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Effect of Covid-19 Pandemic on Maternal Health Indicators in Nigeria

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Abstract

This study examines the impact of the COVID-19 pandemic on maternal healthcare indicators in Nigeria between 2018 and 2024. Before the pandemic, Nigeria's health system faced significant challenges, reflected in persistently high maternal mortality rates. COVID-19 exacerbated these issues, disrupting services and testing the healthcare system's resilience. Using a retrospective, cross-sectional comparative design, this research analyzed nationally representative secondary data from the Demographic and Health Survey (DHS) before and during the pandemic. Descriptive statistics, Chi-square tests, logistic regression, and multivariate analysis of variance (MANOVA) were employed to assess temporal and regional shifts in maternal health indicators. Nationally, declines were observed in skilled birth attendance (67% to 63%) and antenatal care participation (57% to 52%), although these changes were not statistically significant ($p > 0.05$). Regional analyses revealed substantial declines in skilled birth attendance in the North-East and North-West regions ($p < 0.001$) and a substantial improvement in antenatal care attendance in the South-West ($p = 0.032$). Modest improvements were also noted nationally, with institutional deliveries increasing from 39% to 43%, and modest gains in postnatal care utilization. These findings underscore the fragility of maternal healthcare services during global health crises and highlight urgent need to strengthen health system resilience at regional levels. Key recommendations include improving healthcare access in underserved areas, enhancing the healthcare workforce, expanding digital health initiatives, and promoting community-based maternal health education. This study provides critical insights into the pandemic's impact on maternal health outcomes and emphasizes the importance of equity-focused public health strategies for future emergencies.

Keywords: *COVID-19, Health Systems Resilience, Maternal Healthcare, Nigeria, Public Health, Regional Disparities.*

Introduction

Globally, maternal health has improved significantly over the past two decades. Between 2000 and 2019, the global maternal mortality ratio (MMR) dropped from 339 to 223 deaths per 100,000 live births, representing a 34% decline [1]. This downward trend is also evident in Africa, where maternal mortality declined over the same 20-year period at an average annual percent change of −3.0%, reflecting progress in maternal healthcare interventions [2, 3]. However, these global gains mask deep regional build, particularly in low- and middle-income countries like Nigeria, where, despite global gains, the country continues to face a severe maternal health crisis, with its MMR remaining among the highest in the world. In 2018, the MMR stood at approximately 512 deaths per 100,000 live births, rising to over 800 per 100,000 by 2019. This accounts for nearly 20% of global maternal deaths [4, 5].

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The persistently high maternal mortality in Nigeria is primarily driven by postpartum haemorrhage, eclampsia, pre-eclampsia, infections, and complications from unsafe abortion and obstructed labour, most of which are preventable with timely and adequate medical care. Contributing factors include delays in accessing care, inadequate healthcare infrastructure, a shortage of skilled health professionals, and widespread poverty, highlighting critical gaps in maternal healthcare service delivery [6].

Public health interventions in maternal care are essential to addressing these challenges by ensuring that pregnant women receive adequate antenatal care (ANC), skilled birth attendance, emergency obstetric care, and maternal health education, including family planning services [7]. Regular ANC visits, for instance, enable early detection of complications such as preeclampsia and infections, allow for nutritional and preventive care, and ensure preparedness for delivery. Skilled attendance at birth is strongly associated with reduced maternal and neonatal mortality. Despite these interventions, however, access to care in Nigeria remains uneven, with stark contrasts between the northern and southern regions, and between rural and urban areas [8].

The COVID-19 pandemic severely disrupted global health systems, necessitating innovative public health interventions to mitigate adverse effects. Nigeria, like many developing nations, faced significant challenges in maintaining essential health services, particularly maternal care. Lockdowns, transport disruptions, fear of infection, and health facility closures all contributed to a decline in routine maternal health services. As the pandemic evolved, it became clear that its indirect effects on maternal health could be as devastating as the virus itself. Understanding the impact of these disruptions is critical for informing future public health strategies [3].

This study, therefore, seeks to examine the effect of the COVID-19 pandemic on key maternal health indicators in Nigeria from 2018 to 2024. It uses a comprehensive analytical approach to assess national trends, highlight regional disparities, and identify emerging opportunities to improve maternal healthcare delivery. By evaluating changes in skilled birth attendance, ANC participation, institutional deliveries, and postnatal care, this research provides a holistic view of how Nigeria's maternal health system responded to one of the most severe global health crises of our time.

