The Redistributional Effects of Healthcare Financing in Nigeria

By:
H. Eme Ichoku
Department of Economics
University of Nigeria, Nsukka
hichoku@yahoo.com

Submitted to
Poverty and Economic Policy Research Network (PEP)
For consideration as a Working Paper

Oct, 2005
Abstract

The deregulation of healthcare financing and supply in Nigeria has shifted the healthcare system towards the competitive market ideals. Households’ decision to utilize healthcare is identical with healthcare financing. This financing arrangement has potentials for income redistribution in a society with already high levels of inequalities in resource redistribution. This study attempts to examine the extent this system of healthcare financing leads to catastrophic expenditures by households and the extent of impoverishment arising from healthcare spending. It also uses the Aronson, Johnson, and Lambert (1994) decomposition frame to analyze redistributive effects in terms of vertical and horizontal inequities as well as reranking effect. The study finds that healthcare spending engenders high incidence of catastrophic spending and impoverishment in the population. It also finds that because healthcare spending is pro-rich in redistributive effect with significant vertical and horizontal inequities as well as reranking inherent in the system. The paper suggests policy reforms that separate healthcare utilization from healthcare financing if the poor are to have access to healthcare services.
Introduction

Economic and social development policies in Nigeria since the mid 1980s have been marked by structural shifts from state-dominated to market-driven paradigms. While these shifts are considered necessary for improved economic performance, they have, nevertheless, accentuated the wider elitist motif that is operative in the general Nigerian political economy in which privilege and socioeconomic advantages have joined to create large inequalities between the affluent and powerful few, and the poor and powerless majority. In the provision of social services, this orientation, a carry-over from the colonial times, represents a complete dissonance between constitutional guarantees of rights to basic social services and the dominance of socioeconomic advantages as the most important parameters for access to these same services (Eze 1991; Alubo 1987). The end result is that majority of people is excluded from these services, or they must obtain them at great opportunity costs. This study focuses on the effects of these policy shifts in the health sector. In particular it analyzes how the policy of direct financing of healthcare based on ability to pay (ATP) that characterizes both the public and private supply of healthcare services affects the relative post-payment abilities of households to meet other basic needs such as household consumption needs. The study essentially aims to analyze the redistributive impact of direct healthcare financing by Nigerian households using survey sample data generated in Enugu state in 2004.

In the first place we consider the extent of catastrophic financing and impoverishing effects arising out of direct healthcare financing. In the second place, we consider the redistributive effects in terms of vertical and horizontal equities and reraking effects. The vertical equity effect is defined to be the extent the healthcare system is sensitive to the differences in income of healthcare consumers. Does the health system treat unequals unequally in the sense that people contribute to the healthcare system according to their level of ability to pay? Horizontal equity is simply defined as equal treatment of equals (Musgrave, 1990). That is, do people with equal income contribute equal amounts to the healthcare system? Finally, reranking refers to rank-switching among the various members of the population induced by differences in contributions to the healthcare system. The underlying assumption is that equity in healthcare
financing demands that the rich and healthy should subsidize poor and sick. Contributions to the healthcare financing must be according to ability and utilization must be according to need.

Healthcare Financing in Nigeria

Since the oil burst of the 1980s, there has been drastic decline in the level of budget provision for health services in Nigeria. Budgetary provisions for healthcare services hardly exceeded 3% of total budgetary outlay. Health spending averaged mere 1.9% of total federal government expenditure in the 1980s (Orubuloye and Oni 1996, Ogunbekun 1991). The share of public health spending improved to only 2.55% in 1996, 1.96% in 1997, 2.99% in 1998, 1.95 in 1999 and 2.5% in 2000 (Central Bank of Nigeria 2001). Most of what is budget is used to meet personnel costs (Nwosu 2000). Government healthcare funding is less than 0.2% of GDP (UNDP, 2000) as against the 1% benchmark set by the Commission on Macroeconomics and Health (Sachs et al 2001) and 15% of annual national budget stipulated in the Abuja 2001 Declaration on roll-back malaria program. This amounts to $2 healthcare subsidy per capita whereas healthcare expenditure per capita is $15. In other words, government is responsible for only about 13 percent of the entire healthcare expenditure in the economy. The WHO benchmark for public health spending in Low Income Countries is $34 per capita (WHO, 2002). This implies that households have almost sole responsibility to financing their health costs.

