

# Trends and drivers of skilled birth attendant use in Nigeria (1990–2013): policy implications for child and maternal health

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**Introduction:** While Nigeria accounts for only 2% of the world population, it regrettably shares 14% of global maternal death burden. Whether its reported increase in antenatal care utilization is accompanied by increased use of skilled birth attendants (SBAs) is not known. This study assessed trends in utilization of SBAs in Nigeria between 1990 and 2013 and identified its determinants.

**Methods:** Data from four consecutive Nigerian Demographic and Health Survey reports between 1990 and 2013 were pooled. We used basic descriptive statistics, test of association, and logistic regression to assess the prevalence, relative change, and determinants of SBA use at 5% significance level. Sample weights were applied, and adjustment was made for survey design and sampling errors.

**Results:** Nearly half (46.7%) of the respondents were aged 25–34 years, while half (50.3%) of the respondents had no formal education. The prevalence of SBA use increased only marginally across the years and characteristics studied, from 32.4% in 1990 to 38.5% in 2013, an insignificant 6% increase. Educated women used SBA more than women with no education (92.4% vs 13.1%), and their odds ratio of using SBA were thrice that of uneducated women (odds ratio = 3.09, 95% confidence interval = 2.17–4.38). Women involved in decisions regarding their use of health facility were 12% more likely to use SBAs than others who do not. Educational attainment, religion, tribe, rural/urban residence, and zone of residence were significant to the use of SBA.

**Conclusion:** The use of SBA was very low throughout the study period, barely at one third usage with insignificant changes over the studied period. Women empowerment, including decision-making power and residence, were the strongest determinants of SBA use. To overturn poor child and maternal health outcomes in Nigeria through SBA use, efforts should be targeted at educating girls, sexual and reproductive health education, and accessible and improved health care facility services.

**Keywords:** antenatal care, utilization, women education, Nigeria, women empowerment, DHS

## Introduction

Recent statistics show that while Nigeria accounts for only 2% of the world population, it carries 14% of global maternal death burden.<sup>1</sup> Maternal and newborn health, therefore, continues to be a major challenge in Nigeria despite approximately a half decrement in the maternal mortality rate (MMR) in the past 23 years (1,200 deaths per 100,000 live births in 1990 to 560 deaths per 100,000 live births in 2013).<sup>1,2</sup> Little evidence abounds on the reasons for the decline so far. A regional study conducted in northern Nigeria showed an increase in skilled birth attendants (SBAs) use during delivery.<sup>3</sup> In addition,

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the Demographic and Health Survey (DHS) reports showed that antenatal care (ANC) visits in Nigeria increased from 45% in 2008 to 61% in 2013.<sup>2</sup> These buttresses the argument of Tey et al that reduction in maternal death and morbidities could be achieved through the effective use of ANC services, SBA, and postnatal care services.<sup>4</sup>

However, ANC utilization does not seem to have translated to the use of SBA. The degree of progress recorded in the use of SBA over the years in most developing countries is not commensurate with an increase in ANC utilization.<sup>5</sup> In Nigeria, while 61% of pregnant women received ANC services, only 36% utilized SBA.<sup>2,6,7</sup> The situation is not different in other neighboring West Africa countries. For instance, recent Ghanaian studies showed that ANC utilization is increasing faster than SBA use.<sup>8–10</sup> This is despite the fact that SBA use has been reported to contribute more to maternal death reduction than ANC visits.<sup>11,12</sup>

The advantages of SBA use during deliveries cannot be overemphasized. It increases the chances of safe delivery and also abates potential morbidity and mortality among mothers and newborns.<sup>13,14</sup> The skills and performance of persons rendering assistance during delivery influence the chances of proper management of complications and hygienic practices.<sup>2</sup> First-birth delivery using SBA may influence future use of SBA for subsequent deliveries though preconditioned by the availability and quality of services.

A meta-analysis of available literatures on SBA in some databases grouped the identified 20 determinants into four: “1) sociocultural factors; 2) perceived benefit/need of SBA; 3) economic accessibility; and 4) physical accessibility.”<sup>13</sup> However, there are other determinants of SBA use beside the 3Ps – perceived needs/benefits, perceived accessibility of maternal health services, and perceived quality of care.<sup>14,15</sup> Apart from sociocultural and economic characteristics, a recent study conducted in Nigeria highlighted attitudes of health workers, fear of stigma, and nonconfidentiality of the health workers as impediment to several pregnant women’s use of SBA.<sup>16</sup> Similar mistrusts of health care providers have been reported among persons living with HIV/AIDS.<sup>17–20</sup> Acute shortages of SBA and long waiting time have also been reported as barriers to the use of SBA.<sup>3</sup>

Other preconditions notable for the use of SBA in more recent literature include women’s decision-making power such as having a say on their earned money, their health care, and general household decision making. The overwhelming contribution of poverty level in mitigating the use of health care facility in Nigeria and elsewhere has been well documented.<sup>6,12,16,21–23</sup>

While there are few regional studies on changes in SBA use over short periods such as 5 years in Nigeria, such studies for the entire country over a longer period are scarce. This study is therefore designed to assess the trends in utilization of SBA in Nigeria between 1990 and 2013 and to identify its determinants. With respect to SBA use in Nigeria, we provided answers to the following questions: What has changed? How significant is (are) the change (changes)? When was the change? What influenced the changes? The knowledge of trend of SBA use will aid adequate maternal health care use interventions so as to reduce the high poor maternal outcomes in Nigeria. Risk factors of SBA use were also identified so as to provide evidence-based information to policymakers and program implementers on maternal and child health care. The information will aid easier decisions on necessary interventions so as to improve usage and reduce associated risks.