Methods

Study Area

Nigeria, located in West Africa, is the most populous country on the continent and the seventh most populous in the world, with an estimated population of over 220 million as of 2024. The country is politically and administratively divided into 36 states and the Federal Capital Territory (FCT), Abuja. These are further grouped into six distinct geopolitical zones, namely; North-Central, North-East, North-West, South-East, South-South, and South-West. These zones were formed on the basis of shared ethnic, historical, and cultural identities and are often used for administrative, political, and research purposes.

Each zone encompasses diverse populations, languages, and levels of socio-economic development, which significantly influence health outcomes and service delivery.

The country's vast size, coupled with regional disparities in health system performance, infrastructure, and sociocultural practices, creates complex dynamics that significantly influence maternal health indicators. Thus, understanding Nigeria's geopolitical structure and its implications for health equity is essential for interpreting variations in healthcare access and outcomes across regions, especially in the context of pandemic-induced disruptions.

Study Design

This study conducted a retrospective, cross-sectional comparative analysis using secondary data from the Demographic and Health Survey (DHS) before and after the COVID-19 pandemic [9]. The DHS, a global initiative funded primarily by USAID, provides high-quality, nationally representative data on health, nutrition, fertility, and infectious diseases in low- and middle-income countries. Conducted every five years using stratified multistage sampling, the DHS provides critical health indicators, vaccination coverage, and trends in disease burden.

Data Analysis

Descriptive and inferential statistical methods were employed. Summary statistics (mean, standard deviation, proportions) were used to compare pre-and post-pandemic indicators. The relevant DHS data was filtered using Microsoft Excel spreadsheet for further analysis and comparisons. Chi-square tests of independence to determine the significance of differences in maternal health indicators between pre- and post-pandemic periods, logistic regression analysis to assess the influence of period (pre/post-COVID), region, and antenatal care participation on skilled birth attendance and Multivariate Analysis of Variance (MANOVA) to assess the combined effect of period and region on multiple maternal health outcomes were further conducted. All statistical tests were two-tailed, with significance levels set at $p < 0.05$. Analyses were performed using Python (SciPy, StatsModels libraries).

Ethical Considerations

This study utilized publicly available DHS data, ensuring compliance with ethical standards and confidentiality regulations. No direct human participants were involved, minimizing ethical concerns. Ethical approval was sought for the use of supplementary qualitative data obtained from healthcare professionals.

Results

Healthcare services during pregnancy, childbirth, and the postpartum period are essential for the survival and well-being of both mothers and infants. Providing continuous care throughout the antenatal, intrapartum, and postnatal stages is vital for maternal and newborn health and remains a key priority for the Federal Ministry of Health. Access to quality antenatal care (ANC) services during pregnancy plays a crucial role in preventing maternal deaths, as these visits enable healthcare providers to identify and manage infections and obstetric complications while also administering preventive injections, medications, and supplements. During ANC visits, women receive education on healthy behaviours during pregnancy, counselling on recognizing pregnancy danger signs, and information on family planning, ensuring they are well-informed and better prepared for childbirth and postpartum care.

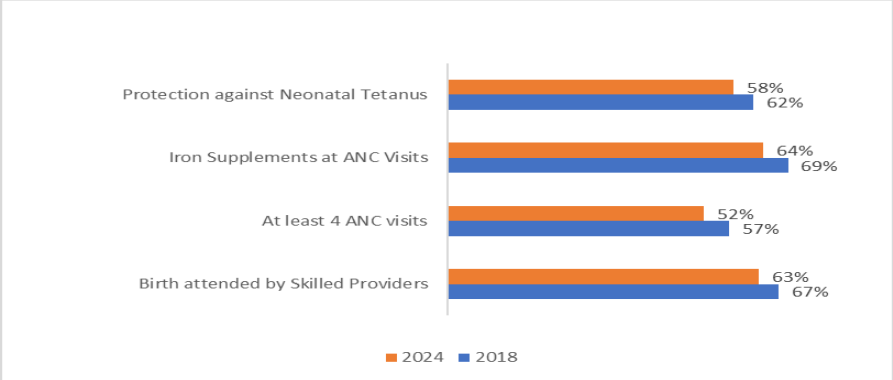

Figure 1. Summary of Indices for Antenatal Care

The data in Figure 1 indicates a decline in key ANC indicators in Nigeria between 2018 and 2024, with the proportion of births attended by skilled providers decreasing from 67% to 63%, suggesting reduced access to or utilization of professional delivery care, while the percentage of women attending at least four ANC visits dropped from 57% to 52%, potentially limiting early detection and management of pregnancy complications. Similarly, iron supplementation during ANC visits declined from 69% to 64%, increasing the risk of maternal anaemia and associated adverse pregnancy outcomes. In contrast, protection against neonatal tetanus fell from 62% to 58% heightening the risk of neonatal tetanus.

