Socioeconomic Inequalities in the Use of Maternal Health Care Services in Nigeria: Trends Between 1990 and 2008

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Abstract

This article examines the socioeconomic inequalities in the use of antenatal care and medical assistance at delivery in Nigeria, using the multi-rounds of the cross-sectional Nigerian Demographic Health Survey conducted between 1990 and 2008. The analyses include only women aged 15 to 49 with at least one live birth in the past 3 years preceding the survey’s date. The socioeconomic indicators selected were household wealth index and women’s level of education. The results indicate that the use of antenatal care has stagnated while medical assistance at delivery has increased sluggishly in Nigeria during 1990 to 2008. Stark socioeconomic differences in utilization of antenatal care and medical assistance at delivery services exist with growing inequalities in utilization across household wealth and women’s level of education. Despite existing maternal health promotion initiatives in the country, the use of antenatal care and medical assistance at delivery is disproportionately lower among the poor and uneducated women.

Keywords
antenatal care, medical assistance at delivery, concentration index, Nigeria, sub-Saharan Africa

Introduction

Improving maternal and child health is a crucial component of developmental issues in any society. At international, regional, and local levels, there are several ongoing efforts to reduce maternal mortality burden. Available evidence indicates high and growing inequalities within and between developing countries in access to health care services to promote maternal health (Ahmed, Creanga, Gillespie, & Tsui, 2010; Bonfrer, van de Poel, Grimm, & Van Doorslaer, 2014; Makinen et al., 2000). Thus, the need for holistic and sustainable efforts in addressing the causes and implications of poor maternal health outcomes remains critical. Recent estimates indicate that Africa and Asia account for more than 95% of total maternal deaths that occurred worldwide (Ronsmans & Graham, 2006; World Health Organization [WHO], 2007).

Overall, Africa has the highest maternal deaths in the world, and sub-Saharan Africa is a primary contributor. Unlike the developed countries, where maternal death is 1 in 2,800, the mortality rate in sub-Saharan Africa is 1 in every 16 pregnant women (Tawiah, 2011). Direct causes such as hemorrhage, hypertensive disorders, sepsis, embolism, and abortion account for about 75% of total maternal deaths in sub-Saharan Africa with hemorrhage as the leading cause, accounting for about 25% of maternal deaths (Say et al., 2014; WHO, 2008).

Many of the maternal deaths are preventable with responsive obstetric care and medical assistance during delivery (Cavallaro & Marchant, 2013; Ray, Madzimbamuto, & Fonn, 2012). Access and responsive health care utilization remain relevant to maternal health promotion in many countries across the region. Inequality in resources such as household wealth and individual income was found to be factors inhibiting the extent of use of antenatal care, medically assisted delivery and to have a postnatal care (Zere, Moeti, Kirigia, Mwase, & Kataika, 2007).

Nigeria is the most populous and a leading contributor of maternal mortality (maternal mortality ratio [MMR] is 560 per 100,000 live births), among sub-Saharan African countries (WHO, 2014). Recent assessments of the achievements of the Millennium Development Goals (MDG-5) relating to maternal health showed that Nigeria has made progress in reducing maternal mortality from 1,100 per 100,000 live births in 1990 to 560 per 100,000 live births in 2013, although it may not reach the set goal by 2015 (Bhutta et al., 2010;
Moreover, the current higher level of MMR clearly suggests that Nigeria’s progress toward reducing maternal mortality will be crucial in the global achievement of MDG-5. Insufficient use of prenatal care services and having non–medical assisted delivery contribute to high maternal deaths arising from pregnancy-related complications in the country (Bankole et al., 2009). According to WHO recent estimate, more than half of the pregnant women in Nigeria do not get skilled attendance at birth (WHO, 2014).

In developing countries, underuse of maternal health care services is attributed to an array of supply and demand factors, social structure and health beliefs (Ngomane & Mulaudzi, 2012; Pathak, Singh, & Subramanian, 2010; Poureslami, MacLean, Spiegel, & Yassi, 2013). The supply-side factors include lack of accessibility, availability, quality, continuity, and comprehensiveness of health services. The demand-side factors are mainly social, economic, and cultural. Among various socioeconomic factors, maternal education level and economic status—measured by a composite wealth index—are most important determinants of utilization of health services (Becker, David, Ronald, Connie, & Black, 1993; Carr, 2004; Singh & Singh, 2007; Warren et al., 1987).

In Nigeria, there are policies and initiatives, such as “removal of user fees policy,” which subsidized maternal care, health promotion campaigns, primary health care, among others to address maternal and child health challenges (Mohammed & Dong, 2012; Richard et al., 2013; Rogers-Block et al., 2012). These programs aim to bring to the barest minimum high mortality in the country by improving quality access to maternal health care services. The removal of user fees policy, for instance, targets pregnant women and newborn. This is to meet the obstetric needs, especially the caesarean section of all pregnant women irrespective of their financial status, a giant step to reduce the unequal access to health care services, especially for those with low socioeconomic status (Mohammed & Dong, 2012).

With different international and local initiatives tailored toward addressing direct, indirect, and other proximate determinants of maternal mortality in Nigeria, substantial improvements are expected in the country (Bhatta et al., 2010). However, a number of these initiatives were anchored on inadequate evidence as shown by the disparity between the set goals and health outcomes. Evidence-based health initiatives are uncommon in many countries in sub-Saharan Africa (Richard et al., 2013), hindering a number of activities such as prioritization of needs, development of tailored interventions, monitoring and evaluation of programs against set objectives. The common exceptions to this practice are interventions or health programs that are externally financed or developed. The Nigerian government has recently come to terms with the relevance of evidence-based approach that will be participatory and evolving unlike the non-inclusive and non-participatory approaches that characterized previous maternal health initiatives.

