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# THE DISTRIBUTIONAL IMPACT OF OUT-OF-POCKET HEALTH PAYMENT IN NIGERIA

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*Cross-subsidization in healthcare financing is an important aspect of financial protection for the most vulnerable members of the population. However, when the dominant method of financing healthcare is direct out-of-pocket payment (oop), the health system creates a potential for income redistribution. This study analyzes the redistributive impact of direct out-of-pocket healthcare payments in Nigeria using primary survey data. The country's healthcare market approximates the competitive market model with numerous small supplies and buyers. The redistributive effects are estimated using a decomposition framework introduced by Aronson, Johnson and Lambert (1994), (AJL) which provides several components of the redistributive effect. The study confirms the regressive characteristics of out-of-pocket healthcare financing and reveals serious vertical and horizontal inequities, as well as reranking effects. Out-of-pocket payments have an impact on the relative socio-economic positions of household. At the same time the study also points out the weaknesses of the AJL decomposition framework.*

***Keywords:*** Nigeria, healthcare financing and out-of-pocket payment, redistributive effects, AJL decomposition framework, vertical and horizontal inequities, reranking effects.

***JEL Classification:*** *C52, H23, I11, I18, I31.*

## Introduction

A notable development in modern health system is the pooling of financial resources and sharing of risks that requires the rich, the healthy, and employed to subsidize the poor, the sick, and the unemployed. The idea of cross-subsidization among the different segments of the population is a fundamental aspect of financial protection in the health sector (Preker, 2005). Pooling of resources and cross-subsidization can also lead to significant gains in pro-poor redistribution of resources (Smith and Witter 2005; World Health Organization, 2000b). Unfortunately, in many low income countries (LIC) about 66% of total health expenditure comes from private health expenditure (World Bank 2000). Direct out-of-pocket payment and spot market purchase of health services remains the prevailing method of healthcare financing in both public and private healthcare sectors in many of these countries. This method of healthcare financing would seem to lead to worsening the pre-existing distributional outcomes (Wagstaff and van Doorslaer, 2001; Preker *et al.* 2004). Markets do not generally perform well in meeting the distributional objectives (Killick, 1981). Furthermore, in many of these

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LICs, the deregulation of the health sector, in the spirit of general market reform process, has increasingly shifted the burden of healthcare financing to the households in order to free public resources for other essential sectors of the economy. Consequently, the demand for and supply of health services is increasingly determined by the market forces (Rice *et al.*, 2000). In the absence significant subsidies, direct out-of-pocket purchase of health services has potential to worsen the existing large inequalities in resource distribution that characterize many developing countries (Stigliz 2000).

In Nigeria the three tiers of government–the Federal, state and local governments have constitutional responsibilities for the financing of publicly provided tertiary, secondary and primary health services respectively. However, private for-profit health providers dominate the curate health system. Aggregate contribution to the health system from the public fiscal system accounts for less than 25% of total health expenditure in the economy. Although other methods of healthcare financing, such as social health insurance and private health insurance, are gradually being introduced to complement existing methods, the Nigerian health system (both public and private for-profit) currently operates almost exclusively on out-of-pocket payments (oops) (Onwujekwe, 2004, Gureje, 2004) which requires consumers of health services whether rich or poor to pay for such services at the point of delivery. The National Health Insurance Scheme designed as a grand scheme for universal coverage of the population through resource pooling and risk sharing took off in 2005 after decades of controversy and skepticism. After a year of operation it has covered about 600000 federal civil servants and their families out of a national population of over 130 million. Ogunbekun (1996) estimates that private health insurance contributes only about 0.3% to total healthcare expenditure in Nigeria, and this has not changed significantly. The contribution of private expenditure on health to total national health expenditure is estimated to be about 77% (Gureje 2004). According the Federal Ministry of Health (FMoH), more than 70% of total healthcare expenditure in Nigeria is financed through oops. (FMoH, 2003). Health utilization in both public and private health facilities depends on ability of households to pay for health services. Health financing is insensitive to the socioeconomic status of healthcare seekers. Yet over, 50% of the population is poor and there is extreme inequality in the distribution of resources. Many families spend a large proportion of their income on health care, which also occurs frequently as malaria, and other infectious diseases are endemic.

The cumulative result of the weaknesses of health financing in Nigeria is poor population health. Life expectancy at birth is estimated to be less than 50 years. Child mortality is 201 per 1000. [Nigeria Demographic and Health Survey (NDHS), 2003]. The main causes of child mortality are malaria (30%) and diarrhoea (20%). The incidence of stunting, a measure of chronic malnutrition among children, is very high. In general, about 45% of Nigerian children are reported to be malnourished while 25% are severely malnourished (NDHS, 2003). Maternal mortality rate (MMR) is estimated to be 800/100,000 live births. Less than 40% of the population has access to sanitation. Only 51% has access to clean water and only 13.8% has access to safe sanitation (National Bureau of Statistics - NBS, 2006)[1].

The main objective of this study is to analyze the redistributive impact of oops in Nigeria in terms of its progressivity/regressivity, vertical and horizontal equity as well as the reranking effects. The study assumes that in the near absence of other methods of financing healthcare and minimal health subsidies by the government, the household is constrained to a trade-off between healthcare needs and other goods (Grossman 1972, Wagstaff 1986). This implies that direct out-of-pocket payments are likely to impact on the ability of households to provide themselves other basic needs (Wagstaff and van Doorslaer 2001). It is this impact of oops on the distribution of post-payment resources (proxied by total expenditure net of health payment) that is of policy concern here. As Arrow (1963:959) notes, medical expenditure, like taxes, acts as random deductions from the household income and it is the net income at the post deduction that is of interest. It seems, therefore, reasonable to use the same tools of economic analysis applied in the tax literature in the analysis of the effects of healthcare financing on income distribution. We use the decomposition framework first developed in Aronson, Johnson and Lambert (1994), which–unlike other decomposition frameworks -provides all relevant components.

