

From Insurance Coverage to Maternal Health: Understanding Determinants of Antenatal Care Delivery Mismatch among enrollees of the Kano State Contributory Healthcare Scheme: A Mixed-Methods study

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Research Article

Keywords: Antenatal care, facility delivery, maternal health, mismatch, KSCHMA, Nigeria

Posted Date: October 5th, 2026

DOI: <https://doi.org/10.21203/rs.3.rs-11225088/v1>

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Additional Declarations: No competing interests reported.

Abstract

Background: Social Health Insurance (SHI) despite providing financial protection to pregnant women "Antenatal care - delivery mismatch" persists where women complete recommended antenatal care (ANC) at booked health facility but deliver at home without skilled birth attendance. This study investigated the pattern and determinants of ANC-delivery mismatch, especially among Kano State Contributory Healthcare Management Agency (KSCHMA) enrollees in Kano State, Nigeria.

Methods: We conducted a sequential mixed-methods study across 20 accredited KSCHMA facilities in Kano State between January and June 2026. We collected quantitative data from a multistage cluster sample of 1,080 enrollees who had delivered within the preceding 12 months and attended ANC at any of the selected facilities. Multinomial logistic regression identified independent determinants of ANC-delivery mismatch. Qualitative data from 6 sessions of Focus Group Discussions (FDGs) with women and 12 Key Informant Interviews (KIIs) with stakeholders were analysed using thematic framework analysis based on Andersen's Behavioural Model of Health Services Use.

Results: The pattern of ANC-delivery mismatch among enrollees was (50.7%) among those booked at Primary Health Care (PHC) facility but delivered at home, (31.9%) booked at PHC and delivered at Secondary Health Care (SHC) or private facility, (6.8%) booked and delivered elsewhere (SHC or private facility), and (10.6%) booked and delivered at PHC. Multinomial regression modelling showed that the primary determinants of mismatch included rural residence [aOR 5.171; 95% CI (1.026–26.047); $p = 0.046$] and being a full-time housewife [aOR 25.027; 95% CI (1.282–488.451); $p = 0.034$], which were significantly associated with home delivery, bypassing the booked PHC. Women in semi-urban areas were more likely to deliver in a booked PHC [aOR 23.163; 95% CI (1.951–274.9720); $p = 0.013$], which significantly reduced the odds of PHC bypassing. Qualitative themes reinforced supply-chain failures, referral and system fragmentation, and gendered decision-making norms as pivotal systemic barriers.

Conclusions: Social health insurance financial protection is necessary but insufficient to ensure facility delivery. Reducing ANC–delivery mismatch requires strengthened supply chains, respectful maternity care, emergency referral transport, and male involvement in birth preparedness.

Clinical Trial Number: Not applicable

Background

Nigeria is still a significant contributor to the global burden of maternal mortality, with a national maternal mortality ratio (MMR) of 814 per 100,000 live births, and regional figures in northern Nigeria are higher [1]. Obstetric complications such as postpartum hemorrhage, pre-eclampsia/eclampsia, sepsis, and obstructed labour account for the majority of these deaths and are preventable when deliveries are conducted by skilled birth Attendants (SBA) in equipped health facilities [1– 3].

Antenatal care (ANC) serves as an important entry point into maternal healthcare and offers risk screening, health education and preparation for delivery. According to the World Health Organisation (WHO) guidelines, a minimum of four visits should be made in order to reduce perinatal mortality and to improve the mother's healthcare experience [4]. Even though attendance at antenatal care in northern Nigeria has been slowly rising as a result of the introduction of social health insurance in Kano State, the rate of deliveries in health facilities has still not kept up [5].

To overcome the financial obstacles to achieving Universal Health Coverage (UHC), the Kano State Government set up the Kano State Contributory Healthcare Management Agency (KSCHMA) to administer the state's social health insurance schemes in the formal, informal, and vulnerable equity sectors and to offer free maternal and child health services [6].