Despite enormous resources and efforts, socioeconomic factors keep accounting for differentials in qualitative access to prenatal and medically assisted care in Nigeria. Available evidence indicates wide variations in access of the services by maternal education and household economic resources (Babalola & Fatusi, 2009; Gabrysch & Campbell, 2009). Among other factors, unequal opportunities to access health care services and socioeconomic differences remain significant as deterrent to women using maternal health care services across various subgroups in Nigeria (Bankole et al., 2009; Omoruyi, 2008, cited in Mojekwu & Ibekwe, 2012). Studies with focus on factors influencing maternal health outcomes and utilization of maternal health care services in Nigeria abound (Babalola & Fatusi, 2009; Bankole et al., 2009; Mojekwu & Ibekwe; Omoruyi, 2008, cited in Mojekwu & Ibekwe, 2012). However, none of the previous studies in Nigeria have analyzed the pattern of socioeconomic disparity in the use of maternal and child health care (MCH) services over time.

The present study, therefore, examines the pattern of socioeconomic inequality in the use of antenatal care and medical assistance at delivery in Nigeria using multi-rounds of the Nigerian Demographic Health Surveys (DHSs) conducted between 1990 and 2008. Studying the trends in socioeconomic inequalities in the use of the maternal health care services over a period of implementation of health program and policies sheds light on the potential benefits of such programmatic initiative on the vulnerable population. Such knowledge could help in developing programs aimed at encouraging many pregnant women to have antenatal care and have their birth at a modern health facility for emergent obstetric care if the need arises. In addition, knowing the disparity in health care accessibility resulting from cost implications of health services will promote health system. This makes antenatal care services cost friendly and accessible irrespective of a woman’s socioeconomic status to achieve good maternal health.

Materials and Method

Data

We used data from multi-rounds of the Nigerian DHS conducted in 1990, 2003, and 2008. For convenience, we refer to the period between 1990 and 2003 as 1990-2003, between 2003 and 2008 as 2003-2008, and between 1990 and 2008 as 1990-2008. The multi-rounds of the Nigerian DHS is a large-scale household survey which provides reliable estimates of fertility, maternal and child health, infant and childhood mortality, nutritional status of children, sexual behavior, knowledge and use of modern contraceptives and knowledge on other reproductive health issues such as female genital cutting and intimate partner violence at national level, regional level, and across rural–urban residence. The Federal Office of Statistics (1990) and the National Population Commission
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of Nigeria (2003 and 2008) conducted the multiple rounds of the survey with collaborative assistance from several national and international organizations. The Nigerian DHS collected data using different interview schedules—household schedule and eligible women/individual schedule.

### Outcome variables

We used antenatal care and medically assisted delivery as our outcome variables in the study. These variables are defined as follows:

**Antenatal care.** Antenatal care refers to care given to a woman throughout her pregnancy period, and it requires observation of medical conditions that require attention all through the pregnancy stage. Antenatal care could be late (after 12 weeks of gestation) or irregular (inconsistent hospital visits during pregnancy). The present study defines antenatal care as four or more antenatal care visits during pregnancy. This definition is in tune with the standard definition recommended by the WHO (2006).

**Medical assistance at delivery.** It is defined as any home or institutional delivery assisted by medical professionals, such as a doctor, an auxiliary nurse midwife/nurse/midwife/lady health visitor, or other health personnel. In the DHS, questions on births attended by medical professionals were asked by respondents. Different rounds of the Nigerian DHS collected information on these indicators with varying reference period and for different birth orders. In the present study, therefore, these outcome variables were estimated for the most recent live birth with a reference period of 3 years preceding the survey date to make the estimates comparable over time and to minimize the recall bias. The final analytical sample size (restricted to the most recent birth with a reference period of 3 years prior to the survey date) is given in Table 1.

### Predictor variables

The key predictors used in the study are household wealth and women’s level of education. Evidence shows that poor household economic status and low maternal education are main determinants of health and use of health care services (United Nations Children’s Fund [UNICEF], 1998). The women education promotes use of maternal health care services through acquisition of health knowledge, independent decision-making capacity regarding use of modern health facilities, and command over resources (Barrera, 1990; Caldwell, 1979).

Like other DHSs, the Nigerian DHS does not provide direct information on income and expenditure, rather it provides information on indirect measures such as housing quality, household amenities, consumer durables, and size of land holding, which may be used as a proxy measure of household economic status (Filmer & Pritchett, 2001; Gwatkin et al., 2009; Montgomery, Gragnolati, Burke, & Paredes, 2000; O’Donnell & Wagstaff, 2008; Vyas & Kumaranayake, 2006).

Using these proxy indicators, the Nigerian DHS-2008 calculated a wealth index using principal component analysis (PCA), and the index is divided into five quintiles—poorest, poorer, middle, richer, and richest. However, the Nigerian DHS-1990 and 2003 computed standard of living index (SLI) based on arbitrary scoring of the economic proxies, and the index was divided into three categories—low, medium, and high. Therefore, in the present study, a separate wealth index (divided into five quintiles—20% each) for each of the DHS-1990 and DHS-2003 is computed using PCA and based on selected economic proxies of households. The aim was to make the wealth index comparable over the successive rounds of the survey.