**Vertical and Horizontal Equity, and Reranking**

A primary goal of most health systems is the pursuit of equity in healthcare financing. It is argued that this concern involves the wish to abandon a strict willingness to pay that characterizes the competitive market since such willingness to pay indirectly reflects the existing distribution of income and wealth. Society may judge that in a specific case, like healthcare, the ability to pay may be impaired for some individuals for various reasons, thus requiring that the distribution of healthcare is not based on ATP (McGuire *et al.* 1988). This is a case of specific egalitarianism.

Current literature on healthcare financing often distinguishes three aspects of equity: vertical and horizontal equity, and reranking. Vertical equity is simply defined as unequal treatment of unequals (Mooney 1983), or as Musgrave (1990) puts it, vertical equity is about "appropriate differentiation among unequals" Though intuitively appealing, especially in the context of healthcare financing, this definition is difficult to operationalize (Wagstaff et al. 1989). In healthcare finance literature, this is often operationalized to imply progressive financing of healthcare based on ability to pay (Donalson and Gerard, 1993). It is concerned with the problem of how individuals or households with unequal ability to pay (ATP)[1] are to contribute to the healthcare system to ensure that financial barriers to access of health services are eliminated. This entails that the health system needs to be progressive in the sense that the income elasticity of health payment should be positive.

While vertical equity has generally been accepted without much of controversy, the case is different with respect to horizontal equity and reranking. Horizontal equity refers to the equal treatment of equals (Mooney 1983). It is concerned with the fair treatment of people who are alike in every respect. A number of suggestions have been made in order to give empirical contents to the terms "equal' and 'unequals' as used in reference to horizontal equity. Mooney (1983) and Donaldson and Gerard (1993)

for instance proposed the following empirical contents: equality of expenditure per capita, equality of utilization for equal need, equality of opportunity of access for equal need. Mooney adds other criteria that include: equality of inputs for equality of inputs of resources, equality of input for equal need, equality of marginal met need and equality of health. These empirical contents point to the desire for people with equal ability to be treated equally in healthcare financing irrespective of their attributive characteristics.

While the notion of horizontal equity appears simple, it has generated some controversy. The argument has centered on whether horizontal equity could be considered to be an independent evaluative principle different from that of vertical equity. While Kaplow (1989, 2001) following Pigou (1947) and Musgrave and Musgrave (1976) argues that horizontal equity does not differ in content from vertical equity, and in fact conflicts with the core of welfare economics, the Pareto principle, many economists seem quite satisfied that horizontal equity has independent content from that of vertical equity [see for example, Atkinson and Stiglitz (1980); Auerbach and Hassett, (2001); Duclos *et al.* (2003); Duclos and Lambert, (2000); Ramos and Lambert, (2003); Lambert and Ramos, (1997b)]. A major plank of the pro-horizontal equity argument rests on the theory of relative deprivation (Runciman, 1966). Individuals often tend to compare themselves with those with similar characteristics so that unequal treatment of equals is more costly to the social fabric than unequal treatment of unequals.

The appearance of reranking in the post-payment distribution and whether it should be regarded as a separate index of horizontal or vertical equity or whether it is only an extension of the later has generated considerable debate in literature and is deeply rooted in theories of justice. Under the assumption that individuals have identical utility functions, Feldstein (1976) lists non-reranking as one of the important properties of equitable tax. He argues that the tax system must preserve the pre-tax utility rankings of individuals. The underlying ethical assumption here is the libertarian argument that the pre-payment income distribution generated by the market is fair and the policy-maker should not use the tax or healthcare payment system to redistribute income. However, Lerman and Yitzhaki (1995) argue that post-payment distribution is a better reflection of the distribution desired by the policy-maker and should therefore be seen as the benchmark for measuring the extent of reranking implied by the payment system. For Atkinson (1979) and Plotnick (1981) rank reversals indicate the extent of horizontal inequity in the transition from pre-to post-payment distribution.

Reranking refers to the possibility that oops may induce rank changes among individuals in the transition from the pre- to the post-payment income distribution. Like Felstein, Plotnick, (1981) considered reranking as part of the classical horizontal inequity. However, subsequent literature, in line with Atkinson-Plotnick framework, distinguishes reranking from classical horizontal equity (Duclos 2003, Aronson et al., 1994, Lambert and Aronson 1993; Auerbach and Hassett 1999, 2001; Wagstaff et al. 1999). In this latter genre, reranking is considered as arising from unequal treatment of unequals rather than unequal treatment of equals.

In the absence of risk pooling mechanisms such as social or private health insurance or substantial healthcare subsidies by the government, there are several reasons to expect reranking of households resulting from unequal contributions of households to the healthcare system. For one thing, illness is a random shock to the household. Although categories of households may have unequal exposure to health risks, in general, ill-health is not evenly distributed across individual households. Consequently, the financial costs of the random distribution of ill-health may also be random when its financing is borne by individual households. For another, even if illness is equally distributed, individual household preferences differ with respect to means of restoration to good health. Thus, it is possible that if household A was above household B by having higher income at the prepayment income distribution, B may be above A at the post-payment distribution on account of the differences in their financial contribution to the health system. A household may move up and another moves down the income ladder at the post-payment period.

