MARGINAL BENEFIT INCIDENCE ANALYSIS OF PUBLIC SPENDING IN NIGERIA

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Abstract

This study estimated Average Benefit incidence, Progressivity of Benefit and Marginal Benefit Incidence of public spending on some selected social utilities in Nigeria, using Nigeria Bureau of Statistics (NBS) Living Standard Household Survey Data of 2004. The various analyses were carried out using Distributive Analysis Stata Package (DASP) 2.1. The results of the analyses show that the spending on social utilities in Nigeria is not pro-poor. The marginal benefit incidence of spending on social utilities in Nigeria indicates that the poorest group can only benefit more than the richest group from extra spending on the social utility in which their current accessibility rate is high. Finally, from the findings of this study we formulated policy recommendations that will make the public spending in Nigeria pro-poor in order to accelerate the speed at which the poor benefit more from increases in access to social utilities in the country.

Key Words: Marginal, Benefit, Public, Spending, Nigeria

JEL Code: H500, H510, H520, H530, H540

1.0 Introduction

1.1 Background Information

With a population of over 151 million people, Nigeria is the most populous country in Africa, with a GDP second only to South Africa’s (World Bank, 2008). Nigeria’s economy depends heavily on the oil and gas sector, which contributes 99 percent of export revenues, more than 80 percent of government revenues. In about forty years of oil production, Nigeria has earned over $400 billion at 1995 price from oil. With its large reserves of human and natural resources, Nigeria has the potential to build a prosperous economy, reduce poverty significantly, and provide the health, education, and infrastructure services its population needs. However, available evidence indicates that these resources have not been judiciously managed to meet the need of the population in terms of human capital development (Aigbokhan, et al, 2007). For example, Nigeria generated about 23 trillion naira (191 billion US dollars) from oil between 1981 and 2006, which is about 83% of total government revenue. However, only about 2% and 3% of total government revenue and oil revenue was spent on education between 1981 and 2006. The government allocated only about 1% of the GDP to education between 1981 and 2006.
(CBN, 2008). The fact that proportionate volume of government finance is not directed at human capital development in Nigeria is evident by the fact that defense expenditure takes the lion share of government’s revenue. The military expenditure as percentage of the combined education and health expenditures increased from 60% in 1981 to 118% in 2005 (CBN, 2008). Abidogun (2008) has asserted that low government resource inflow to education sector may hamper accessibility to education in Nigeria, especially by the poor. He indicated that about 0.76% of GNP allocated to education sector in Nigeria is lower than the average of about 5% of GNP allocated to education sector in other Sub-Saharan African countries, and lower still when compared with the average of 6% of GDP allocated to education sector by OECD countries (Robert et al, 2002). The fact that poor allocation hinders accessibility to education by children from poor homes has been noted in Nigeria (Huebler, 2005).

In Nigeria, less than 1% of GDP, about 2% of government and oil revenue was allocated to health sector in Nigeria between 1981 and 2006 (CBN, 2008). The fact that this low financial commitment will result in inequality in access to health care resources and charges has been noted by Ogunbekun et al (1999). Since majority of Nigerians are poor and pay for their health care out of their pocket (NQAI, 1994), many of them may be left out of health care provision. Nigeria Project Agenda (2007) has demonstrated that the accessibility to health care facilities in Nigeria is low. It was revealed that only 3 out of 5 Nigerians have access to health care facilities.

Achieving higher levels of access to basic infrastructure services such as piped water and electricity is a key objective of many governments in developing countries including Nigeria. According to Le Blanc (2007), improving access to safe drinking water has long been recognized as one of the main challenges of sustainable development. The value to households of access to improved water services can be seen as a stream of benefits which are a function of savings on expenses from buying water from alternative providers; of indirect benefits in terms of time freed up to get water into the household; and of other indirect benefits related for example to improved health or education outcomes. However, Alabi and Adams (2010) indicated that only about 49% of Nigerians had access to improved water source in 1990, which has declined to 48% in 2007 as a result poor funding of water projects in Nigeria.

Although, Nigeria government expenditure on electricity is grouped with social and community service expenditures, it is evident that low amount of expenditure is allocated to
electricity provision in the country. This low financial commitment for the government may also be attributed to low accessibility and consumption of electricity. For instance, the average electricity consumption in Nigeria is lower when compared with averages for Sub Sahara Africa (SSA) and Low Income Countries (LIC). Electricity consumptions were 3793, 456, 317 and 82 kilowatts per capita in South Africa, SSA, LIC and Nigeria respectively (Okonjo-Iweala and Osafo-Kwaako, 2007). The fact that some of these infrastructures may not reach the poor has been noted by Ajwad and Wodon (2007).

However, how much did the poor benefit from these social capitals and infrastructures should be of interest to development economists because of the inequality that may be embedded in their distribution and social distortions that they may generate. This makes the analysis of distributional impact of public spending on education, health and infrastructure in Nigeria of interesting area of study.

1.2 Research Issues, Knowledge Gap and Policy Relevance

Policy makers are increasingly interested in the composition of public spending. This attention stems in part from the recognition that expenditure allocation in favour of education, health and infrastructure can boost economic growth while promoting equity and reducing poverty (Tanzi and Chu, 1998; Estache, 2006). Allocation within the sectors are widely considered to be important in explaining changes in social indicators (Bidani and Ravallion, 1997; Gupta et al, 1999). In the interest of economic and social progress, the use of public resources must emphasize efficiency and equity. The efficient management of these resources is critical to growth, to human capital formation, and to the welfare of the poor. Public expenditures offer significant opportunities for promoting growth and the equitable distribution of its fruits (Mainardi, 2007). The issue of equity in distribution of economic benefits from public investment in human capital and infrastructural development is critical in Nigeria because of pervasive poverty and high income inequality. In Nigeria, accompanying economic growth that was experienced in the 80s and 90s was serious income inequality, which was believed to have widened substantially. Despite past policy to correct this abnormality, inequality has increased the dimension of poverty in Nigeria (Alabi, 2008). This is the reason that, as part of microeconomic objectives, Nigerian government often gives equitable distribution of income a priority (Oyekale, et al, 2006).
Moreover, public spending on basic education, primary health and infrastructure can be justified in Nigeria because they will be of benefit to the poor. However, given the high level of income inequality and disparity in access to these human capital development resources, can increase in public spending in basic education, health and infrastructure benefit the poor? Will it benefit the poor more than the rich? Have the very poor benefited disproportionally more than the less-poor or even the non-poor from the improvements these spending brought about? Thus, these questions have to be answered if a country wants to achieve poverty reduction in the short and the long run. More importantly, for effective policies formulation and implementation on redistribution and poverty reduction, there is a need to have knowledge on the benefit incidence of public spending in Nigeria. What proportion of poor benefited from the past government spending can guide the future spending and make it pro-poor. We still need to know who will benefit from further expenditure, as Nigeria increased her budgetary allocation to education, health and infrastructure by about 13-16% in 2008 (Budget, 2008). Nigeria Government has also promised to channel more money to education, health and infrastructure provision in order to achieve the 7-Points Agenda, Millennium Development Goals (MDGs) and Vision 2020. However, if this future spending will benefit the poor depends on the marginal benefit incidence of the spending.

Many previous studies have been carried out on benefit incidence of public spending in African countries\(^1\) and majority of them did not incorporate marginal benefit incidence (Demery et al, 1995; Van de Walle, 1995; Castro-Leal et al, 1999; Heltberg et al, 2001; Seifu, 2002 and Woldehanna and Jones, 2006)\(^2\). Moreover, many studies on poverty and inequality were conducted in Nigeria in the past ten years to provide elaborate knowledge on how to reduce poverty in Nigeria (Adeyeye, 1999; Adeyeye and Ajakaiye, 2001; Alabi and Oviasiojie, 2003; Alabi et al, 2005; Aigbokhan, 1999; 2000; Alabi and Chime, 2006; Oyekale et al, 2006; Alabi, 2008). Most of these studies have examined the poverty and inequality profile of the country, but none examined the benefit incidence of public spending in Nigeria. This study intends to fill that vacuum. Moreover, it is not just the level of public spending that matters, but also the efficiency of its outlays and how well they are targeted at the poor. In that vein, we examined the

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\(^1\) It is noteworthy that all these studies excluded Nigeria

\(^2\) The few recent improvement in these studies are the works done by Atemnkang et al, 2005 (in Cameroon) Doubouya et al, 2008 (in Guinean), Bernadette, 2008 (in Cameroon) and Djindil et al, 2007(in Chad), however, they used non-parametric approach.
progressivity, average and marginal benefit incidence of public spending on education, health and infrastructure in Nigeria.