Information on individual education was collected on four categories—no education, primary, secondary, and higher. The same information is used to define individual/women education in the present study.

We adjusted a list of sociodemographic confounders in the analysis, which, in previous studies, have been found to be significantly associated with the use of maternal health care services in Nigeria and other African countries. These

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### Table 1. Univariate Distribution of the Women Aged 15 to 49 Years in the Final Analytic Sample Across Household Wealth and Women Education in Nigeria, 1990 to 2008.

| Characteristics                  | Categories       | n   | %    |
|----------------------------------|------------------|-----|------|
| Survey years                     |                  |     |      |
| 1990                             |                  | 4,076 | 19.0 |
| 2003                             |                  | 3,195 | 14.8 |
| 2008                             |                  | 15,068 | 66.2 |
| Household wealth                 |                  |     |      |
| Poorest quintile                 |                  | 5,643 | 23.2 |
| Poorer quintile                  |                  | 5,143 | 22.8 |
| Middle quintile                  |                  | 4,073 | 18.6 |
| Rich quintile                    |                  | 3,910 | 18.6 |
| Richest quintile                 |                  | 3,570 | 16.9 |
| Women’s level of education       |                  |     |      |
| Uneducated                       |                  | 11,502 | 50.0 |
| Primary                          |                  | 5,185 | 23.1 |
| Secondary                        |                  | 4,756 | 22.5 |
| Higher                           |                  | 896  | 4.4  |

Note. All numbers are obtained from unweighted sample.
confounders are place of residence (urban, rural); parity (1, 2, 3, 4+), mother’s age (in years) at birth of the child (15-19, 20-24, 25-29, 30-34, 35-39, 40-44, 45-49), partner education (no education, primary, secondary, higher), religion (Catholic, other Christian, Islam, etc.), ethnicity, women’s exposure to media (exposed, unexposed), current working status of women (not working, working), and region (north central, north east, north west, south east, south west, south south, south west) of the country.

Statistical Analysis

Bivariate analyses were carried out to examine the level and trends in antenatal care and medical assistance at delivery across the household wealth quintiles and women’s education level. We applied chi-square to understand the significant association between use of the maternal health care services and the socioeconomic indicators.

To measure the socioeconomic inequality in the use of maternal health care services in Nigeria over time, we used concentration index (CI). The CI for the health care services is defined with reference to the concentration curve, which plots cumulative percentage of births received health care services (y-axis) against cumulative percentage of the births ranked by household wealth, beginning with the poorest and ending with the richest quintile (x-axis). In a case, when all the births, irrespective of their economic status “x,” have exactly the same “y,” 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 (O’Donnell & Wagstaff, 2008). With reference to the concentration curve and the line of inequality, the CI is defined as twice the area between the concentration curve and the line of equality (Wagstaff & van Doorslaer, 2004). The value of CI 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. A value of 0 indicates absence of inequality. The factor score of household wealth (obtained from the PCA) is used to estimate the CI across household economic status, while the CI of women’s level of schooling is based on their years of schooling (Sastry, 2004).

Although the CI is the most appropriate measure of group inequality, it has certain flaws when the outcomes of interest are dichotomous (Wagstaff, 2005). In the case of dichotomous outcome, the CI can get affected if the mean of the outcome variable changes from one survey round to the other. This shortcoming is addressed while analyzing the data, using the standard procedures as suggested by previous studies (Chalasani, 2012; Kumar, Kumari, & Singh, 2014).

We used binary logistic regression analysis as the selected outcomes in the study (antenatal care and medical assistance at delivery) are binary in nature (i.e., 1 = received the services, 0 = otherwise). The binary logistic regression was run on the pooled data of all three rounds of the Nigerian DHS. The pooled data allow us to examine the interaction survey period with household wealth and women’s level of education. The regression analysis is adjusted for the selected covariates. The results of the logistic regression analysis are presented in terms of predicted probabilities to avoid complexity in interpretation of interaction terms in the regression models. The predictor variables (household wealth and women’s level of education) are tested for possible multicollinearity using variance inflation factor test. All the analyses are carried out using STATA 12.0.

Results

Trends in the Use of Maternal Health Care Services in Nigeria

Figure 1 presents the trends in the use of antenatal care and medical assistance at delivery in Nigeria during 1990 to 2008. The use of antenatal care was 51%, 55%, and 49% in 1990, 2003, and 2008, respectively. The corresponding figures of medical assistance at delivery were 30%, 37%, and 35%, respectively.

Like aggregate level, coverage of both the services followed a similar pattern across the household wealth quintiles and women’s level of education during 1990-2008 (Table 2). For instance, among the richest wealth quintile, the prevalence of antenatal care first increased from 85% in 1990 to 93% in 2003, and then stagnated to 93% in 2008 with a net increase during the study period. Among the poorest wealth quintile, the coverage declined continuously from 28% in 1990 to 24% in 2003 and to 16% in 2008. Across the other wealth quintiles, we observed a mixed pattern. In the case of women education, coverage of antenatal care declined from 37% in 1990 to 25% in 2003 and further to 23% in 2008 among the uneducated women. Among the most educated women (educated higher level), the coverage remained stagnated (about 95% in 1990, 93% in 2003, and 95% in 2008) over the period.