## Methods

Data obtained from four consecutive Nigerian Demographic and Health Survey NDHS reports in 1990, 2003, 2008, and 2013 were pooled. NDHS is a cross-sectional, in design, routinely conducted, and nationally representative survey. Geographically, Nigeria is divided into 6 zones (regions), and each zone has between 5 and 7 states depending on land mass and population density. Data were collected from each of the 36 states and the federal capital territory. The survey used a multistage approach in sampling the respondents and collected information about household and reproductive health of the participants. At the first stage, local government areas (LGAs) were selected from each state, then the enumeration areas (EAs) were selected from the selected LGAs at the second stage, while the primary sampling units commonly referred to as “clusters” and households within the selected EAs were selected at the third and fourth stages, respectively. Primary information about households, sexual and reproductive health, and history was collected from women aged 15–49 years within the selected households. The birth history of all women interviewed was among the key information collected. Details of the sampling methodology have been published.<sup>2,24</sup> In all, 8,781, 7,620, 33,385, and 38,984 women participated in the 1990, 2003, 2008, and 2013 survey years, respectively.

The outcome variable in this study is the use of SBA. The SBAs include doctor, nurse, midwife, and auxiliary nurse/midwife.<sup>2,11,25</sup> Our outcome of interest is the skill of birth attendants at the most recent birth to any woman who had given birth at least once within the 5 years preceding the survey. A total of 46,487 women had at least one child

within 5 years preceding each of the survey years. This was made up of 4,892 women in 1990, 3,775 women in 2003, 18,028 women in 2008, and 20,192 women in 2013. We therefore extracted the skills of person(s) who assisted the women during their latest childbirth and other characteristics as detailed below.

Based on significant variables associated with the use of SBA in literature,<sup>13,26</sup> the independent variables included in this study were the following:

1. Sociocultural factors: maternal age (15–19, 20–24, 25–34, and 35+ years), mother's education (primary, secondary, secondary+, and none), marital status (never married, currently married or living with sexual partner, and formerly married), ethnicity (Hausa/Fulani, Yoruba, Igbo, and others), religion (Islam, Christian/Catholic, and others), women autonomy: women involved in how her earnings are spent (yes and no), women involvement in decisions about her use of health care facility (yes and no).
2. Perceived benefit/need of skilled attendance: pregnancy wanted (wanted then and not wanted then), adequacy of ANC use, based on World Health Organization (WHO)-recommended four visits (none, inadequate [one to three visits], and adequate [four or more visits]; constructed from DHS data), SBA used during previous delivery (skilled [doctor, nurse, midwife, and auxiliary nurse/midwife; constructed from DHS data] and unskilled [others]), and birth order (1, 2–3, 4–6, and 7+).
3. Economic accessibility: mothers currently working (yes and no), household wealth (poorest [lowest and lower], middle, and richest [higher and highest]; constructed from DHS data).
4. Physical accessibility: region (north central, northeast, northwest, southeast, south–south, and southwest), residence (urban and rural), and distance to health facilities is a problem (problem and no problem).

We defined women autonomy as liberty to make or contribute to decisions regarding how a woman spends her earnings and whether to visit health care facilities or not.<sup>6,13,27</sup> The adequacy of number of ANC visits during the pregnancy and the use of SBA or otherwise during previous delivery and self-reported difficulty women had in accessing care were assessed at system level. We also included rural/urban differentials, location of residence as well as household wealth as household-level proximate determinants.

## Data analyses

We used basic descriptive statistics to show the distribution of eligible participants vis-à-vis the characteristics studied (Table 1). We carried out a bivariate analysis of the

**Table 1** Weighted distribution of women who had given birth in the 5 years preceding the survey by analysis variables and survey year