The need to study benefit incidence of public spending in Nigeria stems from the fact that the Nigerian President said that he is more committed to tackling the root causes of violence, inequality and poverty in Nigeria. In that regard, he came up with a Seven Points Agenda for the development of Nigeria to achieve sustained growth and poverty reduction. These Seven Points Agenda is the framework for achieving vision 2020 by the government of Nigeria. The principal focal areas of the agenda are education provision, health care provision, poverty reduction, inequality reduction and infrastructural development. Seven Point Agenda recognises that ‘middle class has all but disappeared in Nigeria. The major aim of the Agenda is to introduce policies and measure that would lead to the re-emergence of a vibrant middle class with positive impact on the quality and standard of living of all Nigerians’ (Nigeria Project Agenda, 2007, page 11). According to the Agenda, the challenge for on-going and future reforms in Nigeria is to ensure that the benefits positively affects and impacts all Nigerians. It is to be noted that the past presidents have always come with agenda that is not based on scientific or analytical anchors. That most of the time, makes the government spending on these focal areas expensive failure. However, the current president has made it clear that the new administration is open to scientific inputs from researchers so as to achieve the targets of these Agenda (Jonathan, 2008). This study will provide a basis on which these investments in education, health care provision and infrastructure can be based to make it pro-poor. This study intends to do that by providing information on how the poor and non poor are currently benefiting from the government spending, and how they will benefit from further spending in these core sectors. This may form the basis for government redistribution efforts.

1.3 Research Objectives

The core objective of this study is the determination of average benefit and marginal benefit incidence of public spending in Nigeria. The specific objectives are to;

(a) Estimate the progressivity and average benefit incidence of government spending on primary and secondary education, health, pipe borne water and electricity in Nigeria.
(b) Estimate the marginal benefit incidence of government spending on primary and secondary education, health, pipe borne water and electricity in Nigeria.

The rest of the paper is divided into four sections, Section two deals with conceptual and empirical framework of the study. Section three is devoted to the research methodology employed in the study. Section four presents and discusses the findings from the study, while section five concludes the study with policy recommendations.

2.0 Conceptual Framework and Literature Review

2.1 Conceptual Framework for Benefit Incidence Analysis

Benefit incidence analysis (BIA) is better understood in relation to the concepts of targeting and progressivity of social spending. Targeting is a tool used to select eligible beneficiaries of any government intervention. In principle, it should concentrate the benefits of social assistance programs to the poorest segments of the population. All targeting mechanisms share a common objective: to correctly identify which households or individuals are poor and which are not. Targeting is a means of increasing the efficiency of the program by increasing the benefits that the poor can get with a fixed program budget (Coady et al, 2004). One way to assess the targeting of government subsidies is with reference to the graphical representation of the distribution of benefits, i.e., concentration curve or benefit concentration curve. A concentration curve is generated by plotting the cumulative distribution of “benefits” of public spending on the y-axis against the cumulative distribution of population sorted by per capita income/consumption on the x-axis. One can assess the progressivity or regressivity of a public spending by comparing the benefit concentration curve with the 45-degree diagonal and the Lorenz curve of income/consumption. The diagonal indicates neutrality in the distribution of benefits. If the distribution of benefits lies along this line, poorest 20 percent account for 20 percent of the expenditure; and so on. Thus, the diagonal reflects perfect equality in the distribution of benefits and it is also referred to as perfect equality (PE) line. The distribution of benefits is said to be progressive if the lower income groups receive a larger share of the benefits from government spending than the richer income groups. For instance, if the concentration curve lies above the diagonal, then the poorest 20% of the population receives more than 20% of the benefits and the distribution of benefits is said to be progressive in absolute terms (See Graph
1). Conversely, if the benefit concentration curve lies below the diagonal, then the poorest 20% of the population captures less than 20% of the benefits and the distribution of benefits is said to be regressive in absolute terms. On the other hand, a benefit concentration curve that lies above the Lorenz curve of income signifies progressivity of public subsidy relative to income (Hakro and Akram, 2007). To wit, the benefits share of the poorest 20% of the population is larger than its income share. Conversely, a concentration curve that lies below the Lorenz curve of income distribution suggests transfers that are more reggressively distributed than income. The concentration index is the most common summary measure of benefit incidence. It is estimated in like manner as Gini coefficient but it is based on concentration curve instead of the Lorenz curve.

2.2 Conceptual Framework for Marginal Benefit Incidence Analysis

The conceptual framework for this study extends a framework proposed by Ajwad (1999) and Ajwad and Wodon (2007) for analyzing allocation rules for investments in public services by local Governments. In the framework they considered an administratively autonomous unit, namely a department. The department is in turn divided into two municipalities, one with rich residents (R) and one with poor residents (P). The local Government at the department level is responsible for public investments in two services: the provision of public schools and the expansion of access to basic infrastructure. In addition, it is assumed that two separate budgets are established for each of the services and that the local Government has no discretion in allocating its budget between the two services. However, the policymaker has discretion over the allocation of the budgets to the two municipalities. The department has an exogenously determined budget constraint, $E$, for each of the services.

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3 The local government can be any tier of government, local, state or federal government.
This budget can be allocated between the rich and the poor municipalities, subject to $E = E_R + E_P$, where $E_R$ and $E_P$ are the investments for expanding access in the rich and poor municipalities. The household access rate in each municipality is $S_i = f_i(E_i)$, for $i = R, P$. This specification enables municipality characteristics (e.g., wealth, distance from the existing infrastructure grid, etc.) to affect the impact of investment expenditures on access rates. The functions $f_R$ and $f_P$ are increasing and strictly concave, such that $f_i'(E_i) > 0$ and $f_i''(E_i) < 0$ for $i = R, P$. Therefore, rates of access increase when investment expenditures increase but the marginal gains diminish with expenditures. For any given level of expenditures, it is assumed that the access rate in the rich municipality is higher than the access rate in the poor municipality. In the case of both education and infrastructure, it is thus assumed that $f_R(e) > f_P(e)$ for all expenditure levels between 0 and $E$. Thus, access to schools and to infrastructure is higher in the rich municipality. The crucial difference between infrastructure and education services is that for infrastructure, an increase in expenditures raises access rates more in the rich than in the poor municipality, so that $f_P'(e) < f_R''(e)$ for all $e \in [0, E]$. The higher marginal impact of expenditures on access rates in the rich municipality may arise because rich households tend to be located closer to the existing infrastructure grid than poor households do. Poor households tend to live in sparsely populated areas, which are often difficult to reach. Therefore, the cost of providing access to an additional household living in the rich municipality is lower than the cost of providing access to an additional household living in the poor municipality.
prevent a corner solution whereby all public expenditures are spent in the rich municipality, it can be assumed that the last dollar spent in the poor municipality has a larger impact on access rates than the first dollar spent on the rich municipality, i.e. \( f_p' (E) < f_R'' (0) \).

For education, it can be assumed that an increase in public expenditures raises the school enrollment rates more in the poor than in the rich municipality, so that \( f_p' (e) < f_R'' (e) \) for all \( e \in [0,E] \). This can be true because those living in the rich municipalities will send their children to school anyway, for example to a school that is located at a distance, if their own municipality has a low density of public schools. In other words, the absence of a conveniently located school in a rich neighborhood is assumed to pose a smaller barrier to education than the absence of a school in a poor neighborhood. As in the case of infrastructure, corner solutions can be avoided by assuming that the first dollar spent in the rich municipality increases the school enrollment rate by more than the last dollar added in the poor municipality, so that \( f_p' (E) < f_R'' (0) \).

Graphs 2 and 3 illustrate the profile of access to schools and infrastructure, respectively, as functions of local public expenditures. The access rate profile for the rich \((R_0 R_E)\) and poor \((P_0 P_E)\) municipalities are such that the slope of the access rate production function in the poor municipality is always greater than the slope in the rich in the case of education, but the reverse is true for infrastructure. A combination \((P_E, R_0)\) would result if all the department’s funds were allocated to the poor municipality, while \((P_0, R_E)\) would result if all the funds were spent in the rich municipality.

**Graph 2:** Access rates in education as a function of expenditures.
Graph 3: **Access rates in infrastructure as a function of expenditures.**

The resource constraint $E = E_R + E_P$ and the functions $f_i'(E_i) > 0$ for $i = R, P$ can be combined to generate a transformation curve for the relationship between the access rates in both municipalities. Writing the access rates as $S_R = f_R(E - E_P)$ and $S_P = f_P(E_P)$ in the rich and poor municipalities, and totally differentiating these two functions yields $dS_R = -f_R'(E - E_P)dE_P$ and $dS_P = f_P'(E_P)dE_P$. Therefore, the slope of the transformation curve is:

$$\frac{dS_R}{dS_P} = \frac{-f_R'(E - E_P)}{f_P'(E_P)} < 0 \quad (1)$$

With a fixed budget, a higher increase in the access rates through investment expenditures in one municipality implies that the increase in access rates in the other municipality will be lower.

