Expanding Access to Health Facility Delivery in Nigeria: Progress, Challenges and Opportunities

Anthony Idowu Ajayi (ajayianthony@gmail.com)
African Population and Health Research Center

Oluwafemi Emmanuel Awopegba
Nigerian Institute of Social and Economic Research

Matthew Tobiloba Obisesan
University of Fort Hare

Charlotte Nwogwugwu
University of Maryland, Baltimore

Eyitayo Omolara Owolabi
Stellenbosch University

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Abstract

Background Nigeria has the highest maternal deaths counts globally, and this reflects poor access to quality maternal health care services. Previous research on access to health facility delivery has not sufficiently probed the within-country inequalities in access to and progress in expanding maternal health care services in Nigeria. Our study fills this gap by examining the progress, challenges, and opportunities in expanding access to health facility delivery in Nigeria.

Methods Data of 37,928 and 40,567 live births in the 2013 and 2018 Nigeria Demographic and Health surveys (NDHS) respectively were analysed in this study. NDHS employs a multistage sampling and is representative of both the country and each of the 36 states and Federal Capital Territory (FCT). We used descriptive statistics to examine the trend in health facility delivery in Nigerian states and presented the results using maps. Also, we used logistic regression analysis to examine progress in expanding access to health facility delivery across Nigerian states.

Results The proportion of births delivered in health facilities increased from 35.8% in 2013 to 39.4% in 2018, representing a 3.6% increment. After adjusting for relevant covariates, women were 17% more likely to deliver in health facilities in 2018 than in 2013 surveys. However, progress in expanding access to health facility delivery was uneven across the country. While the odds of delivering in a health facility significantly increased for women living in 13 of the 36 states and FCT, the odds reduced significantly in seven states and no progress was recorded in 17 states.

Conclusion There was a slight improvement in access to health facility delivery in Nigeria between 2013 and 2018. However, progress remains uneven across the states with only 13 states recording some progress. Four states stood out, recording over a three-fold relative increase in odds of health facility deliveries. These states implemented maternal health care policies that not only made services free but also improved infrastructure and human resources for health. Thus, providing examples of what works in improving access to services for other states to follow.

Introduction

Even though there was a 35% decline from the year 2000 to 2017, maternal mortality remains a significant public health problem (1). Approximately 810 women still die per day from pregnancy and childbirth-related complications globally in 2017 (1). What is concerning is that 94% of these deaths occurred in low and middle-income countries. Close to 66% of these deaths occurred in sub-Saharan Africa. Nigeria alone accounts for 23% of global maternal deaths (1). With one maternal death every eight minutes (1), Nigeria is one of the most dangerous places for a woman to give birth.

Most maternal deaths are preventable with the use of quality maternal health care services (2–4). However, access to quality services is beyond the reach of many women in SSA and particularly in Nigeria, with only 56% and 39% having access to health facility delivery in SSA and Nigeria, respectively (5). Childbirth complications are preventable and amenable to treatment, as such, death of women during
pregnancy or childbirth is due to social causes like poverty, poor quality of care, unavailability of services, inequality, and lack of political commitment (6–10). The wealth available globally is sufficient to end maternal deaths; however, inequality in income distribution and political corruption has led to weak and fragile health systems in low and middle-income countries, resulting in poor and inequitable access to quality health care services and tragic and avoidable deaths of many.

The death of a woman during pregnancy or childbirth has deleterious consequences on the family, children, and society. The tragic loss of the mother, who is the primary caregiver for the family, could devastate the health and economic wellbeing of the family, resulting in unbearable suffering of the husband and children left behind (11–16). Studies have shown that children whose mothers die are more likely to be undernourished, abandoned by their father, perform poorly in school, drop out of school, take on difficult household and farm tasks, and are the least likely to survive until adulthood (11–16). The society also grieves the loss of its essential member. As such, saving the lives of mothers from preventable and avoidable maternal deaths is an important national and global developmental goals, as highlighted in the Sustainable Development Goals.

Over the past decade, several policies and programmes have been enacted to improve access to maternal health care services by the federal and state governments in Nigeria to respond to the worrying maternal health indicators (17–22). Nigeria runs a federal system of government, allowing for the autonomy of the states and decentralisation of health systems. Under the health system governance structure in Nigeria, the federal ministry of health formulate policies and issue guidelines, while the state governments have the liberty to domesticate the policies fully or partially (23). As a result of the health system governance structure, maternal health care interventions remain unevenly implemented across states in Nigeria (4, 24–26). This could potentially result in uneven progress in addressing the dire maternal health outcomes of women across Nigeria states.

However, previous research have mostly focused on geographical and wealth inequalities in access to health facility delivery, neglecting the state-level inequality arising from the health system governance structures in the country. We address this gap by examining progress, challenges, and opportunities in expanding access to health facility delivery in Nigeria, focusing on the states and using the 2013 and 2018 demographic and health surveys. Through presenting the state-level analysis of progress and opportunities, policymakers in Nigeria, both at the federal and state level, will find our paper useful in supporting their policymaking processes. The civil society organisations advocating for improved access to maternal health care services in Nigeria will find our analysis useful to support their work. Also, our study aligns with Sustainable Development Goal three of good health and wellbeing for all and target 3.1 of reducing the global maternal mortality ratio to less than 70 per 100 000 live births by the year 2030. Nigeria contributes one-fifth of global maternal deaths. As such, significant improvement is required in Nigeria for the realisation of the Sustainable Development Goal three globally.