Characteristics	DHS year				
	1990	2003	2008	2013	Total
Number	4,892	3,775	18,028	20,192	46,887
SBA used					
Unskilled	32.4	38.7	36.6	38.5	36.8
Skilled	67.6	61.3	63.4	61.5	63.2
Age (years)					
15–19	7.9	8.3	6.9	6.3	7.0
20–24	20.8	20.5	19.4	19.5	19.7
25–34	48.0	46.7	46.5	46.7	46.7
35–49	23.3	24.6	27.2	27.5	26.6
Mothers education					
No education	63.9	49.9	49.1	46.9	50.3
Primary	23.3	24.2	22.5	20.0	22.0
Secondary	11.6	22.2	23.2	26.6	22.7
Higher	1.3	3.7	5.2	6.4	5.0
Marital status					
Never married	0.8	2.6	2.5	2.6	2.3
Married/LWSP	95.9	93.4	94.5	94.3	94.5
Formerly married	3.3	4.1	3.0	3.1	3.2
Religion					
Islam	58.8	14.4	55.2	58.9	53.7
Xtian	37.3	23.5	42.3	39.6	39.5
Other	3.9	62.1	2.5	1.5	6.8
Tribe					
Hausa/Fulani	–	31.0	36.7	40.6	37.5
Yoruba	–	10.9	11.9	11.4	11.7
Igbo	–	11.6	10.1	9.7	10.1
Other	–	46.5	41.4	38.3	40.8
Involved in their own income spending					
Yes	–	90.3	84.3	89.9	86.9
No	–	9.7	15.7	10.1	13.1
Involved in their own health care decision					
Yes	–	23.2	40.9	36.1	37.8
No	–	76.8	59.1	63.9	62.2
Place of residence					
Urban	31.6	34.7	26.6	33.0	29.7
Rural	68.4	65.3	73.4	67.0	70.3
Zone					
North central	15.6	16.5	18.5	14.8	16.9
Northeast	11.5	23.2	22.0	20.3	20.3
Northwest	35.5	30.9	26.8	32.4	29.8
Southeast	10.1	8.1	8.2	8.1	8.4
South–south	8.1	10.1	11.8	11.9	11.3
Southwest	19.2	11.4	12.7	12.7	13.3
Distance to health facility being a problem					
No problem	–	26.1	40.6	32.5	36.7
Problem	–	74.0	59.4	67.5	63.3
Currently employed					
Yes	64.5	65.4	68.3	70.8	68.4
No	35.5	34.6	31.7	29.2	31.7
Wealth category					
Poorest	45.2	44.2	49.7	45.7	47.6
Middle	13.9	20.3	19.6	19.9	19.0
Richest	40.9	35.5	30.7	34.4	33.4
Child was planned					
Planned	87.4	84.8	89.6	90.3	89.2
Unplanned	12.6	15.2	10.4	9.7	10.8

(Continued)

**Table 1** (Continued)

Characteristics	DHS year				
	1990	2003	2008	2013	Total
ANC attendance					
None	39.4	33.9	39.1	34.5	37.4
Inadequate	10.9	14.4	10.9	12.6	11.7
Adequate	49.7	51.7	49.9	53.0	50.9
SBA used for the last child					
Unskilled	66.2	66.9	68.1	67.0	67.4
Skilled	33.8	33.1	31.9	33.0	32.6
Birth order					
1	16.4	19.2	17.0	17.7	17.3
2–3	30.2	29.0	31.3	30.8	30.9
4–6	33.3	31.1	32.2	32.5	32.4
7+	20.0	20.6	19.5	19.0	19.5
Total	12.0 <sup>a</sup>	7.3 <sup>a</sup>	51.6 <sup>a</sup>	29.0 <sup>a</sup>	100

**Note:** <sup>a</sup>Percentage of total.

**Abbreviations:** ANC, antenatal care; DHS, Demographic and Health Survey; SBA, skilled birth attendant; LWSP, living with sexual partner.

characteristics and use of SBA and reported the prevalence as well as changes in the use of SBA among the survey years (Table 2). Using both bivariate and multiple logistic regression analyses, we determined and tested the association between each of the characteristics and SBA use and reported the unadjusted odds ratio (OR) and adjusted odds ratio (aOR), respectively. The OR is the influence of individual independent variable on the use of SBA. The aOR is the influence of an independent variable on the use of SBA while controlling for other independent variables.  $\chi^2$  tests of association and tests of significance of OR were performed, and significance was determined at 5%. All analyses were conducted by using Stata Version 14, and sample weights duly applied so as to make provisions for unequal sample sizes across groups. We adjusted for survey design and sampling errors in all the analyses. There are some instances where some variables were not included in earlier DHS, and analyses were not performed on such variables for the particular DHS year.

## Ethics approval

We relied on the series of ethical clearance(s) granted to the survey management by Nigeria National Health Research Ethics Committee in the respective survey years as documented earlier.<sup>2,24</sup> Written informed consent for participation in the study was obtained from all the participants aged 18–49 years, and additional written consent was obtained from parents and guardians of participants who had not attained the age of 18 years.

## Results

Among the 8,781, 7,620, 33,385, and 38,984 women interviewed in the 1990, 2003, 2008, and 2013 survey years,

respectively, only 4,892 (55.7%), 3,775 (49.5%), 18,028 (54.0%), and 20,192 (48.2%) women had had at least a child within 5 years preceding the survey. Therefore, a further analysis included only 46,887 (52.8%) of all the 88,734 women interviewed in the four surveys (not shown in the tables). In all, nearly half (46.7%) of the respondents were aged 25–34 years with <10% aged 15–19 years. On average, most (94.5%) of the women were either currently married or living with a sexual partner, while about half (50.3%) of the women had no education, which fell from 63.9% in 1990 to 46.9% in 2013. Nine of every 10 women wanted the child when they got pregnant, while 63.3% encountered problem in getting access to health care facility (Table 1). Throughout the period of 2003–2013, 86.9% and 37.8% of the women claimed to have been involved in decisions on how their earnings are spent and on their use of health care facilities.