Graph 4 and 5 plot the transformation curves for the access rates in the two municipalities for **education** and infrastructure, respectively. Consider Graph 4; point A, equivalent to the $(R_E, P_0)$ combination in Graph 2, is achieved if all available funds are distributed to the rich municipality, while point B, equivalent to the $(P_E, R_0)$ combination in Graph 2, results when $E$ is fully spent in the poor municipality. If the policymaker has a higher implicit weight on the welfare of either of these groups, then one of these outcomes will be observed. At G, average access rates are maximized (this is the point of tangency with a linear objective function giving equal weights to the poor and rich municipalities). At G, investment productivity is equalized in the two municipalities; i.e., the slope of the transformation curve is minus one since maximizing the average access rate $[f_P(E_P) + f_R(E - E_P)]/2$ requires that $f_P'(E_P) = f_R'(E - E_P)$. Point C on
the 45° line represents the allocation that equates the access rates in the two municipalities ($S_R = S_P$). At point C, the slope equals $-f_R'(E_R)/f_P'(E_P)$, and given that $E_P > E_R$, this ratio could be either greater or less than one in absolute value. For education, $f_P'(e) > f_R'(e)$ and hence, the slope of the transformation curve is less than $-1$ at C. On the other hand, $f_P'(e) < f_R'(e)$ for infrastructure and hence, the slope of the transformation curve is greater than $-1$ at C.

Graph 4: Access rate transformation curve for infrastructure.

Despite the ambiguity associated with the position of G relative to C, there is one conclusion that can be drawn from the model if it is assumed that authorities have one consistent goal regardless of the type of public services provided. Consider the goal of maximizing access rates in the department, regardless of the distributional outcomes. To maximize average access rates, the Government chooses point G for both education and infrastructure. In the case of infrastructure or any other service for which the marginal impact of spending on access is higher in the rich municipality, G will be uphill from C, so that the rich municipality will be favored. By contrast, G will be downhill from C in the case of education or any other service for which the marginal impact of spending on access is higher in the poor municipality, so that the poor municipality will be favored. Thus, the relative position of G and C depend on whether the rich or the poor experience the highest impacts from investments in their respective municipalities.
According to Ajwad and Wodon (2007), given the framework of the model, there are at least three other possible outcomes. First, increases in public service access benefits the rich for both infrastructure and education. This would suggest that policymakers place a higher weight on the welfare of the rich, possibly due to the lobbying power the rich possess. Second, increases in public service access benefits the poor for both services. This outcome may result if policymakers place a higher welfare weight on the poor or if policymakers pursue a strategy of equalizing outcomes for both services. The latter outcome could occur since current public service access patterns favor rich municipalities and hence, a pro-poor distribution of public services would erode the disparity between the municipalities. A third case is when increases in access to education benefit the rich while increases in infrastructure benefit the poor. One possible explanation for this outcome could be that policymakers do not need to provide infrastructure services to the rich because private infrastructure providers already serve them, while the rich still consume public education, as tertiary education services tend to be provided mostly by the state in poor countries.

**Graph 5: Access rate transformation curve for education.**

2.3 Empirical Literature Marginal Benefit Incidence of Public Spending

A policy change that increases spending will not necessarily go to existing beneficiaries in proportion to their current benefits or even go to existing beneficiaries at all. In these cases, standard BIA method may be insufficient in analysing the distributional effects of public spending (Younger, 2003). In response to these observations, several recent studies have proposed alternative methods to measure the marginal benefit incidence (MBI) of public
spending. Marginal incidence analysis measures the incidence of actual increases or proposed cuts in programme spending. This approach departs from standard benefit incidence analysis that attempts to estimate how the average benefits from public spending are distributed at point in time (Van de Wall, 2002). The latter can be deceptive about how changes in public expenditures will be distributed. It is possible, for example, that the political economy of incidence means that the rich tend to receive a large share of the inframarginal subsidies, while the poor benefit most from extra spending. Ravallion (1999) provided a model of the political economy of fiscal adjustment that can generate such an outcome. The simplest way to identify marginal incidence is to compare average incidence across geographic areas with different degree of programme sizes. This is essentially the method of Lanjouw and Ravallion (1999). Glick and Razakamanantsoa(2001) and Younger (2002) examined shares of the change in benefit over time across the expenditure distribution. Lanjouw and Ravallion (1999) estimated the ‘marginal odds of participation’ for each expenditure quintile as the coefficient in a regression of quintile and small area participation rates. Lanjouw et al (2002) and Ravallion(1999) applied similar technique to panel data to control for fixed effect characteristics. Younger (1999, 2002) considers marginal incidence to be the distribution of compensating variations for marginal policy changes, based on estimated demands for public services. Ajwad and Wodon (2002; 2003 and 2007) improved on Lanjouw and Ravallion (1999) method by defining the income quintile according to the position in the departmental distribution of income, with the country being divided into several departments.

Lanjouw and Ravallion (1999) found out that primary school enrollment rise with household expenditure per capita nationally, and in all states. They indicated that enrolment tends to be lowest for the poorest quintiles, and to increase as consumption per person increases. Their average odd of enrolment (marginal benefit) suggests that subsidies to primary schooling would mildly favour the non-poor. With a data set from Ecuador, Younger (1999) used a combination of benefit and behavioral approaches and found that public spending improves health and education indicators in developing countries. Ajwad and Wodon (2002) investigated whether poor benefit more or less than the non poor from an expansion in access to public services. In answering the question, they applied marginal benefit incidence analysis to local-level data from Bolivia and Paraguay. Their results indicated that the marginal benefit incidence is higher (or at

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4 They did not separate public schools from private schools in the data they used.
least not systematically lower) for the poor than for the non poor in education, but this was not the case for many basic infrastructure services. More generally, the poor seem to gain access only once the non poor already have high levels of access.

Ajwad and Wodon (2003) estimated average benefit and marginal benefit incidence for Sri Lanka. In their study they revealed that the highest disparities between the access rates of rich and poor households are for access to electricity and indoor taps (i.e., piped water connection within the house). For the case of access to electricity for lighting, although almost 60 percent of households have access to electricity, but less than 40 percent of the poorest households have access while 80 percent of the richest households have access. Similarly, of the 15 percent of households that have a tap within the house, only 4 percent of poor households have such a tap, versus more than a third of among the richest households. In many cases, their estimates suggested that households in the poorest quintile would benefit more than the average household from an overall increase in access rates. This is the case for access to a property title, protected well, unprotected well, private or public latrine, primary school, and main road. Ajwad and Wodon (2003) indicated that although there are important differences between different types of services, in many cases marginal benefit incidence tends to be more pro-poor than benefit incidence, especially once the non-poor already have high levels of access.

Ajwad and Wodon (2007) in their study in Bolivia revealed that 43.1% of all households had access to piped water while 10.6% of households had sewage draining facilities. Slightly more than a third (37.2%) of all households had access to electricity and 1.5% of all households have access to telephones. They indicated that participation rates in pre-primary, primary and secondary schools increase with municipality wealth. They demonstrated that the pattern in access to infrastructure too was positively correlated with municipality wealth. However, the disparity in access rates between the rich and poor was more pronounced for infrastructure relative to education. Piped water, sewage, and electricity access rates for the rich quintile were, respectively, 3.8, 12.5, and 11.8 times larger than the access rate in the poorest quintile of municipalities. They showed further that overall increases in participation rates in pre-primary, primary and secondary schools appeared to benefit poor and middle-income municipalities more than rich municipalities. The middle group showed the highest gains from increases in pre-school and secondary school participation rates, while the poorer municipalities gained the most from increases in primary school participation rates. For infrastructure services, poor municipalities
exhibit the lowest levels of marginal benefit incidence for access to piped water, sewage, electricity, and telephones.

As for Paraguay, they indicated that improvements in access to primary school were the most pro-poor, simply because most other groups of households already have access. Improvements in access to telephones were the least pro-poor, because in this sector, even those in the highest quintiles still lack universal access. Electricity and secondary schooling tend to be pro-poor at the margin, whereas the distribution of the gains in access to water and sewage were more evenly distributed.

Kruse et al (2009) estimated marginal benefit incidence for Indonesia. Taking into account behavioural responses to changes in public spending, they suggested that increased public health spending improves targeting of public funds to the poor. At the margin, increased local public health spending leads to net public resource transfers from the richest to the poorest quartile of the population, as it increases both public health care utilization by the poor and the average benefit of public funds through using these services. However, they concluded that initial utilization shares still dominate the marginal benefits, such that the bulk of the benefits accrue to the two middle quartiles.

