



UNIVERSITY OF LEEDS

This is a repository copy of *Socio-economic inequalities in access to maternal and child healthcare in Nigeria: changes over time and decomposition analysis*.

White Rose Research Online URL for this paper:  
<http://eprints.whiterose.ac.uk/116817/>

Version: Accepted Version

---

**Article:**

Adeyanju, O, Tubeuf, S [orcid.org/0000-0001-9001-1157](https://orcid.org/0000-0001-9001-1157) and Ensor, T [orcid.org/0000-0003-0279-9576](https://orcid.org/0000-0003-0279-9576) (2017) Socio-economic inequalities in access to maternal and child healthcare in Nigeria: changes over time and decomposition analysis. *Health Policy and Planning*, 32 (8). pp. 1111-1118. ISSN 0268-1080

<https://doi.org/10.1093/heapol/czx049>

---

(c) 2017, Oxford University Press. This is an author produced version of a paper published in *Health Policy and Planning* . Uploaded in accordance with the publisher's self-archiving policy.

**Reuse**

Items deposited in White Rose Research Online are protected by copyright, with all rights reserved unless indicated otherwise. They may be downloaded and/or printed for private study, or other acts as permitted by national copyright laws. The publisher or other rights holders may allow further reproduction and re-use of the full text version. This is indicated by the licence information on the White Rose Research Online record for the item.

**Takedown**

If you consider content in White Rose Research Online to be in breach of UK law, please notify us by emailing [eprints@whiterose.ac.uk](mailto:eprints@whiterose.ac.uk) including the URL of the record and the reason for the withdrawal request.



[eprints@whiterose.ac.uk](mailto:eprints@whiterose.ac.uk)  
<https://eprints.whiterose.ac.uk/>

# **Socio-economic inequalities in access to maternal and child healthcare in Nigeria: changes over time and decomposition analysis**

Oludamilola Adeyanju\* Sandy Tubeuf and Tim Ensor

Academic Unit of Health Economics, Leeds Institute of Health Sciences, University of Leeds, Room 10.38, Worsley Building, Leeds LS2 9NL, UK

\*Corresponding author. Leeds Institute of Health Sciences, University of Leeds, Room 10.38, Worsley Building, Leeds LS2 9NL, UK. E-mail: umoaa@leeds.ac.uk

## **Abstract**

This paper examines socio-economic inequalities in maternal and child health care in Nigeria over an 18-year period. Studies demonstrate that maternal and child mortality is much higher amongst the poor in low income countries, with access to health care concentrated among the wealthiest. Evidence suggests that in Nigeria inequalities in access to quality services continue to persist. We use data from two rounds of the Nigerian Demographic and Health Survey (NDHS) conducted in 1990 and 2008 and measure inequalities in maternal and child health care variables across socio-economic status using concentration curves and indices. Factors contributing to the inequalities are investigated using decomposition analysis. The results show that in 1990, maternal access to skilled assistance during delivery had the highest levels of inequalities. It reveals that child and maternal health inequalities appear to be determined by different factors and while inequalities in child care have declined, inequalities in maternal care have increased. We discuss the findings in relation to the much greater attention paid to child health programmes. The findings of this study call for specific maternal programmes targeting the poor, less educated and rural areas in Nigeria.

## **Introduction**

Evidence from Sub-Saharan African (SSA) countries has revealed that health outcomes and access to key health services are unevenly distributed across different social groups of the population and that women and children from socio-economically disadvantaged homes have higher morbidity and mortality rates and a lower coverage of health services than those from wealthier homes (Eshetu and Woldesenbet. 2011; Zere et al. 2011; Houweling and Kunst.

2010; Barros et al. 2012). Poverty and access to health care services are major development problems in Africa. Health has a strong influence on people's earning capacity and productivity; it affects educational performance, determines employment prospects and is fundamental to people's ability to enjoy and appreciate all other aspects of life. The Nigerian Government has reorganised primary health care so that it is now provided at various levels of the community for both the mother and the child. Expectant and nursing mothers are given health education at health centres and clinics. Except in extreme emergency cases, many child deliveries now take place in clinics, maternity and health centres (Okunola, 2002). Research in Nigeria has shown that in spite of efforts to reform the health sector and improve the health status of the population, inequalities in health and health care have increased within regions (Timothy et al. 2014; Menizibeya, 2011).

Currently, a high proportion of women have barriers to accessing health care in Nigeria. For example, the report by the National Population Commission (NPC and ICF) in 2009 showed that around 56% of Nigerian women had some financial barriers to accessing health care while 33% had a physical barrier. At 157 per 1,000 live births childhood mortality remains a major public health challenge in the country (NPC and ICF, 2009). While some studies have been conducted to understand factors driving maternal and childhood mortality (Harttgen et al, 2006; Schell et al., 2007; Wang 2003) evidence is sparse on the impact of inequalities in access to health care on maternal and child health outcomes. Available evidence indicates wide variations in access of the services by maternal education and household economic resources (Babalola and Fatusi, 2009; Gabrysch and Campbell, 2009). Among other factors, unequal opportunities in access to health care services and socioeconomic differences continue to remain significant barriers to women using maternal health care services in various subgroups in Nigeria (Bankole et al., 2009; Mojekwu & Ibekwe, 2012). In this context, health service research is necessary in order to understand and monitor socioeconomic inequalities in various

aspects of health. A report from the Nigerian Association of Health Service Managers and Consultants (NAHSMAC) in 2011 indicated the scarcity of qualified researchers, lack of career and educational opportunities in health services as the main contributors to the inadequate attention in this field (Eboh, 2012); this is reflected in the presence of only a handful of articles discussing and investigating inequalities in access to maternal and child health care. This study is the first to analyse the trends in socioeconomic inequalities in the access to maternal and child health care over time in Nigeria. This is also the first study to decompose the inequalities in access to maternal and child health care in Nigeria into determining factors.

This paper aims to answer the following questions: (i) how have inequalities in maternal and child health care access in Nigeria changed between 1990 and 2008? (ii) what explains inequalities in access to maternal and child health care in 1990 and 2008 in Nigeria?

## **Methods**

### Data

Data come from two rounds of the NDHS in 1990 and 2008. These surveys are nationally representative, with sample sizes of 8,999 and 33,385 households respectively. The surveys were conducted by the Federal Office of Statistics with the aim of gathering reliable information on fertility, family planning, infant and child mortality, maternal care, vaccination status, breastfeeding, and nutrition. The data intend to provide programme managers and policymakers with detailed information including levels and trends in fertility; marital status; sexual activity; fertility preferences; awareness and use of family planning methods; infants and young children feeding practices, early childhood mortality and maternal mortality; maternal and child health; and awareness and behaviour regarding HIV/AIDS and other sexually transmitted infections. Additionally, the 2008 NDHS collected information on malaria prevention and treatment, neglected tropical diseases, domestic violence, fistulae, and female

genital cutting. Information was gathered from respondents through face-to-face interviews, including socio-economic status and health service utilisation and spending on health. Although there were differences in the variables collected each year, the basic structure of the sampling and some core variables were the same. Therefore, it was possible to compare variables across years.