Table 2 presents the prevalence of SBA use by the women by their characteristics. The estimates increased only marginally across the years studied, except by education and marital status which showed a downward trend. In all, SBA use rose from 32.4% in 1990 to 38.5% in 2013, a 5% increment. Nevertheless, more educated women had higher use of SBA compared with less educated women (92.4% vs 13.1%). The never married and formerly married women had higher SBA use compared with their currently married counterparts although SBA usage among the single women dwindled significantly. Involvement of women in how their earnings are spent did not influence SBA use significantly, but involvement in their use of health care facility was significant. Across the regions of residence, the prevalence was generally lower in the northern regions compared with the southern regions. Highest absolute change across regions was observed in southeast with 27.4% increase between 1990 and 2013. In addition, the higher the wealth quintile, adequate use of ANC, and use of SBA during previous delivery, the higher the SBA use as shown in Figure 1 and Table 2. Lower parity seemed to have encouraged SBA use across the years; however, the prevalence among women with >6 children fell from 30.5% in 1990 to 22.7% in 2013. Mothers who used SBA for previous pregnancy also have higher tendencies of repeating such SBA use. We found significant association among the categories of all variables considered, except women involvement in her income spending.

The bivariate logistic regression models showed that the use of SBA was more likely in 2013 and 2003 than it was in 1990. Women were 11% more likely to use SBA in 2013 than in 1990 (OR =1.11; 95% CI =1.04–1.19). Mothers with higher education were 80 times more likely to use SBA than those with no formal education (OR =80.2; 95% CI =68.6–93.7).

**Table 2** Trends in the percentage of married women who had given birth in the 5 years preceding survey who used SBA

Characteristics	Prevalence of SBA use					Percentage change		
	1990	2003	2008	2013	Total <sup>a</sup>	1990–2013	2003–2013	2008–2013
Age, years								
15–19	23.7	30.2	24.9	25.7	25.4*	2.0	–4.5	0.8
20–24	30.8	33.4	32.0	34.3	32.6*	3.5	0.9	2.3
25–34	34.2	41.1	40.5	41.2	40.0*	7.1	0.1	0.7
35–49	33.1	41.6	36.1	39.9	37.3*	6.9	–1.6	3.8
Mothers education								
No education	16.0	15.2	12.4	12.3	13.1*	–3.7	–2.9	–0.1
Primary	51.4	46.6	42.4	42.0	43.8*	–9.4	–4.7	–0.5
Secondary	78.4	74.2	69.6	69.0	70.3*	–9.3	–5.2	–0.5
Higher	93.4	92.0	91.9	93.1	92.4*	–0.3	1.1	1.2
Marital status								
Never	65.6	70.9	48.5	49.1	51.3*	–16.4	–21.7	0.6
Married/LWSP	31.7	37.5	36.0	38.0	36.2*	6.3	0.5	2.0
Formerly married	42.7	45.7	44.1	45.6	44.5*	2.9	–0.1	1.5
Religion								
Islam	17.5	18.9	21.2	22.6	22.1*	5.0	3.6	1.3
Christianity	57.3	62.0	57.7	62.8	59.3*	5.4	0.8	5.1
Other	18.8	22.9	19.0	25.0	22.0*	6.2	2.1	6.0
Tribe								
Hausa/Fulani	–	13.6	10.8	13.1	11.8*	–	–0.5	2.3
Yoruba	–	78.9	78.7	87.0	81.4*	–	8.1	8.3
Igbo	–	77.7	77.5	83.2	79.3*	–	5.5	5.7
Other	–	36.4	37.3	39.6	37.9*	–	3.2	2.3
Involved in their own income spending								
Yes	–	44.0	43.1	42.8	43.1	–	–1.2	–0.4
No	–	53.6	39.8	48.3	43.0	–	–5.3	8.5
Involved in their own health care decision								
Yes	–	60.6	51.0	59.1	54.1*	–	–1.5	8.1
No	–	32.1	25.7	26.1	26.5*	–	–6.1	0.4
Place of residence								
Urban	60.1	59.7	63.9	68.2	64.5*	8.1	8.5	4.3
Rural	19.6	27.5	26.7	23.9	25.1*	4.3	–3.7	–2.8
Zone								
North central	37.3	48.1	43.8	52.4	45.6*	15.1	4.3	8.6
Northeast	15.0	20.4	17.1	19.9	18.1*	4.9	–0.6	2.7
Northwest	5.5	15.7	9.9	12.5	10.5*	7.0	–3.2	2.6
Southeast	55.0	77.5	75.5	82.4	74.7*	27.4	4.9	6.9
South–south	41.8	60.6	51.4	48.4	50.3*	6.6	–12.2	–3.0
Southwest	73.0	78.3	77.4	81.5	77.9*	8.6	3.3	4.1
Distance to health care facility being a problem								
Problem	–	19.6	25.7	21.3	24.1*	–	1.8	–4.4
No problem	–	45.5	44.1	46.9	45.2*	–	1.4	2.8
Currently employed								
Yes	39.3	43.4	41.1	42.4	41.4*	3.1	–1.0	1.3
No	19.8	29.8	26.9	29.3	26.8*	9.5	–0.5	2.4
Wealth category								
Poorest	13.3	18.8	13.4	11.9	13.3*	–1.4	–6.9	–1.5
Middle	22.3	32.8	37.9	40.0	36.8*	17.7	7.2	2.1
Richest	57.0	66.9	73.2	73.0	70.3*	16.0	6.1	–0.2
Child was planned								
Planned	31.0	36.0	35.4	36.8	35.3*	5.8	0.9	1.5
Unplanned	41.5	54.0	48.7	55.5	50.0*	14.0	1.5	6.8
ANC attendance								
None	2.0	4.0	4.4	4.6	4.1*	2.6	0.5	0.2
Inadequate	28.0	29.4	31.4	27.3	29.6*	–0.7	–2.1	–4.1
Adequate	58.2	64.1	63.1	63.2	62.7*	5.0	–0.9	0.1