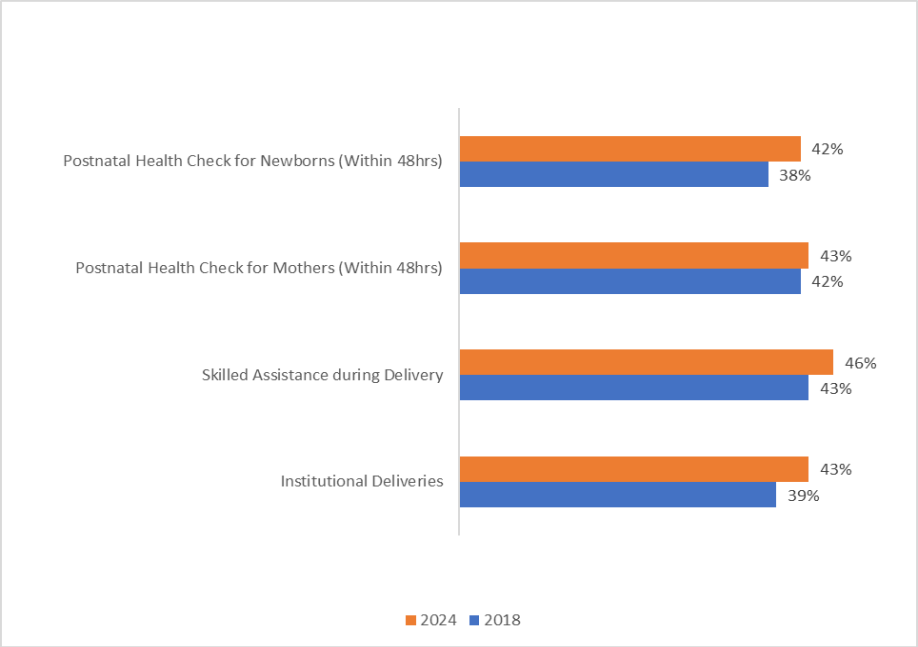

Figure 2. Summary of Delivery Services and Post-Natal Care

The data in Figure 2 indicates a modest improvement in key delivery and postnatal care indicators in Nigeria between 2018 and 2024, with institutional deliveries increasing from 39% to 43%, suggesting a gradual shift towards facility-based births, while skilled assistance during delivery rose from 43% to 46%, reflecting slight progress in access to professional obstetric care. Similarly, the proportion of mothers receiving a postnatal health check improved marginally from 42% to 43%. In contrast, postnatal health checks for newborns increased from 38% to 42%, indicating enhanced but still limited postnatal care coverage, collectively underscoring the need for further efforts to strengthen maternal and newborn healthcare services.

Table 1. Nationwide and Regional Differences in Antenatal Care Indices

Indices for Antenatal care	**Percent Coverage (%)**	
	2024	**2018**
Birth attended by Skilled Providers- Nationwide	63.0	67.0
North-Central	54.6	66.2
North-East	32.3	58.5
North-West	25.6	53.9
South-East	88.1	89.2

South-South	76.6	77.1
South-West	84.9	88.2
At least 4 ANC visits-nationwide	52.0	57.0
North-Central	50.3	51.3
North-East	50.6	46.6
North-West	40.6	38.3
South-East	73.6	84.1
South-South	67.1	67.8
South-West	80.8	66.4
Iron Supplements at ANC Visits-nationwide	64.0	69.0
North-Central	54.7	66.8
North-East	73.7	69.1
North-West	58.3	61.5
South-East	78.5	93.3
South-South	83.4	66.9
South-West	84.0	76.1
Protection against Neonatal Tetanus-nationwide	58.0	62.0
North-Central	52.0	57.9
North-East	64.7	54.0
North-West	42.1	45.7
South-East	86.3	92.0
South-South	81.2	75.7
South-West	82.7	83.2

Table 1 presents nationwide and regional differences in antenatal care indicators, showing significant declines in skilled birth attendance and ANC visits [9].