Methods
Sample and Population

The data analysed in the study were retrieved from the 2013 and 2018 Nigeria Demographic and Health Surveys (NDHS). The NDHS survey adopts a cross-sectional design, and the sample size is representative of the country, its thirty-six states and Federal Capital Territory. Detailed information were collected on individual and household characteristics, sexual activity, fertility levels and preferences, awareness and use of contraceptives, and related reproductive behaviours from men and women of reproductive age (15–49 years). Representative samples of 40,680 and 42,000 households were selected for the 2013 and 2018 NDHS, respectively, using multistage cluster random sampling. In the first stage, 904 and 1,400 enumeration areas (EA) were selected with probability proportional to the number of households in the EA in 2013 and 2018, respectively. In the second stage, a fixed number of 30 households were selected in every cluster by equal probability systematic sampling. For this study, we use the children recode dataset containing information on all children born over the period and women of reproductive age (15 to 49) who gave birth within the five years preceding the surveys. Overall, 37,928 and 40,567 women were interviewed in the survey; however, we included a weighted distribution of 31,828 and 34,193 women in 2013 and 2018, respectively, who met the inclusion criteria. Further details on sample size and design used by the NDHS can be found elsewhere (27).

Ethical consideration

National Health Research Ethics Committee of Nigeria (NHREC) and the ICF International Institutional Review Board approved the NDHS. Therefore, we do not need additional ethical approval, given that we used de-identified secondary data that is publicly available and obtained in line with the highest ethical standard for conducting human subject research.

Variables and Measurement

We illustrate the definition and coding of the variables used in the study in Table 1. The outcome variable was a binary measure of place of delivery. Women who delivered at a health facility, either government or private, were defined as having health facility delivery and given the value of "1", while those who delivered at the respondent's home or other homes, were classified as having home delivery and given the value of "0".

The explanatory variables include women's demographic characteristics (age, marital status, women and partner's education level and wealth status), geographical location (residential area and states), media exposure, parity, getting to health facility and health insurance coverage.
| Study Variables | Operational definition and coding |
|-----------------|----------------------------------|
| Place of delivery | 0 = home delivery and 1 = health facility delivery |
| Age | According to the 5-year age category as provided by NDHS, 15–19 = 1, 20–24 = 2, 25–29 = 3, 30–24 = 4, 35–39 = 5, 40–44 = 6 and 45–49 = 7 |
| Marital status | 0 = never married (Ref), 1 = currently married, 2 = previously married and 3 = cohabiting |
| Womens’ education | 0 = no formal education (Ref), 1 = primary education, 2 = secondary education and 3 = higher education |
| Partner’s education | Same as women’s education |
| Wealth status | According to the NDHS classification, 1 = poorest (Ref), 2 = poorer, 3 = middle, 4 = richer and 5 = richest |
| Residential area | 0 = rural (Ref) and 1 = urban |
| States | The 36 states and the Federal Capital Territory (FCT) Abuja |
| Media exposure | Constructed from three variables on the frequency of exposure to three different media outlets, which are print media, radio, and television. 0 = “not at all” response, 1 = “less than once a week” and 2 = “at least once a week”. The addition of these scores yielded an overall score of 0 to 6. 0 = low (Ref), 1–3 = moderate and 4–6 = high. |
| Parity | Number of children, 0 = 1–2 (Ref), 2 = 3–4 and 3 = 5–6+ |
| Getting to health facility | 0 = Big difficulty (Ref) and 1 = No difficulty |
| Health insurance coverage | 0 = No (Ref) and 1 = Yes |

**Statistical Analysis**

We carried out our analysis using STATA Version 16.0 and Microsoft Excel Version 2019. The NDHS guidelines were followed in applying women's sampling weights to obtain unbiased estimates. We used descriptive statistics, including frequencies and percentages, to describe respondents’ sociodemographic and behavioural characteristics. We adopted spatial analysis to explore the state-level health facility delivery using percentile map. Pearson's chi-square test analysis was also used to examine the relationship between the outcome variable and the explanatory variables. We fitted multivariable regression models to examine the factors that are significantly associated with health facility delivery. Further, to examine the progress in health facility delivery over time, we pooled the DHS 2013 and 2019
datasets to investigate the effect of time trend on the dependent variable, adjusting for other factors. We estimated the 95% confidence interval (CI) for the odds ratios (OR), and adopted P-value a significance threshold of < 0.05 for all tests.

**Results**

**Descriptive Findings**

The characteristics of the women included in the study are presented in Table 2. Most of the respondents (in 2013 and 2018) were aged below 40 years (89.9% and 90.6%), currently married (93.3% and 92.6%), possessed secondary education or lower (94.2% and 91.8%), had less than five children (67.7% and 67.4%), lived in low to middle-income households (65.6% and 65.6%) and resided in rural areas (65% and 61.5%). Although the majority of women in 2013 and 2018 felt they did not have a problem getting to a health facility (68.2% and 71.9%), the vast majority of them had no health insurance coverage (98.5% and 97.9%).
Table 2
Univariable Analysis