(Continued)



**Table 2** (Continued)

Characteristics	Prevalence of SBA use					Percentage change		
	1990	2003	2008	2013	Total <sup>a</sup>	1990–2013	2003–2013	2008–2013
SBA used for the last child								
Unskilled	5.3	6.3	6.6	6.7	6.4*	1.5	0.4	0.2
Skilled	81.7	86.4	87.8	88.8	87.2*	7.1	2.4	1.0
Birth order								
I	38.8	50.1	47.0	49.8	47.2*	11.0	−0.3	2.8
2–3	30.6	40.7	41.2	43.5	40.6*	12.9	2.9	2.3
4–6	31.9	36.7	35.2	36.8	35.4*	5.0	0.1	1.7
7+	30.5	28.4	22.4	22.7	24.0*	−7.8	−5.6	0.4
Total	32.4	38.7	36.6	38.5	36.8*	6.2	−0.2	1.9

**Notes:** \*Significant at 5%  $\chi^2$  test of association; <sup>a</sup>SBA use for all the data pooled together irrespective of survey years.

**Abbreviations:** ANC, antenatal care; DHS, Demographic and Health Survey; SBA, skilled birth attendant; LWSP, living with sexual partner.

Single mothers were almost double likely to use SBA than the currently married women (OR =1.75; 95% CI =1.55–1.96). Been older, Christian, from Yoruba or Igbo tribe, and living in urban area seemed to have increased likelihood of SBA use. Involvement of women in decisions regarding whether they use health care facilities or not increased SBA use by over three times (OR =3.39; 95% CI =3.25–3.54). The use of SBA at previous delivery and adequate ANC visits also increased the likelihood of SBA use by 37 (OR =36.9; 95% CI =34.1–39.9) and 98 (OR =97.9; 95% CI =89.3–107.3) times, respectively, as shown in Table 3 (left panel).

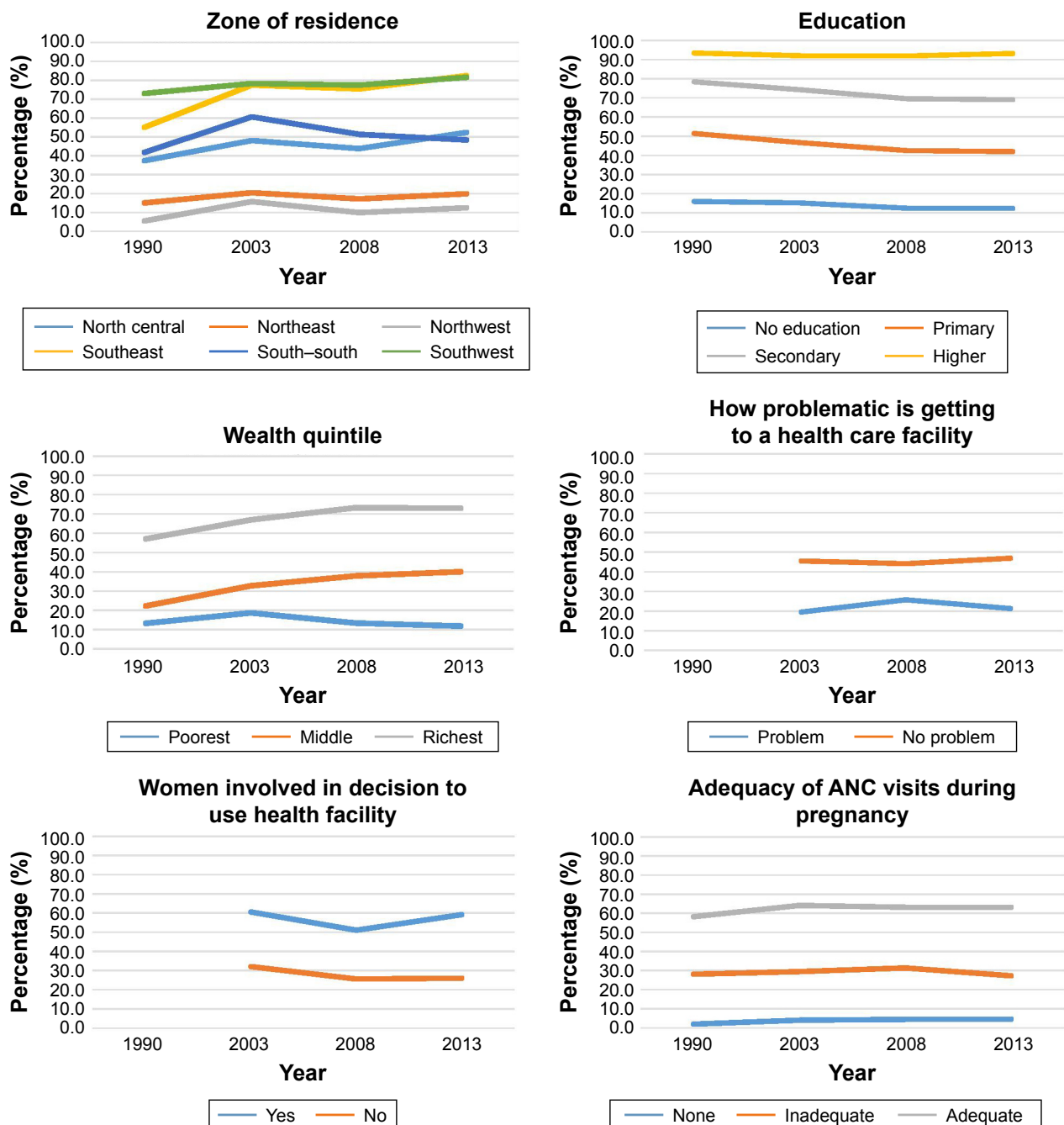
The multiple logistic regression for the use of SBA while controlling for other variables produced the adjusted ORs presented in Table 3 (right panel). The only significant variables at this level are maternal age, educational attainment, religion, tribe, rural/urban residence, zone of residence, and involvement in health care facility use. Others are accessibility of facilities, wealth quintile, whether the child was wanted or not, adequate use of ANC, use of SBA at previous delivery, and parity. In the presence of other variables, there was no significant difference in SBA use by the years of survey. Mothers with higher education were thrice likely to use SBA than uneducated women (OR =3.09, 95% CI =2.17–4.38). Women involved in decisions regarding their use of health facility were 12% more likely to use SBA than others who do not. Usage of SBA was significantly higher in other regions compared with the northwest, and the highest and lowest likelihoods were found in the southwest (OR =1.98, 95% CI =1.34–2.50) and northeast (OR =1.26, 95% CI =1.04–1.53), respectively. Women who had adequately accessed ANC were five times more likely to use SBA, relative to those who did not attend ANC (OR =5.45, 95% CI =4.63–6.41), and repeated use of SBA was 31 times more likely among women who used SBA