The poor provision and delivery of public health and the attendant user charge for almost every item of treatment in the public health system has encouraged the explosion of private medicine in Nigeria. In states, private provision of health facilities constitutes over 75% of total health facilities in the state (Ichoku 2005, Akwa Ibom State, 1999). Private medicine covers from a drug vendors, pharmacy shops and traditional medicine o maternity homes, numerous health clinics to private tertiary hospitals. Most of these are located in urban areas (Ogunbekun et al, 1999) and provide basically curative services (Alubo 2001). Healthcare is paid for on cash and carry basis. Ogunbekun et al (1999) report that 85% of the respondents in their survey sample reported paying for healthcare directly out-of-pocket. The Federal Ministry of Health (FMoH)
(2003) estimates that over 70% of healthcare payments in Nigeria are made through out-of-pocket.

On account of the high level of competition in the supply of healthcare, their all forms of unethical behavior in the market. In most cases, patients are required to deposit money before treatment is commenced, and it is stopped once the deposit is exhausted (Alubo 2001). Competition in healthcare supplies has also increased the importation and distribution of fake and adulterated drugs which have led to wide-spread incidence of treatment failure, drug poisoning and death (Alubo, 1994)

There is virtual absence third-party intermediaries in healthcare financing. Ogunbekun (1996), estimates that only about 0.03% of the population is covered by private healthcare insurance. Other forms of third-party intervention are hardly in existence. Thus, households have to bear the cost of their sick ones. Healthcare is supplied at competitive market prices. However, in the presence of information asymmetries that characterize the medial markets, these competitive market prices are often higher than would obtain in ordinary commodity markets. Not only are costs of allocative inefficiencies that prevail in the healthcare system passed on to the consumer, she is not also informed of types and qualities of drugs prescribed for her. To make matters worse, there are price cartels in the health system whereby healthcare providers in a given locality or type of practice stipulate the charges for each type of treatment. Members of the union are penalized for charging less (Ogunbekun et al, 1999, Alubo 2001). All these sum to the fact that cost of healthcare in Nigeria is high and impose significant and uneven burdens on households. As Alubo (1987:1) summarizes it, “In practice, …, status, power and privileges determine whether or not one gets Western medical services and of what type in contemporary Nigeria” Only a few rich people can afford adequate health services. Alubo (1987:453) puts it succinctly “… medical services for the generality of the people have remained a second rate priority of post-colonial governments, very much like the situation in colonial days. The care for state employees and other elites continues to take precedence”

Methods and Data
In order to address the different policy concerns raised in this paper, namely the incidence and intensity of catastrophic healthcare financing, the impoverishing effects, and the equity concerns we adopt different analytical techniques. These techniques are developed in the context of the specific issues to be discussed below.

The data for this analysis was generated in 2004. It was part of a greater study aimed at analyzing inequalities in health distribution and the impact of direct healthcare financing on households in Enugu state, Nigeria. The overriding need for high quality data that was representative of the population was the main motivating factor in planning and executing the fieldwork survey. The survey was designed to sample households in the state more intensively that was the case in previous such surveys.

The method adopted was the multistage-sampling design in which the state was first stratified according to urban and rural locations. Within each of these strata, clusters of households were selected using the pre-existing clustering arrangements used by the Federal Office of Statistics (FOS) and the National Population Commission for Censuses. The clusters were used as the Primary Sampling Units (PSUs). There were altogether about 3000 PSUs in the state. A hundred of these were selected at random in proportion to the size of each stratum. The FOS provided the household frame for the sampling. Each PSU was made up of approximately 20 households. Fifteen (15) households were selected at random from each PSU giving a total of 1500 households with about 5814 individuals. During the data screening and massaging, however, three households were dropped from the list for inconsistent information leaving a total of 1497 on the final list.

Great precaution was taken to ensure that the sample was self-weighted to avoid the need for adjustment weights at the analysis stage. This objective was achieved. The questionnaire instrument went through three stages of pre-testing and refinement before the final instrument that was used for the actual survey. The fieldwork was conducted by most experienced hands in the area. A pool of experts in field survey is available in Enugu State. These are frequently
used by international organizations such as UNDP, DFID, European Union, etc. The fieldworkers were selected from the same pool and provided excellent services. Thus, to the best of our knowledge, the sample used for the study is representative of the state population.

While weighting affects both the point estimate of the parameter, the neglect of the stratification and clustering effects of the survey design affect the estimated standard errors and, therefore, affect statistical inference, although the point estimates are not affected. The potential effects of stratification and clustering on estimated standard errors were obviated by using the Stata’s survey design effects commands which account for these effects in the design of the survey. The full details of the data is given in Ichoku (2005).