### Outcome variables

We consider as outcome measures, five variables that appeared to us as basic care and therefore would be expected to be equally accessible to women and children in Nigeria, including antenatal care, skilled birth attendance, vaccination, diarrhoea and fever/cough treatments. Skilled antenatal care is defined as a binary variable taking the value 1 when women reported that they have had antenatal care from a doctor, nurse, or midwife and 0 otherwise. Skilled birth attendance is defined as a binary variable taking the value 1 when women reported a doctor, nurse, or midwife assisted them during delivery and 0 otherwise. Vaccination coverage is defined as a binary variable taking the value 1 when children under 2 years had received all the three of the following vaccines: three doses of Diphtheria, Pertussis and Tetanus (DPT), three doses of polio, Bacillus Calmette–Guérin (BCG) and measles at the time of the survey. Treatment for diarrhoea is defined as a binary variable taking the value 1 when children reporting symptoms in the past two weeks who had received treatment from a doctor, nurse or pharmacist. Finally, treatment of fever or cough is defined as a binary variable taking the value 1 when children reporting symptoms in the past two weeks had received treatment from a doctor, nurse or pharmacist.

### Regressor variables

It is well established that socioeconomic factors such as lower levels of household wealth and mother's level of education are key determinants of inequalities in maternal and child health

care (Novignon et al, 2015; World Health Organization, 2011; Tanja and Anton, 2009; Abuya et al., 2012). Religion, region and type of place of residence (urban and rural) have also been shown by several studies to be correlated with inequalities in health care and so are included in the analysis (Karlsen et al., 2011; Osazuwa-Peters, 2011).

The vector of control variables includes the place of residence (urban versus rural), regions (North-east, North-west, South-east, and South-west), education (No education, Primary, Secondary and Higher), religions (Christians versus Muslim) and wealth index (poorest, poorer, middle, richer, richest). We use household wealth index as a proxy for household's economic status. The wealth index is directly available in the data and constructed with economic proxies, such as housing quality, household amenities, consumer durables and size of land holding (National Population Commission, 2009). For the decomposition analysis, we also included age as a continuous variable and literacy (can read and write versus cannot read nor write).

### Inequality analysis

In this study, we analyse the trends in selected maternal and child health care outcomes and we also estimate and measure inequalities using concentration indices (CCI) and concentration curves (CC). The CCI, defined with reference to the concentration curve plots cumulative percentage of the population ranked by wealth starting with the most disadvantaged group on the x-axis against the cumulative proportion of the healthcare variable under study (e.g. access to skilled assistance during delivery) on the y-axis. In such a case, when all the population, irrespective of their economic status  $x$ , have exactly the same health outcome  $h$ , the concentration curve will be a 45-degree line (line of equality), running from the bottom left-hand corner to the top right-hand corner. If  $h$  takes higher values among poorer people, the concentration curve will lie above the line of equality. The opposite is true if  $h$  takes a lower value. A greater distance of the curve from the line of equality implies higher economic

inequality in  $h$ . The CCI is a measure of this inequality; it is defined as twice the area between the concentration curve and the line of equality (O'Donnell et al 2008). The value of the CCI varies between -1 and +1. Its value is negative when the concentration curve is above the diagonal and positive when the curve is below the diagonal. If there is no inequality (the concentration curve coinciding with the line of equality), the value of the CCI is zero. A negative value implies that the outcome studied is concentrated among the poor, whereas a positive value indicates the opposite condition. A value of 0 implies that the outcome is equally distributed across the socioeconomic groups. For computation, a more convenient formula for the concentration index defines it in terms of the covariance between the healthcare variable and the fractional rank in the socioeconomic distribution.

*Equation 1:* 
$$CCI = \frac{2}{\mu} cov(h, r)$$

Where  $h$  is the healthcare outcome of interest,  $\mu$  is the mean of  $h$  and  $r$  is the fractional rank of an individual in the wealth distribution.

Concentration curves are a graphical illustration for identifying whether there are socioeconomic inequalities in healthcare variables and whether it is more pronounced at one point in time than another or in one country than another. They do not, however, quantify the magnitude of those inequalities nor its determinants. The determinants of inequality can be examined through a decomposition analysis of the concentration index. Wagstaff et al (2003) showed that the concentration index of a healthcare variable could be decomposed into the sum of the contributions of the various determinants of that variable, together with an unexplained residual component. In this case, let us consider that the outcome variable of individual  $i$  is defined according to  $k$  regressors, such as  $k = (1, \dots, K)$ .

*Equation 2:* 
$$h_i = \alpha + \sum_k \beta_k X_{ki} + \varepsilon_i$$

Where  $i$  is the  $i^{\text{th}}$  individual,  $\beta_k$  denotes the coefficients attached to the  $K$  regressors and  $\varepsilon_i$  is an error term (interpersonal variations in  $h$  are thus assumed to derive from systematic variations across socioeconomic groups in the determinants of  $h$  i.e. the  $X_{ki}$ ). Given the relationship between  $h_i$  and  $X_{ki}$  in *Equation 2*, the concentration index for  $h$  can be written as:

*Equation 3:*

$$CCI = \sum_k \left( \frac{\beta_k \bar{x}_k}{\mu} \right) C_k + \frac{GC_\varepsilon}{\mu}$$

Where  $\bar{x}_k$  is the mean of  $X_k$ ,  $C_k$  is the CCI for  $X_k$  (defined exactly like CI) and the term  $GC_\varepsilon$  is the generalized CCI related to the residual  $\varepsilon_i$ . This equation is made up of two components: a deterministic or explained component and an unexplained component. The first component is the product of the elasticity and CCI of each  $k$  regressor. The elasticity  $\left( \frac{\beta_k \bar{x}_k}{\mu} \right)$  indicates the impact of each  $k$  determinant on the healthcare outcome, i.e. how much change in the health dependent variable is associated with one unit of change in the explanatory  $k$  variable. The CCI indicates the extent of unequal distribution of the  $k$  determinant across the socioeconomic distribution. The second component, the unexplained portion, is the part of the inequality that cannot be explained by systematic variation in  $k$  regressors across the socioeconomic distribution.

In our analysis, we consider several binary dependent variables and the decomposition relies on a linear probability model where we use wealth to rank individuals. The vector of explanatory factors is composed of appropriate factors to specify the healthcare outcome including region, education, religion and type of place of residence as well as age and literacy. The analysis was carried out in STATA 13.0.



## **Results**

### Trends

We observe a change in population to north east and away from the south-west. The population remains religious and can be seen to be quite evenly split between Christian (42% in 1990) and Muslim (53%) at both time points although there it seems that the latter is larger overall this may be as a result of the increasing birth rates in the Muslim groups. We also observe that the population is still largely rural (75% in 1990 and 64% in 2008) but we see an increase in the population in the urban. We expect this as Nigeria's population has become increasingly urbanised. These trends in urbanization in Nigeria may reflect a shift from agriculture and a flight from conflict affected areas by terrorists and violence. We also observe some major differences in the wealth quintile groups from 1990 to 2008. We observe that in 1990, the wealth index showed that almost 29% of the women surveyed were in the highest wealth quintile group while women in the lowest wealth group represented almost 19% of the population surveyed. While in 2008, the reverse seems to be the case with women in the lowest wealth quintile group representing around 27% of the women survey and approximately 13% were in the highest wealth group because the quintiles are computed for households and because households are larger for the poor the percentage of the population in the poorest is larger and has increased over time. (See Table)