during previous delivery than those who did not (OR =31.1, 95% CI =27.7–34.4). Women who stated that distance to health care facility was not a problem were significantly more likely to use SBA (OR =1.31, 95% CI =1.15–1.48), as were those who did not want the child (OR =1.22, 95% CI =1.03–1.44). Furthermore, the odds of SBA use was 45% times higher in urban areas than in rural areas (OR =1.45, 95% CI =1.27–1.66).

## Discussion

In this study, we reviewed the trends in the use of SBA in Nigeria and also identified pertinent risk factors influencing the use of SBA. We analyzed four consecutive NDHS reports in 1990, 2003, 2008, and 2013. The distributional characteristics of the women and the observed pattern in use of SBA over these two decades are of importance. While our findings showed that a half of the women had at least a birth with almost all the reference child wanted, the rate of woman participation in the decisions on how their earnings were spent and their use of health care within the last 10 years (2003–2013) was alarming and constituted a major concern. Surprisingly, only a minimal upward trend of 6% was observed in the use of SBA within the 23-year period, which was characterized with fluctuations in 2003 and 2008.

Going by the reported increase in the use of ANC in the national surveys and empirical studies,<sup>2,6,7</sup> a corresponding increase in the use of SBA would have been expected, but our results showed that only marginal changes occurred. This is further consummated by past studies conducted in northern Nigeria<sup>3</sup> and another west African country, Ghana,<sup>8–10</sup> that SBA use has remained low. However, the 11% success rate in SBA between 2003 and 2013 might be due to various investments and intervention programs conducted over these years: for instance, increased government participation in health



**Figure 1** Trends in SBA utilization by selected women characteristics.

**Abbreviations:** ANC, antenatal care; SBA, skilled birth attendant.

sector at all levels, enhanced capacity and increased staff strength, expanded coverage and equipping of the primary health care facilities and better operation platforms obtained through the Millennium Development Goals debt relief gains, Midwives Service Scheme, the Subsidy Reinvestment and Empowerment Program, Maternal and Child Health, and perhaps the sustained gained attention in complete childhood immunization and HIV/AIDS prevention.<sup>28</sup>

Despite these efforts and initiatives, the nonuse of SBA during delivery had brought about morbidities as a result of complications and eventual maternal and newborn deaths. Reports have shown that MMR in Nigeria is as high as 560 per 100,000 with neonatal mortality rate of 37 per 1,000 live births providing Nigeria a rate more than the sum of all neonatal mortalities across the entire Africa.<sup>2,6,7,29</sup> These negative health burdens though directly affect the mothers