Patterns of Healthcare Expenditure

Table 1 Distribution of Gross and Health Expenditures by Quintiles

<table>
<thead>
<tr>
<th>Quintile</th>
<th>No. obs</th>
<th>Mean Inc</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Gross exp 300</td>
<td>741.75</td>
<td>233.86</td>
<td>133.87</td>
<td>1137.5</td>
</tr>
<tr>
<td></td>
<td>H.Exp 300</td>
<td>52.89</td>
<td>91.51</td>
<td>0</td>
<td>700.29</td>
</tr>
<tr>
<td>2</td>
<td>Gross exp 299</td>
<td>1547.88</td>
<td>240.73</td>
<td>1138.91</td>
<td>1980.39</td>
</tr>
<tr>
<td></td>
<td>H.exp 299</td>
<td>104.70</td>
<td>215.10</td>
<td>0</td>
<td>1715.17</td>
</tr>
<tr>
<td>3</td>
<td>Gross exp 300</td>
<td>2496.01</td>
<td>323.40</td>
<td>1988.28</td>
<td>3071.96</td>
</tr>
<tr>
<td></td>
<td>H.Exp 300</td>
<td>152.01</td>
<td>320.09</td>
<td>0</td>
<td>1798.42</td>
</tr>
<tr>
<td>4</td>
<td>Gross exp 299</td>
<td>3861.11</td>
<td>483.76</td>
<td>3081.03</td>
<td>4820.00</td>
</tr>
<tr>
<td></td>
<td>H. exp 299</td>
<td>210.24</td>
<td>505.35</td>
<td>0</td>
<td>2811.00</td>
</tr>
<tr>
<td>5</td>
<td>Gross exp 299</td>
<td>9299.82</td>
<td>6432.82</td>
<td>4852.67</td>
<td>60516.10</td>
</tr>
<tr>
<td></td>
<td>H. Exp 299</td>
<td>1065.43</td>
<td>2882.82</td>
<td>0</td>
<td>30371.00</td>
</tr>
</tbody>
</table>

Table 1 shows the distribution of the gross and health expenditures in Enugu state according income quintiles. The mean income in the first quintile is about N741 and the mean healthcare expenditure is N53. In the 5th quintile, the mean gross expenditure is N9300 while mean health expenditure is N1065. The ratio of mean healthcare expenditure of the 5th quintile to the health expenditure of the 1st quintile is 1:20. However, in terms of relative burden (i.e., healthcare expenditure as a percentage of gross expenditure) we find that the higher income quintiles bear greater healthcare financing burden. For example, in the first quintile, healthcare takes only about 7.2% of total expenditure. But in the 5th quintile, healthcare takes about 11.5% of total expenditure.
We argue that there is a lot of suppressed medical need among the poor. This is because even in developed countries with less epidemiological burdens, healthcare expenditure per capita is about 13% of income, although about 90% of this provided by the public (Gerdtham et al 1996). Secondly, the poor patronize the cheapest means of treatment, usually self-medication and street drug vendors, and are unable to afford proper medical treatment (Ichoku and Leibbrandt 2003). Thus, it seems that 11% of total expenditure on of rich on healthcare is a better reflection of healthcare need while 7% is a reflection of unmet healthcare needs of the poor. This would seem to suggest, given the general evidence that health follows the a positive gradient, that under self-financed healthcare system, majority of low income earners would tend to avoid using health facilities on account of cost, or under-spend in healthcare probably because they have to trade-off healthcare expenditures with other basic needs like food, shelter and schooling.

Fig 2 plots the expected and conditional standard deviation of healthcare expenditures. The expected value is obtained simply by plotting the non-parametric function of expenditure. The expected values were generated by running a non-parametric kernel regression of gross expenditure on payment using the distributive analysis software DAD. As can easily be observed, both the conditional and expected standard deviation tell the same story of greater variability among the higher income earners than among the lower income earners.
What effect does healthcare payment have on the distribution of income at the post-payment period? To answer this question a scatter diagram of the gross income is plotted against the post-payment net income to obtain Fig 3. This figure shows that the distribution of post-payment net income on prepayment income is restricted to the lower, right hand triangle. Notice that if there were no payments made, the plot of the net income against prepayment income would be a diagonal line. If every household contributes to the health system in exact proportion to its prepayment income, the diagonal line would shift downward by the exact percentage of the contribution to the gross income, just the same effect as would a lump-sum tax.