| Background Characteristics | 2013 DHS       |       | 2018 DHS       |       |
|----------------------------|---------------|-------|---------------|-------|
|                            | N = 31,828    | Percent | N = 34,193    | Percent |
| Age in 5-year groups       |               |       |               |       |
| 15–19                      | 1,597         | 5.0   | 1,460         | 4.3   |
| 20–24                      | 6,237         | 19.6  | 6,683         | 19.5  |
| 25–29                      | 8,893         | 27.9  | 9,591         | 28.1  |
| 30–34                      | 6,974         | 21.9  | 7,792         | 22.8  |
| 35–39                      | 4,926         | 15.5  | 5,441         | 15.9  |
| 40–44                      | 2,317         | 7.3   | 2,337         | 6.8   |
| 45–49                      | 885           | 2.8   | 887           | 2.6   |
| Marital Status             |               |       |               |       |
| Never married              | 500           | 1.6   | 584           | 1.7   |
| Currently married          | 29,709        | 93.3  | 31,673        | 92.6  |
| Previously married         | 837           | 2.6   | 1,003         | 2.9   |
| Cohabiting                 | 783           | 2.5   | 933           | 2.7   |
| Woman’s Education level    |               |       |               |       |
| No education               | 15,657        | 49.2  | 15,858        | 46.4  |
| Primary                    | 6,127         | 19.3  | 5,103         | 14.9  |
| Secondary                  | 8,211         | 25.8  | 10,413        | 30.5  |
| Higher                     | 1,834         | 5.8   | 2,817         | 8.2   |
| Partner’s Education level  |               |       |               |       |
| None                       | 13,142        | 41.3  | 14,092        | 41.2  |
| Primary                    | 5,884         | 18.5  | 4,530         | 13.3  |
| Secondary                  | 9,035         | 28.4  | 10,839        | 31.7  |
| Higher                     | 3,767         | 11.8  | 4,732         | 13.8  |
| Wealth Status              |               |       |               |       |
| Poorest                    | 7,496         | 23.6  | 7,572         | 22.2  |
| Background Characteristics    | 2013 DHS | 2018 DHS |
|------------------------------|---------|---------|
| Poorer                       | 7,355   | 7,782   |
| Middle                       | 6,001   | 7,043   |
| Richer                       | 5,656   | 6,254   |
| Richest                      | 5,320   | 5,541   |
| Residence                    |         |         |
| Rural                        | 20,702  | 21,023  |
| Urban                        | 11,126  | 13,170  |
| Parity                       |         |         |
| 1–2 Children                 | 10,263  | 11,218  |
| 3–4 Children                 | 11,291  | 11,820  |
| 5–6 + Children               | 10,274  | 11,155  |
| Health Insurance Cover       |         |         |
| No                           | 31,353  | 33,466  |
| Yes                          | 475     | 727     |
| Media Exposure               |         |         |
| Low media exposure           | 10,734  | 13,291  |
| Moderate media exposure      | 13,604  | 14,677  |
| High media exposure          | 7,490   | 6,225   |
| Getting to Health Facility   |         |         |
| Big Problem                  | 10,118  | 9,603   |
| No problem                   | 21,710  | 24,589  |

**Spatial Analysis**

The spatial analyses of the prevalence and trend of the health facility delivery among women across states in Nigeria were illustrated in Fig. 1, 2, and 3. In both 2013 and 2018, Imo state (90.9% and 94.5%) had the highest prevalence of health facility delivery, while Zamfara (4.7%) in 2013 and Kebbi (7.4%) in 2018 had the lowest prevalence of health facility delivery, respectively. The proportion of women delivering in health facilities increased from 35.8% in 2013 to 39.4% in 2018, representing a 3.6% increment. However, while there was an increase in the rate of health facility delivery in 18 states, the rate of utilisation remained stagnant or declined in 17 states over the two survey periods. We observe that
Ondo state (24.5%), Abia (19.2%), Cross River (12.2%), Benue (16.2%) and Jigawa (13.4%) achieved the largest increase in health facility delivery. On the contrary, states with the largest reduction in health facility delivery include Kwara (-21.6%), Kaduna (-14.8%), Ekiti (-14.5%), Akwa Ibom (-8.6%) and Kogi (-6.6%). Notably, all states in the North-East geopolitical zone had at least a five percentage point increase in health facility delivery between 2013 and 2018, except Gombe state. In the North-West geopolitical zone, Jigawa state had the highest (13.4%) improvement in health facility delivery, followed by Kastina (7.5%), Kano (6.3%), and Zamfara (5.8%) states. However, the rate of health facility delivery declined in Kaduna (-14.8%) and Kebbi (-1%) states. In the North Central geopolitical zone, only Benue (16.2%), Nasarawa (9.7%) and Plateau (8%) states had an increase in the rate of health facility delivery. The rate of health facility delivery declined in Kwara (-21.6%), Kogi (-6.6%) and Abuja (-5.9%). For the South-East geopolitical zone, while Abia (19.2%), Anambra (5.8%), and Imo (3.6%) states had an increase in the rate of health facility delivery, the rate declined in Enugu (-6%) and Ebonyi (-3.1%) states. Only Cross river (12.2%) and Edo (5.3%) states recorded an increase in the rate of health facility delivery in the South-South geopolitical zone; other states recorded a decline. In the South-West geopolitical zone, Ondo (24.5%) and Osun (2.4%) states had an increase in the rate of health facility delivery, while others recorded a decline.

**Multivariable findings**

To examine the rate of improvement in health facility delivery in Nigeria between 2013 and 2018 surveys, we fitted unadjusted and adjusted logistic regression models and presented the results in Table 3. After adjusting for relevant covariates, women were 17% more likely to deliver in health facilities in 2018 than in 2013 surveys.

The results of the improvement rate in health facility delivery stratified by states in Nigeria between 2013 and 2018 surveys are presented in Table 4. The odds of delivering in health facilities significantly increased in 2018 survey year for women living in Ondo [AOR: 3.06, 95% CI: 2.12,4.41] in South West, Edo [AOR: 1.51, 95% CI: 1.04,2.20] in the South-South; Abia [AOR: 3.44, 95% CI: 2.22,5.33] in the South East; Sokoto [AOR: 2.13, 95% CI: 1.44,3.14], Katsina [AOR: 1.58, 95% CI: 1.19,2.09], Kano [AOR: 1.34, 95% CI: 1.09,1.64] and Jigawa [AOR: 2.91, 95% CI: 2.23,3.79] in the North West; Gombe [AOR: 1.59, 95% CI: 1.27,1.99], Bauchi [AOR: 1.29, 95% CI: 1.04,1.60] and Adamawa [AOR: 3.33, 95% CI: 2.52,4.40] in the North East; and Plateau [AOR: 1.67, 95% CI: 1.28,2.18], Benue [AOR: 1.66, 95% CI: 1.29,2.15] and FCT-Abuja [AOR: 1.65, 95% CI: 1.20,2.27] in the North Central regions, compared to the 2013 survey. However, women living in Oyo [AOR: 0.52, 95% CI: 0.37,0.73] and Ekiti [AOR: 0.45, 95% CI: 0.32,0.64] in the South West; Bayelsa [AOR: 0.65, 95% CI: 0.46,0.91] and Akwa Ibom [AOR: 0.46, 95% CI: 0.33,0.62] in the South-South; Enugu [AOR: 0.57, 95% CI: 0.40,0.81] and Ebonyi [AOR: 0.78, 95% CI: 0.63,0.98] in the South East; Kaduna [AOR: 0.52, 95% CI: 0.41,0.67] in the North West; and Kwara [AOR: 0.49, 95% CI: 0.36,0.67] in the North Central regions, were significantly less likely to deliver in a health facility in 2018 survey year compared to the 2013 survey.
Table 3
Multivariable regression models showing the difference in health facility delivery between 2013 and 2018 surveys