All these three forms of redistributive effects are captured in the Aronson, Johnson and Lambert (1994) decomposition framework. In addition, it also emphasizes the contribution of the *proportion of income* taken up by healthcare payment in overall redistributive effect. In general, the larger the proportion of total income absorbed by healthcare payments, the larger would be the impact of healthcare payment on post-payment income distribution (van Doorslaer *et al.*, 1999; Wagstaff, 2001). It is important to note however, that this result would only obtain if the higher average proportion of income absorbed by out-of pocket healthcare payment is accompanied by greater variability in health payments. This point is clearly suggested by Podder (1993) who notes, in the case of income inequality, that the addition of a constant across all incomes decreases inequality. In other words, the less variability in health care payment across individuals, the less impact we expect the proportion of income taken by healthcare payments to have on prepayment income inequality.

**The Aronson, Johnson and Lambert (AJL, 1994) Decomposition Framework**

This framework advances the previous attempts to decompose the total redistributive effects into its various components[2]. Under the AJL framework, the health care payment function, following the same formulation as the tax function for which the model was first developed, may be specified simply as:

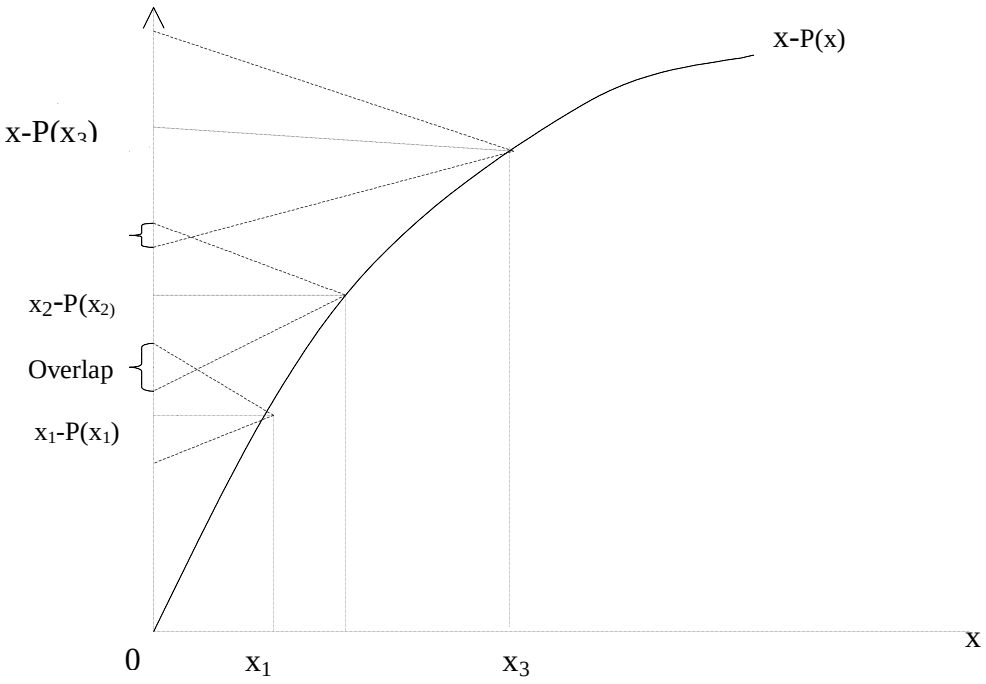
$$P = P(x_i) + \varepsilon(x_i). \quad (1)$$

Where: $x_i$ is the *i* th income group or income band, and ε is random error.

The random term should have an expected value of zero at each income level of prepayment equals. However, due to heterogeneity within classes of prepayment equals, it turns out to be a measure of the deviation of the health payment liability of an individual from the average payment liability. If $\varepsilon(x_i) \neq 0$ then it implies the presence of randomness in the financing system which introduces horizontal inequity among prepayment equals. In other words, when within a class of prepayment income

equals individuals make unequal financial contributions towards the financing of the healthcare system, then, this may lead to the violation of the maxim that requires that persons with equal income should make equal financial sacrifice towards the healthcare system. Those individuals or households with equal income should contribute equally to the healthcare system irrespective of their health status. Above all, it may also happen that distinct pre-payment subgroups may overlap at the post payment period giving rise to reranking of individual. This is the key to the Aronson-Johnson-Lambert (AJL) framework for decomposing the Gini coefficient.

**Fig 1: Horizontal Equity and Reranking: Source: Aronson *et al.* (1994)**




As figure 1 shows, if everyone in the same prepayment income group were to pay equal amount towards the sustenance of the healthcare system, then we would have only the horizontal solid lines depicting average payments [$x_i$–$P(x_i)$] in the groups. But this is not the case. The development of fans indicated by the dotted lines, around the average payments, for individuals in the same prepayment income bracket shows the presence of horizontal inequity induced by the payment system among prepayment income equals. The over-lapping of the dotted 'wings' indicates the presence of reranking effects arising from oops. The figure illustrates the case of three income groups or income bands. According to Aronson *et al.* (1994), the appearance of the fans in the post-payment distribution shows unequal treatment of prepayment equals. The fans are induced by the payment system.

The vertical redistributive effect arises from the fact that healthcare payment liability $P(x)$ is an increasing function of $x$ such that: $0 \leq P^{'}(x) \leq 1$. A marginal health payment rate that is greater than unity would obviously lead to reranking since it would imply that at the top of the income distribution marginal payments exceeds marginal income.