Between 2018 and 2024, there was a national decline in skilled birth attendance (67.0% to 63.0%), with the sharpest drops in the North-East (58.5% to 32.3%) and North-West (53.9% to 25.6%). The North-Central zone also saw a significant decline (66.2% to 54.6%), while the South maintained relatively high coverage despite slight reductions.

Visits for ANC also declined nationally (57.0% to 52.0%), with the South-East experiencing the largest drop (84.1% to 73.6%). However, the South-West improved significantly (from 66.4% to 80.8%), while the North-East and North-West saw slight gains. Iron supplementation during ANC fell nationally (69.0% to 64.0%), with declines in the North-Central and North-West but improvements in the North-East, South-South, and South-West. The South-East, despite a decline, remained the highest (93.3% to 78.5%).

Neonatal tetanus protection dropped nationally (62.0% to 58.0%), with declines in the North-Central and North-West but improvements in the North-East (54.0% to 64.7%) and South-South (75.7% to 81.2%). The South-East and South-West saw minor declines. Overall, regional disparities persist, with the North facing greater challenges compared to the South.

Table 2. Nationwide and Regional Differences in Postnatal Care Indices

Delivery and post-natal care indices	**Percent Coverage (%)**	
	2024	**2018**
Institutional Deliveries-Nationwide	43.0	39.0
North-Central	49.7	49.2
North-East	37.2	25.4
North-West	21.9	15.6
South-East	86.7	81.8
South-South	64.8	50.2
South-West	82.5	76.3
Skilled Assistance during Delivery-Nationwide	46.0	43.0
North-Central	49.7	49.2
North-East	37.2	25.4
North-West	21.9	15.6
South-East	86.7	81.8
South-South	64.8	50.2
South-West	82.5	76.3
Postnatal Health Check for Mothers 48 hours after delivery-nationwide	43.0	42.0
North-Central	53.4	44.5
North-East	36.3	33.7
North-West	24.9	21.1
South-East	63.1	71.6
South-South	66.5	52.6
South-West	78.5	77.3
Postnatal Health Check for Newborns 48 hours after delivery--Nationwide	42.0	38.0
North-Central	53.7	42.2
North-East	35.4	31.1
North-West	23.9	16.9
South-East	61.8	69.0
South-South	67.1	44.6
South-West	79.2	71.7

Table 2 highlights nationwide and regional variations in delivery and postnatal care, including improvements in institutional deliveries and postnatal checks in most southern regions [9].

Nationally, institutional deliveries rose from 39.0% to 43.0% (2018–2024), with notable gains in the North-East (25.4% to 37.2%) and North-West (15.6% to 21.9%). The South-South increased significantly (50.2% to 64.8%), while the South-East (81.8% to 86.7%) and South-West (76.3% to 82.5%) maintained high rates. The North-Central remained stable (49.2% to 49.7%). With similar regional trends, skilled delivery assistance also improved nationally (43.0% to 46.0%).

Postnatal checks for mothers rose slightly (42.0% to 43.0%), with significant gains in the North-Central (44.5% to 53.4%) and South-South (52.6% to 66.5%), but declines in the

South-East (71.6% to 63.1%). Newborn postnatal checks increased nationally (38.0% to 42.0%), with the North-Central (42.2% to 53.7%), South-South (44.6% to 67.1%), and South-West (71.7% to 79.2%) showing great improvements, while the South-East declined (69.0% to 61.8%). Regional disparities persist, particularly in the North-East and North-West.

Table 3. National-level Statistical Analysis

Analysis	Result	Interpretation
Chi-Square (Skilled Birth)	p = 0.657	No significant difference
Chi-Square (ANC 4+ Visits)	p = 0.570	No significant difference
Chi-Square (Institutional Delivery)	p = 0.666	No significant difference
Logistic Regression (Period effect)	p = 0.553	Period not a predictor
MANOVA (Overall Effect)	p = 0.696	No significant multivariate effect

While descriptive statistics revealed overall declines in skilled birth attendance and ANC visits and a modest increase in institutional deliveries between 2018 and 2024, further statistical analysis, as shown in Table 3, showed that these changes were not statistically significant at the national level.

The Chi-square tests indicated that observed shifts in skilled birth attendance, ANC participation, and institutional delivery could be due to random variation rather than true systemic change. Similarly, logistic regression showed that being in the post-COVID period did not significantly influence the likelihood of skilled birth attendance, although a slight decline was observed. The MANOVA results further confirmed that the COVID-19 pandemic did not have a statistically significant combined effect on maternal healthcare utilization indicators when analyzed simultaneously. These suggest that while the pandemic may have disrupted services and access, the aggregate national-level impact on maternal health service utilization was limited.