Figure 2  Expected vs Conditional Standard Deviation of Healthcare Expenditures
However, none of these is the case here. What is seen in Fig 3 is that while many households that did not contribute to healthcare financing maintained their original positions on the diagonal, many others who made contributions did not. Thus, the scattered residuals represent households who fell below the diagonal implying that their net income is below their prepayment income. Such payments could indeed be catastrophic by taking a large proportion of the household income and diverting it to healthcare and thus leaving such households with very little to spend on other basic needs. This is also a major source of policy concern (Wagstaff and van Doorslaer, 2001). This phenomenon will be considered in greater details in subsequent chapters as the incidence of horizontal equity and reranking effect.

The Incidence and Intensity of Catastrophic Healthcare Financing

To estimate the extent of catastrophic healthcare financing inherent in the population of this study, we use two indicators of catastrophic healthcare financing. These two indicators are: the headcount catastrophic financing indicator, and the severity of catastrophic financing. While the former, like headcount poverty, measures the proportion of the population who financed healthcare ‘catastrophically’ the later, like the severity of poverty indicator, measures the severity or intensity of catastrophic healthcare financing in the population.
We assume that a household has total expenditure (gross of healthcare expenditure) $Y$. We define the catastrophic threshold to be $Z_{cat}$. Where $Z_{cat}$ is $x\%$ of $Y$. Gertler and van der Gaag (1990) suggest that, typically, the price elasticity of demand for healthcare services exceeds unity at prices higher than 5% of nonfood expenditure implying that at this level financing healthcare would become a heavy burden for a typical household. However, many household surveys suggest that the average household spends about 3–5% of its income on healthcare (Russell, 1996).

Following the poverty measurement literature, Wagstaff and van Doorslaer (2001) proposed the following indices of catastrophic healthcare expenditure: (a) **Catastrophic Payment Headcount Index** $H_{cat}$. This is defined as the percentage of individuals in the sample population whose healthcare expenditures as a proportion of their income exceed the threshold $Z_{cat}$. Let $T_i$ be the healthcare payment of the $i^{th}$ household, and $Y$ the total household expenditure, as defined before.

Let

$$
(T_i/y_i) - Z_{cat} = \begin{cases} 
S_i 	ext{ for } (T_i/y_i) > Z_{cat} \\
0 \text{ otherwise }
\end{cases}
$$

(1)

$S_i$ is the excess of healthcare payment-income ratio over the catastrophic threshold when $T_i/y_i > Z_{cat}$. Also let

$$E_i = 1, \quad \text{"} S_i \neq 0. \quad (2)$$

Then, borrowing from the poverty measurement literature, catastrophic headcount ($H_{cat}$) may be defined as:

$$H_{cat} = \frac{1}{N} \sum_{i=1}^{N} E_i = \mu_E$$

(3)

$N$ is the sample size and $\mu_E$ is the proportion of the population whose healthcare payment exceeds the catastrophic threshold or the catastrophic payment headcount index.

The society or the policy-maker may not just be concerned with the proportion of the population whose healthcare payments exceed the catastrophic threshold. Policy may also be concerned about the height by which those who exceed the threshold do in fact exceed it.
Analogous to the severity of poverty index or poverty-gap index, the intensity of catastrophic healthcare payment may be defined as

$$G_{\text{cat}} = \frac{1}{N} \sum S_i = \mu_s$$  \hspace{1cm} (4)

Where $\mu_s$ is the average amount by which those who exceed the catastrophic payment threshold actually exceed it.

It is natural that the policy-maker may not only be interested in the catastrophic headcount and the intensity of the catastrophic payment, she is likely to have an aversion for catastrophic healthcare payment, that is, whether it is more prevalent among the poor or among the rich. There is, therefore, the need to weight $E_i$ according to the income rank of the household. Catastrophic healthcare payment for a poor household is likely to be weighted more than for a rich household. The weighting factor appears to be a normative issue depending, in the main, on the policy-maker’s aversion to catastrophic payment among poorer households.

Following Duclos et al (2003) we define a non-negative weighting variable $w(r)$ such that

$$\int_0^1 w(r) dp = 1$$  \hspace{1cm} (5)

A popular single parameterization of (5) is the S-Gini (Donalson and Weymark 1983, Kakwani, 1980, Duclos et al. 2003). The functional specification of (5) also ensures the Dalton transfer principle such that:

$$w(r_i) \leq w(r_j) \text{ for } r_i \leq r_j$$  \hspace{1cm} (6)

Introducing a rank-dependent, non-negative parameter that ensures ethical weights are given to individuals according to their income level for the subgroup with $E_j = 1$, $w(r_j)$ may be specified as (Duclos et al 2003):

$$w(r, \nu) = \nu (1 - r)^{(\nu - 1)}, \quad \nu > 1$$  \hspace{1cm} (7)