Under the foregoing assumptions Aronson et al (1994) established that

$$RE = V - H - R \tag{2}$$

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

However, in the presence of classical horizontal inequity and reranking effect, the redistributive effect may be more fully expressed as (Aronson et al. 1994):

$$RE = \left(\frac{g}{1-g}\right)K - \sum a_x G_{F(x)} \text{ - } (G_{X-P} - C_{X-P}) \tag{3}$$

The first term on the right of equation (3) estimates the counterfactual level of inequality reduction that would have obtained had everyone within a given income bracket made equal contribution to the healthcare financing system. This counterfactual reduction in inequality may be expressed as a proportion of overall redistributive effect (following van Doorslaer *et al.* 1999):

$$\begin{aligned} \frac{RE}{RE} &= \frac{V}{RE} - \frac{(H+R)}{RE} \\ \Rightarrow V^{100} &= 1 + \frac{(H+R)}{RE} \end{aligned} \tag{4}$$

The expression $V^{100} = 1 + \frac{(H + R)}{RE}$ clarifies that $\frac{(H + R)}{RE}$ is the percentage by which the payment system would have been more redistributive if everyone at a given prepayment income bracket had made equal contribution to the healthcare system. That is the payment system would have been more redistributive by a percentage of $\frac{(H+R)}{RE}$ if everyone within an income band paid the same amount. This counterfactual reduction in income inequality is composed of progressivity of payment $K$ (Kakwani 1977) and the average level of payment $g$. The Kakwani index is obtained as the concentration index (C) 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 (3) is an index of classical horizontal inequity:

$$H = \sum a_x G_{f(x)} \tag{5}$$

Where $f(x)$ denotes class of equals at pointin 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 health system, they would experience horizontal inequity within the 'band' at the post-payment distribution. If on the other hand, they make unequal payment because their experience of ill-health, and consequently cost of ill-health, are different, then there is likely to arise post-payment inequity within the class of prepayment of equals. This *within*-class inequity at the post-payment income distribution is local H. Aggregating local H for all the groups will give rise to global H.

In the model $a_x$ is the product of the population share of $i$ th prepayment income band and the post-payment income share of the band. Thus, in this model, global $H$ is the summation of $G_{f(x)}$ weighted by $a_x$, at every level of.

The last term in equation (4) measures the extent of reranking consequent upon payment:

$$R = G_a - C_a \tag{6}$$

Where: $G_a$ is the Gini coefficient of the net income distribution. $C_a$ is the concentration index of the net income where the ranking variable is the prepayment income. Reranking occurs because illness is a random phenomenon. The extent of re-ranking is shown by the difference between the Gini index for post-payment income and the concentration index for post-payment income. 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.

To compute $K$, and therefore, of $V$ under the AJL framework, it is important to determine the question: who are 'income equals'? This is identification problem and it is obviously a critical issue since the estimated local and global H will be, among others, a function of the definition of 'income equals'. At the same time it is easy to see that a discrete distribution with little gaps between income equal groups could easily lead to a situation where a little change in the income of an individual leads to a transition from membership in one group to another. In other words, the values of $V$ which depend directly on $K$, and $H$ and $R$ which depend indirectly on $K$ are not likely to be invariant to alternative definitions of income group. This sensitivity of the values of $V$, $H$ and $R$ will be shown in the results using different definitions of income bands or 'income equals'.

It is clear from the AJL decomposition method that the total contribution of healthcare payment system to income inequality can be decomposed into four main components: (i) vertical equity component represented by the degree of progressivity of the healthcare financing system. If payments are progressive on prepayment income then we conclude that the healthcare payment system exerts equalizing effect on post-

payment income given the average payment. That is, there is greater parity in households' ability to purchase other basic needs at the post-payment period. (ii) The percentage of total income that is used to finance healthcare. This is represented by. Following Podder (1993) a uniform rise in proportion of income devoted to healthcare payment raises the degree of vertical equity and a fall in proportion of income devoted to healthcare similarly decreases inequality. (iii) When households are grouped according to their income categories, the horizontal inequity (i.e. within category inequity) arising from the health financing system is estimated by the level of inequality in the post-payment income.

This within-category inequity in post-payment income is estimated by the weighted within-group Gini coefficients. The population-weighted sum of the within-group Gini coefficients gives the level of horizontal inequality in the post-payment distribution. Thus, the has a positive sign (since within-group Gini coefficient at the post-payment period cannot be less than zero, some groups may have positive Gini in the post-payment distribution so that necessarily reduces the redistributive effect. (iv) the tendency of households to be reranked in the post-payment distribution is captured by the reranking effect (R). This occurs when a household in a superior position in the prepayment income distribution is forced to an inferior position in the net income distribution on account of disproportionate contribution to the health system through OOP. All the four components are deducible from the overall redistributive effect using the AJL decomposition framework.

**The Data**

The sample data set used for this study was a primary data set generated through a household survey designed specifically to meet the analytical needs of the study. The need to provide health financing policymakers with information based on empirical evidence was the driving force for the data collection exercise. On account of the magnitude of resource requirements and other difficulties associated with generating a nationally representative sample this study was based in Enugu state, one of the 36 six states of Nigeria but with a significant population of about 3 million people. Geographically, Enugu State is located south-east of Nigeria.

The decision to limit the survey to Enugu state was also strategic. In the first place, many of the major health financing policy decisions in Nigeria are made at the state and household levels. In particular, Primary and Secondary health facilities are regulated at the state levels. Secondly, familiarity and prior information about the state was also important since such prior information is usually important in designing the field survey (Deaton, 1997). Thirdly, it helped us to sample the state more intensely than were usually the case with national surveys. Finally, Enugu state mirrors the developmental problems of other states of Nigeria particularly in the area of health financing. Thus, the results of this study could be confidently generalized to other states of the country.