However, regional disparities, as seen in the descriptive breakdowns, remain critical. The lack of national statistical significance seem to mask regional inequalities, particularly affecting northern Nigeria as observed in the regional declining trend.

Table 4. Regional-level Statistical Analysis (P-Value)

Region	Skilled Birth Attendance	ANC 4+ Visits	Institutional Delivery
North-Central	0.125	1.000	1.000
North-East	0.000 (significant)	0.671	0.100
North-West	0.000 (significant)	0.851	0.337
South-East	0.982	0.100	0.449
South-South	1.000	1.000	0.052 (borderline)
South-West	0.634	0.032 (significant)	0.363

Table 4 shows that regional chi-square tests revealed significant declines in skilled birth attendance in the North-East (p = 0.0003) and North-West (p = 0.00008) regions, highlighting the disproportionate impact of COVID-19 on maternal health services in northern Nigeria. No significant change was detected in antenatal care (ANC 4+) visits or institutional deliveries

for these regions. Conversely, the South-West region demonstrated a statistically significant increase in ANC 4+ visit completion rates ($p = 0.032$), suggesting the effectiveness of post-pandemic recovery interventions. The South-South region showed a borderline significant improvement in institutional deliveries ($p = 0.052$), while no statistically significant changes were observed in the North-Central and South-East zones. These results underscore substantial regional disparities in the pandemic's effects on maternal health service utilization in Nigeria.

Discussion

Between 2018 and 2024, maternal healthcare utilization in Nigeria witnessed notable disruptions. The pandemic disrupted multiple building blocks of Nigeria's health system. Service delivery was impaired due to facility closures and reduced antenatal outreach. Health workforce availability declined amid fears of infection and burnout [9]. Applying the Health Belief Model, fear of infection, misinformation, and perceived barriers during the pandemic likely deterred many women from seeking ANC and facility-based deliveries. Using Andersen's Behavioral Model, we see that enabling factors such as health system closures, transportation difficulties, and regional poverty compounded the decline in service utilization. Meanwhile, Systems Theory elucidates how the pandemic, acting as a health system shock, led to systemic failures, especially in the North-East and North-West where health systems were already fragile. The observed improvements in institutional deliveries in certain southern regions align with Systems Theory's concept of system adaptation, where more resilient areas rapidly adjusted service delivery mechanisms (e.g., through outreach and mobile clinics). Thus, interpreting the findings through these models highlights not only the direct effects of the pandemic but also how underlying structural vulnerabilities magnified its impact. Table 1 shows that the North-East and North-West regions witnessed the largest declines in skilled birth attendance, to 32.3% and 25.6%, respectively, compared with 88.1% in the South-East [10]. These disparities illustrate geographical inequities in healthcare access, worsened by the pandemic. However, some areas, such as institutional deliveries and postnatal care, highlighted in Table 2 showed modest improvements, with the South-South and South-West regions seeing notable gains between 2018 and 2024, indicating targeted regional recovery efforts in maternal health programs. These trends underscore both challenges and opportunities in maternal healthcare during this period.

Skilled birth attendance fell from 67% to 63%, while the percentage of women attending at least four ANC visits dropped from 57% to 52%. These declines align with global reports of reduced healthcare access during the pandemic, driven by lockdowns, transportation barriers, and fears of infection [11]. Similar trends were observed in sub-Saharan Africa, worsening risks for maternal and neonatal health [12].

The decline in ANC visits and skilled birth attendance can be linked to pandemic-related restrictions, economic hardships, and fears of infection, which deterred pregnant women from seeking care [13]. Despite these challenges, institutional deliveries increased from 39% to 43%, and skilled birth assistance rose from 43% to 46%, likely due to targeted efforts to promote facility-based births through community outreach, transportation support, or financial incentives.

Postnatal care also saw slight improvements, with coverage for mothers rising from 42% to 43% and for newborns from 38% to 42%. While this reflects growing recognition of the importance of postnatal care, coverage remains below global recommendations [14], highlighting the need for further investment.