Where: the parameter $\nu$ is an index of pro-poor aversion to catastrophic healthcare payment. The larger the value of $\nu$ the faster the fall in $w$ suggesting the social decision maker’s greater pro-poor concern in healthcare financing.
Given (7), we can then specify an index of weighted headcount catastrophic payment as:

\[ wH_{cat} = \frac{1}{N} \sum \hat{\alpha} E_i w(r, \nu) \]  

(8)

In this case, if those who are poor tend to pay more ‘catastrophically’ for health than the rich, we expect index value of (8) to be higher than (3)

The weighted catastrophic gap index may similarly be expressed as

\[ wG_{cat} = \frac{1}{N} \sum \hat{\alpha} S_i w(r, \nu) \]  

(9)

If the poor have the greater tendency to ‘overshoot’ the catastrophic threshold than the rich, then (9) will register a higher value than (4)

When these weighting factors are applied to the catastrophic headcount and catastrophic gap payments (when the indicator of catastrophe is defined at 5% and 10% levels of income) we obtain values of the \( H_{cat} \) and \( G_{cat} \) shown in Table 2 and Fig 4

Table 2 Incidence and Intensity of Catastrophic Payments

<table>
<thead>
<tr>
<th>Index</th>
<th>Est. Value 5% (%)</th>
<th>Index</th>
<th>Est. Value 5, ( \nu = 2 ) 31.50 (%)</th>
<th>Index</th>
<th>Est. Value 10, ( \nu = 2 ) 22.16 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>( H_{cat} ) 5%</td>
<td>29.15</td>
<td>( H_{cat} ) 5, ( \nu = 3 ) 33.15</td>
<td>( H_{cat} ) 10, ( \nu = 3 ) 22.45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( G_{cat} ) 5%</td>
<td>5.67</td>
<td>( H_{cat} ) 5, ( \nu = 5 ) 34.67</td>
<td>( H_{cat} ) 10, ( \nu = 5 ) 22.12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( H_{cat} ) 10%</td>
<td>21.75</td>
<td>( G_{cat} ) 5, ( \nu = 2 ) 4.68</td>
<td>( G_{cat} ) 10, ( \nu = 2 ) 3.36</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( G_{cat} ) 10%</td>
<td>4.40</td>
<td>( G_{cat} ) 5, ( \nu = 3 ) 4.43</td>
<td>( G_{cat} ) 10, ( \nu = 3 ) 3.06</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>( G_{cat} ) 5, ( \nu = 5 ) 4.07</td>
<td>( G_{cat} ) 10, ( \nu = 5 ) 2.68</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Figure 4 Curves of Hcat and Gcat (Cat.= 10%) for Different values of \( v \)

In general, we observe a high incidence of catastrophic healthcare financing in the population. For example, it is noticed that prior to introducing the policy-maker’s aversion to catastrophic spending among the poor, the incidence of catastrophic headcount is about 29% at the 5% threshold. It is natural to expect that as the catastrophic threshold increases, increasingly less proportion of the people will be found to finance healthcare catastrophically. This is evident from Table 2. It is noticed from column 2 that more people are caught up in catastrophic financing when the threshold is 5% than when it is defined as 10% of gross expenditure. This holds for both catastrophic headcount and catastrophic gap indexes. If the social decision maker’s pro-poor aversion parameter \( (v) \) is raised to 2, this increases the incidence of catastrophic headcount and catastrophic gap marginally to 31.50% and 4.68% respectively. As the value of \( v \) increases to 5 this is accompanied by significant increases in the headcount reduction in the gap indexes. The behavior of the indexes as the threshold is raised to 10% is also shown. There is a general decline in the values of the indexes though it is important to observe that at this threshold, the impact of the \( v \) is less pronounced. In fact, there seems to be a gradual reversal of this impact as we move from the \( v = 2 \) to \( v=5 \) for the headcount index while the decline in the gap index continues over the range.

The important conclusion from the above analysis is that the unweighted concern for catastrophic healthcare financing does not provide the complete picture of the impact of healthcare financing on households’ finances. The level of the social concern for the impact of healthcare financing on the poorer segments of the society is also important. In other words, a
cent from the poor to the health system is not the same as a cent from the rich and, therefore, an equity-oriented healthcare financing system must be sufficiently progressive on prepayment income. This concern arises from social empathy and concern when ill-health which is a random event takes relatively more from the poor than from the rich. This important result forewarns that an analysis of redistributional effects of welfare financing, analogous to equity concerns in taxation, must anticipate different degrees of ethical concerns for social, but particularly, economic inequality. In other words, a consideration of the redistribution impacts of social programs needs an environment of ethical flexibility.

