high proportion of out-of-pocket expenditure is sufficient justification to switch to private insurance that can spread the risk of above-average out-of-pocket payments.

In senegal, Jutting (2001, 2003), using combined logit and log-linear models, found that members of the rural populace who participate in the insurance program have a higher probability of using hospitalization services than non-members and pay substantially less when they need care. In Namibia, Janssens *et al.* (2009) reported that through the provision of low-cost private health insurance scheme for low-income workers, enabled an increase in participant and employer payments of the insurance premiums and thereby increased the sustainability of health financing. Another instance

where, health insurance seems to have worked is Mexico where, a simple insurance scheme, targeted at small income earners and known as Seguro Popular, has met with what has been referred to as extraordinary success (Suri, 2006). Yet, another case where, health insurance targeted at a group has recorded some success is Egypt's school health insurance (Yip and Berman, 2001). These examples tend to suggest that when the health insurance is targeted at a group a better outcome often results.

MATERIALS AND METHODS

The main instrument for data collection was a survey conducted between April and June 2007 in 14 of the 20 Local Government Areas of Lagos State (Ibiwoye and Adeleke, 2008). As reported in the earlier study officials of the Lagos State Ministry of Health showed a keen interest in the survey and therefore, gave a considerable executive fiat in ensuring that the civil service supplied reliable data. The researchers were also, able to leverage on the goodwill garnered by one of them as previous life, health and pension consultants in getting the private sector employees to participate actively in the survey. A total of 6000 workers responded. The survey classified the respondents according to Gender (G), Occupation (O), Income (I), Family size (F), Age group (A), Marital status (M). To evaluate how these characteristics affect the usage of the NHIS we constructed six hypotheses, thus:

- The income of an individual does not influence his usage of the NHIS
- The gender of an individual does not influence his usage of the NHIS
- The occupation of an individual does not influence his usage of the NHIS
- The age group of an individual does not influence his usage of the NHIS
- The marital status of an individual does not influence his usage of the NHIS
- The family size of an individual does not influence his usage of the NHIS

These constitute the first set of hypotheses. For this, the chi-square (χ^2) test of independence was employed. The hypotheses were tested at the 5% significance level. The results are displayed in Table 1.

The main focus of this new investigation is to establish whether, two or more factors jointly influence the usage of NHIS. For this purpose, we constructed a second set of hypotheses to determine if associations and/or interactions were taking place among the variables. The motivation derives from earlier works that had

Table 1: Effect of demographic factors on usage of NHIS

Enrolment function	Are you enrolled with NHIS?					
	Yes	Pearson chi-square (χ^2)	Pearson chi-square (χ^2) with Yates' correction	No. of valid cases	The minimum expected value	p-value
Subscription to NHIS as a function of gender						
What is your gender?	-	40.16	39.94	5561	2287.2	0.000
Male	0.72	-	-	-	-	-
Female	0.68	-	-	-	-	-
Subscription to NHIS as a function of occupation						
What is your occupation?	-	1357.6	-	5210	81.9	0.000
Casual labour	0.20	-	-	-	-	-
Civil service	0.77	-	-	-	-	-
Professional	0.62	-	-	-	-	-
Others	0.67	-	-	-	-	-
Subscription to NHIS as a function of income						
What is your annual income?	-	830	-	5097	117	0.000
<240000	0.43	-	-	-	-	-
Between 240000 and 500000	0.74	-	-	-	-	-
Between 500000 and 1000000	0.92	-	-	-	-	-
Between 1000000 and 2400000	0.65	-	-	-	-	-
Subscription to NHIS as a function of age group?						
What is your age group?	-	1978.9	-	5076	490.32	0.000
18-25	0.05	-	-	-	-	-
26-40	0.67	-	-	-	-	-
41-60	0.80	-	-	-	-	-
Subscription to NHIS as a function of family size						
How many children do you have?	-	100.62	-	5296	27.92	0.000
<2	0.72	-	-	-	-	-
3-4	0.77	-	-	-	-	-
5-6	0.82	-	-	-	-	-
>6	0.88	-	-	-	-	-
Subscription to NHIS as a function of marital status						
What is your marital status?	-	1047.6	-	5341	71.644	0.000
Single	0.55	-	-	-	-	-
Divorce	0.33	-	-	-	-	-
Married	0.78	-	-	-	-	-
Widow	0.50	-	-	-	-	-