**Table 3** Unadjusted and adjusted determinants of SBA use among women in Nigeria

Characteristics	OR (95% CI)	p-value	aOR (95% CI)	p-value
DHS year				
1990	Ref		Ref	
2003	1.11 (1.02–1.21)	0.02	1.22 (0.95–1.57)	0.11
2008	0.95 (0.89–1.02)	0.15	0.99 (0.89–1.12)	0.93
2013	1.11 (1.04–1.19)	0.00	1.22 (0.95–1.57)	0.11
Age, years				
15–19	Ref		Ref	
20–24	1.43 (1.31–1.56)	0.00	1.08 (0.74–1.60)	0.68
25–34	1.97 (1.81–2.14)	0.00	1.26 (0.86–1.86)	0.24
35–49	1.77 (1.62–1.93)	0.00	1.64 (1.08–2.48)	0.02
Mothers education				
No education	Ref		Ref	
Primary	5.04 (4.77–5.32)	0.00	1.07 (0.92–1.24)	0.40
Secondary	14.9 (14.1–15.7)	0.00	1.66 (1.4–1.96)	0.00
Higher	80.2 (68.6–93.7)	0.00	3.09 (2.17–4.38)	0.00
Marital status				
Never	1.75 (1.55–1.96)	0.00	1.07 (0.02–63.6)	0.97
Formerly married	1.37 (1.24–1.52)	0.00	1.21 (0.42–3.48)	0.72
Married/LWSP	Ref		Ref	
Religion				
Islam	Ref		Ref	
Christianity	4.91 (4.71–5.11)	0.00	1.09 (0.93–1.29)	0.29
Other	0.95 (0.87–1.04)	0.26	0.58 (0.44–0.77)	0.00
Tribe				
Hausa/Fulani	Ref		Ref	
Yoruba	33.1 (30.3–36.1)	0.00	1.34 (0.98–1.83)	0.07
Igbo	28.7 (26.2–31.3)	0.00	1.83 (1.20–2.80)	0.01
Other	4.47 (4.23–4.73)	0.00	1.16 (0.95–1.40)	0.14
Involved in their own income spending				
Yes	Ref			
No	1.05 (0.97–1.13)	0.26		
Involved in their own health care decision				
Yes	3.39 (3.25–3.54)	0.00	1.12 (0.99–1.26)	0.08
No	Ref		Ref	
Place of residence				
Urban	5.69 (5.45–5.93)	0.00	1.45 (1.27–1.66)	0.00
Rural	Ref		Ref	
Zone				
North central	7.31 (6.82–7.84)	0.00	1.93 (1.54–2.42)	0.00
Northeast	1.93 (1.79–2.08)	0.00	1.26 (1.04–1.53)	0.02
Northwest	Ref		Ref	
Southeast	25.3 (23.2–27.7)	0.00	1.92 (1.22–3.03)	0.01
South–south	8.27 (7.67–8.92)	0.00	1.38 (1.06–1.80)	0.02
Southwest	29.1 (26.8–31.5)	0.00	1.98 (1.34–2.50)	0.00
Distance to health care facility being a problem				
Problem	Ref		Ref	
No problem	2.72 (2.60–2.85)	0.00	1.31 (1.15–1.48)	0.00
Currently employed				
Yes	1.88 (1.81–1.96)	0.00	1.10 (0.97–1.25)	0.15
No	Ref		Ref	
Wealth category				
Poorest	Ref		Ref	
Middle	3.78 (3.57–4.01)	0.00	1.29 (1.11–1.50)	0.00
Richest	15.5 (14.8–16.4)	0.00	1.84 (1.56–2.16)	0.00
Child was planned				
Planned	Ref		Ref	
Unplanned	1.82 (1.71–1.92)	0.00	1.22 (1.03–1.44)	0.02

(Continued)



**Table 3** (Continued)

Characteristics	OR (95% CI)	p-value	aOR (95% CI)	p-value
ANC attendance				
None	Ref		Ref	
Inadequate	9.23 (8.4–10.13)	0.00	2.73 (2.24–3.32)	0.00
Adequate	36.9 (34.1–39.9)	0.00	5.45 (4.63–6.41)	0.00
SBA used for the last child				
Unskilled	Ref		Ref	
Skilled	97.9 (89.3–107.3)	0.00	31.1 (27.7–34.3)	0.00
Birth order				
1	2.89 (2.71–3.09)	0.00	1.23 (1.09–1.35)	0.00
2–3	2.20 (2.08–2.33)	0.00	0.98 (0.80–1.20)	0.82
4–6	1.76 (1.66–1.86)	0.00	1.06 (0.90–1.26)	0.48
7+	Ref		Ref	

**Abbreviations:** ANC, antenatal care; aOR, adjusted odds ratio; DHS, Demographic and Health Survey; OR, odds ratio; SBA, skilled birth attendant; LWSP, living with sexual partner.

and newborns, the burden on families, communities, and the country is overwhelming. While a recent WHO report suggested that MMR in Nigeria had crashed by 53% between 1990 and 2013,<sup>5</sup> the estimate of 576 per 100,000 for 2013 was not significantly different from the estimate of 545 per 100,000 in 2008.<sup>2</sup> In addition, our findings suggested only a marginal increase of 6% in SBA use within the same period, averaging 35% utilization within the 1990–2013 window,<sup>5</sup> it is not certain whether the MMR target of 70 per 100,000 will be met in Nigeria.<sup>30</sup>