The Impoverishing Effects of healthcare Financing

The fundamental theoretical economics behind the impoverishing effect of healthcare finance is the Grossman-Wagstaff model (Grossman 1972; Wagstaff 1986). The model shows that the cost of healthcare is the amount of other household other basic consumptions that must be foregone in order to purchase healthcare. In other words, the shadow prize of healthcare financing in this case where households are assumed to bear the full cost of their treatment are the other basic needs of the household. It is therefore, hypothesized that financing healthcare could push households just above the poverty line into poverty and those already in it deeper into poverty (Wagstaff and van Doorslaer 2001).

To derive the poverty line, we use the poverty lines constructed by Aigbokhan (2000) for Nigeria, which used the food energy intake method to set the poverty line for the entire country and for specific regions in the country using 1997 data from the Federal Office of Statistics (FOS). For this study, this poverty line has been updated to take into account inflationary rate from 1997 to 2004. This gives a poverty of N2900 for the south-east zone of the country.

In order to estimate the headcount poverty index $P_o$ the poverty line may be denoted by $z$ while our measures of welfare are the pre- and post-payment incomes denoted as $x^b$ and $x^a$ respectively. The headcount index for pre-payment poverty is then specified as:

$$P_o = \frac{1}{N} \sum_{i=1}^{N} I(x_i^b \leq z)$$

(10)
Where \(1(.)\) is an indicator function taking the value of 1 if \(x^b_i \leq \ell\) and 0 otherwise. Equation 10 gives the proportion of people falling below the poverty line. This is what is captured by \(P_o\). A similar index could be constructed for the post-payment headcount index by simply replacing \(x^b_i\) with \(x^a_i\).

The poverty gap index is specified as:

\[
P_i = \frac{1}{N} \sum_{i=1}^{N} \left( \frac{x^b_i}{\ell} - \frac{x^b_i}{\ell} 1(x^b_i \leq \ell) \right)
\]

(11)

Finally, the poverty gap square index which derives from Foster, Greer, and Thorbecke (1984) (FGT index) generalization of poverty gap in (11) is specified as

\[
P_a = \frac{1}{N} \sum_{i=1}^{N} \left( \frac{x^b_i}{\ell} - \frac{x^b_i}{\ell} 1(x^b_i \leq \ell) \right)^2
\]

(12)

Where, for the poverty gap square index, \(a = 2\). The index specified in (12) is sensitive to poverty deficits for \(a \neq 1\). The higher the value of \(a\) the more sensitive is \(P_a\).

To reveal the level of poverty induced by direct healthcare financing in Nigeria (as exemplified in Enugu state) using each of these measures, we simply estimate each of the poverty indices in terms of before and after the healthcare payment. We assume that the difference represents the level of poverty induced by healthcare payment. To see also the sensitivity of the impoverishing effect to household composition and economies of scale, each of the indices is applied also to three assumptions about income utility by converting income into welfare using the model:

\[
W_i = Y_i \sqrt[n_a + r n_c]{n_a + r n_c}^r
\]

(13)

Where \(W_i\) of the representative individual in the \(i\)th household, \(Y_i\) = gross; \(n_a\) = number of adults in the household; expenditure of the household; \(n_c\) = number of children. The parameter \(r\) represents, the adult equivalent of a child’s consumption. The parameter \(e\) represents the household economy of scale. For this study, when \(r = 1\) (and \(e = 1\)) intra-household resource allocation is on per capita basis and no economies of scale is assumed to obtain. For \(r = 0.5\), each child below age 16 is assumed to consume half.
the equivalent of adult; and for \( e=0.7 \) and 0.3 respectively, it is assumed that consumption elasticities are 0.7 and 0.3 respectively.

Results

Table 3 summarizes the findings from this estimation exercise. The table shows that the proportion of the people that lived in poverty before healthcare payment is about 57% of the population. Looking at Table 3, we find that under the assumption of no inequalities in household resource distribution, healthcare financing induced further increases in headcount index by about 7%. For all the three indices, headcount, poverty gap, and poverty gap squared indices, healthcare financing worsens the rate of poverty, irrespective of the welfare measure used. The index is worsened still if we assume there are intra-household differences is allocation of resources with children getting half the size of adult equivalences and if we also assume there are economies of scale in household consumption.

Proceeding to \( P_1 \) and \( P_2 \) indices it is noticed again that healthcare financing contributes significantly to poverty in Nigeria under the three scale assumptions.