**Table: Characteristics of surveyed respondents**

Characteristics	Groups	1990 (%)	2008 (%)
Region	North-East	24.8	40.0
	North- West	23.9	27.7
	South-East	25.4	20.0
	South-West	25.9	11.6
Religion	Christian	42.6	41.2
	Muslim	53.0	56.7
	Other	4.4	2.1
Education	No education	57.2	50.3
	Primary	26.2	22.9
	Secondary	13.5	22.1
	Tertiary	1.5	4.7
Literacy	Cannot read	77.1	70.0
	Reads easily	22.9	30.0
Age	15-30	68.3	63.6
	31-49	31.7	36.4
Place of residence	Urban	24.9	35.7
	Rural	75.1	64.3
Wealth Index	Poorest	18.4	26.5
	Poorer	18.7	24.0
	Middle	14.6	19.6
	Richer	19.3	16.6
	Richest	28.9	13.3
Total		8999	33385

*Maternal Health Care*

In 1990, 57.5 % (95% Confidence Interval (CI) 0.565-0.585) of respondents were found to have used trained health care personnel for their antenatal care; 36.1 % with a doctor, 20.1% with a nurse/midwife and 1.2% with an auxiliary midwife. The proportion in 2008 was almost identical at 57.9% (95(%) CI 0.574-0.585). The rest of the respondents in both years had received antenatal care from untrained or unqualified birth attendants and a large percentage 34.8% (95% CI 0.340-0.358) in 1990 and 36.4% (95% CI 0.362-0.369) in 2008 received no of

antenatal care. An increase in use of skilled attendance during delivery was observed. In 1990, 32.2% (95% CI 0.312-0.331) of respondents were found to have used a type of skilled assistance during delivery which increased to 39.5% (95% CI 0.389-0.401) in 2008. Remaining respondents in both years either received assistance during delivery from untrained or unqualified birth attendants or received no form of skilled assistance.

### *Child Health Care*

Child health care exhibits rather more improvement in use of services. In 1990, only 26.9% (95% CI 0.259-0.278) of children of surveyed women received any medical treatment for diarrhoea. This increased to 48.1% (95% CI 0.475-0.487) in 2008. Similarly, in 1990, 37.0% (95% CI 0.359-0.379) of the children of women surveyed received any form of medical treatment for fever or cough increasing to 61.6% (95% CI 0.610-0.622) in 2008. Vaccination coverage increased from 41.0% (95% CI 0.394-0.412) in 1990 to 61.0% (95% CI 0.601-0.628) in 2008.

### Inequality Measurements

Concentration curves show that for both years the five health variables services are used disproportionately more by wealthier women and children than by their poorer counterparts. While the inequality in use has fallen substantially for the three child health care variables between the two years, inequality has increased for the two maternal health care variables. Graphs are provided in the supplementary appendix.

### *Inequalities in Maternal Health Care*

Concentration curves for antenatal care show that there were inequalities in both years. Inequalities in access to skilled antenatal care were concentrated among the wealthier group with both years' curves lying below the line of equality and inequalities increased over time with a CCI of 0.24 (95% CI 0.235-0.251) in 1990 and 0.26 (95% CI 0.256-0.272). Similarly,

inequalities in skilled birth attendance increased between 1990 and 2008. Pro-rich inequalities were also found among women who received skilled assistance during delivery (Supplementary appendix figure 1) and corresponding CCIs increased over time from 0.31 (95% CI 0.305-0.348) in 1990 to 0.43 (95% CI 0.425-0.445) in 2008.

### *Inequalities in Child Health Care*

Results showed a decrease in inequalities in the three child health care outcomes. The most important reduction was observed in inequalities in immunization coverage that reduced from CCI= 0.24 (95% CI 0.236-0.249) in 1990 to CCI= 0.11 (95% CI 0.106-0.124) in 2008. The level of inequalities in 2008 was very low as demonstrated by the concentration curve in 2008 being close to the line of equality. Inequalities in access to medically treated diarrhoea also decreased between 1990 (CCI=0.17; 95% CI 0.106-0.120) and 2008 (CCI=0.07; 95% CI 0.066-0.081) (Supplementary appendix figure 2). Similarly, inequalities in access to medically treated fever and cough were higher in 1990 (CCI=0.20; 95% CI 0.196-0.214) than in 2008 (CCI=0.09; 95% CI 0.088-0.099).

### Inequalities by region

Presuming there could be substantial differences between the richer south and poorer north, we analysed the inequalities between regions for skilled attendance and vaccination since both have changed between 1990 and 2008.

In the south, inequalities in skilled attendance during delivery grew between 1990 (CCI= 0.148; 95% CI 0.146-0.154) and 2008 (CCI= 0.197; 95% CI 0.189-0.201) to become more pro-rich (Supplementary appendix figure 3). A similar pattern is evident in the north where the use of services also became more pro-rich but from a much more unequal base than in the south; the concentration index increased from 0.41 in 1990 (95% CI 0.401-0.426) to 0.47 in 2008 (95% CI 0.465-0.487) (Supplementary appendix figure 4).

In the case of vaccination, inequalities fell in the south (Supplementary appendix figure 5); the concentration index fell from CCI=0.216 (SE=0.017) to CCI=0.0189 (SE=0.008), leading to a distribution of vaccination that is almost proportional. Inequalities also fell in the north from a CCI 0.236 (95% CI 0.230-0.239) in 1990 to CCI=0.196 (95% CI 0.189-0.198) in 2008 but substantial inequalities clearly remain (Supplementary appendix figure 6).

### Decomposition Analysis

We undertook a decomposition of inequalities for one maternal and one child outcome. We choose skilled assistance during delivery because inequalities substantially increased between 1990 and 2008. For children's health we choose vaccination because inequalities substantially reduced from 1990 to 2008.

#### *Decomposition of inequalities in skilled assistance during delivery in 1990 and 2008*

The decomposition of inequalities in 1990 revealed that women were less likely to have received skilled assistance during delivery if they had no education, were poor and lived in northern Nigeria and were Muslim. Results from 2008 showed inequalities increased in most of the factors. The main contributors were being poor, being illiterate or having no education as well as living in Northern and rural Nigeria. (Figure 7). Pro-poor inequalities were observed in women living in the south-western region of Nigeria in this year.

#### *Decomposition of inequalities in vaccination in 1990 and 2008*

In 1990, the main contributors to inequalities in vaccination were living in a rural area and Northern Nigeria, being Muslim, having no education or being illiterate, and being poor. However, in 2008 we firstly observe a reduction in many of the factor that contributed to inequalities in 1990 with the exception of the contribution of education that can be seen to increase over time (Figure 8).

## **Discussion**

In this study, we have examined the trends and patterns of socioeconomic inequalities in maternal and child health care variables in Nigeria between 1990 and 2008 using the Nigerian data from the DHS. Our results have shown inequalities in access to maternal and child health care and these inequalities have changed overtime. We observed an increase in inequalities in access to care for the two maternal health variables while we found a decrease in inequalities in access to care for children over time. Our findings highlight the important role played by socioeconomic characteristics for the access to maternal and child health care services by trained providers. In the case of child health, we observed a reduction in inequalities in access to the treatment of diarrhoea and fever/cough for children aged five and under. These inequalities were seen to favour children from non-poor families by providing them with more access to these services than the poor with greater need in 1990 and those inequalities fell in 2008. In particular access to under-five child vaccination against diseases such as polio, DPT, measles saw a large positive change between 1990 and 2008 with a substantial reduction in the magnitude of inequality and a concentration curve almost coinciding with the line of equality.