3.0 Methodology

3.1 Data Sources and Collections

This study was carried out in Nigeria. The study made use of Nigeria Bureau of Statistics (NBS)’s Living Standard Household Survey conducted in 2004. The Household Survey was conducted with assistance from European Union, World Bank, Department for International Development and United Nations Development Programme to ensure good quality of the data generated. The survey had a national coverage, that is, all the 36 states of the Federation including the Federal Capital Territory were covered. The sample design for the survey was a two stage stratified sample design. The first stage was the division of each state...
into clusters called Enumeration Areas (EA), while the second stage was the division of enumeration areas into housing units. One hundred and twenty (120) EAs were created for each state and 60 EAs for the Federal Capital Territory. Ten EAs for each state and five EAs for the FCT were covered per month (The survey was conducted through twelve months period). In each of the enumeration areas, 5 housing units were systematically selected and studied. On the whole, 600 housing units were studied per state and 300 for the FCT. The survey has information on 96610 respondents from 19158 households. Data on education (public primary and secondary school enrolment), health (child vaccination, prenatal and postnatal consultations in public health institution), publicly provided electricity and pipe-borne water, socio-economic characteristic, location, region, per capita expenditure (deflated by the region current prices) were extracted from the survey and analysed in this study.

3.2 Selection of the Social Utilities

The current situation of these social utilities such as education, health, electricity and water and their importance in improving the livelihood of the people necessitated their inclusion as our indicators to measure the impact of public spending in Nigeria. Moreover, the systematic selection of these social utilities is justified because they are relevant to the poor. Education is one of the most important services the poor need to escape from poverty. Likewise, in the Millennium Development Goals, education is seen as a powerful instrument not only for reducing poverty and inequality but also for improving health and social well-being, laying the basis for sustained economic growth, and being essential for building democratic societies and dynamic, globally competitive economies (United Nation, 2000).

The reasons for selecting education also apply to health. Improving the health status of the poor makes a significant contribution to escape from poverty. Child vaccination, prenatal and postnatal hospital consultations are preventive measure to reduce infant and maternal mortalities which were reported to be higher in Nigeria than the average for the low income countries (Okonjo-Iweala and Osafo-Kwaako, 2007). McGuire (2006) has shown that in a cross

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6The fact that under five mortality rate of 194 estimated for Nigeria is higher than the average for SSA can be attributed to the decline in immunization between 1990 and 2007. The measles immunization declined from 54% to 35% within the period, while it increases form 56% to 73% between 1990 and 2007 in SSA (Alabi and Adams, 2010).
section of developing countries, access to maternal and infant health programs was correlated with decreased under-five mortality.

Water is a critical input into the welfare of the poor. As part of his seminal work on benefit incidence in Malaysia, Meerman (1979) asked respondents which service they needed most. Rural Malaysians placed clean water high on their list of important services, even though they were expecting to pay the full cost of its provision. Participatory poverty assessments in Africa have found water to be an overwhelming priority among the rural poor, especially in the drier savanna regions (Norton et al, 1995). Water complements health services in improving the health status of the poor (Demery, 2000). Hammer et al (1995) found that water supply was a critical variable in explaining regional variations in infant mortality rates (immunization rates were also important).

Energy plays a decisive role in the development process of a country. It not only enhances the productivity of factors of production but also promote higher standard of living. It is now widely recognized that economic development and energy consumption are interdependent (Burney, 1995). Moroney et al (1990) have analysed the relationship between energy consumption and GNP, the estimated regression coefficient with respect to GNP is found to be close to 0.9. The households need electricity for business activities, agricultural activities, refrigeration, cooking, lighting, etc. In the absence of electricity, 80% of Nigerians households use wood-fuel and charcoal for cooking (Osaghae, 2009).

3.3 Data Analysis Techniques

3.3.1 Benefit Incidence Analysis

The main objective of using a benefit incidence approach is to analyse the distribution of benefits from the use of public services according to the distribution of living standards. Two main sources of information are used. The first informs on the access of household members to public services and the second deals with the government expenditure on the public services. The benefit incidence approach combines the use of these two sources of information to analyse the distribution of public benefits and its progressivity. We performed Benefit Incidence using Distributive Analysis Stata Package (DASP) 2.1 procedure as indicated in Araar and Duclos(2009). This was done for all categories of the benefits (education, health, ownership of electricity and pipe-borne water) based on location (rural and urban) region and nationally. The
advantage of Distributive Analysis Stata Package (DASP) 2.1 is the possibility of using frequency data approach when information about the level of total public expenditures is not available. In this approach, we estimated the individual participation rate in each of the benefit by dividing the number of users by the eligible members in the households. This participation rate gives the idea of participation in the benefit (programme) by the members of the household.

### 3.3.2 Progressivity of the Benefits (PB)

Progressivity of Benefit (PB) was analysed using Distributive Analysis Stata Package (DASP) 2.1 procedure as indicated in Duclos and Araar (2009). In following their procedure, we estimated the progressivity of benefit by comparing the Lorenz and concentration curves. In doing this, the household expenditures of the people were ranked in ascending order, then the benefits (primary school, secondary school enrolment, vaccination, pre and postnatal consultation, ownership of electricity and pipe-borne water), were ranked according to their associated expenditure. The concentration curve shows the proportion of benefit enjoyed by the bottom $p$ proportion of population. We supplemented the estimation of progressivity with concentration Index. Normally, the higher the index, the more concentrated is the benefit and the higher the inequality. Hence, of the benefit schemes, the more regressive one would be associated with the highest Concentration Index (Bernadette, 2008).

### 3.3.3 Marginal Benefit Incidence Analysis

To determine whether a government maximizes average access rates across municipalities over time, it is typically necessary to have panel data with information on both income/consumption and access to services for various areas or administrative entities over time. Without such panel data, location unobserved heterogeneity cannot be controlled for.

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7 We were not able to get information on expenditure on these social utility(they are kept official)
8 For primary school, the eligible member is any child between the ages of 6 and 11 years in the household, while the user is any child aged between 6 and 11 years who attends public primary school. For secondary school, the eligible member is any child between the ages of 12 to 18 years in the household, while the user is any child aged between 12 to 18 years who attends public secondary school. For child vaccination, the eligible member is any child who is one day old to less than 5 years in the household, while the user is any child who is one day old to less than 5 years who was vaccinated in publicly provided health facilities. For prenatal and postnatal consultation, the eligible member is any pregnant and nursing mother in the household, while the user is any pregnant and nursing mother respectively, who attended publicly provided health facilities for prenatal and postnatal medical consultations.
Unfortunately, panel data are not available in the case of Nigeria as in other developing countries. The data restrictions often encountered require a technique for identifying the beneficiaries of public service expansion using only cross sectional data. Ajwad and Wodon (2007) and Lanjouw and Ravallion (1999) proposed alternative empirical methodologies that use a single cross section\(^9\). Both papers used the geographic variation in access rates across regions in a country to capture the expected evolution over time, had one region been followed over time. Thus, cross sectional variation in access rates were exploited to conduct a marginal benefit incidence analysis\(^{10}\). So in estimating the marginal benefit incidence we followed the procedure of Ajwad and Wodon (2007).

In following the steps of Ajwad and Wodon (2007), we defined \(i = 1, \ldots, N\) states, which in this case are 37 states\(^{11}\) in Nigeria. We ranked the households by expenditure per capita within each state and assign them to one of \(q = 1, \ldots, Q\) expenditure bracket intervals (these quintiles were defined at the state level). We denoted \(X_{ij}^q\), the benefit incidence of a programme or service in household \(J\) belonging to interval \(q\) of state \(i\). This benefit incidence reflects the share of the population with access to the public programme or service. The mean benefit incidence in interval \(q\) for state \(i\) is denoted by \(X_i^q\), and the overall state mean is denoted by \(\bar{X}_i\) and \(J_i^q\) is the number of households in interval \(q\) of state \(i\). The two means are respectively equal to:

\[
X_i^q = \frac{\sum_{J=1}^{J_i^q} X_{ij}^q}{J_i^q}
\]

\(^9\) The approaches differ in the manner in which the countries are ranked. Lanjouw and Ravallion (1999) classified municipalities as poor or rich according to their rank in the national distribution of income. On the other hand, Wodon and Ajwad (2007) classified municipalities according to their rank in the local (i.e., departmental) distribution of income, rather than the national-level.

\(^{10}\) Said differently, the method subsumes that different regions are in different levels of development, with poorer regions today being like the richer ones in the past.