Despite KSCHMA coverage, an implementation gap persists: a substantial proportion of insured women complete the recommended ANC visits at accredited facilities but deliver at home without skilled assistance [5,7]. This phenomenon, termed the **"ANC-delivery mismatch"**, undermines strategic purchasing goals and limits the mortality impact of universal coverage policies. While general barriers to maternal healthcare utilisation are documented [5,8], empirical evidence on why financially covered enrollees drop out of the institutional continuum of care at delivery remains scarce.

The objective of this study was to find out the prevalence, pattern, factors related to the health system, individual factors, community and cultural factors associated with a mismatch between antenatal care and delivery, in particular the practice of bypassing primary health care, among those enrolled in the KSCHMA in Kano State, Nigeria.

Conceptual framework

The study was based on a version of **Andersen's Behavioural Model of Health Services Use** [9]. This model holds that an individual's use of health services is the result of three dynamics:

1. *Predisposing Factors* (age, education, parity, cultural beliefs, spousal decision-making);
2. *Enabling Factors* (Health insurance coverage, out-of-pocket expenditure, transportation availability, spatial access); and
3. *Factors relating to need and access* (perceived quality, availability of drugs, the attitudes of providers, responsiveness in emergency situations).

Methods

Study design and setting

A sequential explanatory mixed-methods cross-sectional study was carried out from January to June 2026 in Kano State, in the northwest of Nigeria. For this purpose, a multi-stage cluster sampling method,

stratified by tier, was used across 20 accredited KSCHMA facilities located in three senatorial districts of Kano State.

Quantitative study population sampling

- **Stage 1:** Randomly selected 6 local government areas (LGAs) across Kano State by balloting, stratified according to geopolitical zone (Kano Central, Kano South, Kano North) and urban/rural classification.
- **Stage 2:** Stratified random selection of 20 accredited health facilities by tier;
 - Six General Hospitals (SHC), two from each senatorial district
 - Nine PHCs, three from each senatorial district
 - Five Private facilities
- **Stage 3:** (Participant recruitment) We used systematic sampling of eligible women from KSCHMA facility registers and capitation lists during routine postnatal and immunisation clinics at a quota of 54-56 per facility.

Qualitative Study Population

The qualitative interviews consisted of six focus group discussions with (8 - 12) women and 12 key informant interviews, the interviews involving the KSCHMA desk officers, the facility heads (that is, the Medical Directors or the Acting In-Charge officers), the lead midwives and nurses, and the community leaders (members of the Ward Development Committee).

Eligibility Criteria

- Eligibility criteria were that women between (15 - 49) years of age, be enrolled in KSCHMA, and have given birth within the previous 12 months, having both booked and attended antenatal care (ANC) at an accredited facility during that pregnancy.
- The stakeholders include the KSCHMA desk officers, the facility heads (for example, the Medical Directors or the Acting In-Charge officers), the lead midwives and nurses, and the community leaders (that is, members of the Ward Development Committee).

Sample size estimation

Quantitative Sample: We calculated our sample size of 1,080 participants using Cochran's formula for a single proportion, assuming a 50% proportion of ANC-delivery mismatch, a 95% confidence level, a 4% margin of error, and a multistage cluster design effect of 1.8.

Qualitative Sample: Purposive sampling was used to recruit (8-10 women for FGDs) and 12 Key Informants across the healthcare administrative hierarchy: 5 Facility In-Charges/Managers (3 PHC, 2 Secondary), 4 KSCHMA Facility Desk Officers, and 3 Community Health Development Committee (CHDC) Chairs until empirical saturation was achieved.