To generate the data for this study, a household survey was undertaken between April and June 2004 in Enugu state. The method adopted was the multistage-sampling

design in which the state was first stratified according to urban and rural locations[3]. Within each of these strata, households were divided up into small enumeration areas (EAs). There were about 2000 such units in both rural and urban strata. Each EA comprised roughly 20 households. These EAs were used as the Primary Sampling Units (PSU) and reflected the clustering arrangement of households in the survey population. A major guiding principle in the selection of EAs and households was probability proportional to size (p. p. s). This principle was strictly adhered to not only because it ensures that the sample data set was representative of the population but also obviates the need for post-sampling weighting. In other words, it ensures that the sample is self-weighted. For the actual sampling, a hundred of the EAs were selected at random in proportion to the size of each stratum; with each EA having an equal chance of being included in the sample.

The size of the sample was determined using information from previous national and state surveys (Nigerian Demographic Survey 2000; Budget and Economic Planning Directorate Enugu State, 2002) which showed that the average household size was five (5). Thus, given the state population of about 3 million (about 600,000 households), a sample of 1500 households was selected. This is well within the precision level of even ±3% (see Israel, 1992). Fifteen (15) households were selected at random from each of the hundred (100) EAs, covering a total of 5814 individuals. Twenty EAs were urban while the rest were rural. However, during the data cleaning, three households were dropped from the list for inconsistent information leaving a total of 1497 on the final list.

The survey instrument was the questionnaire and the survey manual. A free consent form was also used, though in actual fact no household objected to being interviewed. The structure and contents of the questionnaire were critically reviewed by experts in field survey, including those from African Economic Research Consortium (AERC) based in Nairobi. The survey covered the following information on the household and household members: demographics, education, household expenditures, health, gender, employment etc.

Fifteen field enumerators and two supervisors participated in the actual survey. These were experienced field enumerators that had participated in several other surveys conducted in Enugu state by many international organizations including the World Bank, UNDP and DFID. They were nevertheless trained for two days. The training revolved around familiarization with the survey instruments, roles of enumerators and supervisors, interview techniques and field practice. The training was followed by a pre-test sampling exercise. The pre-test exercise helped to fine-tune the instrument before the actual survey started. On ethical grounds, a note of approval was obtained from the Enugu State Ministry of Health prior to the commencement of the field survey. Furthermore, before enumeration started in any of the communities, a courtesy visit was made to the traditional chief of the community. Such visits helped to smooth the entry into the communities.

To further ensure quality control, the survey instructions were strictly adhered and the field supervisors were required to undertake both skim- and spot-checks. Also, data

processing went on simultaneously with data collection such that any errors detected in the process of screening could be corrected immediately in the field. Coding was used to identify strata, EAs and households. Thus, it was easy to merge files and carry out data editing. Data input into Excel template was checked and verified by data editors. This rigorous process of quality control, which was in-built into the survey design and field execution, accounted for the low level of error found after processing the data.

To take care of the price differences between rural and urban locations, the Laspeyres' index was used to reflate the nominal values of expenditures of the rural EAs to bring them on par with the urban cost of living. This implied multiplying the rural nominal expenditures by a factor of 1.255 since the cost of living computed on a basket of 20 core consumer items was 25.5% more expensive in urban than rural arrears. To obtain household total expenditure, the household expenditure on various goods and services including all healthcare related expenditures were aggregated. Since there is unsettled debate in literature about intra-household allocation of resources (Deaton, 1997), we assumed equal allocation. We also assumed there are no economies of scale, and thus, used the per capita value of household expenditure (household expenditure gross of health expenditure) as proxy for income in our analysis. This is the prepayment income variable. To compute household expenditure on health care services the sum total of all direct expenditures relating to the production of treatment for an illness episode including cost of drugs, cards, consultation fee, transportation, and so on, in the four weeks preceding the interview were used to generate the health care expenditure variable. Zero was recorded for a household that did not spend any amount on healthcare services.

The post-payment income variable was obtained simply by netting-off the healthcare cost from the gross per capita expenditure. A fortiori, for households that did not make any expenses on healthcare within the period their net income or post-payment income was the same as their gross income. The unit of analysis in this study is the household representative individual, rather than all the members of the household.

It is now known that 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, statistical inference, although the point estimates are not affected (Stata Corporation, 2001). 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 the design of the survey. Further details about the survey design and sampling methodology can be found in Ichoku and Fonta, (2006).

**Empirical Results**

The sample shows that 35% of the population reported financing healthcare within the period covered by the survey, which confirms the high incidence of diseases, and poor population health as described above. About 38% of households with income below the poverty line of 2900 naira (N2900) also reported financing healthcare while the

30% of household with income above the poverty line reported financing healthcare during the same period. However, the mean amount spent on health by the poor and non-poor varied significantly. The poorest 75% of the households spends on average N342.38. The top richest 5 percent of households spends on average N2389.40 (or 700% of the amount by poorest 75% of households). Similarly, poor households that financed health during the period spent on average N255.00, the non poor spent on average N2021.71. The top richest 1% of household that financed healthcare spent on average N8429.76 or 3,300% of the amount spent by the poorest 60% of households.

In the results set out in Table 1, the decomposition parameters are estimated under different definitions of 'income bands'. Column 2 presents results of estimated parameters using a definition of income band comprising deciles of the population incomes. In this case, there are about 150 observations under a given income band. Column 3 shows results estimated using 5 percent income band. In this case there are, on average, about 75 observations in each income band. The 3.3 and 1 percent income bands imply there are about 50 and 15 observations, respectively in each income band.