\(^{11}\) The states are 36 states with Federal Capital Territory.
The households are ranked by expenditure interval at the state level. An obvious weakness in this ranking is that the poorest household in the richest state may be richer than the richest households in the poorest state. However, this ranking is more appropriate under decentralisation, it is also appropriate (even at national level) if welfare improvements were to be evaluated using relative as opposed to absolute deprivation (Ajwad and Wodon, 2007). We then regress the benefit incidence in each of the intervals against the state means, using Q regressions as follows:

\[
X^q_i = a^q + \beta^q \left[ \frac{\sum_{q=1}^{Q} \sum_{j=1}^{J^q_i} X^q_{ij} - \sum_{j=1}^{J^q_i} \sum_{i=1}^{J^q_i} X_{ij}}{\sum_{q=1}^{Q} J^q_i - J^q_i} \right] + \epsilon^q_i
\]

for \( q = 1, \ldots, Q \)

In the first and poorest interval (\( q = 1 \)), equation 3 yields a regression of the mean level of programme participation in the poorest households in the various states on the mean level of programme participation in the corresponding state. To avoid endogeneity, the right hand side variable was computed at the state level as the mean on all the households except those belonging to interval \( q \). We assumed that all the intervals within a given state have the same number of households (\( J^q_i = J_i \)). With \( J^q_i = J_i \) for all \( i \), then we have \( \sum_{q=1}^{Q} X^q_i = Q \bar{X}_i \), equation (3) can be simplified as follows:

---

12 That is, each household compares its level of access to public services not in absolute terms, but in terms of its relative position within a peer comparison group consisting of the other households in the same state.
\[ X_i^q = a^q + \beta^q \left( \frac{Q \bar{X}_i - X_i^q}{Q - 1} \right) + \epsilon_i^q \]  \hspace{1cm} (4)

for \( q = 1, \ldots, Q \)

We pulled all the observations from the various intervals together and estimate 4 as a single equation as follows:

\[ X_i^q = \sum_{q=1}^{Q} a^q + \sum_{q=1}^{Q} \beta^q \left( \frac{\sum_{q=1}^{Q} X_i^q - X_i^q}{Q - 1} \right) + \epsilon_i^q \]  \hspace{1cm} (5)

In equation 5, the intercepts and the slopes are allowed to differ for various intervals, this is an implicit restriction. It must be that across the various intervals, the average marginal increase in access from a unitary increase in mean access is one\(^{13}\). The restriction can be made explicit by totally differentiating

\[ \bar{X}_i^q = \frac{1}{Q} \sum_{q=1}^{Q} X_i^q \]  \hspace{1cm} (6)

So that: \[ \sum_{q=1}^{Q} \left( \frac{\beta^q}{Q - 1 + \beta^q} \right) = 1 \]  \hspace{1cm} (7)

Writing \( \beta^Q \), the parameter for the last interval \( Q \), in terms of the other parameters yields:

\[ \beta^Q = X_i^q = \frac{(Q - 1)(1 - \sum_{q=1}^{Q-1} \beta^q / (Q - 1 + \beta^q))}{\sum_{q=1}^{Q-1} \frac{\beta^q}{Q - 1 + \beta^q}} \]  \hspace{1cm} (8)

Taking into account restriction in 6, we can rewrite equation 5 as

---

\(^{13}\) The restriction is that the mean marginal benefit incidence estimates for all the categories must be equal to one.
\[
X_i^q = \sum_{q=1}^{Q} a^q + \sum_{q=1}^{Q-1} \beta^q \left( \sum_{q=1}^{Q} X_i^q - X_i^q \right) \left( Q - 1 \right) + (Q - 1) \left( 1 - \sum_{q=1}^{Q-1} \frac{\beta^q}{Q - 1 + \beta^q} \right) \left( \sum_{q=1}^{Q} X_i^q - X_i^q \right) + \epsilon_i^q
\]

(9)

Dropping the error term and rearranging the terms equation 9 yields

\[
X_i^q = \frac{a^q + \beta^q (Q / Q - 1) \bar{X}_i}{1 + \frac{\beta^q}{Q - 1}}
\]

(10)

for \( q = 1, \ldots, Q \)

Therefore, a change in program benefit incidence for the household belonging to \( q \) in response to change or increase in the aggregate incidence at the state level is given by

\[
: \frac{\partial X_i^q}{\partial \bar{X}_i} = \frac{Q \beta^q}{Q - 1 + \beta^q}
\]

(11)

for \( q = 1, \ldots, Q \)

The right side values of equation 11 \( \left( \frac{Q \beta^q}{Q - 1 + \beta^q} \right) \) are the estimates of marginal benefit incidence.

A value larger (smaller) than one implies that the corresponding group of households benefit more (less) than all the households on average from an expansion in public programs or services.

Equation 5 was estimated through non-linear least square methodology procedure.
4.0 Results and Discussion

4.1 Results and Discussion of Benefit Incidence of Public Spending in Nigeria

4.1.1 Results and Discussion of Benefit Incidence of Public Spending on Education in Nigeria.

Table 1 presents the participation rates (accessibility rates) in primary and secondary schools in Nigeria. The table reveals that about 77% and 56% of school age children were enrolled in public primary and secondary schools respectively. About 60% and 39% of school age children in the poorest quintile were enrolled in primary and secondary school respectively, while about 90% and 72% of the school age children in richest quintile were enrolled in primary and secondary school respectively as indicated in the table. The table reveals further that the school age children in the richest group benefited more than the poorest group in public education expenditure in Nigeria. It shows that school age children in poorest quintile shared about 15% and 14% of public spending on public primary and secondary school respectively, while school age children in the richest quintile of the population shared about 23% and 25% of public spending on primary and secondary school respectively.

The global averages of share of school enrolment of the children from the poorest quintile are 26% and 14% for public primary and secondary schools respectively (Shahin, 1999). This implies that disparity in accessibility to primary education between the rich and the poor in Nigeria is wider than the global average. Education for All Monitoring Report (2009) has alluded to that fact in Nigeria education system. However, the result is comparable with the findings from Sub Sahara Africa. For example, Djindil et al (2007) demonstrated that the poorest and the richest quintiles in Cote d’Ivoire shared 19% and 14% of public spending on public primary education respectively. Generally, from the available data on benefit incidence of public spending in Sub Sahara Africa, the richest quintiles benefited more than the poorest quintiles on spending on education\(^{14}\).

On regional disparity on school enrolment in Nigeria, Table 2 indicates that generally, the school age children in Southern part of the country participated more in public primary and

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\(^{14}\) Except for the case of Ghana, in Ghana, the poorest and richest quintiles shared 22% and 14% of public spending on primary education respectively.
secondary schools than the school age children in the Northern part of Nigeria. While about 93% and 73% of the school age children in South- South region participated in primary and secondary schools respectively, the same figures for North West region are about 56% and 41% respectively. There is also regional disparity in terms of benefit incidence; Table 2 reveals that South West has the largest share of public spending on public primary and secondary education, while the North East has the lowest share. The table shows that while South West shared 19% and 21% shares of public spending on primary and secondary education respectively, the North East shared 11% and 9% respectively. This regional disparity reported here has also attracted international attention (Education for All Monitoring Report, 2009).

In the case of rural-urban divide, Table 2 shows that the school age children in urban areas participated in education more than the school age children in rural areas. While 86% and 66% school age children from urban areas participated in primary and secondary schools respectively, the same figures for rural areas are 70% and 50% respectively. In terms of sharing, the urban area shared 53% and 57% of public spending on primary and secondary education respectively, while rural area shared 47% and 43% of public spending on primary and secondary education respectively. The disparity in education system in rural and urban areas in Nigeria has been noted by other scholars. Huebler (2005) noted that children in urban areas had a higher primary enrolment than children in rural areas in Nigeria. Hazans and Trapeznikora (2008) reported that rural location can be an obstacle to accessibility to secondary school education.

Table 1: Benefit Incidence of Public Spending on Primary and Secondary Education in Nigeria

<table>
<thead>
<tr>
<th>Quintile</th>
<th>Primary Education</th>
<th>Secondary Education</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Share by Participation</td>
<td>Share by Expenditure Group</td>
</tr>
<tr>
<td>Poorest</td>
<td>0.596</td>
<td>0.154</td>
</tr>
<tr>
<td>Poor</td>
<td>0.723</td>
<td>0.187</td>
</tr>
<tr>
<td>Average</td>
<td>0.789</td>
<td>0.204</td>
</tr>
<tr>
<td>Rich</td>
<td>0.854</td>
<td>0.221</td>
</tr>
<tr>
<td>Region</td>
<td>Primary Education</td>
<td>Secondary Education</td>
</tr>
<tr>
<td>-------------</td>
<td>-------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td></td>
<td>Share by Participation</td>
<td>Share by Expenditure Group</td>
</tr>
<tr>
<td></td>
<td>Share by Participation</td>
<td>Share by Expenditure Group</td>
</tr>
<tr>
<td>South South</td>
<td>0.927</td>
<td>0.191</td>
</tr>
<tr>
<td>South East</td>
<td>0.917</td>
<td>0.142</td>
</tr>
<tr>
<td>South West</td>
<td>0.913</td>
<td>0.194</td>
</tr>
<tr>
<td>North Central</td>
<td>0.843</td>
<td>0.174</td>
</tr>
<tr>
<td>North East</td>
<td>0.617</td>
<td>0.114</td>
</tr>
<tr>
<td>North West</td>
<td>0.563</td>
<td>0.185</td>
</tr>
<tr>
<td>All</td>
<td>0.773</td>
<td>1.00</td>
</tr>
<tr>
<td>Urban</td>
<td>0.855</td>
<td>0.534</td>
</tr>
<tr>
<td>Rural</td>
<td>0.696</td>
<td>0.466</td>
</tr>
<tr>
<td>All</td>
<td>0.773</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Sources: Authors’ Computation Based on NBS (2004)

Table 2: Benefit Incidence of Public Spending on Primary and Secondary Education Based on Location and Regions

4.1.2 Results and Discussion of Benefit Incidence of Public Spending on Health in Nigeria.

Generally, the participation rate of under-five year vaccination is low in Nigeria as indicated in Table 3. The table indicates that only 46% of the children that eligible for vaccination were vaccinated, while 51% of eligible children from richest quintile participated in
vaccination, 44% of eligible children from poorest quintile participated in vaccination programme. According to NBS (2004), the reasons for non-participation in vaccination programme as given by the respondents are; ignorance about the vaccination (27%), long distance to vaccination centre (20%), short supply of vaccine (7%), too costly (3%) and other reasons (41%).