Coverage of medical assistance at delivery first increased, then decreased (11% in 1990, 13% in 2003, and 7% in 2008) among the poorest quintile and resulted in a net decline during 1990-2008. A similar pattern was observed across the richest wealth quintile (69% in 1990, 83% in 2003, and 80% in 2008); however, a net increase was marked during 1990-2008. Prevalence of medical assistance at delivery declined continuously during 1990-2008 across the levels of women’s education.

The coverage of antenatal care declined by 42 percentage points among poorest wealth quintile, while it increased by 8 percentage points among the richest wealth quintile during 1990-2008. Within the education groups, the coverage declined across all the educational categories, except the higher educated women, where it stagnated. Furthermore, medical assistance at delivery declined by about 55 percentage points among poorest wealth quintile, while it increased by about 13 percentage
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...points among the richest wealth quintile during 1990-2008. The coverage declined across the education categories. It was, however, much higher among the uneducated (34 percentage points) compared with the most educated women (5 percentage points).

Table 2 further shows that there is a great difference in the use of maternal health care services within socioeconomic groups. For instance, the coverage of antenatal care was 16% among the poorest compared with 93% among the richest wealth quintile in 2008. Similarly, the prevalence was 23% among uneducated women compared with 95% among the most educated women. A similar difference is observed for medical assistance at delivery, and the pattern remained similar over time.

Table 3 shows the extent of socioeconomic inequality (measured by CI) in antenatal care and medical assistance at delivery during 1990-2008. In general, the result of the CI shows pro-rich condition in the use of the services over time. The inequality in the use of antenatal care has increased significantly across household economic status over time. For instance, the value of CI for antenatal care has increased from 0.467 in 1990 to 0.621 in 2008. For medical assistance at delivery, the value of CI was 0.455 in 1990 and 0.523 in 2008. A similar pattern is observed from concentration curves presented in Figure 2. The extent of inequality in the

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Table 2. Socio-Economic Differentials in Antenatal Care and Medical Assistance at Delivery Among Women Aged 15 to 49 Years in Nigeria, 1990 to 2008.

|                      | Prevalence (%) of antenatal care | % Change during 1990-2008 | Prevalence (%) of medically assisted delivery | % Change during 1990-2008 |
|----------------------|---------------------------------|---------------------------|-----------------------------------------------|---------------------------|
|                      | 1990   | 2003   | 2008   | 1990   | 2003   | 2008   |
| Household wealth     |        |        |        |        |        |        |
| Poorest              | 27.6   | 23.7   | 16.2   | −41.5  | 11.4   | 13.4   | 7.4    | −54.5  |
| Poor                 | 36.0   | 28.1   | 30.3   | −15.7  | 16.6   | 21.2   | 15.5   | −7.4   |
| Middle               | 54.5   | 45.0   | 53.0   | −2.9   | 24.9   | 28.7   | 30.9   | 19.2   |
| Rich                 | 61.8   | 63.8   | 74.1   | 20.0   | 38.9   | 48.6   | 56.3   | 31.0   |
| Richest              | 85.4   | 92.5   | 92.5   | 8.4    | 69.4   | 82.7   | 79.5   | 12.8   |
| Ratio: Highest to lowest | 3.1   | 3.9   | 5.7    | 6.1    | 6.2    | 10.8   |
| Women’s level of education |        |        |        |        |        |        |
| Uneducated           | 36.8   | 24.8   | 22.8   | −37.9  | 15.5   | 14.7   | 10.2   | −33.9  |
| Primary              | 67.7   | 60.4   | 59.0   | −12.8  | 45.3   | 44.5   | 37.7   | −16.9  |
| Secondary            | 85.3   | 82.8   | 79.4   | −6.9   | 71.4   | 71.5   | 64.2   | −10.0  |
| Higher               | 94.8   | 93.0   | 95.3   | 0.5    | 92.4   | 89.7   | 88.1   | −4.6   |
| Ratio: Lowest to highest | 2.6   | 3.8   | 4.2    | 6.0    | 6.1    | 8.6    |

***p < .01.
use of services is higher across women’s level of education and increased over the period of 1990 to 2008. For instance, the value of CI for antenatal care was 0.538 in 1990 and 0.644 in 2008.

**Multivariate Analysis**

The results obtained from the descriptive analysis and CI clearly indicate that the socioeconomic inequality in the use of the maternal health care services has increased in Nigeria over time. However, it is worth noting here that these findings may be biased, as they were not adjusted for the other sociodemographic determinants, which might have a strong influence on the use of the maternity services. To account for this issue, we used binary logistic regression analysis using the pooled datasets of the three rounds of the Nigeria DHS. In the models, we examined the effect of interaction terms—one between the survey period and household wealth and the other between the survey period and women’s level of education—after adjusting the place of residence, parity, mother’s age at birth of the child, partner education, religion, ethnicity, women’s exposure to media, current working status of women, and region of the country. In case of medical assistance at delivery, we adjusted for antenatal care additionally. The coefficients of the interactions are presented in Appendix Table A1. The results show that the interaction term of the survey year and household wealth is statistically significant for both the outcome variables. The interactions between the survey year and women’s level of education are also significant for the outcome variables, though the level of the significance is not even across all the interaction terms.