In addition, a preponderance of factors also interplayed in explaining the changes in SBA use observed in the study. These factors remained consistent at both bivariate and multivariate levels of analysis. Education and residence were found to have mostly influenced SBA use. Similar findings have been reported earlier.<sup>26</sup> Outstandingly, low educational attainment and rural residence have been widely reported as a disadvantage to the use of SBA.<sup>6,11,31,32</sup> Researchers have attributed the wide gap difference in the use of SBAs occasioned by educational attainment to wide gap in perceived need, but attributed household wealth inequalities to residential settings.<sup>10,33,34</sup>

In general, SBA use is lower in the northern region particularly in the northeast compared with the southern women, especially women in the southwestern regions. Besides the recent terrorist attacks in the former, the regions have long been reported to lag behind in the uptake of maternal and child health services.<sup>3,35</sup> Nevertheless, better individual social status such as higher levels of education, wealth status, and working status among women in the southwest regions could have influenced the differences. Literature is replete on the fact that demands for SBA use are affected by social pedigree of women such as education, ownership of property, and employment status.<sup>15,26</sup> Our finding suggests that achieving steady progress in the use of SBA depends so much

on women empowerment, since better empowerment has been linked to higher propensity of using SBA both in the past and in the recent times.<sup>6,11,31,32</sup> In the same vein, studies conducted in neighboring West African countries have associated inequalities in the use of SBAs to socioeconomic factors. The studies showed disparities in socioeconomic status and also identified the ordinal contributions of education and wealth through the intermediate factors to utilization of SBAs.<sup>10,33,34</sup> Physical accessibility of SBA, measured by distance to health care facility, and economic accessibility expressed by women autonomy were not significant to SBA use. Financial autonomy, which we defined as participation in decisions about how women's income are spent (a well-known indicator for empowerment), is not associated with SBA use at deliveries. This is an indication that the level of women earnings may influence financial autonomy more than her participation in decisions on how her earnings are spent since earnings are most likely to be correlated to the level of educational attainment, at least in contemporary African setting. This suggests that empowerment should go beyond participation in decision makings and focus more on other empowerment indicators such as education and employability. However, woman participation in decisions to use health care facilities seemed to have increased odds of SBA use thrice compared with those without such opportunity. This finding is corroborated by earlier studies.<sup>6,13,27</sup> As women get more involved in taking proactive decisions regarding their health and as they move up to better wealth status, they get more empowered to use SBA since differences in wealth quintiles have been found to be rooted in the spatial gaps that exist in the residential settings. Similar assertions have been made earlier.<sup>14,15</sup>

The parity and wantedness of the index child preempt the women's perceived benefit/need of SBA. Women who

are pregnant for the first time exhibit more cautions than others and thus may attract more positive attitude. Pregnant women must therefore be encouraged to use SBA right from the first pregnancy as a strategy to ensuring usage during succeeding deliveries. This may be connected with more emotional and psychological preparedness enjoyed during the first pregnancy compared with higher-order parities.<sup>2,13,14</sup> On the contrary, we found women who did not want the pregnancy to have higher use of SBA. This finding might have been influenced by other characteristics of the involved pregnant women.

Experience of women during ANC visits and most importantly during their previous child delivery is highly consequential for their subsequent use as found in the current study. Women who perceived the quality of services in delivery as optimally acceptable would have higher likelihood of using SBA again. Similar assertion has been made earlier with respect to the use of ANC.<sup>12</sup> In addition, previous experience with birth attendant may affect reuse of SBA. This is in consonance with earlier findings that ascribed negative attitude of health workers and poor confidentiality as hindrances to the use of SBA.<sup>16</sup> The nonuse of SBA may be worst among women who felt that their health reports, particularly those living with HIV/AIDS, are not treated confidentially. This might stir up a fearful and negative disposition among the women.<sup>17–20</sup>

## Study limitations and strengths

There were no means of verifying the information supplied on the use of SBA by the women. It is not impossible that the data might have suffered recall bias. However, the national representativeness of huge data collected from four waves of survey in studying the trends in the use of SBA and its determinants has made our findings much more reliable, unlike the commonly utilized hospital records in most studies. The uniqueness of our study in data type, sample size, and methodology among others could serve as a benchmark, underpinning subsequent national studies in related topics.

## Conclusion

The use of SBA has remained very low throughout the periods covered at barely one third usage. The 6% difference recorded between 1990 and 2013 was not significant. Socio-cultural factors, maternal education, and urban residence are strong determinants of SBA use. Women autonomy, in particular with reference to their involvement in decisions on their use of health care facility and economic and

physical accessibilities, influenced the use of SBA. Women who adequately use ANC and whose previous birth and experience were encouraging had a repeated use. Efforts geared at increasing the use of SBA should take a holistic approach as this will fast-track the ongoing slow progress. Such efforts should be targeted at girl child education, better family planning methods, sexual and reproductive health education, and accessible and improved health care facility services so as to overturn poor children and maternal health outcomes in Nigeria. However, an effective and efficient collaboration is necessary between the education sector and the government health apparatus so as to achieve optimal education needed to empower and enlighten women on the use of SBA.

## Availability of data and materials

All materials, data, and methods used for this study are readily available at the website of Measure DHS and ICF Macro, USA.

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## Author contributions

All authors contributed toward data analysis, drafting and revising the paper and agree to be accountable for all aspects of the work.

## Disclosure

The authors report no conflicts of interest in this work.

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