The same trend of low participation is also noticed in prenatal and postnatal consultations. Table 3 reveals that only 45% and 21% of women that supposed to consult public health institution for prenatal and postnatal health care did. The reasons for low participation in prenatal consultation cannot be attributed solely to the cost of vaccination, because only 55% of them that went for prenatal consultation paid, the other reasons given by the women in the survey are that they did not know it was necessary (41%), unavailability of prenatal consultation in their area (18%), long distance to prenatal consultation centre (16%), they cannot afford it (10%) and other reasons (15%).

The low rate of vaccination, prenatal and postnatal consultations have implication for under-five, infant and maternal mortalities in Nigeria. The under-five mortality rate of 194 per 1000 births in Nigeria which is higher than the Sub Sahara Africa’s average of 183 per 1000 births, has been attributed to the decline in child vaccination in Nigeria (Alabi and Adams, 2010). FIDH (2010) reveals that healthcare facilities in Nigeria are inadequate in quality, in number, and in funding and that lack of access to prenatal and postnatal care contributes to the high maternal mortality rate in Nigeria. FIDH (2010) reveals further that Nigeria has the world second highest maternal mortality rate (1,100 per 100,000 births) after India.

The social selectivity based on income is also noticed in vaccination, prenatal and postnatal consultations. For example, the poorest quintile shares 19%, 13% and 11% of public spending on vaccination, prenatal and postnatal consultation respectively, while the shares of the richest quintile are 22%, 28% and 29% respectively. This indicated that the richest quintiles benefited more than the poorest quintiles on public spending on vaccination, prenatal and postnatal consultation. Other scholars have also reported that the richest benefited more than the poorest on public spending on health in Africa (Demery, 2000; Djindil et al, 2007)

The North South disparity can also be observed in the incidence of public spending on vaccination, prenatal and postnatal consultation in Nigeria as indicated in Table 4. The South-
East has the highest share of vaccination (23%), while the North - Central has the lowest share of vaccination (9%). However, the share of prenatal and postnatal consultations was in the favour of the North. The share of the North-West in public spending on prenatal and postnatal consultation were 21% and 25% respectively, the South-South had the lowest share of prenatal consultation (13%) and the South East had the lowest share of postnatal consultation. This may be due to the fact that health institutions where prenatal and postnatal consultation can be administered are more in the Northern part than in the Southern part of the country. NBS (2005) indicated that there are more public health care facilities in the Northern part of Nigeria, while the Southern part has more of private health care providers.

Table 4 also indicates that location effect is also significant in the incidence of public spending on vaccination in Nigeria. The table shows that the urban area shared 58%, 55% and 54% of public spending on vaccination, prenatal and postnatal cares respectively, while the shares of the rural area were 42%, 46% and 47% respectively. The reasons for these disparities may be attributed to the fact that the centres where vaccinations, prenatal and postnatal were administered were concentrated in the urban areas. For example, Ogunbekun (1992) has indicated that most of health facilities in Nigeria are located in urban areas. Ojo (1990) also supported the fact that there are inequalities in the distribution of health care resources in Nigeria, which may affect the pattern of its demand.

Table 3: Benefit Incidence of Public Spending on Vaccination, Pre and Postnatal Consultation in Nigeria

<table>
<thead>
<tr>
<th>Quintile</th>
<th>Vaccination Participation</th>
<th>Vaccination Expenditure Group</th>
<th>Prenatal Consultation Participation</th>
<th>Prenatal Consultation Expenditure Group</th>
<th>Postnatal Consultation Participation</th>
<th>Postnatal Consultation Expenditure Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poorest</td>
<td>0.439</td>
<td>0.192</td>
<td>0.281</td>
<td>0.125</td>
<td>0.118</td>
<td>0.114</td>
</tr>
<tr>
<td>Poor</td>
<td>0.450</td>
<td>0.197</td>
<td>0.358</td>
<td>0.156</td>
<td>0.167</td>
<td>0.162</td>
</tr>
<tr>
<td>Average</td>
<td>0.448</td>
<td>0.195</td>
<td>0.411</td>
<td>0.186</td>
<td>0.197</td>
<td>0.192</td>
</tr>
<tr>
<td>Rich</td>
<td>0.433</td>
<td>0.191</td>
<td>0.565</td>
<td>0.252</td>
<td>0.250</td>
<td>0.243</td>
</tr>
<tr>
<td>Richest</td>
<td>0.511</td>
<td>0.244</td>
<td>0.634</td>
<td>0.282</td>
<td>0.296</td>
<td>0.288</td>
</tr>
<tr>
<td>Region</td>
<td>Vaccination</td>
<td>Prenatal Consultation</td>
<td>Postnatal Consultation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------------</td>
<td>-------------</td>
<td>-----------------------</td>
<td>------------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Share by Participation</td>
<td>Share by Expenditure Group</td>
<td>Share by Participation</td>
<td>Share by Expenditure Group</td>
<td>Share by Participation</td>
<td>Share by Expenditure Group</td>
</tr>
<tr>
<td>South South</td>
<td>0.429</td>
<td>0.177</td>
<td>0.697</td>
<td>0.130</td>
<td>0.249</td>
<td>0.138</td>
</tr>
<tr>
<td>South East</td>
<td>0.458</td>
<td>0.230</td>
<td>0.801</td>
<td>0.143</td>
<td>0.327</td>
<td>0.130</td>
</tr>
<tr>
<td>South West</td>
<td>0.395</td>
<td>0.210</td>
<td>0.832</td>
<td>0.178</td>
<td>0.323</td>
<td>0.186</td>
</tr>
<tr>
<td>North Central</td>
<td>0.444</td>
<td>0.093</td>
<td>0.525</td>
<td>0.158</td>
<td>0.233</td>
<td>0.150</td>
</tr>
<tr>
<td>North East</td>
<td>0.448</td>
<td>0.115</td>
<td>0.411</td>
<td>0.183</td>
<td>0.160</td>
<td>0.142</td>
</tr>
<tr>
<td>North West</td>
<td>0.625</td>
<td>0.175</td>
<td>0.231</td>
<td>0.207</td>
<td>0.141</td>
<td>0.253</td>
</tr>
<tr>
<td>All</td>
<td>0.456</td>
<td>1.00</td>
<td>0.450</td>
<td>1.00</td>
<td>0.206</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Sources: Authors’ Computation Based on NBS (2004)

Table 4: Benefit Incidence of Public Spending on Vaccination, Pre and Postnatal Consultation Based on Location and Regions
4.1.3 Results and Discussion of Benefit Incidence of Public Spending on Infrastructure in Nigeria.

The result of benefit incidence of public spending on pipe borne water and electricity are presented in Table 5. The table shows that only 21% and 45% of Nigerian have ownership\(^\text{15}\) to pipe borne water and electricity respectively. The low ownership of pipe borne water can be predicated on the fact that provision of pipe borne water was not given due priority by the government of Nigeria despite its importance. This can be attested to by the fact that capital expenditure was not allocated to ministry of water resources between 2001 and 2004 in Nigeria (CBN, 2007). In fact, as from 2007, the ministry of water resources was merged with ministry of agriculture. Even at that, provision of water resources was only 0.24% of the budget of ministry of agriculture and water resources (Budget, 2007). The poor accessibility to pipe borne water exposes the poor who cannot sink the boreholes to unhygienic water sources such as unprotected well, rivers and ponds (NBS, 2005).

The general pattern of incidence of spending on the other social utilities discussed in the previous sections is also evident in the case of pipe borne water and electricity. For example, Table 5 shows that the poorest and the richest quintile shared about 14% and 29% of public spending on pipe borne water respectively in Nigeria. However, the gap in this incidence of spending is lower than what was observed in some other Sub Sahara African countries. For example, Demery (2000) demonstrated that the poorest quintile and the richest quintile shared 11% and 40% of public spending on pipe borne water respectively in Tanzania.