The results shown in Table 1 clearly indicate a large amount of income inequality in the surveyed population. The prepayment Gini Index ($G_X$) is about 0.45. It can be seen that this value is not affected by the definition of income equal under the frame work. This is not the case for the estimated core parameters of the distributive effect: $V$, $H$ and $R$ as will be discussed shortly. The value of $G_X$ is, therefore, constant across the different income bands. The post payment income Gini index ($G_{X-P}$) is also constant across income bands. Likewise the parameters $RE$ and $g$. These parameters are computed prior to the estimation of $K$ where the definition of income band begins to exert influence.

The estimated prepayment Gini Index ($G_X$) of 0.45 on the [0, 1] interval is statistically different from zero as shown by the estimated standard error. It is however lower than the unweighted[4] sample estimate of 0.47 (This is not shown in the table).

**Table 1**
**Results from AJL Decomposition Based on Per Capita Income**

| *Parameters* | *Income-bands: 10 percentiles* | *Income-bands: 5 percentiles* | *Income-bands: 3.3 percentiles* | *Income-bands 1 percentile* |
|---|---|---|---|---|
| $G_X$ | 0.4474** | 0.4474** | 0.4474** | 0.4474** |
| Se | 0.0111 | 0.0111 | 0.0111 | 0.0111 |
| CI | 0.4691 | 0.4691 | 0.4691 | 0.4691 |
| | 0.4258 | 0.4258 | 0.4258 | 0.4258 |
| $G_{X-P}$ | 0.4482** | 0.4482** | 0.4482** | 0.4482** |
| $RE$ | -0.0008 | -0.0008 | -0.0008 | -0.0008 |
| $g$ | 0.0883 | 0.0883 | 0.0883 | 0.0883 |
| $C_P$ | 0.5754 | 0.5875 | 0.5875 | 0.5893 |
| $K$ | 0.1280 | 0.1401 | 0.1416 | 0.1419 |
| $V$ | 0.0124 | 0.0136 | 0.0137 | 0.0138 |
| $H$ | 0.0086 | 0.0070 | 0.0042 | 0.0009 |
| $R$ | 0.0045 | 0.0074 | 0.0103 | 0.0137 |

NB ** Estimated parameter statistically significant at 5% level.

It is comparable to the estimated national Gini Index of 0.50 reported in other studies [see, for example., Canagarajan *et al.* 1997, Okogie et al. (2000)]. The result is not surprising considering that the state is culturally and economically less heterogeneous than the entire country. The result indicates that there is high level of income inequality among the population. The estimated Gini coefficient is also high relative to that for developed and most developing countries even in Africa. The Gini index for the former group of countries lies within the range of 0.20 and 0.30, and the latter countries within the range of 0.30 and 0.40.

The table also shows that the value of $G_{X-P}$ lies within the lower and upper bounds of the confidence interval of $G_X$. This suggests that the difference ($G_X - G_{X-P}$) is not statistically different from zero. Hence the redistributive effect, though indicating a regressive financing system (pro-rich redistributive effect) is nevertheless statistically insignificant so that the sign, though negative is actually indeterminate. The conclusion from this is that under the assumptions of the AJL framework, (particularly under the implied assumption of inequality neutrality of the Gini index of this framework), the direct out-of-pocket method of paying for healthcare in Nigeria does not lead to any significant income redistribution. Rather households tend to finance their healthcare needs according to their level of income or in proportion to their ATP.

A comparable result was also observed by Wagstaff *et al.* (1999) among some EU countries where the authors found a low degree of regressivity in out-of-pocket payment in Germany, the Netherlands and Ireland. They explained the result as reflecting the absence of or incomplete social health insurance cover for insurance for the better-off. It would now seem, in the light of this further evidence from a predominantly market-driven health market that out-of-pocket financing tends to force households to buy health in proportion to their income with hardly any redistributive implications. In any case, the important conclusion from this result is that healthcare financing in Nigeria is largely determined by ability of households to pay for health care services. Households purchase healthcare services in direct proportion to their income or their ability to pay for those services when this ability to pay is proxied by household income.

**Key Components of the Redistributive Effect**

The parameter $g$ indicates the proportion of households' income taken up by out-of-pocket healthcare payments. Here, $g = 0.09$ indicates 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 *aggregate* 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. With a higher epidemiological burden, the relative lower value of $g$ for Nigeria compared with Sweden suggests that Nigerians are under-spending in health. In other words, there are suppressed healthcare needs among the population. 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 relatively high value of not only confirms the virtual dependence of households on direct financing of their health needs but also signals that health financing is a potential source of impoverishment among the population. Healthcare financing is a big burden to most households in Nigeria (see also Gotsadze *et al.* 2005). And the situation is made worse in a cash economy where, in the absence of third party intervention and significant subsidies, households must deposit money to obtain any form of medical care (Alubo, 2001). But as Wagstaff and van Doorslaer (2001) suggest, the policy-maker's concern is not only in respect of access of the poor to healthcare utilization but also the impact healthcare expenditure has on the household's ability to provide itself other basic needs. The large value of coming from out-of pocket is a measure of the opportunity cost, in terms of other basic needs, households have to trade-off in order to obtain healthcare.