| DHS 2013 and 2018 | Unadjusted Odds Ratios | 95% CI | Adjusted odds Ratios | 95% CI |
|-------------------|------------------------|--------|----------------------|--------|
| Survey Year       |                        |        |                      |        |
| 2013              | Ref                    |        |                      |        |
| 2018              | 1.14***                | [1.11,1.18] | 1.17***               | [1.12,1.22] |
| Age in 5-year groups |                       |        |                      |        |
| 15–19             | Ref                    |        |                      |        |
| 20–24             | 1.33***                | [1.21,1.45] | 0.94                 | [0.84,1.05] |
| 25–29             | 1.69***                | [1.55,1.84] | 0.97                 | [0.86,1.08] |
| 30–34             | 1.94***                | [1.78,2.12] | 1.08                 | [0.96,1.22] |
| 35–39             | 1.89***                | [1.73,2.07] | 1.25***               | [1.10,1.43] |
| 40–44             | 1.54***                | [1.39,1.70] | 1.34***               | [1.16,1.55] |
| 45–49             | 1.16*                  | [1.02,1.32] | 1.36***               | [1.14,1.62] |
| Marital Status    |                        |        |                      |        |
| Never married     | Ref                    |        |                      |        |
| Currently married | 0.63***                | [0.56,0.70] | 0.9                  | [0.77,1.04] |
| Previously married| 0.86*                  | [0.74,0.99] | 1.09                 | [0.91,1.29] |
| Cohabiting        | 1.05                   | [0.91,1.21] | 0.68***              | [0.57,0.81] |
| Woman's Education level |              |        |                      |        |
| None              | Ref                    |        |                      |        |
| Primary           | 4.55***                | [4.33,4.78] | 1.46***              | [1.37,1.56] |
| Secondary         | 11.98***               | [11.46,12.53] | 2.15***              | [2.01,2.30] |
| Higher            | 54.20***               | [49.09,59.84] | 4.93***              | [4.35,5.59] |
| Partner's Education level |          |        |                      |        |
| None              | Ref                    |        |                      |        |
| Primary           | 3.57***                | [3.39,3.76] | 1.30***              | [1.21,1.40] |

Exponentiated coefficients; 95% confidence intervals in brackets * p < 0.05, ** p < 0.01, *** p < 0.001
| DHS 2013 and 2018          | Unadjusted Odds Ratios | 95% CI       | Adjusted odds Ratios | 95% CI       |
|---------------------------|------------------------|--------------|----------------------|--------------|
| Secondary                 | 7.13***                | [6.82,7.45]  | 1.54***              | [1.44,1.65]  |
| Higher                    | 12.66***               | [11.96,13.41]| 1.96***              | [1.80,2.13]  |
| Wealth Status             |                        |              |                      |              |
| Poorest                   | Ref                    |              |                      |              |
| Poorer                    | 2.51***                | [2.35,2.68]  | 1.47***              | [1.36,1.58]  |
| Middle                    | 6.60***                | [6.19,7.04]  | 2.07***              | [1.91,2.24]  |
| Richer                    | 13.72***               | [12.85,14.64]| 2.58***              | [2.35,2.82]  |
| Richest                   | 38.90***               | [36.13,41.88]| 4.51***              | [4.04,5.03]  |
| Residence                 |                        |              |                      |              |
| Rural                     | Ref                    |              |                      |              |
| Urban                     | 4.67***                | [4.51,4.83]  | 1.33***              | [1.26,1.41]  |
| Media Exposure            |                        |              |                      |              |
| Low media exposure        | Ref                    |              |                      |              |
| Moderate media exposure   | 3.18***                | [3.05,3.31]  | 1.23***              | [1.16,1.30]  |
| High media exposure       | 10.63***               | [10.12,11.17]| 1.48***              | [1.38,1.59]  |
| Health Insurance Cover    |                        |              |                      |              |
| No                        | Ref                    |              |                      |              |
| Yes                       | 5.22***                | [4.58,5.94]  | 1.44***              | [1.21,1.72]  |
| Parity                    |                        |              |                      |              |
| 1–2 Children              | Ref                    |              |                      |              |
| 3–4 Children              | 0.80***                | [0.77,0.83]  | 0.72***              | [0.68,0.76]  |
| 5–6 + Children            | 0.48***                | [0.46,0.50]  | 0.61***              | [0.57,0.66]  |
| Getting to Health Facility|                        |              |                      |              |
| Big Problem               | Ref                    |              |                      |              |
| No problem                | 2.41***                | [2.32,2.50]  | 1.45***              | [1.38,1.53]  |