In the case of electricity, the richest quintile share is more than double (29%) of the share of the poorest quintile (13%). Lack of accessibility to electricity leaves the poor households with the options of generating light through kerosene and fire-woods. The health and environmental consequences of generating light from these sources have been documented by Osaghae (2009).

In terms of regional distribution of pipe borne water and electricity, Table 6 shows that North West shared 32% of the public spending on pipe borne water, while the share of the South East is only 6%. In the case of electricity, while South West shared 33% of public spending on

\(^{15}\) The data on accessibility to pipe borne water and electricity in Nigeria contain information only on ownership of these social utilities not accessibility. But we are aware that in Africa, that those that don’t own these social utilities can access them through their neighbours. So accessibility to these social utilities can be higher than their ownership but the difference is not significant (Dagdeviren and Robertson (2009).
electricity, the share of the North East is only 8% of public spending on electricity. The case of neglect of South-South region (which is the oil producing region) in the distribution of social amenities is brought to fore in this table. The shares of South-South in the incidence of public spending on pipe borne water and electricity were 9% and 13% respectively, which are lower when compared with other non-oil producing regions. This neglect has been the reason for long agitations and crises in the oil producing region in Nigeria (Omofonmwan and Odia (2009). Alabi et al (2009) indicated that lack of good quality drinking water and electricity rank higher in the felt needs of the people of the oil producing region in Nigeria.

Table 6 presents the urban and rural disparity in terms of their share in public spending on pipe borne water and electricity. The table shows that urban area shared 84% and 77% of public spending on pipe borne water and electricity respectively in Nigeria, while the share of the rural areas were 16% and 23% respectively. The urban- rural gap in the incidence of public spending in Nigeria is more pronounced in the case of water and electricity than in the cases of education and health. This apparent neglect of rural areas in terms of social amenities can account for high rate of rural–urban migration in Nigeria (Oluwasola, 2007).

Table 5: Benefit Incidence of Public Spending on Pipe Borne Water and Electricity in Nigeria

<table>
<thead>
<tr>
<th>Quin tile</th>
<th>Pipe Borne Water</th>
<th>Electricity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Share by</td>
<td>Share by</td>
</tr>
<tr>
<td></td>
<td>Participation</td>
<td>Expenditure</td>
</tr>
<tr>
<td>Poorest</td>
<td>0.143</td>
<td>0.140</td>
</tr>
<tr>
<td>Poor</td>
<td>0.167</td>
<td>0.163</td>
</tr>
<tr>
<td>Average</td>
<td>0.179</td>
<td>0.175</td>
</tr>
<tr>
<td>Rich</td>
<td>0.242</td>
<td>0.236</td>
</tr>
<tr>
<td>Richest</td>
<td>0.293</td>
<td>0.286</td>
</tr>
<tr>
<td>All</td>
<td>0.205</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Sources: Authors’ Computation Based on NBS (2004)
Table 6: Benefit Incidence of Public Spending on Pipe Borne Water and Electricity Based on Location and Regions

<table>
<thead>
<tr>
<th>Region</th>
<th>Pipe Borne Water</th>
<th>Electricity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Share by Participation</td>
<td>Share by Expenditure Group</td>
</tr>
<tr>
<td>South South</td>
<td>0.119</td>
<td>0.087</td>
</tr>
<tr>
<td>South East</td>
<td>0.093</td>
<td>0.055</td>
</tr>
<tr>
<td>South West</td>
<td>0.280</td>
<td>0.267</td>
</tr>
<tr>
<td>North Central</td>
<td>0.259</td>
<td>0.182</td>
</tr>
<tr>
<td>North East</td>
<td>0.143</td>
<td>0.093</td>
</tr>
<tr>
<td>North West</td>
<td>0.252</td>
<td>0.316</td>
</tr>
<tr>
<td>All</td>
<td>0.205</td>
<td>1.00</td>
</tr>
<tr>
<td>Urban</td>
<td>0.390</td>
<td>0.840</td>
</tr>
<tr>
<td>Rural</td>
<td>0.059</td>
<td>0.160</td>
</tr>
<tr>
<td>All</td>
<td>0.205</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Sources: Authors’ Computation Based on NBS (2004)

4.2 Results and Discussion of Progressivity of Public Spending in Nigeria

Here we supplement the Benefit Incidence Analysis with progressivity analysis. Figures 1 to Figure 7 suggest that the concentration curves of all the social utilities considered in this study lie above the Lorenz curve but below the diagonal, this indicates that the public spending on them is relatively progressive. This implies that the social utilities are more evenly distributed than the expenditure (income). This fact is established in Table 7, where the Gini coefficients are greater than the Concentration Indices of participation in all the social
utilities considered (the differences between these Gini Coefficients and Concentration Indices of the benefits are also significant). However, since the concentration curves for participation in them do not lie above the diagonal, it shows that spending is not progressive in absolute term. This indicates that they are not well targeted at the poor or that the spending on them is not pro-poor. In other word, the public spending on these social utilities in Nigeria can be said to be progressive in relative terms but regressive in absolute terms. This reinforces the findings of benefit incidence reported in Tables 1, 3 and 5 (The tables show that the poorest quintile shares less than 20% of spending in all the social utilities considered in this study). The fact that the spending is regressive in absolute terms implies that the poorest 20% get less than 20% of the benefit of public spending in all the social utilities considered in this study.

However, Table 7 shows that spending on primary school (Concentration Index=0.08) is more progressive than the spending on secondary school (Concentration Index=0.12). Similarly, spending on child vaccination (Concentration Index=0.02) is more progressive than spending on prenatal (Concentration Index=0.17) and postnatal consultation (Concentration Index=0.18). Likewise spending on pipe borne water (Concentration Index=0.26) is more progressive than spending on electricity (Concentration Index=0.28).
Fig 1: Progressivity of Primary Schooling in Nigeria

Fig 2: Progressivity of Secondary Schooling in Nigeria
Fig 3: Progressivity of Vaccination in Nigeria

Fig 4: Progressivity of Prenatal Consultation in Nigeria
Fig 5: Progressivity of Postnatal Consultation in Nigeria

Fig 6: Progressivity of Ownership of Pipeborn Water in Nigeria
Table 7: Gini and Concentration Indices for Education, Health and Infrastructure in Nigeria

<table>
<thead>
<tr>
<th>Social Utilities</th>
<th>Gini Coefficient</th>
<th>Concentration Index</th>
<th>Difference</th>
<th>T-ratio</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary School</td>
<td>0.431</td>
<td>0.081</td>
<td>-0.350</td>
<td>-10.379*</td>
<td>Relatively Progressive</td>
</tr>
<tr>
<td>Secondary School</td>
<td>0.411</td>
<td>0.117</td>
<td>-0.294</td>
<td>-15.395*</td>
<td>Relatively Progressive</td>
</tr>
<tr>
<td>Vaccination</td>
<td>0.409</td>
<td>0.021</td>
<td>-0.388</td>
<td>-9.367*</td>
<td>Relatively Progressive</td>
</tr>
<tr>
<td>Prenatal Consultation</td>
<td>0.378</td>
<td>0.170</td>
<td>-0.208</td>
<td>-11.382*</td>
<td>Relatively Progressive</td>
</tr>
<tr>
<td>Postnatal Consultation</td>
<td>0.391</td>
<td>0.179</td>
<td>-0.212</td>
<td>-10.943*</td>
<td>Relatively Progressive</td>
</tr>
<tr>
<td>Pipe-borne Water</td>
<td>0.422</td>
<td>0.261</td>
<td>-0.161</td>
<td>-8.945*</td>
<td>Relatively Progressive</td>
</tr>
<tr>
<td>Electricity</td>
<td>0.422</td>
<td>0.283</td>
<td>-0.138</td>
<td>-11.592*</td>
<td>Relatively Progressive</td>
</tr>
</tbody>
</table>

Source: Authors’ Computation Based on NBS (2004)
* It implies that the difference between the Concentration index and Gini coefficient is significant at the 5% level of significance.

4.3 Results and Discussion of Marginal Benefit Incidence of Public Spending in Nigeria

The result of marginal benefit incidence analysis presented in Table 8 suggests that any commitment that result in 1% expansion in primary school enrolment, secondary school enrolment, child vaccination, prenatal consultation, postnatal consultation, ownership of pipe borne water and electricity will lead to about 1.16%, 1.04%, 1.10%, 1.16%, 0.92%, 0.78%, and 1.00% increase in primary school enrolment, secondary school enrolment, child vaccination, prenatal consultation, postnatal consultation, ownership of water and electricity among the poorest income group respectively. The same values for the richest income group are about 0.84%, 0.79%, 0.87%, 0.71%, 0.74%, 1.18 % and 0.88% for primary school enrolment, secondary school enrolment, child vaccination, prenatal consultation, postnatal consultation, ownership of water and electricity respectively. This table implies that the poorest group will benefit more than the richest group in expansion of primary school, secondary school, child vaccination, prenatal consultation and ownership of electricity, while the richest income group will benefit more than the poorest income group in the expansion of pipe-borne water in Nigeria. The poor and average income group will benefit more than the other income groups in the expansion of postnatal health care provisions.