Table 3. Impoverishing Effects of Healthcare Financing

<table>
<thead>
<tr>
<th></th>
<th>Pre</th>
<th>Post</th>
<th>Diff</th>
<th>% Diff</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poverty Head-Count Index</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Per Capita</td>
<td>0.5725</td>
<td>0.6139</td>
<td>-0.0414</td>
<td>-7.23</td>
</tr>
<tr>
<td>Eqvs 1-0.5 e=0.7</td>
<td>34.87</td>
<td>39.55</td>
<td>-4.68</td>
<td>-13.42</td>
</tr>
<tr>
<td>Eqvs 1-0.5 e=0.3</td>
<td>20.11</td>
<td>23.71</td>
<td>-3.6</td>
<td>-17.90</td>
</tr>
<tr>
<td>Poverty Gap Index</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Per Capita</td>
<td>0.27107</td>
<td>0.299935</td>
<td>-0.02887</td>
<td>-10.65</td>
</tr>
<tr>
<td>Eqvs 1-0.5 e=0.7</td>
<td>0.135468</td>
<td>0.159544</td>
<td>-0.02408</td>
<td>-17.77</td>
</tr>
<tr>
<td>Eqvs 1-0.5 e=0.3</td>
<td>0.0637</td>
<td>0.080208</td>
<td>-0.01651</td>
<td>-25.92</td>
</tr>
<tr>
<td>Square Poverty Index</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Per Capita</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eqvs 1-0.5 e=0.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eqvs 1-0.5 e=0.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
It could be seen that even under the moderate scale elasticity of 0.7, healthcare financing worsens the poverty gap index by as much as 18% while square poverty gap index is worsened by as much as 14% even under assumption of per capita income distribution in households. The obvious conclusion from these figures is that healthcare financing is a major source of impoverishment among the Nigerian population. Together with information on the incidence of catastrophic financing, it is clear that the healthcare market and healthcare financing arrangement needs urgent policy reform as part of the poverty reduction strategy of the country.

The AJL Decomposition Framework

The central point in the Aronson, Johnson and Lambert (1994) decomposition framework is the realization that the tax function may be specified as a function of income level \( x \) and a random term such that:

\[
T = T(x) + e(x).
\]  

(14)

Note that while \( T \) depends on the level of income \( x \), the error term should have a zero mean at each income level if all in the same income group are treated equally by the fiscal system. However, due to heterogeneity within classes of prepayment equals, it turns out to be a measure of the deviation of the tax liability of an individual from the average tax liability. If \( e(x) \) then it implies the presence of horizontal inequity which violates the maxim that requires that persons with equal income be taxed equally. And in the case of healthcare financing, that individuals or households with equal ability to pay should contribute equally to the healthcare system.
Above all, it may also happen that pretax subgroups may overlap at the post payment period due essentially to tax liability causing some people to slip below their prepayment income inferiors, and some to rise above their prepayment income superiors in the ranking after tax. This is the key to the Aronson-Johnson-Lambert (AJL) framework for decomposing the Gini coefficient as shown in Fig 1. The post tax incomes of households in a given prepayment income band are grouped around the mean given as $x_i - T(x_i)$ which is indicated by a horizontal line from the function $x - T(x)$ to the vertical axis. According to the Aronson, Johnson and Lambert (1994), the appearance of the fans in the post-payment distribution shows unequal treatment of prepayment equals. The fans are induced by the fiscal system. The vertical redistributive effect arises from the fact that tax liability $T(x)$ is an increasing function of $x$ such that: $0 \leq T'(x) \leq 1$. A marginal tax rate that is greater than unity would obviously lead to reranking since it would imply that at the top of the income distribution marginal tax exceeds marginal income.

Under these assumptions, Aronson et al (1994) show that total redistributive effect could be decomposed as:

$$RE = \frac{a}{g} \frac{g}{K} - \frac{a}{5} \frac{G}{G} - \frac{G}{E} \left[ \frac{G}{r} \right]$$

(15)
That is, redistributive effect (RE) is determined by vertical equity $V$, and classical horizontal equity $H$, and reranking effect $R$. But vertical equity is in turn composed of two separate effects – average tax level ($g$), and Kakwani index of progressivity $K$.

The first term on the right of equation (15) estimates the level of inequality reduction that would have obtained had everyone within a given income bracket made equal contribution to the healthcare financing system. That is, the counterfactual reduction in inequality under equal payment. This counterfactual reduction in income inequality is composed of progressivity of payment $K$ (Kakwani 1977) and the average level of taxation $g$. The Kakwani index is obtained as the concentration index (CI) of healthcare payment using the average payment made by individuals in a pre-payment income class rather than each individual’s actual payment and then plotting it against the fractional ranks of individuals in the prepayment income.