established that such interaction effects can be examined using log-linear analysis (Dillon and Goldstein, 1984; Knoke and Burke, 1980; Lee and Viele, 2001; Bishop *et al.*, 1975). The disadvantages of collapsing the dimensions of higher order contingency tables and analyzing them two variables at a time as was the practice before the introduction of log linear method were discussed Dillon and Goldstein (1984). Following Theus and Lauer (1999), the general form of the log-linear model for a three-dimensional contingency table assuming a sample of size n distributed over IJK = N cells is as follows:

F_{ijk} for all i = 1, ...I, j = 1, . . ., J, k = 1, . . . , K. The expected value m_{ijk} thus is $n\pi_{ijk}$.

A log-linear model is also differentiated as to whether it is a saturated model or an unsaturated model. For a saturated model every possible interaction is included and is represented as:

$$\log(m_{ijk}) = \mu + \lambda_i^X + \lambda_j^Y + \lambda_k^Z + \lambda_{ij}^{XY} + \lambda_{ik}^{XZ} + \lambda_{jk}^{YZ} + \lambda_{ijk}^{XYZ}$$

For an unsaturated model not all interactions are included. The closest of the unsaturated models to the saturated model is one where, there is no interaction between all three variables although the variables are allowed to interact two at a time, that is where:

$$\log(m_{ijk}) = \mu + \lambda_i^X + \lambda_j^Y + \lambda_k^Z + \lambda_{ij}^{XY} + \lambda_{ik}^{XZ} + \lambda_{jk}^{YZ}$$

Other cases include: mutual independence, in which only λ^X, λ^Y and λ^Z are present; partial independence, where there is additional presence of one λ_{AB}, A, B $\in$ {X, Y, Z}, A≠B) and conditional independence where, all parameters are present except λ^{XYZ} and one λ^{AB}, A, B $\in$ {X, Y, Z}, A≠B).

If the three variables are mutually independent, then $\pi_{ijk} = \pi_{i++}\pi_{+j+}\pi_{++k}$ as well as $m_{ijk} = n\pi_{i++}\pi_{+j+}\pi_{++k}$ where, the index "+" means to sum up to values over this index. Taking logarithm we then have:

$$\log(m_{ijk}) = \log(n) + \log(\pi_{i++}) + \log(\pi_{+j+}) + \log(\pi_{++k})$$

or,

$$\log(m_{ijk}) = \mu + \lambda_i^X + \lambda_j^Y + \lambda_k^Z \text{ with}$$

$$\lambda_i^X = \log(\pi_{i++}) - \sum_v \log(\pi_{v++})/I$$

$$\lambda_j^Y = \log(\pi_{+j+}) - \sum_v \log(\pi_{+v+})/J$$

$$\lambda_i^Z = \log(\pi_{++k}) - \sum_v \log(\pi_{++v})/K \quad (1)$$

$$\mu = \log(n) + \sum_v \log(\pi_{v++})/I + \sum_v \log(\pi_{+v+})/$$

$$J + \sum_v \log(\pi_{++v})/K$$

the parameters $\{\lambda_i^X\}$, $\{\lambda_j^Y\}$ and $\{\lambda_k^Z\}$ satisfy

$$\sum \lambda_i^X = \sum \lambda_j^Y = \sum \lambda_k^Z = 0 \quad (2)$$

Equation 1 is the model of mutual independence for a three-dimensional contingency table. Without the constraint (Eq. 2) it would not be possible to identify the parameters uniquely.

RESULTS

The study classified the respondents according to Gender (G), Occupation (O), Income (I), Family size (F), Age group (A), Marital status (M) and whether or not they have subscribed to NHIS (S). Table 2 shows, all possible models of interest, starting with the S + I on subscription to NHIS and Income and moving up towards S + I + O + G + F + M + A. For each model the Table 2 shows, the likelihood ratio, Pearson chi-square (χ^2) and the degrees of freedom.

In the analysis of the data collected, we take all seven variables as responses and study the extent to which they are associated. Thus, we test the various hypotheses of independence.