The fact that the children from poorest income group will benefit more than the children from the richest income group in the expansion of public primary and secondary schools can be envisaged because many of the children from the poorest group attend public primary and secondary schools, whereas most of the children from the richest groups attend private primary and secondary schools. Generally, public primary school education is tuition free and public secondary schools are also subsidized in Nigeria; this will allow the children from the poorest group to access them if there is expansion. While the school age children from the richest quintile may continue in their private secondary schools even if there is expansion of public primary and secondary schools, the middle income earners may decide to make use of the expanded primary and secondary education opportunities, hence, they may benefit more than the richest income group in the expansion of primary and secondary school education in Nigeria.
That may explain the reason for higher marginal benefit incidence of spending on primary school for the poor income group (1.0333) and average income group (1.0224) than the richest income group (0.8391) in Nigeria.

The fact that expansion in child vaccination programme will benefit the poorest income group more than the richest income group may be due to the fact that the poorest income households tend to have more children more children than the richest income group, hence they may need this service more than the richest income group. The positive effect of UNICEF vaccination campaign in Nigeria may also explain the chances that the children from the poorest household are vaccinated. The campaign is being done in such a manner that the vaccinators target places where the children from the poorest income groups can be found such as public schools and religious places of worship.

Table 8 reveals that the poorest group will benefit more than the richest in the expansion of prenatal consultation, while the middle income group will benefit more in the case of postnatal consultations. Adekolu-John (1989) demonstrated that postnatal care was not a priority to the nursing mothers (majority who are illiterate and poor) in Nigeria and not a priority even to the health care providers. This may explain the fact that even if there is expansion in the provision of postnatal cares the poorest group will not benefit as much as the middle income group in the expansion as the poorest group may not consider postnatal health care as a necessity at least after safe child delivery.

Table 8 indicates also that the richest group will benefit more that the poorest group if government decides to expand pipe borne water supply. This may be due to the fact that pipe borne water’s distribution is not in the favour of the poor in Nigeria. Table 6 demonstrates that 84% of pipe borne water ownership is in urban area, while only 16% of people in rural areas have pipe borne water. If this distribution that is biased against the rural area, where majority of the poor reside is not corrected, general expansion of pipe borne water may not be in the favour of the poorest income group.

The fact that expansion on electricity in Nigeria will benefit the poorest group more than the richest group in Nigeria can be predicated on the fact that majority of the richest income groups have alternative private electricity generators at home, while the poorest income groups

\[16\] In some health care centres prenatal consultation is free of charge, whereas postnatal consultation is not.
that have not access to electricity before can make use of the opportunity the expansion of electricity may provide for lighting and other activities.

The general observation about the marginal benefit incidence in Nigeria as presented in Table 8 is that the marginal benefit incidence is higher for the poorest income group in the social utilities in which the poorest income group has a high participation rates (This is the case for primary school, secondary school, child vaccination, prenatal consultation and ownership of electricity), and the marginal benefit incidence is low for the poorest income group in the social utilities in which the poorest income group has low participation rates (This the case for postnatal consultation and ownership of pipe borne water). The poorest income participation rates in primary school, secondary school, child vaccination, prenatal consultation and ownership of electricity are 60%, 39%, 44%, 28% and 30% respectively, while the participation rates by the poorest income group in postnatal consultation and ownership of pipe borne water are 12% and 14% respectively as indicated in Table 8. So, initial accessibility rate to social utility by the poor may determine whether the poor will benefit more or less from the expansion of that social utility. This finding is in consonance with result of marginal benefit incidence estimated by Ajwad and Wodon (2003; 2007). They indicated that although there are important differences between marginal benefit incidence for different types of services, and that in many cases marginal benefit incidence tends to be more pro-poor than benefit incidence, especially once the non-poor already have high levels of access. By contrast, when access rates are relatively low, they suggested that special efforts may be needed to ensure that the poor benefit from future increases in access.
Table 8: Marginal Benefit Incidence of Public Spending in Nigeria

<table>
<thead>
<tr>
<th>Social Utilities</th>
<th>Poorest</th>
<th>Poor</th>
<th>Average</th>
<th>Rich</th>
<th>Richest</th>
<th>Participation Rate by the Poorest Quintile (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary School</td>
<td>1.1586</td>
<td>1.0333</td>
<td>1.0224</td>
<td>0.9466</td>
<td>0.8391</td>
<td>60</td>
</tr>
<tr>
<td>Secondary School</td>
<td>1.0394</td>
<td>1.0164</td>
<td>1.0986</td>
<td>1.0532</td>
<td>0.7924</td>
<td>39</td>
</tr>
<tr>
<td>Vaccination</td>
<td>1.0963</td>
<td>0.9267</td>
<td>1.3890</td>
<td>0.7148</td>
<td>0.8732</td>
<td>44</td>
</tr>
<tr>
<td>Prenatal Consultation</td>
<td>1.1633</td>
<td>1.1003</td>
<td>1.0280</td>
<td>0.9996</td>
<td>0.7088</td>
<td>28</td>
</tr>
<tr>
<td>Postnatal Consultation</td>
<td>0.9179</td>
<td>1.2438</td>
<td>1.1693</td>
<td>0.9256</td>
<td>0.7433</td>
<td>12</td>
</tr>
<tr>
<td>Pipe-borne Water</td>
<td>0.7759</td>
<td>0.7814</td>
<td>0.9624</td>
<td>1.3053</td>
<td>1.1751</td>
<td>14</td>
</tr>
<tr>
<td>Electricity</td>
<td>1.0047</td>
<td>0.9834</td>
<td>1.1243</td>
<td>1.0083</td>
<td>0.8784</td>
<td>30</td>
</tr>
</tbody>
</table>

Source: Authors’ Computation Based on NBS (2004)

5.0 Conclusion and Policy Recommendations

Generally, the spending on social utilities in Nigeria is relatively progressive (the distribution of the social utilities are more evenly distributed than the income) but not pro-poor. There is marked disparity between accessibility to these services in the rural and urban areas, with urban area having more than 50 percent of the share of the spending on the social utilities considered in this study. There are also regional inequalities in the share of these social utilities. South has more share of the spending on primary, secondary schools and vaccination than the North, while the North has more share of the spending on prenatal, postnatal consultation, water and electricity than the South.

Marginal benefit of incidence of spending on social utilities in Nigeria indicates that the poorest group will benefit more on the social utility in which their current participation (accessibility) rate is high. This is the case for primary school enrolment, secondary school enrolment, child vaccination, prenatal consultation and ownership of electricity.
From this study, we can make some recommendations. Generally, there is a need for pro-poor policies in order to accelerate the speed at which the poor benefit more from increases in access to social utilities in Nigeria. The pro-poorness demands that equity should be at the centre of financing strategies in order to reach the disadvantaged groups in Nigeria. This can be done in Nigeria by spending more in rural areas in order to expand accessibilities to these social services. The regional disparities can be bridged by increasing expansion to educational opportunities and vaccination programmes in the Northern part of Nigeria, while more resources are devoted to expand accessibility to prenatal, postnatal consultations and infrastructure in the South. It may also be necessary to de-emerge ministry of water resources from ministry of agriculture and water resources in order to enhance the performance of ministry of water resources. Apart from provision of vaccines and health care facilities to the most needed areas such as rural areas, it is necessary to educate the populace on the importance of vaccination and postnatal care to safeguard against infant and maternal mortality in which Nigeria is reported to be the second highest in the World. The current National Health Insurance Scheme (NHIS) should be designed to make provision for prenatal and postnatal consultations.

The recent increase in electricity tariff rates in Nigeria by 10% may harm further the accessibility to electricity especially in the rural areas where the accessibility is already low. Concessionary electricity tariff rates can be designed for the rural dwellers so that they can make use of this service.

Finally, we recommend that the scope of this study can be enlarged by incorporating behavioural responses in the analysis of the marginal benefit incidence. This may necessitate the use of panel that which may be used when they are available. This study can be extended further by estimating marginal benefit incidence of public spending on some other publicly provided goods such as road, telephone etc.
References


Ajwad, M.I and Q. Wodon (2003). Who benefits from increased access to public services at the local level? A marginal benefit incidence analysis for education and basic infrastructure. Munich Personal RePEc Archive (MPRA) No 12309. Available at http://mpra.ub.uni-muenchen.de/12309.


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