Although we cannot definitively identify the reasons for the reduction in child health service inequalities, a number of factors are likely to be important. A number of awareness raising and health policies and interventions have been introduced since the late 1990s in Nigeria which are likely to have improved access to child health care services. The global initiatives that have been adopted and implemented include for example targeted interventions on the elimination of Iodine Deficiency Disorders (IDD), Vitamin A deficiency (VAD) control as well as initiatives such as the Baby-Friendly Hospital Initiative (BFHI), the Integrated Management of Childhood Illness (IMCI) (WHO, 2009), the Roll Back Malaria (RBM) Initiative, and the Expanded Programme on Immunization (EPI) (WHO, 2009; The World Health Report ,1999; USAID, 2002; WHO, 2001; Oku et al, 2016), the latter having a special emphasis on the

eradication of poliomyelitis. Many of the activities in these areas have focused on basic knowledge of child health, nutrition, environmental sanitation, and child health-related issues (USAID, 2002; WHO, 2001), and have therefore improved formal and non-formal education. Progress has also been made in increasing the awareness by the public of the benefits of child survival interventions, such as routine immunisation, adequate infant and childhood nutrition (especially exclusive breastfeeding), use of Insecticide Treated Nets (ITNs) (Oresanya et al 2009), appropriate home childcare methods, and adequate environmental sanitation. The Nigerian government has also received the support of partners such as UNICEF, WHO, and USAID in developing these messages as well as disseminating them through posters, pamphlets, radio, and television dramas to increase the knowledge of the populace. There has also been a concerted effort at all levels, and especially by the National Primary Health Care Development Agency (NPHCDA), to ensure community participation in implementing primary health care activities for children and women (USAID, 2002; WHO, 2001; Oku et al, 2016).

We also observe inequalities in maternal health care access. We particularly observe some that literacy related inequality in skilled birth attendance increased while education related inequality declined over-time. We believe that these differences are observed because the education and literacy variable are slightly different variables as such we expect a slightly different relationship with our outcomes of interest, while the literacy variable represents the women who can read easily and those who cannot read at all, the education variable represents the different levels of education. The levels of literacy and education is also different across the two groups and over time (see table 1). It may also be worth noting that in Nigeria, many secondary school graduates cannot read or write due to the quality of education they have or in this case have not received. So, in this case it may report an increase contribution of literacy to

inequalities in skilled birth attendance and not in education but education in the Nigerian context does not necessarily mean literacy.

While some socio-economic groups have benefits from faster economic growth and improvements in living standards, much of the population continues to lack access to maternal services (World Bank, 2014; Dali., 2015). This may explain the persistence and even increase in pro-rich inequalities. In Nigeria, maternal health care remain highly underfunded with only 7% of Nigeria's annual budget has gone to the health sector since the early 1990s (Igboanugo et al., 2011). Culture, poverty and illiteracy are also other issues of concern. In terms of accessibility, many women, especially in rural areas, still travel long distances to reach a formal health care facility (Adedini et al., 2014). One of the most recent Nigerian study showed that two out of five women in Nigeria lack transportation to facilities during labour (Fagbamigbe et al., 2015). The affordability of maternity care remains a serious issue in Nigeria. More than two third of Nigerians live below the poverty line. Further, the quality of maternity care in Nigeria remains low by global standards. For instance, patients' waiting time is often unusually long and unsatisfactory, and the abuse and mistreatment of patients are widespread. The persistent lack of access to safe and effective sexual and reproductive health services among Nigerian women and girls is also a major barrier to maternal health and wellbeing (Izugbara et al., 2005). The Nigerian referral system is also very weak and highly uncoordinated (WHO et al, 2014). Due to inadequate funding, poor development, misplaced priorities on the investment of meagre resources, the inadequate supply of basic essentials, irregular power supply and a lack of modern health equipment pervade (Fagbamigbe et al., 2015; Ezeonwu and Berkowitz, 2014; Galadanci et., 2010). The lack of adequate qualified health care personnel and negative attitudes of some providers towards women have remained constant in maternity care delivery in Nigeria (Nnebue et al., 2014). There have been several reports of women conforming to home delivery because of unfriendly health care providers in many Nigerian public health



facilities (Envuladu et al., 2013; Idris et al., 2013). Cultural practices also persist in inhibiting maternal health care for example in some parts of the north, purdah (female seclusion) frustrates women's access to modern care. Practices like female genital mutilation also continue to affect maternal health outcomes negatively in several parts of Nigeria (Idris et al., 2013).

We observe that in both the maternal and child healthcare variable analysed, pro-rich inequalities were higher in the North at both time points than in Southern Nigeria. Some studies in Nigeria have suggested that there continues to remain an uneven distribution of health workers in the country mostly favouring the Southern regions of Nigeria. While health workers are in abundance in the south where more than half of specialist doctors are based, there is a shortage of doctors in the North. More than half of the specialist doctors work in south-west Nigeria. Shortage of health-related workers are especially acute in the Northern States of Niger, Jigawa, Zamfara and Taraba. While there are 160 doctors per million population in Northern Nigeria, there are 443 doctors per million population in the southern regions. The main reasons for this uneven distribution over the country are conflict, financial and social; some states in the North do not offer pensionable appointment to workers from other parts of the country, thus making it unattractive for non-indigenes to seek employment (Labiran et al, 2008). In addition, the Nigerian government continues to play a weak role in health financing in Northern Nigeria and on the average, the proportion of the total government health expenditure is relatively higher in the South than in the North. It has observed that the ability of the public in the regions to raise revenue for health care is influenced by their aggregate economic capacity. The greater contribution of public funding for health in the South is partly explained by the general economic advancement of the Southern states relative to their Northern counterpart (Sambo et al., 2005). The incidence of poverty is also much higher in the North. More than 70% of the population of the North live below the poverty line compared to less than 35% in the South

(Ngbea and Achunike., 2014). This again can affect service availability and access to health care and thereby increasing inequalities.

### Limitations

We recognise a number of limitations with this study. Firstly, the analysis is not causal but rather presents associations between a number of characteristics and the care outcomes. The use of panel data or instrumental variables might be used to examine causality although the identification of robust instruments is not straightforward. Additionally, the binary outcomes were considered as linear probability models using OLS regression. The OLS assumes normality of the outcome variable and implicitly assumes that the mean outcome is a linear combination of the determinants. This approach may be over simplistic and it may be worth re-working the same analysis using a generalised linear regression or a non-linear model and see how this refines the results (Wooldridge, 2000).

Secondly, a difference-in-difference approach or an Oaxaca decomposition could have been done where we could have identified which factors contributed the most to the changes. This approach has the advantage in relation to the decomposition of the concentration index by allowing the separation of the overall components of the decomposition into the contribution of a single variable or groups of variables (O'Donnell et al, 2008).

Finally, the asset index, although commonly used in inequality measurement is sensitive to the assets included. The main challenge to using asset indicators to measure inequality in living standards is in ensuring that there are a sufficiently broad class of asset indicators collected as to allow for differentiation of living standards across all households. . Consumption is viewed as “one of the best measure of the economic component of living standards” and is thus the preferred unit of analysis for study of poverty and inequality in developing countries. It is not, however, available in the DHS. In the absence of reliable information on income or

expenditure, the use of an asset index is generally a good alternative to distinguish socio-economic layers within the population (Howe et al, 2009).