The interaction effect (in terms of predicted probability) of survey periods and household wealth and survey periods and women’s level of education on the use of antenatal care and medical assistance at delivery during 1990-2008 is presented in Tables 4 and 5, respectively. There is a clear association between household wealth quintiles and the probability of using the maternity services (Table 4). For

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**Table 3. Concentration Indices Showing Economic Inequality in the Use of Antenatal Care and Medical Assistance at Delivery Among Women Aged 15 to 49 Years in Nigeria, 1990 to 2008.**

|                      | Antenatal care |                      | Medical assistance at delivery |                      |
|----------------------|----------------|----------------------|-------------------------------|----------------------|
|                      | Concentration index | SE | 95% CI                      | Concentration index | SE | 95% CI                      |
| **Household wealth** |                |      |                              |                      |      |                              |
| 1990                 | 0.467***       | 0.010 | [0.447, 0.486]             | 0.455***            | 0.010 | [0.436, 0.474]             |
| 2003                 | 0.441***       | 0.011 | [0.419, 0.462]             | 0.409***            | 0.011 | [0.388, 0.430]             |
| 2008                 | 0.621***       | 0.006 | [0.608, 0.633]             | 0.523***            | 0.006 | [0.512, 0.534]             |
| **Women’s level of education** |        |      |                              |                      |      |                              |
| 1990                 | 0.538***       | 0.009 | [0.520, 0.556]             | 0.495***            | 0.009 | [0.477, 0.515]             |
| 2003                 | 0.494***       | 0.010 | [0.474, 0.515]             | 0.461**             | 0.010 | [0.441, 0.480]             |
| 2008                 | 0.644***       | 0.006 | [0.631, 0.656]             | 0.523***            | 0.006 | [0.512, 0.534]             |

Note. CI = confidence interval. 
**p < .05, ***p < .01.
instance, the probability of using antenatal care was .231 among poorest wealth quintile, .362 among poor quintile, .591 among middle quintile, .758 among rich wealth quintile, and .916 among richest wealth quintile in 2008. Similarly, the probability of medical assistance at delivery was .098 among poorest wealth quintile, .169 among poor quintile, .323 among middle quintile, .566 among rich wealth quintile, and .810 among richest wealth quintile in 2008. The pattern is similar across the period. We further computed percentage changes in the probability of antenatal care and medical assistance at delivery decreased across all levels of education; however, the decline was greater among the uneducated women than among educated women.

Table 4: Predicted Probabilities (95% CI) Showing the Interaction Effect of Time and Household Wealth on the Use of Antenatal Care and Medical Assistance Among Women Aged 15 to 49 Years in Nigeria, 1990-2008.

|          | Prenatal care | Medical assistance at delivery |
|----------|---------------|--------------------------------|
|          | PP            | 95% CI                         | PP               | 95% CI                        |
| 1990     |               |                                |                  |                               |
| Poorest  | .259          | [0.233, 0.385]                 | .119             | [0.100, 0.139]                |
| Poor     | .331          | [0.303, 0.359]                 | .159             | [0.138, 0.181]                |
| Middle   | .503          | [0.466, 0.540]                 | .265             | [0.234, 0.296]                |
| Rich     | .656          | [0.626, 0.685]                 | .446             | [0.417, 0.475]                |
| Richest  | .870          | [0.850, 0.889]                 | .709             | [0.685, 0.733]                |
| 2003     |               |                                |                  |                               |
| Poorest  | .311          | [0.270, 0.352]                 | .186             | [0.152, 0.220]                |
| Poor     | .376          | [0.335, 0.418]                 | .254             | [0.221, 0.287]                |
| Middle   | .486          | [0.444, 0.527]                 | .323             | [0.288, 0.357]                |
| Rich     | .669          | [0.633, 0.706]                 | .505             | [0.469, 0.540]                |
| Richest  | .937          | [0.916, 0.957]                 | .806             | [0.775, 0.838]                |
| 2008     |               |                                |                  |                               |
| Poorest  | .231          | [0.211, 0.251]                 | .098             | [0.084, 0.112]                |
| Poor     | .362          | [0.342, 0.382]                 | .169             | [0.153, 0.184]                |
| Middle   | .591          | [0.570, 0.612]                 | .323             | [0.304, 0.343]                |
| Rich     | .758          | [0.741, 0.776]                 | .566             | [0.547, 0.586]                |
| Richest  | .916          | [0.904, 0.929]                 | .810             | [0.793, 0.827]                |

% Changes during 1990-2008

|          |      |      |
|----------|------|------|
| Poorest  | −10.8| −17.6|
| Poor     | 9.4  | 6.3  |
| Middle   | 17.5 | 21.9 |
| Rich     | 15.5 | 26.9 |
| Richest  | 5.3  | 14.2 |

Note. Models are adjusted for place of residence, parity, mother’s age at birth of the child, partner education, caste, religion, women’s exposure to media, current working status of women, and region of the country. Model for medical assistance at delivery is additionally adjusted for antenatal care. PP = predicted probabilities; CI = confidence interval.

Discussion

Being a signatory country to the pursuit of the MDG-5, Nigeria has committed to improving reproductive health and achieving the MDG-5 of reducing maternal mortality by 75% by the year 2015. The country has developed a wide range of policies and programs since the 1990s with the objective of reducing these outcomes. Since the year 1999 with the inception of civil governance in Nigeria, some policies targeted at promoting maternal health have been initiated. The programs such as National Health Insurance Scheme for mother and child, removal of user fees for MCH services at the federal and state levels were introduced to make the lives of mothers and their children safer.