Exponentiated coefficients; 95% confidence intervals in brackets * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Table 4
State stratified multivariable regression models showing the difference in health facility delivery between 2013 and 2018 surveys

| States      | Unadjusted Odds Ratios | 95% CI       | Adjusted odds Ratios | 95% CI       |
|-------------|------------------------|--------------|----------------------|--------------|
| North Central |                        |              |                      |              |
| FCT-Abuja   | 0.85                   | [0.67,1.07]  | 1.65**               | [1.20,2.27]  |
| Benue       | 1.48***                | [1.21,1.82]  | 1.66***              | [1.29,2.15]  |
| Kogi        | 0.65**                 | [0.49,0.86]  | 0.79                 | [0.55,1.12]  |
| Kwara       | 0.36***                | [0.29,0.45]  | 0.49***              | [0.36,0.67]  |
| Nasarawa    | 1.23*                  | [1.00,1.51]  | 0.96                 | [0.76,1.23]  |
| Niger       | 0.89                   | [0.73,1.08]  | 0.97                 | [0.77,1.24]  |
| Plateau     | 1.24*                  | [1.01,1.53]  | 1.67***              | [1.28,2.18]  |
| North East  |                        |              |                      |              |
| Adamawa     | 1.2                    | [0.99,1.44]  | 3.33***              | [2.52,4.40]  |
| Bauchi      | 1.36**                 | [1.13,1.64]  | 1.29*                | [1.04,1.60]  |
| Borno       | 0.99                   | [0.78,1.26]  | 1.34                 | [0.98,1.84]  |
| Gombe       | 1.48***                | [1.24,1.77]  | 1.59***              | [1.27,1.99]  |
| Taraba      | 1.37***                | [1.14,1.65]  | 1.19                 | [0.96,1.47]  |
| Yobe        | 1.44**                 | [1.09,1.90]  | 1.37                 | [0.96,1.96]  |
| North West  |                        |              |                      |              |
| Jigawa      | 3.12***                | [2.46,3.95]  | 2.91***              | [2.23,3.79]  |
| Kaduna      | 0.63***                | [0.52,0.77]  | 0.52***              | [0.41,0.67]  |
| Kano        | 1.56***                | [1.32,1.84]  | 1.34**               | [1.09,1.64]  |
| Katsina     | 1.80***                | [1.44,2.24]  | 1.58**               | [1.19,2.09]  |
| Kebbi       | 1.11                   | [0.84,1.49]  | 0.99                 | [0.71,1.39]  |
| Sokoto      | 1.78***                | [1.32,2.40]  | 2.13***              | [1.44,3.14]  |
| Zamfara     | 1.35                   | [0.98,1.86]  | 1.05                 | [0.71,1.56]  |
| South East  |                        |              |                      |              |
| Abia        | 3.46***                | [2.48,4.83]  | 3.44***              | [2.22,5.33]  |

Exponentiated coefficients; 95% confidence intervals in brackets * p < 0.05, ** p < 0.01, *** p < 0.001
| States     | Unadjusted Odds Ratios | 95% CI       | Adjusted odds Ratios | 95% CI       |
|------------|------------------------|--------------|----------------------|--------------|
| Anambra    | 1.68**                 | [1.21,2.33]  | 1.16                 | [0.74,1.82]  |
| Ebonyi     | 0.92                   | [0.76,1.12]  | 0.78*                | [0.63,0.98]  |
| Enugu      | 0.62**                 | [0.45,0.85]  | 0.57**               | [0.40,0.81]  |
| Imo        | 1.03                   | [0.66,1.61]  | 1.14                 | [0.65,2.01]  |
| South South|                        |              |                      |              |
| Akwa Ibom  | 0.71**                 | [0.56,0.91]  | 0.46***              | [0.33,0.62]  |
| Bayelsa    | 0.85                   | [0.65,1.10]  | 0.65*                | [0.46,0.91]  |
| Cross River| 1.54**                 | [1.19,1.99]  | 1.19                 | [0.87,1.63]  |
| Delta      | 0.97                   | [0.77,1.21]  | 1.11                 | [0.80,1.54]  |
| Edo        | 1.61**                 | [1.20,2.17]  | 1.51*                | [1.04,2.20]  |
| Rivers     | 0.94                   | [0.75,1.18]  | 0.84                 | [0.62,1.12]  |
| South West |                        |              |                      |              |
| Ekiti      | 0.42***                | [0.31,0.58]  | 0.45***              | [0.32,0.64]  |
| Lagos      | 0.92                   | [0.74,1.15]  | 0.79                 | [0.61,1.03]  |
| Ogun       | 0.96                   | [0.73,1.27]  | 0.9                  | [0.61,1.34]  |
| Ondo       | 3.68***                | [2.84,4.77]  | 3.06***              | [2.12,4.41]  |
| Osun       | 1.24                   | [0.81,1.88]  | 1.06                 | [0.64,1.75]  |
| Oyo        | 0.95                   | [0.75,1.20]  | 0.52***              | [0.37,0.73]  |

Exponentiated coefficients; 95% confidence intervals in brackets * p < 0.05, ** p < 0.01, *** p < 0.001

**Discussions**

Nigeria has the highest maternal deaths counts globally (1), and this reflects poor access to quality maternal health care services. Only 36% of all deliveries occurred in health facility delivery in 2013 (27). To reverse this trend and improve the use of maternal health care services, and as a late push to achieve the Millennium Development Goal 5, the Nigerian government through the Ministry of Health and each state government implemented a range of maternal and child health care policies (3, 28, 29). However, the extent to which these policies have led to improved use of health facility delivery in Nigerian states have received limited research attention. We address this gap by examining the progress, challenges, and opportunities in expanding access to health facility delivery in Nigeria as well as across the states. Our analysis shows that facility delivery only increased by 3.6 percentage points between 2013 and 2018.
surveys. Also, we found that progress in the use of health facilities for child delivery is uneven among Nigerian states. While some states recorded a substantial increase in health facility delivery, others stagnated, and several states recorded a decline.

The progress and lack thereof observed in our analysis reflects the differences in the maternal health policy landscape and existing inequality in health system infrastructure and resources across the Nigerian states (3, 28, 30–33). The health system governance structure of the country is devolved, allowing states to formulate and implement health policies in line with the guidelines issued by the federal ministry of health. Also, resources available to states vary (33), letting some states with larger resources to allocate significant budget to maternal health to fully implement policies as recommended by the Federal Ministry of Health while others are only able to allocate meagre budget for partial implementation of policies. For example, while some states in Nigeria implemented free maternal health programme in all government-owned health facilities—as was the case in Ondo State (3, 4)—, several other states partially implemented the policy in selected primary healthcare facilities, as was done in Ekiti State (34). It is therefore not surprising that progress in expanding access to health facility delivery remained uneven across Nigerian states.