## **Conclusion**

This study concludes with the two key messages emerging from the analysis. Firstly, inequalities in access to child health care in Nigeria have declined over the period 1990 – 2008 and although there remain some social inequalities in 2008, these are quite small. Secondly, the socioeconomic inequalities in access to maternal health care have increased with access to care favouring women in the richer households. Based on the findings, the study suggests for specific policies towards mothers' care, in line with those that have addressed inequalities in child health care in Nigeria over the period 1990-2008.

The emphasis on financial barriers is essential due to the persistent link between access to care and poverty among women particularly in the rural areas. Policymakers must embrace the principle that a woman's financial and educational status and where she lives should have no bearing on access to maternal and reproductive health.

Mothers' education was found to be an important determinant influencing the use of maternal health services, it is suggested that improving the level of general education among the population would be beneficial. Educational policies that seek to address persistent cultural and traditional practices that facilitate and entrench gender inequality in communities in Nigeria should be developed.

The Nigerian government through its local administration could develop ways of more effectively providing information to rural women and their families regarding unforeseen complications before during and after child birth since most of maternal and child deaths are caused by negligence of women to access health facilities.

Expanding the scope of the National Health Insurance Scheme (NHIS) to the poor and rural families including coverage of maternal conditions could help to expand access. Providing some incentives for medical personnel to work in conflict affected northern areas may also improve access.

## References

Abuya, B., Ciera, J, and Kimani-Murage, E. (2012). 'Effect of mothers education on child's nutritional status in the slums of Nairobi', *BMC Pediatrics*, 12(80), pp. 2-10.

Adedini S, Odimegwu C, Imasiku E, Ononokpono D, Ibisomi L.(2014). Regional variations in infant and child mortality in Nigeria: a multilevel analysis. *Journal of Biosocial Science*; 1(23);pp.1-10.

Babalola S, Fatusi A. (2009). *Determinants of use of maternal health services in Nigeria – looking beyond individual and household factors*. BMC Pregnancy and Childbirth; 9:43 pp. 1-10.

Bankole, A., Sedgh, G., Okonofua, F., Imarhiagbe, C., Hussain, R., & Wulf, D. (2009). *Barriers to safe motherhood in Nigeria*. New York, NY: *Guttmacher Institute*.

Barros A.J., Ronsmans C., Axelson H., Loaiza E., Bertoldi A.D. et al. (2012). 'Equity in maternal, newborn, and child health interventions in Countdown to 2015: a retrospective review of survey data from 54 countries', *The Lancet*, 379(1), pp. 1225-1233.

Dali S. (2015). Nigeria: The Restrained Ambitions of Africa's Largest Economy. *Macroeconomics and Development*. 19(1),pp 1-39.

Eboh D. (2012). *Health Inequality in Nigeria: a complete absence of conscience and common sense* , Nigeria: Nigerian Association of Health Service Managers and Consultants.

Envuladu E, Agbo H, Lassa S, Kigbu J, Zoakah A. (2013). Factors determining the choice of a place of delivery among pregnant women in Russia village of Jos North, Nigeria: achieving the MDGs 4 and 5. *International Journal of Medicine and Biomedical Research*. 2(1):pp.23-27.

Eshetu E.B., Woldeesenbet S.A. (2011). 'Are there particular social determinants of health for the world's poorest countries?', *African Health Science*, 11(1), pp. 108-114.

Ezeonwu M and Berkowitz B. (2014). A Collaborative Communitywide Health Fair: The Process and Impacts on the Community, *Journal of Community Health Nursing*, 31(2) pp.118-129.

Fagbamigbe A, Adebawale A, MorhasonBello I. (2015). Survival analysis of time to uptake of modern contraceptives among sexually active women of reproductive age in Nigeria. *BMJ Open* 5 (1); pp.1-10.

Gabrysch, S., & Campbell, O. M. (2009). Still too far to walk: Literature review of the determinants of delivery service use. *BMC Pregnancy and Childbirth*, 9(1); pp. 34.

Galadanci H, Idris S, Sadauki H, Yakasai I. (2010). Programs and Policies for Reducing Maternal Mortality in Kano State, Nigeria: A Review. *African Journal of Reproductive Health*. 14(3): pp.31.

Harttgen K, Misselhorn M. (2006). *A multilevel approach to explain child mortality and undernutrition in South Asia and sub-Saharan*. Ibero-America Institute for Economic Research. 156.

Houweling T., Kunst A. (2010). 'Socio-economic inequalities in childhood mortality in low- and middle-income countries: a review of the international evidence', *British Medical Bulletin* , 93(1), pp. 7-26.

Howe, L., Hargreaves, J., Gabrysch, S. and Huttly S. (2009). 'Is the wealth index a proxy for consumption?', *Journal of Epidemiology and Community Health*, 63(11), pp. 871-880.

Idris, S. H., Sambo, M. N., & Ibrahim, M. S. (2013). Barriers to utilisation of maternal health services in a semi-urban community in northern Nigeria: The clients' perspective. *Nigerian Medical Journal : Journal of the Nigeria Medical Association*, 54(1), pp.27–32.

Igboanugo G, Martin C. (2011). What are pregnant women in a rural Niger Delta community's perceptions of conventional maternity service provision? An exploratory qualitative study. *African Journal of Reproductive Health*. 15(3):pp.59-72.

Izugbara CO, Brown A. (2005). Women, pregnancy risks, and birthing-related complications: Conversations with traditional birth attendants. In: Balin RE (ed.). *Trends in midwifery research*. New York: Nova Science Publishers, pp. 167–84.

Karlsen, S, Say, L, Souza, J, Hogue, C, Calles, D, Gülmezoglu A, and Raine, R. (2011). The relationship between maternal education and mortality among women giving birth in health

care institutions: Analysis of the cross sectional WHO Global Survey on Maternal and Perinatal Health. *BMC Public Health*. 11(606); pp.1-10.

Labiran, A., Mafe, M., Onajole, B. and Lambo E. (2008). *Health Workforce Country Profile For Nigeria*, : Nigerian Federal Ministry of Health.

Menizibeya O.W. (2011). 'The Nigerian health care system: Need for integrating adequate medical intelligence and surveillance systems', *Journal of Pharmacy and Bioallied Sciences*, 3(4), pp. 470-478.

Mojekwu, J. N., & Ibekwe, M. U. (2012). Maternal mortality in Nigeria: Examination of intervention methods (Special issue) *International Journal of Humanities and Social Science*, 2(20) pp.1-10.

National Population Commission (NPC) [Nigeria] and ICF Macro. (2009). *Nigeria Demographic and Health Survey 2008*. Abuja, Nigeria: National Population Commission and ICF Macro.

National Population Commission. (2014). *Nigeria Demographic and Health Survey*, Maryland: ICF International.

Ngbea, G and Achunike H. (2014). Poverty in Northern Nigeria. *Asian Journal of Humanities and Social Studies*. 2(2) pp.266-272.