The purpose of these programs is to upgrade the average level of health care utilization and to narrow the regional and
Table 5. Predicted Probabilities (95% Confidence Interval) Showing the Interaction Effect of Time and Individual Education on the Use of Antenatal Care and Medical Assistance Among Women Aged 15 to 49 Years in Nigeria, 1990 to 2008.

|                | Prenatal care |                | Medical assistance at delivery |
|----------------|---------------|---------------|-------------------------------|
|                | PP            | 95% CI        | PP                           | 95% CI                       |
| 1990           |               |               |                               |
| Uneducated     | .371          | [0.355, 0.388]| .187                         | [0.174, 0.200]               |
| Primary        | .722          | [0.698, 0.746]| .517                         | [0.491, 0.542]               |
| Secondary      | .885          | [0.861, 0.910]| .770                         | [0.739, 0.802]               |
| Higher         | .964          | [0.917, 0.998]| .911                         | [0.838, 0.983]               |
| 2003           |               |               |                               |
| Uneducated     | .325          | [0.298, 0.352]| .165                         | [0.145, 0.186]               |
| Primary        | .657          | [0.621, 0.692]| .476                         | [0.440, 0.511]               |
| Secondary      | .855          | [0.830, 0.881]| .753                         | [0.723, 0.784]               |
| Higher         | .951          | [0.910, 0.991]| .918                         | [0.865, 0.970]               |
| 2008           |               |               |                               |
| Uneducated     | .305          | [0.291, 0.319]| .140                         | [0.130, 0.150]               |
| Primary        | .640          | [0.662, 0.659]| .393                         | [0.375, 0.411]               |
| Secondary      | .811          | [0.798, 0.825]| .640                         | [0.624, 0.657]               |
| Higher         | .944          | [0.927, 0.962]| .879                         | [0.855, 0.903]               |

% Changes during 1990-2008

|                |               |               |
|----------------|---------------|---------------|
| Uneducated     | −17.8         | −25.1         |
| Primary        | −11.4         | −24.0         |
| Secondary      | −6.5          | −16.9         |
| Higher         | −2.1          | −3.5          |

Note. Models are adjusted for place of residence, parity, mother’s age at birth of the child, partner education, caste, religion, women’s exposure to media, current working status of women, and region of the country. Model for medical assistance at delivery is additionally adjusted for antenatal care. PP = predicted probabilities; CI = confidence interval.

socioeconomic gap by assuring equitable and quality health services, particularly among poor and underserved women and children. However, due to limited evidence on the use of maternal health care over time and across socioeconomic entities, it is difficult to evaluate the extent to which these programmatic efforts have benefitted the neediest socioeconomic population subgroups. The present study, therefore, made an attempt to examine the trends and patterns of socioeconomic inequality in the utilization of antenatal care and medical assistance at delivery in Nigeria, using multi-rounds of the Nigerian DHS conducted between 1990 and 2008.

The findings indicate that the use of the maternal health care services was lower in Nigeria. The condition is worst for medical assistance at delivery, as just one in three births is delivered with medical assistance. Moreover, the service coverage has increased sluggishly over the study period. These alarming trends raise several critical questions on the role of the supply-side factors related to the public health care system in Nigeria. Most of the well-conceived policies and programs are driven by non-governmental organizations (NGOs) and private agencies, with no substantial funding coming from public sector. Skilled birth attendants are in short supply in Nigeria. Roughly 60% of births are attended by unskilled birth attendants, while up to 50% of practitioners with skills work in the private sector. To date, maternity services provided by the private sector have not been audited, and there has been little attempt to link them to the formal public health sector (Bankole et al., 2009).

Like national average, the coverage of both services has stagnated across the household wealth quintiles and education level of women in Nigeria during 1990-2008. However, coverage has slightly increased among women of richest wealth quintile but decreased among poorest wealth quintile. The current level of services coverage is considerably lower among poorest and uneducated mothers than their counterparts. These findings indicate increasing socioeconomic inequality in the coverage of maternal health care services in Nigeria. Our finding is in tune with previous studies which have noted significant socioeconomic disparities in the use of MCH services in Nigeria and other developing countries (Olayinka, Achi, Amos, & Chiedu, 2014; Pathak et al., 2010; Rai, Singh, & Singh, 2012).

The lower coverage of the MCH services among women of poorest wealth quintile and growing inequality within the economic groups indicate that women from better-off economic households have benefitted from the ongoing health policies and programs to a greater extent than women from poor households. Similarly, greater use of the services among most educated women might be conferred by acquisition of health knowledge, independent decision-making capacity regarding use of modern health facilities, and increased command over resources among the educated mothers (Caldwell,
1979). Interestingly, use of the services has declined, though minimal, among the most educated mothers. This could be understood by starting from an absolute high level of coverage of the services, particularly of antenatal care, among the higher educated women in Nigeria.

The results of the multivariate analysis confirm that when controlled for selected background characteristics, use of the maternal health care services varied significantly across household wealth quintiles and women’s level of education. The socioeconomic inequality remained persistent over the study period. Across the household wealth quintiles, the highest improvement in use of antenatal care services was observed in the middle wealth quintile. This may be attributed to the striking improvement in the economic status of the population as measured by the wealth index, in the middle wealth quintile during 1990-2008.

**Limitation**

This article uses cross-sectional data from the Nigerian DHS. It is, therefore, subjected to such limitations associated with cross-sectional survey, in that the data cannot serve as the basis of establishing causality among variables. Furthermore, data are prone to recall bias as respondents were to report past incidences in relation to their reproductive health.