The five states (Ondo, Abia, Benue, Cross River, and Jigawa states) that made substantial progress in increasing access to health facility delivery invested substantially in their health systems since 2010 (3, 4, 29, 34–40). Ondo state expectedly recorded the highest percentage point (24.5%) improvement in health facility delivery of all the 36 states in Nigeria. Ondo state implemented the "Abiye" (Safe Motherhood) programme, which was evidence-based and directed resources to building primary and tertiary health facilities where needed while also removing user fees for health facility delivery in all government-owned facilities as well increasing the health workforce (3, 17, 19, 20). The "Abiye" programme was funded by the state government, the federal government through the subsidy reinvestment programme and grants from Bill and Melinda Gates, Department of International Development (DFID), Society for Family Health (SFH), World Health Organisation (WHO), and Ford Foundation (28). The programme gained the attention of public health experts and institutions both nationally and internationally, with UNICEF, World Bank, UNDP, and Center for Strategic and International studies touting the programme as a model for reducing maternal mortality (28).

Meanwhile, Abia state, the second-best performing state, embarked on massive health infrastructure development, ensuring that women have access to health facilities within five kilometres of their place of residence in line with WHO's and the Federal Ministry of Health's guidelines and recommendations (29, 41, 42). Through this initiative, 210 additional primary health care facilities were built, increasing the number of PHC facilities to 527 by 2012 (43). Similarly, in Benue state, massive health infrastructure and human resources for health were provided to tackle the health challenges in the state and particularly the burden of HIV. The state also benefitted from several HIV programmes implemented or being implemented in the state with grants from international donors to improve access to maternal care. Jigawa State government introduced the "successful delivery program" in 2007, which freely covers all the services rendered during pregnancy period to 6 weeks post-partum/delivery (37–39). Besides this
programme, Jigawa was among the 12 states to implement the national health insurance scheme (NHIS), and MDG’s free maternal and child health programme were implemented (44). Finally, Cross River state's progress is attributable to its implementation of free maternal health care programme, backed by legislation in the state's parliament, under a programme titled "project hope"(29, 35). Besides this, the state embarked on improving its primary health care infrastructure, and 64 midwives were recruited for the state under the federal government's Midwives Service Scheme, being the first state to sign a memorandum of understanding (22). Besides, Cross River state was among the 12 states where the NHIS-MDG free maternal health programme was implemented, with the state providing counterpart funding (45). International non-government organisations like World Bank, UNICEF, USAID, Population Council, Pathfinder International Initiative, and Family Health International also contributed to the progress in the state through various maternal health interventions implemented in the state over the past decade (46–50).

The parallel in all these five states that recorded marked progress expanding access to maternal health services is striking. All these states focused on addressing both the demand and supply sides of maternal health care services. They all recognised that while removing user fees for maternal health care services is crucial, free health alone is not sufficient to increase access to services significantly, especially in settings where there is a shortage of health facilities and health workforce (4). It requires, as implemented in Ondo State, the strengthening of health systems, which include hiring additional health workers, building more primary and tertiary health care centres, re-training health workers and task shifting. The partnership and investment of global developmental partners are also important, given that most Nigerian states lack the fund to implement comprehensive interventions to address lack of access to maternal health care services. It is, however, worth noting that the progress recorded would be impossible without visionary and committed leadership from the state government and through the ministry of health in these states. As noted by Kuruvilla et al. (51), the key success factors in reducing maternal and child mortality include leadership and partnership, good governance, women's participation in politics and workforce, decision-making and accountability and approach to sustain progress.

What it takes to increase access to maternal health care services are well known (51, 52), yet approximately half of the Nigerian states are either stagnating or retrogressing in expanding access to services. The challenges in these states are the lack of leadership, insufficient partnership, inadequate budget allocation to maternal health, lack of sustainability and funding of existing maternal health programmes (4, 10, 34, 44, 45, 51). This is the case especially in Kwara and Ekiti States, where the use of health facilities for child delivery has declined by approximately 22 and 15 percentage points, respectively (3). While there is a strong case to be made on the paucity of funds in these states to expand access to maternal health care services, other key challenges hindering progress include lack of sustained effective leadership to mobilise resources, seek partnership, institute sustainability and accountability plans. The examples of the over five states that recorded a marked improvement in the proportion of women delivering in health facilities show that with leadership, progress is possible. Also, the fact that states in the northeast region managed to sustain progress despite being plagued with the Boko Haram conflict further buttress the point that progress is possible with effective and sustained leadership are needed to
address lack of access to maternal health care services. It is, however, important to accentuate the role of global developmental partners, Non-Governmental Organisations working in the conflict zones in ensuring progress made in expanding access to health facility delivery is sustained.

Policy recommendations

As a signatory to the SDG, Nigeria consistently lags behind in achieving the goal of reducing maternal mortality. Progress in expanding access to health facility delivery remains slow and uneven across the country. Since access to quality health facility delivery is critical to reducing maternal and child mortality, we hope that our paper will draw the attention of policymakers in underperforming states to draw lessons on what works in expanding access to maternal health care services from states that recorded marked improvement over the period in review. Specifically, these states need political will to institute effective policies, seek partnership, investment in health infrastructure and human resources by budgeting adequately and ensuring accountability. It is also critical to ensure interventions that work are sustained in the states that recorded some improvements for continued use of health facilities for child delivery.

Study Strengths And Limitations

The strength of this secondary data analysis is the use of large sample size, which makes the findings of representative of Nigerian states and allows for the generalisation of the results. The collection of several variables related to household characteristics, income, education level allows for the accurate measure of social determinants of health which are impacted by inequality. A common limitation of such study designs is the risk of recall bias by study participants. In this case, participants who participated in the primary data collection process were required to recall information from the previous 5 years. Memory recall may be limited in this sense.