Nnebue C, Ebenebe U, Adinma E, Iyoke C, Obionu C, Ilika A. (2014). Clients' knowledge, perception and satisfaction with quality of maternal health care services at the primary health care level in Nnewi, Nigeria. *Nigerian Journal of Clinical Practice*. 17 (1); pp.594-601.

Novignon, J., Aboagye, E., Agyemang, S. and Aryeetey, G. (2015). 'Socioeconomic-related inequalities in child malnutrition: evidence from the Ghana multiple indicator cluster survey', *Health Economics Review*, 5(34), pp. 1-11.

Oku, A., Oyo-Ita, A., Glenton C., Atle, F., Ames, H., Muloliwa, A et al. (2016). 'Communication strategies to promote the uptake of childhood vaccination in Nigeria: a systematic map', *Global Health Action*, 9(1), pp. 1-10.

Okunola M.I. (2002). *A Handbook for Nigerian Social Workers*, Ibadan: Daybis Limited.

O'Donnell O., van Doorslaer E., Wagstaff A, and Lindelow M. (2008). *Analyzing Health Equity Using Household Survey Data: A Guide to Techniques and Their Implementation*.

[Online]. Available at:

<http://siteresources.worldbank.org/INTPAH/Resources/Publications/459843-1195594469249/HealthEquityFINAL.pdf> (Accessed: 17th October 2014).

Oresanya O., Hoshen M., and Sofola O. (2009). Utilization of insecticide-treated nets by under-five children in Nigeria: Assessing progress towards the Abuja targets. *Malaria Journal*, 7(145), pp. 1-15.

Osazuwa-Peters, N. (2011). Determinants of Health Disparities: The Perennial Struggle against Polio in Nigeria. *International Journal of Preventive Medicine*, 2(3), pp.117–121.

Sambo, M, Ejembi C, Adamu Y, Aliyu, A. (2005). Out-of-pocket health expenditure for under-five illnesses in a semi-urban community in Northern Nigeria. *Journal of Community Medicine & Primary Health Care*. 16 (1) pp.29-32.

Schell C.O., Reilly., M, Rosling H, Peterson S, Ekstrom AM. (2007). Socioeconomic determinants of infant mortality: a worldwide study of 152 low-, middle-, and high-income countries. *Scandinavian Journal of Public Health*; 35: pp. 288–97.

Tanja, A.H and Anton, K. (2009). 'Socio-economic inequalities in childhood mortality in low- and middle-income countries: a review of the international evidence', *British Medical Bulletin*, 93(1), pp. 7-26.

Timothy, G.,Irinoye, O., Yunusa, U., Dalhatu, A., Ahmed, S. and Suberu, A. (2014). 'Balancing Demand, Quality and Efficiency in Nigerian Health Care Delivery System', *European Journal of Business and Management*, 6(23), pp. 50-54.

The World Health Report. (1999). *Rolling Back Malaria*. Roll back malaria partner.

USAID (2002) *Child Survival in Nigeria: Situation, Response, and Prospects*, Nigeria: U.S. Agency for International Development.

Wang L. (2003). *Determinants of child mortality in LDCs: empirical findings from demographic and health surveys*. *Health Policy*; 65: pp. 277–99.

Wagstaff A., van Doorslaer E, and Watanabe N. (2003). 'On Decomposing the Causes of Health Sector Inequalities, with an Application to Malnutrition Inequalities in Vietnam', *Journal of Econometrics*, 112(1), pp. 219-227.

World Bank (2014). *Nigeria Economic Report: Improved Economic Outlook in 2014, and Prospects for Continued Growth Look Good*. The World Bank.

World Health Organisation (2001). *WHO's Contribution to the Report for the Follow-up to the World Summit for Children*: World Health Organisation.

World Health Organization (2009). *Baby-Friendly Hospital Initiative*: World Health Organization.

World Health Organization (2011). *Social determinants of health*: World Health Organization.

Wooldridge J. (2000). *Econometric Analysis of Cross Section and Panel Data*. 1<sup>st</sup> ed. Cambridge, Massachusetts: The MIT Press.

Zere E., Oluwole D., Kirigia J.M., Mwikisa C.N. and Mbeeli T. (2011). 'Inequities in skilled attendance at birth in Namibia: a decomposition analysis', *BMC Pregnancy and Childbirth*, 11(34), pp. 11-34.

## Appendix

## Appendix

Figure 1: Concentration curves for skilled assistance during delivery in 1990 and 2008