Regional disparities persisted, with northern regions experiencing sharper declines due to weaker healthcare infrastructure, economic

hardships, and sociocultural barriers. These challenges, including limited facilities, reduced incomes, and cultural norms restricting women's autonomy, underscore the need for targeted interventions to address systemic and sociocultural barriers [15-17]. Regional statistical analyses provided deeper insights beyond the national picture with statistically significant declines in skilled birth attendance in the North-East and North-West regions, confirming that pandemic-induced disruptions disproportionately impacted already vulnerable populations. In contrast, the South-West demonstrated resilience, with a statistically significant increase in antenatal care attendance. These divergent regional patterns reinforce the urgent need for tailored, region-specific strategies, recognizing that national averages may obscure critical local disparities. Strengthening maternal health systems in the northern zones must be a priority, focusing on rebuilding healthcare infrastructure, addressing sociocultural barriers, and restoring trust in health services disrupted during the pandemic [18].

Conclusion

This study, informed by public health theories such as the Health Belief Model, Andersen's Behavioral Model, and Systems Theory, demonstrates that both individual behavior and systemic resilience jointly influenced maternal health outcomes during the COVID-19 pandemic in Nigeria. Addressing future shocks requires strategies that consider individual perceptions, systemic enablers, and structural vulnerabilities across regions. Between 2018 and 2024, the pandemic disrupted access to essential maternal healthcare services, resulting in a noticeable decline in skilled birth attendance and antenatal care visits. These declines highlight not only the fragility of Nigeria's maternal health infrastructure in times of crisis but also the broader implications of underinvestment in health systems, particularly in low-resource and high-risk regions.

Regional disparities were a recurring theme throughout the study, with the northern zones, especially the North-East and North-West, experiencing the steepest declines in key maternal health metrics. These regions continue to grapple with entrenched challenges, including insecurity, cultural barriers, poverty, and inadequate health service delivery systems. In contrast, the southern zones, particularly the South-East and South-West, showed more resilience and in some cases modest improvements, reflecting stronger health infrastructure and more adaptive local responses.

However, the increase in institutional deliveries and postnatal care suggests that positive changes were possible even amid a global health emergency, when focused interventions and policy responses were implemented. These gains should serve as a foundation for scaling up successful programs and crafting responsive health policies.

Moving forward, Nigeria must prioritize investments in maternal health as part of a broader strategy to build resilient and equitable health systems. This includes decentralizing maternal health services, ensuring uninterrupted access during emergencies, enhancing the capacity of the healthcare workforce, and implementing inclusive, region-specific interventions. Ultimately, sustaining maternal health improvements post-pandemic will depend on the country's ability to learn from this crisis, address longstanding inequities, and commit to health system strengthening at all levels. Without urgent and strategic actions, the pandemic risks reversing decades of hard-won progress in maternal health outcomes.

Policy Recommendations

Strengthening Nigeria's maternal health resilience post-COVID requires region-specific, evidence-based strategies embedded

in systemic reform. Future health policies must prioritize not only national averages but also local disparities that affect maternal health outcomes at their root. Investments in health information systems, workforce development, and digital health innovations will be essential to achieving maternal health equity across Nigeria.

The South-West region, which recorded a statistically significant increase in ANC visits, serves as a successful model for digital health integration. Building on this momentum, the Federal Ministry of Health's Digital Health Division should scale up mobile health (mHealth) platforms that offer ANC booking, reminders, and remote consultations. These efforts should be institutionalized as ongoing programs, with coverage of four or more ANC visits tracked as a key performance indicator.

To address the significant decline in skilled birth attendance observed in the North-East and North-West, the government should consider deploying mobile clinics and scaling up community midwife programs. These interventions could be led by the National Primary Health Care Development Agency (NPHCDA), in collaboration with state Ministries of Health, and delivered by trained community-based health workers. Implementing these solutions within 6-12 months can directly increase the proportion of births attended by skilled personnel in underserved regions.

Given the persistent gaps in postnatal care coverage, there is an urgent need to integrate postnatal checkups with routine child vaccination visits. National Health Insurance Scheme (NHIS) and Primary Health Care Boards should introduce bundled service packages that make postnatal care both accessible and efficient. Implementation within the next 12 months should aim to improve maternal and newborn postnatal care uptake, as measured by postnatal visit completion rates.

Lastly, disparities in the distribution of the health workforce require urgent attention. The Federal Ministry of Health and the National Council on Health should consider establishing rural workforce incentive programs to attract and retain skilled professionals in underserved areas. These initiatives could include task-shifting strategies, continuous training, and deployment through regional training hubs, with an expected rollout over 12-24 months. The success of these programs should be monitored and documented.

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Conflict of Interest

There is no conflict of interest related to the research, authorship, or publication of this study.

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