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

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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.

Key words: Socio-economic, social inequality, access, health care utilization, child health, maternal health, concentration curve, concentration indices, decomposition

JEL classification: I10 I14 I18
1 Introduction

Evidence from Sub-Saharan African (SSA) countries has revealed that health outcomes and access to key health services are unevenly distributed across the 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 particularly in Nigeria. 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. Studies conducted in Britain, the United States and other Western societies indicate that health and access to health care facilities are consistently valued higher than any other aspects of well-being including housing, money income, social status, education, family life and leisure (Akpomuvie 2010). 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). In this context, health service research is necessary in order to understand and monitor socioeconomic inequalities in various aspects of health. It is essential for African countries to monitor equity and equality in health status and health access in order to target better scarce public resources required to achieve the Millennium Development Goals and other international development goals (Dodd
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 paper therefore aims to answer the following questions: (i) how have the 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? The findings therefore add to the existing evidence in inequalities in access to child and maternal health care in Nigeria. This research characterises the structure of inequalities and identifies the contributing factors to inequalities in maternal and child health care access.

2 Methods

Data

Data comes 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**

For both years, data that are extracted from the NDHS dataset and we consider as outcome measures 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. 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). The main variables we use as regressors in the analysis are 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 (lowest, low-middle, middle, high-middle and highest). 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 and 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: \[ CCI = \frac{2}{\mu} \text{cov}(h, r) \]

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 \( k = (1, ..., K) \).

Equation 2: \[ h_i = \alpha + \sum_k \beta_k X_{ki} + \varepsilon_i \]

Where \( i \) is the \( i^{th} \) 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 $\left( \frac{\beta_k x_k \tilde{\mu}}{\mu} \right)$ 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.

3 Results

Trends

Maternal Health Care

In 1990, 57.53 (%) (95(% Confidence Interval (CI) 0.565-0.585) of respondents were found to have consulted with trained health care providers; 36.12(%) with a doctor, 20.12 (%) with a nurse/midwife and 1.23 (%) with an auxiliary midwife. The proportion in 2008 was almost identical at 57.97 (%) (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 34.76 (%) in 1990 and 36.4 (%) in 2008 received no of antenatal care. An increase in use of skilled attendance during delivery was observed. In 1990, 32.18 (%) (95(%) CI 0.312-0.331) of respondents were found to have used a type of skilled assistance during delivery which increased to 39.48 (%) (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 26.87% (95% CI 0.259-0.278) of children of surveyed women received any medical treatment for diarrhoea. This increased to 48.09% (95% CI 0.475-0.487) in 2008. Similarly, in 1990, 36.99% (95% CI 0.359-0.379) of the children of women surveyed received any form of medical treatment for fever or cough increasing to 61.61% (95% CI 0.610-0.622) in 2008. Vaccination coverage increased from 41% in 1990 to 61% in 2008.

**Inequality Measurement**

Concentration curves show that for both years and for all 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 investigated between the two years, inequality has increased for the two maternal health care variables.

**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 CI of 0.24 (0.003) in 1990 and 0.26 (0.005) in 2008. 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 (Figures 1 and 2) and corresponding CIs increased over time from 0.31 (Standard Error (SE) : 0.007) in 1990 to 0.43 (SE: 0.004) in 2008.

**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 CI= 0.24 (SE: 0.001) in 1990 to CI= 0.11 (SE: 0.005) 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 (CI=0.17; SE: 0.004) and 2008 (CI=0.07; SE: 0.002) (Figure 1 and 2). Similarly, inequalities in access to medically treated fever and cough were higher in 1990 (CI=0.20; SE: 0.008) than in 2008 (CI=0.09; SE: 0.009).

**Figure 1: Concentration curves for skilled assistance during delivery and diarrhoea treatment in 1990**
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 access to medical treatment for diarrhoea where because inequality fell 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 were illiterate, had no education, were poor and lived in Northern Nigeria. In addition to this, results from 2008 also showed that living in South Western Nigeria was a driver of pro-rich inequalities in the use of skilled assistance during delivery than living in any other region (Figure 3). The contribution of wealth, literacy, living in north western and rural Nigeria increased from 1990 to 2008 while educational attainment and religion reduced over time.
Decomposition of inequalities in medically treated diarrhoea in 1990 and 2008

In 1990, the main contributors to inequalities in medically treated diarrhoea were living in a rural area, living in the South West and being Muslim. In 2008, wealth-related inequalities in access to medically treated diarrhoea were lower and the main contributors to inequalities were lower literacy, education and living in North Western Nigeria. Wealth appeared to contribute marginally to inequalities in medical treatment for diarrhoea (Figure 4).

Figure 3: Decomposition of inequalities in access to skilled assistance during delivery
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).

With respect to maternal health care outcomes, we observe that both access to antenatal care and assisted child delivery by at least one trained health professional favoured the rich with the concentration curves in both 1990 and 2008 lying below the line of equality. Women who had no trained assistance during delivery by a health professional were concentrated among the poor and non-educated. The decomposition of the inequalities in access to skilled assistance during delivery showed that the main contributions to inequality in skilled assistance during delivery were the region of residence especially living in the North, in rural areas, being illiterate, having no education and being at the bottom of the wealth distribution. In the 2008 DHS, women were asked about the factors that would prevent them accessing health services. The majority of women reported that they felt it was not necessary to use health facilities before and after delivery (55%), followed by distance to health facility and transportation problems (24%). More than 63% of women from the poorest wealth quintile reported lack of money for treatment, distance and having to take transport as major barrier compared to 14% of women from the richest wealth quintile. One third of the women surveyed reported that the final say on how income was spent in their household rested solely with their husband or partner while 34% said that other members of the family made the decision on how income was spent. This is likely to affect whether women have access to funds to access health facilities or not. This suggests that education to health care should not be limited to the women alone but should involve an increase in awareness for the entire family and population of the importance of using health care services before, during and after delivery (National Population Commission, 2008). Distance and lack of transportation were one of the major barriers to access maternal and child health care. Rural areas had the highest inequalities in access to antenatal care and assistance.
during delivery and women faced a lot of birth complications in these areas (MSF, 2009). In rural areas women are forced to travel long distances to seek care. Women sometimes give birth during travel and others die along the way due to unattended birth complications. Unfortunately, there are few transport services even when these are available, ambulance services are provided in district and regional hospitals with patients mostly responsible for payment of fuel even when they are referred from district to regional or specialized hospitals. Most women in rural areas do not have money for purchasing fuel and they often do not receive proper care even when they manage to travel for long distance to health facilities seeking for care (MSF, 2009). There is also an uneven distribution of health workers over the country. While health workers are in abundance in the Southern parts of Nigeria 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 160.5 doctors per million population in Northern Nigeria, there are 443.6 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).

**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, it is important to underline that the analysis did not test the significance of the changes over time. This could have been undertaken using a difference-in-difference approach and an Oaxaca decomposition 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 socioeconomic layers within the population (Howe et al, 2009).

5 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. Furthermore, nurses and midwives are at the centre of maternal health care delivery. They however operate under the shadow of physicians as reflected in the overall differential benefits and professional support and recognition through various major funding mechanisms. Adequate funding of nursing education and traditional birth attendants would be a big step forward. Integrating nurses’ expert knowledge and views as core maternal health providers in health policies will help improve access to care and health outcome for mothers not only in Nigeria but could be applied in other developing countries.
References