While the parameters $G_X$, $G_{X-P}$, $RE$ and $g$ are invariant to the definition of pre-payment equals, payment concentration index is not $C_P$ is a measure of inequality that indicates the extent of inequality in one variable in relation to ranking in another. It is computed on the assumption of effective payment schedule; that is, the inequality in average payment charged on each group of prepayment equals (see Aronson *et al.* 1994) in relation to ranking of individuals according to prepayment income. In other words, this method of computing $C_P$ eliminates both the influence of horizontal differences within each pre-payment income group (since each household within the group is charged the average payment of the group) and all measurement errors. The estimated $C_P$ will therefore vary according to the definition of prepayment income equals adopted. The estimated $C_P$ for 10-per cent definition of pre-payment equals is about 0.57 and increases rather slowly as the size of the income band shrinks.

**Kakwani Index of Progressivity and Vertical Equity**

The Kakwani index *(K)*, the measure of progressivity of healthcare payment, is computed straightforwardly as the difference between $C_P$ and $G_X$ (Kakwani, 1977). Noting that the latter is computed based on the individual level data and the $C_P$ based on group observations, Aronson *et al.* (1994) suggest that *K*, in this case gives the counterfactual Kakwani index indicating the reduction in inequality that would have obtained in the absence of horizontal inequality in healthcare financing. In the absence of horizontal equity and re-ranking considerations, *RE* of OOP is simply the vertical equity (*V*) and tells us how much income inequality is reduced on account of the progressivity (or regressivity) of the payment system since everyone faces the same payment schedule.

The level of vertical inequity is a function of the effective payment schedule *g* (i.e., the average payment rate) and *K*. In other words, vertical equity is not just a function

of the progressivity of the payment schedule alone but also of the proportion of average households' income used to finance healthcare. A high value of *g* may imply a high value of *V* even if *K* is small. In Table 1, we find that the value of *V* is small though it may be considered high in relation to its source: household direct payment. That is, the value of *g* is high relative to other components of household expenditure but it is small relative to expected level of healthcare expenditure per capita.

The estimated value of the parameter *K* ranges between 0.128 to 0.142 for the 10 decile and 1 percentile income bands respectively. This 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. It fails to meet the cross-subsidization principle of equity in healthcare financing. This reinforces our earlier observation that households in the population seem to purchase healthcare in proportion to their income not necessarily in proportion to their need and this calls for a major policy response

**Horizontal Equity**

The estimated values of *H* for deferent definitions of income band 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 implies that the financing system would have been more redistributive without horizontal inequity.

It is however difficult to say, in this case by much the system would have been more redistributive. The formula specified in (6) does not seem strictly applicable in the case where RE is negative.

**Table 2**
**Matrix of Gini Coefficients for 5 Per cent 'Income Equals'**

| *Pcentiles* | *1* | *2* | *3* | *4* | *5* | *6* | *7* | *8* | *9* | *10* |
|---|---|---|---|---|---|---|---|---|---|---|
| $G_{f(x)}$ | 0.105 | 0.073 | 0.089 | 0.064 | 0.080 | 0.054 | 0.058 | 0.076 | 0.064 | 0.077 |
| $a_x G_{f(x)}$ | 4.1E-5 | 4.3E-5 | 6.09E-5 | 5.5E-5 | 7.9E-5 | 6.5E-5 | 7.7E-5 | 1.2E-4 | 1.0E-4 | 1.4E-4 |
| Pcentiles | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| $G_{f(x)}$ | 0.051 | 0.080 | 0.084 | 0.046 | 0.078 | 0.072 | 0.069 | 0.084 | 1.258 | 0.349 |
| $a_x G_{f(x)}$ | 1.1E-4 | 1.8E-4 | 2.E-4 | 1.3E-4 | 2.4E-4 | 2.5E-4 | 2.7E-4 | 3.8E-4 | 6.8E-3 | 3.1E-3 |

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 definition of size 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 the value of *H* at income band of 1 percentile).

It is also to be noticed from Table 2 that within-group or within-band inequality is highest among the poorest and highest income groups of the population. This in itself provides useful information for policy aimed at targeting the most vulnerable segments of the society through provision of social programs or to tackle intra class inequalities in the top income classes where the amounts involved are highest. The within group Gini coefficients contributed more to the size of *H* than the weighting factor $\alpha_x$ although when the income bands are wide the latter contributes considerably to the size of *H* as noticeable in Table 1.

But there are several other factors that could contribute to a high value of *H* through $G_{F(x)}$. One is the variation in amounts that households are required to pay in the event of an illness. Others may include age and differences in ease of access to healthcare facilities. But, perhaps the most important factor would be the random nature of illness itself. It would, therefore, seem that some method of protecting households against unpredictable illness is desirable. The policy of social health insurance, which is still in infancy in the country or some form of prepayment scheme, seems to require urgent development.

**The Re-ranking Effect**

The final component of the AJL decomposition is reranking which measures the extent of overlapping of flaps between income bands (See Fig 1). 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 1. 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 bandwidth approaches zero, the value of *H* approaches zero as all horizontal inequity now turn into reranking effect. All these results point to the fact that the estimates of *V*, *H*, and *R* are sensitive to the definition of income band.

It is possible that a policy-maker might be more concerned about re-ranking than with horizontal inequity resulting from healthcare financing. This is because losing one's income status among prepayment peers has a potential to generate a psychological feeling of alienation, an observation that has since been formalized in the theory of relative deprivation (Runciman 1966). Thus, ethically, a social decision maker might consider re-ranking a more serious problem than horizontal inequity and this requires cushioning the effects of healthcare financing through medical subsidies particularly for those groups of the population that are more prone to catastrophic healthcare spending.