**Conclusion**

Our findings reflect that despite several governmental efforts to increase access to maternal health care services among the underserved groups, use of antenatal care and medical assistance at delivery remains disproportionately lower among poor and uneducated mothers in Nigeria across the time. Evidence-based approach in reducing maternal health inequalities is needed in developing and implementing maternal health programs in Nigeria. Such policies need to reckon with the differences and similarities in the socioeconomic factors that promote or constrain responsive maternal health care services utilization across the six geopolitical zones and within the 36 states in Nigeria.

Socioeconomic differentials are products of larger interactions within the social system. As such, efforts aimed at addressing these differentials must also account for both proximate and distal factors stimulating existing socioeconomic differentials and incorporate such evidence into maternal health care services. While current efforts are made at reducing maternal mortality and promoting maternal health in Nigeria, an appraisal of these initiatives at the different six geopolitical zones and within the various states will help redirecting maternal health initiatives in the post-MDGs development agenda.

**Appendix**

**Table A1.** Regression Coefficient (95% CIs) Showing the Interaction Effect of Survey Time and Household Wealth and Survey Time and Women’s Level of Education on the Use of Antenatal Care Medical Assistance at Delivery in Nigeria, 1990 to 2008.

| Survey year and household wealth | 1990 | 2003 | 2008 |
|---------------------------------|------|------|------|
| Poor                            |      |      |      |
| Middle                          | 0.24 [0.09, 0.57] | 0.71 [0.37, 1.05] | 1.73 [1.29, 2.17] |
| Rich                            | 0.56 [0.22, 0.91] | 0.86 [0.51, 1.20] | 1.34 [0.97, 1.71] |
| Richest                         | 1.07 [0.76, 1.39] | 1.34 [0.97, 1.71] | 1.53 [1.30, 1.77] |
| Survey year and women's level of education | 1990 |      |      |
| Uneducated                      | 0.14 [-0.09, 0.37] | 0.19 [-0.04, 0.42] | 0.33 [0.16, 0.51] |
| Primary                         |      |      |      |
| Medical assistance at delivery  |      |      |      |
| Antenatal care                  |      |      |      |
Table A1. (continued)

|                | Antenatal care          | Medical assistance at delivery |
|----------------|-------------------------|------------------------------|
|                | 0.31 [-0.07, 0.69]      | 0.63*** [0.30, 0.97]          |
| >Secondary     | 0.31 [-1.19, 1.81]      | 0.81*** [-0.20, 1.82]         |
| 2003 Uneducated|                          |                              |
| Primary        | 0.56*** [0.32, 0.81]    | 0.42*** [0.15, 0.69]          |
| Secondary      | 0.96*** [0.63, 1.29]    | 0.97*** [0.65, 1.30]          |
| >Secondary     | 1.33*** [0.40, 2.25]    | 1.81*** [0.98, 2.64]          |

2008 Uneducated

|                | 0.59*** [0.47, 0.71]    | 0.41*** [0.26, 0.56]          |
| Secondary      | 0.88*** [0.73, 1.03]    | 0.77*** [0.60, 0.94]          |
| >Secondary     | 1.46*** [1.07, 1.84]    | 1.39*** [1.08, 1.70]          |

Note. Models are adjusted for place of residence, parity, mother’s age at birth of the child, partner education, caste, religion, women’s exposure to media, current working status of women, and region of the country. Model for medical assistance at delivery is additionally adjusted for antenatal care. **p < .01. ***p < .001.

Authors’ Contributions

Both authors made sufficient contributions to this work, and the content of the manuscript has never been previously published.

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References

Ahmed, S., Creanga, A. A., Gillespie, D. G., & Tsui, A. O. (2010). Economic status, education and empowerment: Implications for maternal health service utilization in developing countries. *PLoS ONE, 5*(6), e11190.

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*(1), Article 43.

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

Barrera, A. (1990). The role of maternal schooling and its interaction with public health programs in child health production. *Journal of Development Economics, 32*, 69-91.

Becker, S., David, H. P., Ronald, H. G., Connie, G., & Black, R. E. (1993). The determinants of use of maternal and child health services in Metro Cebu, the Philippines. *Health Transition Review, 50*, 77-89.

Bhutta, Z. A., Chopra, M., Axelson, H., Berman, P., Boerma, T., Bryce, J., & Daelmans, B. (2010). Countdown to 2015 decade report (2000–10): Taking stock of maternal, newborn, and child survival. *The Lancet, 375*, 2032-2044.

Bonfrer, I., van de Poel, E., Grimm, M., & Van Doorslaer, E. (2014). Does the distribution of healthcare utilization match needs in Africa? *Health Policy and Planning, 29*, 921-937.

Caldwell, J. C. (1979). Education as a factor in mortality decline an examination of Nigerian data. *Population Studies, 39*, 395-413.

Carr, D. (2004). *Improving the health of the world’s poorest people* (Health Bulletin 1). Washington, DC: Population Reference Bureau.

Cavallaro, F. L., & Marchant, T. J. (2013). Responsiveness of emergency obstetric care systems in low-and middle-income countries: A critical review of the “third delay.” *Acta obstetricia et gynecologica Scandinavica, 92*, 496-507.

Chalasani, S. (2012). Understanding wealth-based inequalities in child health in India: A decomposition approach. *Social Science & Medicine, 75*, 2160-2169.

Filmer, D., & Pritchett, L. H. (2001). Estimating wealth effects without expenditure data—Or tears: An application to educational enrollments in states of India. *Demography, 38*, 115-132.

Gabryschi, 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), Article 34.