Conclusions

There was a slight improvement in access to health facility delivery in Nigeria between 2013 and 2018. However, progress remains uneven across the states with only 13 states recording some progress. Four states stood out, recording over a three-fold relative increase in odds of health facility deliveries. These states implemented maternal health care policies that not only made services free but also improved infrastructure and human resources for health. Thus, providing examples of what works in improving access to services for other states to follow. Despite the challenges of funds, there are opportunities to improve maternal health care utilisation judging by the examples of states that managed to record progress through committed leadership and partnership with developmental partners. Sustaining progress in the states that recorded progress is critical and should be the focus of their policymakers.

Declarations
Ethics approval and consent to participate: The DHS dataset is publicly available and anonymised. This study, therefore, does not require another ethical approval since the study was previously approved by the ethical review board of Nigeria Ministry of Health and ICF Institutional Review Board (IRB).

Consent for publication: Not Applicable

Availability of data and materials: The data analysed in this study is available on DHS website via https://dhsprogram.com/data/available-datasets.cfm

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Authors' contributions: AIA conceptualised the study. OEA conducted the analysis. All authors contributed to the draft, revised and approved the manuscript.

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References

1. World Health Organization. Trends in maternal mortality 2000 to 2017: estimates by WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division. 2019.
2. Pierre AS, Zaharatos J, Goodman D, Callaghan WM. Challenges and opportunities in identifying, reviewing, and preventing maternal deaths. Obstetrics and gynecology. 2018;131(1):138.
3. Ajayi AI, Akpan W. Who benefits from free institutional delivery? evidence from a cross sectional survey of North Central and Southwestern Nigeria. BMC Health Services Research. 2017;17:620.
4. Ajayi A, Akpan W. Maternal Outcomes in the Context of Free Maternal Healthcare Provisioning in North Central and South Western Nigeria. Studies in the Sociology of Population: Springer; 2019. p. 301-18.
5. National Population Commission, ICF International. Nigeria Demographic and Health Survey 2019. Abuja: National Population Commission and ICF International; 2019.
6. Asseffa NA, Bukola F, Ayodele A. Determinants of use of health facility for childbirth in rural Hadiya zone, Southern Ethiopia. BMC pregnancy and childbirth. 2016;16(1):355.
7. Dickson KS, Adde KS, Amu H. What Influences Where They Give Birth? Determinants of Place of Delivery among Women in Rural Ghana. International journal of reproductive medicine. 2016;2016.
8. Ng S, Kiserud T, Kvåle G, Byskov J, Evjen-Olsen B, Michelò C, et al. Factors associated with health facility childbirth in districts of Kenya, Tanzania and Zambia: a population based survey. BMC pregnancy and childbirth. 2014;14(1):219.
9. Nyango DD, Mutihir JT, Laabes EP, Kigbu JH, Buba M. Skilled attendance: the key challenges to progress in achieving MDG-5 in north central Nigeria. African Journal of Reproductive Health. 2014;14(2):129-38.
10. Fagbamigbe AF, Idemudia ES. Barriers to antenatal care use in Nigeria: evidences from non-users and implications for maternal health programming. BMC Pregnancy and Childbirth. 2015;15(1):1-10.

11. Mosley WH, Koblinsky MA, Reed HE, Council NR, Population Co. The consequences of maternal morbidity and maternal mortality: report of a workshop: National Academies Press; 2000.

12. Finlay JE, Moucheraud C, Goshev S, Levira F, Mrema S, Canning D, et al. The Effects of Maternal Mortality on Infant and Child Survival in Rural Tanzania: A Cohort Study. Matern Child Health J. 2015;19(11):2393-402.

13. Miller S, Belizan JM. The true cost of maternal death: individual tragedy impacts family, community and nations. Reprod Health. 2015;12(1):56.

14. Molla M, Mitiku I, Worku A, Yamin A. Impacts of maternal mortality on living children and families: A qualitative study from Butajira, Ethiopia. Reprod Health. 2015;12 Suppl 1(1):S6.

15. Zhou H, Zhang L, Ye F, Wang HJ, Huntingdon D, Huang Y, et al. The Effect of Maternal Death on the Health of the Husband and Children in a Rural Area of China: A Prospective Cohort Study. PLoS One. 2016;11(6):e0157122.

16. Scott S, Kendall L, Gomez P, Howie SR, Zaman SM, Ceesay S, et al. Effect of maternal death on child survival in rural West Africa: 25 years of prospective surveillance data in The Gambia. PLoS One. 2017;12(2):e0172286.

17. Alebiosu EA. National Health System, Maternal Health and the Millennium Development Goals: A Review of Abyie Programme in Ondo State, Nigeria.

18. Cooke JG, Tahir F. Maternal health in Nigeria. Center for Strategic & International Studies. 2013.

19. Downie R. Smart global health [Internet]. 1616 Rhode Island Avenue, NW Washington, DC 20036: Center for strategic and international study. 2016.

20. Mimiko O. Experiences with universal health coverage of maternal health care in Ondo State, Nigeria, 2009-2017. African Journal of Reproductive Health. 2017;21(3):9-26.

21. Okpani AI, Abimbola S. The midwives service scheme: a qualitative comparison of contextual determinants of the performance of two states in central Nigeria. Global health research and policy. 2016;1(1):16.

22. Abimbola S, Okoli U, Olubajo O, Abdullahi MJ, Pate MA. The midwives service scheme in Nigeria. PLoS Med. 2012;9(5):e1001211.

23. Abimbola S, Olanipekun T, Igbokwe U, Negin J, Jan S, Martiniuk A, et al. How decentralisation influences the retention of primary health care workers in rural Nigeria. Global health action. 2015;8(1):26616.

24. Ononokpono DN, Odimegwu CO. Determinants of maternal health care utilisation in Nigeria: a multilevel approach. The Pan African medical journal. 2014;17(Suppl 1).