The log-linear analysis was used to study the relationship between the included variables of each fitted model. The statistics presented in Table 2 test the null hypothesis that the model adequately fits the data. These statistics, i.e., likelihood Ratio and Pearson chi-square (χ^2) also test the independence of the included variable. If the null hypothesis is true, the Pearson and likelihood ratio statistics have chi-square (χ^2) distribution with the tabulated degrees of freedom.

In Table 2, all the p-values are near zero (all <0.05), for all the fitted models. Thus, there is some relationship between all the variables in each of the model. The likelihood ratio decreases as more and more factors are

Table 2: Likelihood ratios and pearson chi-square (χ^2) statistics for log-linear model fitted to health data

Model	Likelihood ratio	Pearson chi-square (χ^2)	df	p-value
S + I	71835.302	553608.20	5394	0.000
S + I + O	53937.146	436408.16	5390	0.000
S + I + O + G	53924.456	433816.08	5389	0.000
S + I + O + G + F	51699.595	439464.56	5387	0.000
S + I + O + G + F + M	30430.273	167570.77	5384	0.000
S + I + O + G + F + M + A	29801.814	159462.99	5383	0.000

jointly considered. This suggests that the results are more significant as more factors are jointly included. Not unexpectedly, the degree of freedom reduces as more and more factors are taken into consideration. What is even more significant is that the Pearson chi-square (χ^2) reduces as more and more factors are taken into consideration. This indicates that the expected values are far from the observed values and that rather than conclude independence there is some degree of association between the variables in each of the model.

DISCUSSION

The result shows that 72% of the male respondents make use of NHIS while, the corresponding figure for female respondents is 68%. The corresponding percentages of respondents from those sampled are 13, 77 and 62% for casual workers, civil servants and professionals, respectively. The percentage for others is 67%. The relatively high percentage for civil servants is understandable given the fact that, for civil servants, registration for the scheme is mandatory.

There appears to be a considerable high level of usage of NHIS among the professionals and civil servants. This must be a direct result of the fact that they are probably constrained by the employers to comply. The case of the university staff earlier referred to possibly reflects, for this community, the effected of the much touted academic freedom spilling over to choice of health care provider. The group that does not seem to readily comply is the low income. This can be explained by the fact that while, they face essentially all the economic issues confronting the higher income group, they also usually have larger family sizes. The figures for the age grouping shows low enrollment among very young people <25 years. This probably reflects the fact that young people have parents on whom they tend to depend for their health care expenditure. In the case of family size, it would appear that the larger the family size the higher is the propensity to embrace the usage of NHIS. The sixth factor-marital status seem to indicate that divorcees and single parents (widows) generally record a low enrolment

level. For each factor considered, the chi-square (χ^2) test records a p-value that is very close to zero. This suggests that each of the null hypotheses should be rejected. It then means that all six factors to various degrees influence the usage of NHIS.

CONCLUSION

The study has shown that occupation, income and other socio-economic factors affect the use of the NHIS scheme in Nigeria and that these factors are mutually reinforcing. An awareness campaign segmented along the six main factors will therefore, result in better outcome than is presently experienced.

Further, although civil servants and professionals are obligated to use the NHIS scheme it is obvious from the study that subscription among the low income group is still low. This group is therefore, a definite target for an NHIS awareness education. This reinforces Pauly *et al.* (2008) argument that with the brightening prospect for voluntary insurance in developing countries, even low income households might be attracted to take health insurance. Additional efforts need to be expended to win the middle-aged employees to use the NHIS scheme. Once this group embraces the scheme they are not likely to depart from using it as they grow older, that is, provided the scheme continues to be operated efficiently. Special attention needs to be given to the needs of lower income group and casual employees, for instance, arranging for them a flexible method of paying capitation fee. The inertia on the part of employees in migrating to the new scheme results primarily from the fact that there are still many substitutes. Until, there is a political will on the part of the regulator to encourage full participation by bringing all providers under the NHIS scheme the rate of enrolment may continue to be very low. We believe that the Nigerian government can learn from the experience of other developing countries like South Korea and Taiwan (Yang, 2003) where, a strong political will on the part of the government has raised the level of participation in the health insurance scheme substantially. An awareness campaign segmented along our six main factors but with emphasis on low income and middle age employees can help in raising the level of usage of the scheme.

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