Gwatkin, D., Rutstein, S., Johnson, K., Suliman, E., Wagstaff, A., & Amouzou, A. (2009). *Socio-economic differences in health, nutrition, and population within developing countries: An overview*. The World Bank, Government of the Netherlands, Swedish International Development Agency. Retrieved from http://siteresources.worldbank.org/INTPAH/Resources/IndicatorsOverview.pdf

Kumar, A., Kumari, D., & Singh, A. (2014). Increasing socioeconomic inequality in childhood undernutrition in urban India: Trends between 1992-93, 1998-99, and 2005-06. *Health Policy and Planning, 30*, 1003-1016.

Makinen, M., Waters, H., Rauch, M., Almagambetova, N., Bitran, R., Gilson, L., & Ubilla, G. (2000). Inequalities in health care use and expenditures: Empirical data from eight developing countries and countries in transition. *Bulletin of the World Health Organization, 78*, 55-65.

Mohammed, S., & Dong, H. (2012). Tackling Millennium Development Goals (MDGs) 4 and 5: The National Health Insurance Scheme (NHIS) approach in Nigeria. *Journal of Public Health in Africa, 3*(1), e9.

Mojekwu, J. N., & Ibekwe, M. U. (2012). Maternal mortality in Nigeria: Examination of intervention methods [Special issue].
Obian and Kumar

International Journal of Humanities and Social Science, 2(20). Retrieved from http://www.ijhssnet.com/journals/Vol_2_No_20_Special_Issue_October_2012/13.pdf

Montgomery, M. R., Gragnolati, M., Burke, K. A., & Paredes, E. (2000). Measuring living standards with proxy variables. Demography, 37, 155-174.

Ngomane, S., & Mulaudzi, F. M. (2012). Indigenous beliefs and practices that influence the delayed attendance of antenatal clinics by women in the Bohlabelo district in Limpopo, South Africa. Midwifery, 28, 30-38.

O’Donnell, O. A., & Wagstaff, A. (2008). Analyzing health equity using household survey data: A guide to techniques and their implementation. Washington, DC: The World Bank.

Pathak, P. K., Singh, A., & Subramanian, S. (2010). Economic inequalities in maternal health care: Prenatal care and skilled birth attendance in India, 1992–2006. PloS ONE, 5(10), e13593.

Poureslami, I. M., MacLean, D. R., Spiegel, J., & Yassi, A. (2013). Socio-cultural, environmental and health challenges facing women and children living near the borders between Afghanistan, Iran and Pakistan (AIP region). Journal of International Women’s Studies, 6, 10-15.

Rai, R. K., Singh, P. K., & Singh, L. (2012). Utilization of maternal health care services among married adolescent women: Insights from the Nigeria Demographic and Health Survey, 2008. Women’s Health Issues, 22, e407-e414.

Ray, S., Madzimbamuto, F., & Fonn, S. (2012). Activism: Working to reduce maternal mortality through civil society and health professional alliances in sub-Saharan Africa. Reproductive Health Matters, 20(39), 40-49.

Richard, F., Antony, M., Witter, S., Kelley, A., Sieleunou, I., Kafando, Y., & Meessen, B. (2013). Fee exemption for maternal care in sub-Saharan Africa: A review of 11 countries and lessons for the region. Global Health Governance, 6(2), 52-72.

Rogers-Block, Q., Spratt, K., Folasire, O., Irabor, A., Folasire, A., Gulland, A., & Mathema, H. (2012). 2010-2011 baseline facility survey for the Nigerian Urban Reproductive Health Initiative. Nature Medicine, 18(1), 1. Retrieved from https://www.urbanreproductivehealth.org/sites/inle/files/nurhi_baseline_facility_report_23feb12_final.pdf

Ronsmans, C., & Graham, W. J. (2006). Maternal mortality: Who, when, where, and why. The Lancet, 368, 1189-1200.

Sastry, N. (2004). Trends in socioeconomic inequalities in mortality in developing countries: The case of child survival in Sao Paulo, Brazil. Demography, 41, 443-464.

Say, L., Chou, D., Gemmill, A., Tuncalp, O., Moller, A.-B., Daniels, J., & Alkema, L. (2014). Global causes of maternal death: A WHO systematic analysis. The Lancet Global Health, 2(6), e323-e333.

Singh, L., & Singh, C. H. (2007). Rich–poor gap in maternal care: The case of Northeast India. Asian Population Studies, 3, 79-94.

Tawiah, E. (2011). Maternal health care in five sub-Saharan African countries. African Population Studies, 25, 1-25.

United Nations Children’s Fund. (1998). The state of the world’s children 1998. New York, NY: Oxford University Press.

Vyas, S., & Kumananayake, L. (2006). Constructing socio-economic status indices: How to use principal components analysis. Health Policy and Planning, 21, 459-468.

Wagstaff, A. (2005). The bounds of the concentration index when the variable of interest is binary, with an application to immunization inequality. Health Economics, 14, 429-432.

World Health Organization. (2006). Provision of effective antenatal care: Integrated Management of Pregnancy and Child Birth (IMPAC). Geneva, Switzerland: Standards for Maternal and Neonatal Care (1.6), Department of Making Pregnancy Safer. Retrieved from http://www.who.int/making_pregnancy_safet/publications/Standards1.6N.pdf

Zere, E., Moeti, M., Kirigia, J., Mwase, T., & Kataika, E. (2007). Equity in health and healthcare in Malawi: Analysis of trends. BMC Public Health, 7(1), Article 78.

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