25. Shehu C, Ibrahim M, Oche M, Nwobodo E. Determinants of place of delivery: A comparison between an urban and a rural community in Nigeria. Journal of Public Health and Epidemiology. 2016;8(6):91-101.
26. Udoh EE, Ushie BA. Determinants of antenatal HIV testing in the opt-out approach in Nigeria: findings from the Nigerian Demographic and Health Survey. Journal of biosocial science. 2019:1-18.

27. National Population Commission [Nigeria] and ICF International. Nigeria demographic and health survey 2013. Abuja, Nigeria, and Rockville, Maryland, USA: NPC and ICF International; 2014.

28. Cooke J, Tahir F. Maternal health in Nigeria: with leadership, progress is possible. Washington DC, USA: Center for Strategic and International Studies (CSIS). 2013.

29. Okonofua F, Lambo E, Okeibunor J, Agholor K. Advocacy for free maternal and child health care in Nigeria—Results and outcomes. Health policy. 2011;99(2):131-8.

30. Doctor HV, Findley SE, Ager A, Cometto G, Afenyadu GY, Adamu F, et al. Using community-based research to shape the design and delivery of maternal health services in Northern Nigeria. Reproductive health matters. 2012;20(39):104-12.

31. Ogbuabor DC, Onwujekwe OE. Implementation of free maternal and child healthcare policies: assessment of influence of context and institutional capacity of health facilities in South-east Nigeria. Global health action. 2018;11(1):1535031.

32. Ezeonwu M. Policy strategies to improve maternal health services delivery and outcomes in Anambra State, Nigeria. Health care for women international. 2014;35(7-9):828-44.

33. Dang DY. Revenue allocation and economic development in Nigeria: An empirical study. SAGE Open. 2013;3(3):2158244013505602.

34. Ajayi AI. “I am alive; my baby is alive”: Understanding reasons for satisfaction and dissatisfaction with maternal health care services in the context of user fee removal policy in Nigeria. Plos one. 2019;14(12):e0227010.

35. Archibong E, Agan U. Review of policies and programs for reducing maternal mortality and promoting maternal health in Cross River State, Nigeria. African journal of reproductive health. 2010;14(3):37-42.

36. Edu BC, Agan TU, Monjok E, Makowiecka K. Effect of free maternal health care program on health-seeking behaviour of women during pregnancy, Intra-partum and Postpartum Periods in Cross River State of Nigeria: A Mixed Method Study. Open access Macedonian journal of medical sciences. 2017;5(3):370.

37. Okereke E, Tukur J, Aminu A, Butera J, Mohammed B, Tanko M, et al. An innovation for improving maternal, newborn and child health (MNCH) service delivery in Jigawa State, northern Nigeria: a qualitative study of stakeholders’ perceptions about clinical mentoring. BMC health services research. 2015;15(1):1-10.

38. Okereke E, Tukur J, Oginni AB, Obonyo B. Evaluating Health Workers’ Knowledge Following the Introduction of Clinical Mentoring in Jigawa State, Northern Nigeria. African journal of reproductive health. 2015;19(3):118-25.

39. Abdulkadir M, Rainis RB, Mohammed MU. Free Maternal Healthcare Programme under the Successful Delivery Programme in Jigawa State, Nigeria. International Journal of Psychosocial Rehabilitation. 2019;23(4).
40. Uzondu CA, Doctor HV, Findley SE, Afenyadu GY, Ager A. Female health workers at the doorstep: a pilot of community-based maternal, newborn, and child health service delivery in northern Nigeria. Global Health: Science and Practice. 2015;3(1):97-108.

41. Nelson I, J. Ekpenyong, A. Carlson, J. Sine, and F. Ilika. Health Financing Landscape: Abia State, Nigeria. Washington, DC: Palladium, Health Policy Plus; 2020.

42. Eto EU. Government Policy and Initiatives on Maternal Mortality Reduction in Nigeria: South Dakota State University; 2016.

43. Nigeria. FMoH. Nigeria Health Facility Registry (HFR) Abuja, Nigeria: Federal Ministry of Health Nigeria; 2020 [Available from: https://hfr.health.gov.ng/facilities/hospitals-list?page=9.

44. Onwujekwe O, Obi F, Ichoku H, Ezumah N, Okeke C, Ezenwaka U, et al. Assessment of a free maternal and child health program and the prospects for program re-activation and scale-up using a new health fund in Nigeria. Niger J Clin Pract. 2019;22:1516.

45. Onwujekwe O, Obi F, Uzochukwu B. Assessment of the NHIS-MDG free maternal and child health program and the prospects of reactivationSCALE-UP using the basic health care provision fund in Nigeria. Research summary. 2016;7.

46. Sripad P, Nwala E, McClair T, Ishaku SM, Warren CE. Engaging community women’s groups to improve maternal health care delivery in Cross River: Implementation research report. 2019.

47. WHO’ Joint Woking Team for UHC. Nigeria: Producing well-trained, skilled and qualified health workers to achieve UHC Geneva: WHO; 2019 [ ]

48. Heals C, Green H. Social innovation in health and social care: case study results. A deliverable of the project: Social innovation: Driving force of social change (SI-DRIVE). 2016.

49. USAID. HelloMama—Using Digital Health Platforms to Improve Health Outcomes for Pregnant Women and New Mothers in Nigeria. USAID; 2018.

50. Healthy newborn network. Results of a Five-year partnership to reduce Maternal and Newborn Mortality. Healthy newborn network; 2018.

51. Kuruvilla S, Schweitzer J, Bishai D, Chowdhury S, Caramani D, Frost L, et al. Success factors for reducing maternal and child mortality. Bulletin of the World Health Organization. 2014;92(7):533-44.

52. Campbell OMR, Graham WJ, Lancet Maternal Survival Series steering g. Strategies for reducing maternal mortality: getting on with what works. The lancet. 2006;368(9543):1284-99.