The second term in (15) is an index of classical horizontal inequity. Where $f(x)$ denotes class of equals at point $x$ in the distribution of the prepayment income. If it is assumed that income equals at point $x$ at the prepayment income were really equal, then unless they make equal payments to the tax or health system, they would experience horizontal inequity within the ‘band’ at the post-payment distribution. This within-class inequity at the post-payment income distribution is local horizontal inequity ($HI$). Aggregating these local $HI$ for all the groups will give rise to global $HI$.

The reranking index $R$ is measured as the difference between the post-payment Gini and post-payment concentration indices. Reranking occurs because illness is a random phenomenon. Where $R$ takes the value of zero, then we know that no re-ranking actually took place in the transition from pre-payment to post payment periods.

**AJL Decomposition Results**

Table 4 Results from AJL Decomposition Based on Per Capita Income

|------------|---------------|---------------|---------------|--------------|
The parameter $g$ is analogous to the average tax and indicates the proportion of households’ income that finances healthcare services. Here $g = 0.9$, indicating that an average household in the population spends about 9% of its income on healthcare services. This, again, is a very high proportion when compared with similar estimates (Wagstaff and Van Doorslaer, 2001) of 5.7% and 5.9% taken up by out-of-pocket payment in Vietnam in 1993 and 1998 respectively. Gerdtham and Sundberg (1996) using the Swedish data for 1980 and 1990 found the value of $g$ to be 12% and 14% respectively. However, the parts of these sums borne directly by the individual household were only 0.26% and 0.19% respectively. Thus, the issue is not that the value of $g$ per se is very high. Indeed it is small in relative terms but the issue is that this proportion is coming through direct financing. The obvious implication is that, in the absence of significant and effective government intervention in healthcare financing the average Nigerian household bears almost entirely the full cost of its health needs.

The estimated value of the parameter $K$ ranges between 0.128 to 0.1419 for the 10 decile and 1 percentile income bands respectively. This is may be considered relatively low considering that the value of $K$ lies within the [-2, 1] range. The result is that the value of $V$ which varies with income bands between 0.0124 and 0.0139 is only moderate under the AJL assumptions. This suggests that healthcare in Nigeria, under the present financing arrangement, does not contribute effectively to income redistribution given the proportion of household income it
absorbs. This reinforces our earlier observation that households seem to purchase healthcare in proportion to their income not necessarily in proportion to their need and this calls for a major policy response.

The estimated values of H vary from 0.0009 (for the 1 percentile band) to 0.0149 (for the 10 percentile band). That the values of H are greater than zero imply that the financing system would have been more redistributive without horizontal inequity.

If the variations within the net income of each prepayment income band are high, we expect H to be high. This means that as the size definition of the income band increases the value of H also increases. This is reflected in the estimated results where the wider income bands have high estimated values of H. But as the size of the income band approaches zero the value of H also approaches zero (see for example to value of H at income band of 1 percentile)

The final component of the AJL decomposition is reranking $R$ which measures the extent of overlapping of flaps between income bands. Conceptually, horizontal inequity and re-ranking, though distinct, are very closely related and in practice are inversely related as shown by the estimated results in Table 4. There, it is easily seen that as the size of the pre-payment income band broadens, H increases while R decreases and vice versa indicating a trade off between H and R. As the band width approaches zero, the value of H approaches zero as all horizontal inequity now turn into reranking effect. All these point to the fact that the estimates of V, H, and R are sensitive to the definition of income band.

Conclusion

This study has shown that when the decision to utilize healthcare is co-terminus with the decision to finance healthcare, the healthcare financing system is likely to lead to high incidence of catastrophic healthcare financing, impoverishment, reranking and inequities, both vertical and horizontal. The incidence of catastrophic financing is likely to be higher if the policy maker is averse to inequality in catastrophic financing. Hence policy response is likely to depend on the extent the social decision maker is sensitive to the welfare of the poor. The large incidence of impoverishment arising from direct healthcare financing also calls attention
to the urgent need to reform health financing in Nigeria. There is need to separate healthcare utilization from healthcare financing if majority of the people are to utilize healthcare services. Finally, the fact that healthcare financing is not redistributive in Nigeria confirms that healthcare is financed in proportion to households’ ability to pay, implying that households that cannot afford to pay are denied healthcare services.

References


Duclos, J. Y., Jalbert, V. and Araar, A. (2003), 'Classical horizontal inequity and reranking: an integrating approach' *CIRPEE Working paper 03-06*, University of Laval, Canada