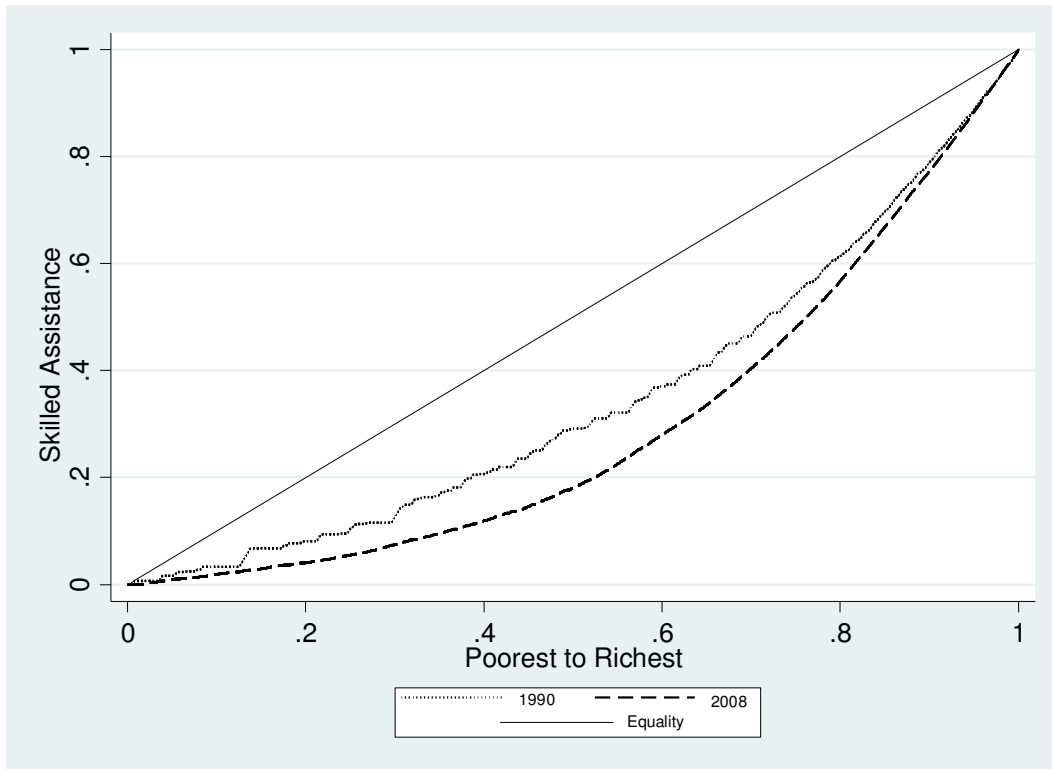
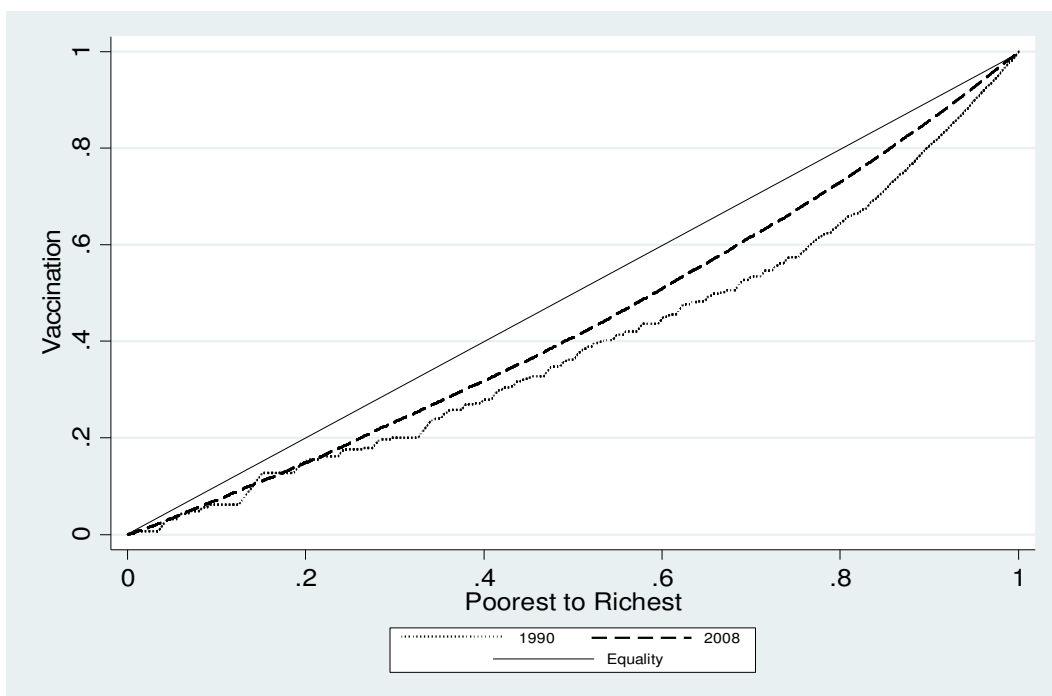
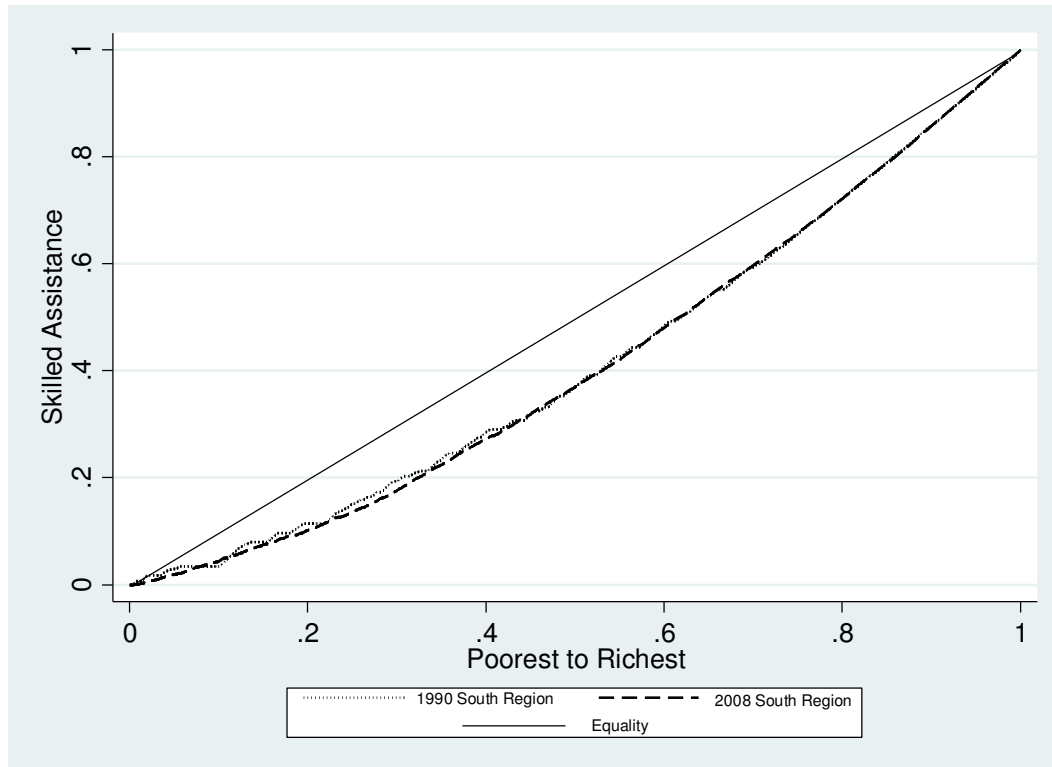


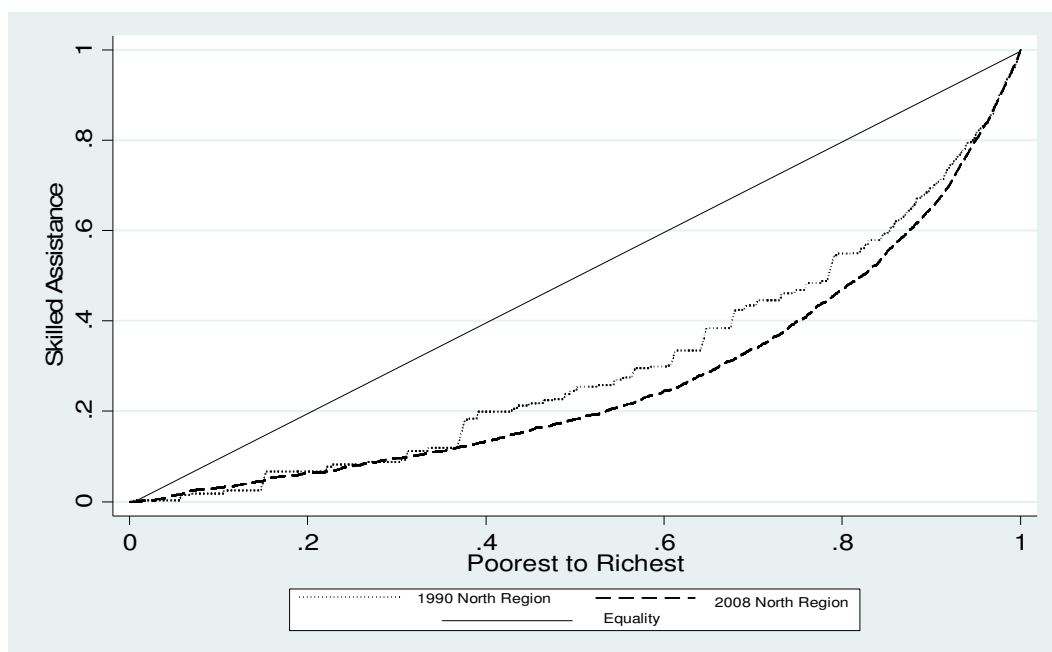
Figure 2: Concentration curves for vaccination in 1990 and 2008