**Evaluation of the AJL Decomposition Method**

The key components of the AJL decomposition vary across definitions of prepayment income equals. Evidently, as the class size shrinks, *V* and *R* components increase while *H* decreases. The movement in opposite directions between *H* and *R* seems intuitive. An increase in number of income bands is likely to increase the chances of overlapping

between income classes at the post-payment distribution. On the contrary, the smaller the number of income bands the higher the variability within classes and, hence, increases in the size of $H$. This implies that in the context, not only $H$ and $R$ are sensitive to the definition of income equals but also $V$. We recall that in the AJL model $H$ is computed from the Gini indices of post-payment groups who were deemed equal before payment. By reducing the number of income bands, we are also reducing the size of vertical inequity because we thereby, also, reduce differences between observations that may be close equals though they belong to different income bands.

This observation confirms the observation in Lambert and Ramos (1997b) who noted the arbitrariness inherent in the definition of income equals in the AJL model, but they nevertheless proceeded in very much the same way as Aronson *et al.* (1994) by developing the concept of 'pseudo horizontal inequity'. The significant difference between the AJL approach and Lambert and Ramos (1997a, 1997b) approach being the latter's introduction of a new weighting scheme, a pure weight rather than a weighting scheme contaminated by vertical considerations as in Aronson *et al.* (1994). In Lambert and Ramos (1997a, 1997b) the weighting scheme is only the population share of each prepayment income group rather than population share multiplied by post-payment income share as done in AJL approach. This highlights, on one hand the importance of appropriate definition of pre-payment 'income equals' for policy purposes and, on the other hand, seems to emphasize the limitations of the AJL approach to estimating redistributive effects as the model leaves this important question of deciding the optimal pre-payment 'income equals' unresolved

Furthermore, it is worth noting that the level has important implications for the level of $V$, though not for $K$. If policy or changes in healthcare financing is able to alter the payment structure, for instance, this would affect the value of $V$. But does the level of $g$ also affect the levels of $H$ and $R$? It seems that $g$ enters the computation of $H$ and $R$ indirectly since any of these components can be calculated as a residual of the decomposition equation $RE = V - H - R$. Moreover, $H$ is computed from net income (after subtracting healthcare costs), which implies that the level of $g$ could as well influence the level of $H$ indirectly. It seems, therefore, that altering the average level of healthcare payment made by households could also alter the level of $H$ and $R$. It seems further then, that within the AJL framework, there is no way of isolating the effect of $g$ on $H$ and $R$. If this were possible, it would assist policy in separating pure horizontal equity and re-ranking affects from the effect arising from a general rise in the value of $g$. Both aspects of horizontal and re-ranking effect would seem to require different policy instruments to reduce. However, the AJL model provides an important framework for thinking clearly about the different components of redistributive effect and showing that each of these components could become a separate policy objective requiring a different set of policy instruments to tackle it.

**Conclusion**

A major policy concern in healthcare financing is how to protect the most vulnerable groups from random expenditure incidence that characterise the ill-health and cost of

treatment. A healthcare financing system that is dominated by oop is likely to take more from the poor than from the non-poor and thus, violating the principle of cross-subsidization. In the virtual absence of other forms of healthcare financing, the Nigeria healthcare system depends almost entirely on oop. This study examines the redistributive implications of this heavy reliance on oop for post-payment distribution of income. Using the AJL framework which unlike other decomposition frameworks, provides several components of the redistributive effects, we were able to show that this method of healthcare financing is anti-poor in redistributive effects, though it might be more correct to say that oop is not progressive and, in fact, tends to force health consumer to purchase healthcare services according to their ability to pay rather than according to their need.

The redistributive components show evidence of vertical and horizontal inequities inherent in oop, as well and reranking effects. Relatively large proportion of household income is devoted to financing healthcare in this way. An important policy result from the decomposition is that apart from fundamental policy concern of using the healthcare system for cross-subsidization and vertical redistribution, there is a trade-off between the pursuit of policies that address horizontal equity and those that address reranking effects. How this trade-off is sustained depends on the society's normative valuation of these two components of redistributive effects.

The findings of the study must, however, be taken with caution due to observed weaknesses of the AJL decomposition framework. The main weaknesses of the framework are with respect to the arbitrariness evident in the definition of 'income equals', and the contamination of horizontal inequity by vertical equity consideration. However, the AJL method clearly provides an important analytical framework for examining the redistributive effects of policy.

### *Notes*

1. These figures are derived from the provisional results released by the National Bureau of Statistics for the 2006 Core Welfare Indicators Survey.

1. The measurement of ATP has generated much debate in literature. ATP has been defined both from the short-and long-run perspectives. The short-run perspective defines ATP in terms of health expenditure-income ratio (Wagstaff and van Doorslaer 2001). The long-run perspective defines ATP in terms of opportunity costs of healthcare payments (Russell, 1996) or through the concept of comprehensive income (Acocella, 1998).

2. Musgrave and Thin (1948) developed a simple measure of this redistributive effect (RE) represented by $RE = G_b - G_a$ Where: $G$ represent the Gini index, and the subscripts $b$ and $a$ refer to the distribution before and after healthcare payments. However, the size of the average payment [0]($g$) also determines the extent of redistributive effects. This result is shown by the Reynolds-Smolensky (1977) decomposition of redistributive effect such that:

   $RE = \left[\frac{g}{1-g}\right] K$ which suggests that redistributive effect is a function of average payment rate and Kakwani (1977) measure of progressivity (K). The Kakwani index measures the income elasticity of health payments. But the Reynolds-Smolensky index does not take

account of the fact that due to differences in characteristics (for example, in age, education, residential location, sex, etc.), the health system may impose different healthcare financing payment liabilities on two individuals on exactly the same income level.

3. 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. [0].

4. The weighting factor in this case is the household size.

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