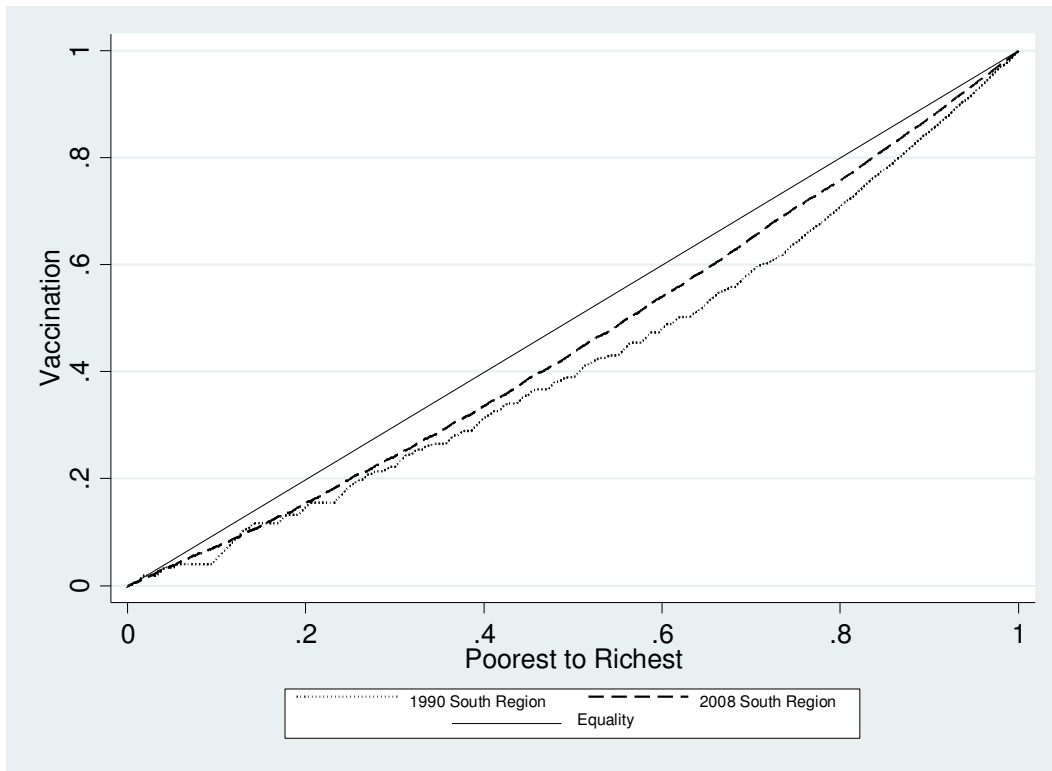
**Figure 3: Concentration curves for skilled assistance during delivery in Southern Nigeria in 1990 and 2008**



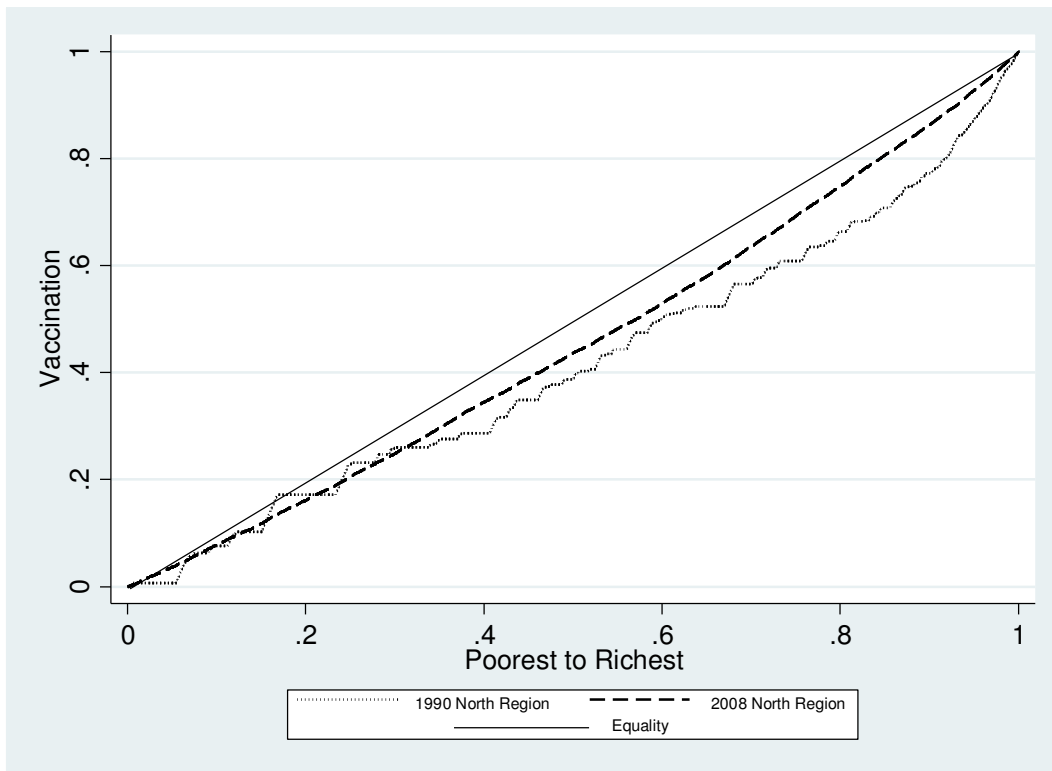
**Figure 4: Concentration curves for skilled assistance during delivery in Northern Nigeria in 1990 and 2008**



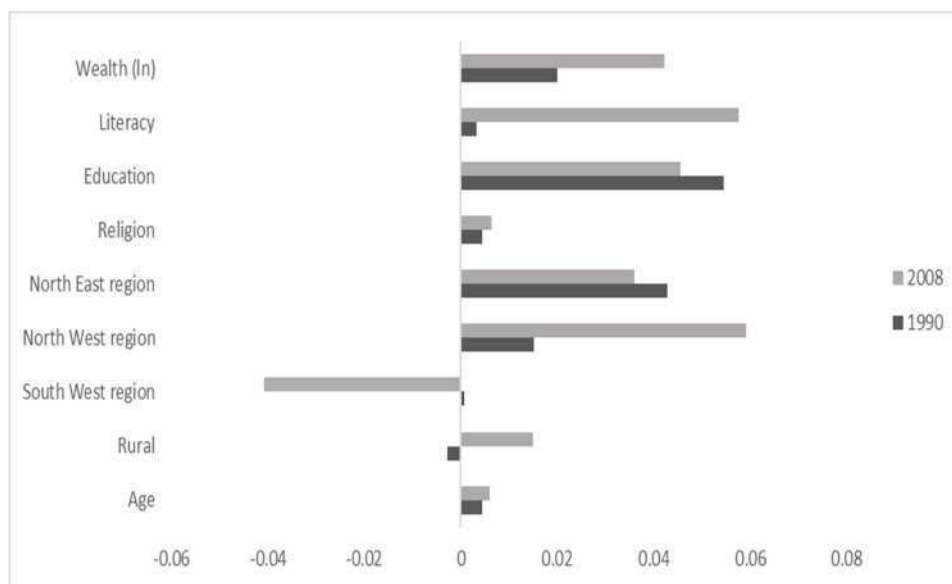
**Figure 5: Concentration curves for vaccination in Southern Nigeria in 1990 and 2008**



**Figure 6: Concentration curves for vaccination in Northern Nigeria in 1990 and 2008**



**Figure 7: Decomposition of inequalities in access to skilled assistance during delivery**



**Figure 8: Decomposition of inequalities in vaccination**