Statistical Analysis

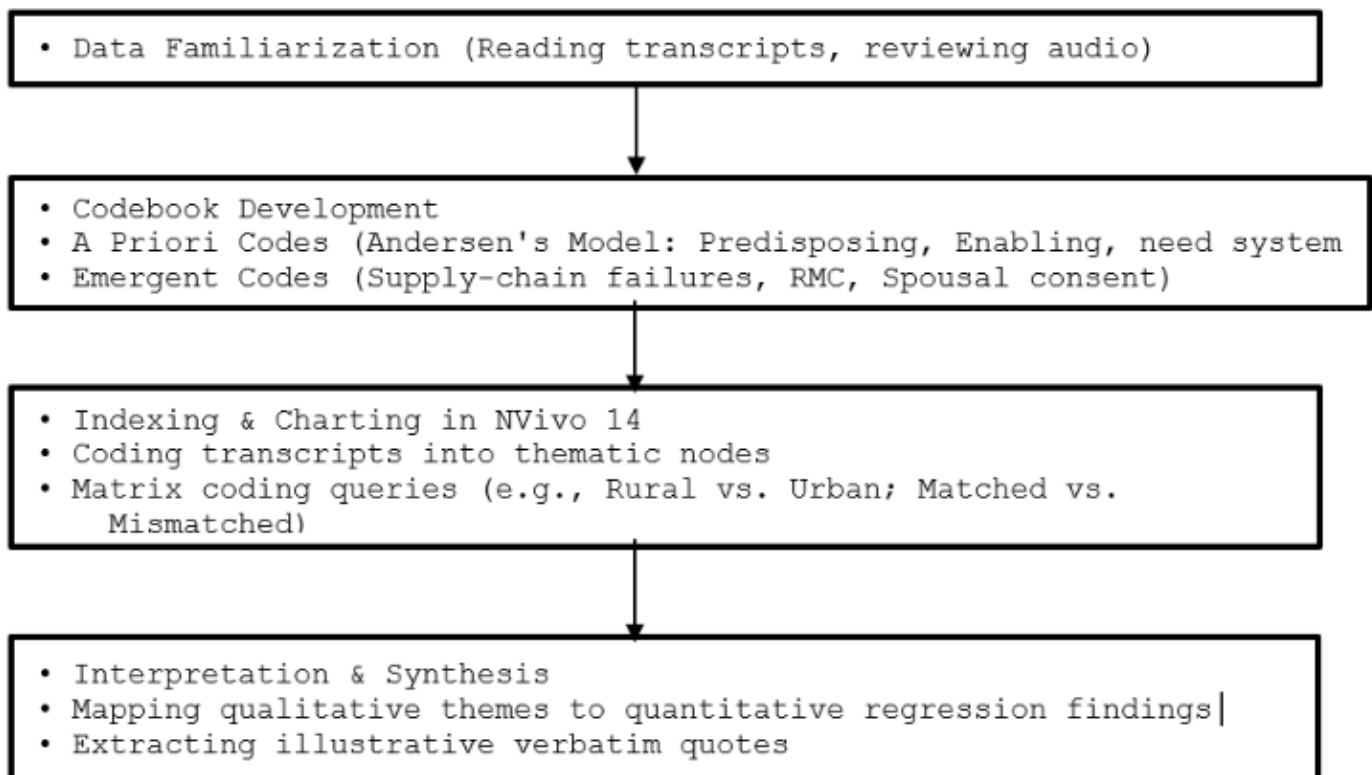
We used descriptive analysis with frequencies, percentages, means (standard deviation), and medians (interquartile range) to summarise socio-demographic characteristics and the number of antenatal care visits. To identify independent factors associated with ANC-delivery mismatch, we entered variables with statistically significant associations ($p \leq 0.05$) in bivariate analysis into a multinomial logistic regression model. The outcome variable consisted of four mismatch categories, with “Booked and delivered elsewhere - SHC or private” (Category C) designated as the reference outcome. We computed adjusted odds ratios (aOR) with corresponding 95% confidence intervals (CI) to estimate predictor effects while controlling for covariates. We assessed multicollinearity using variance inflation factors (VIF), and evaluated model fit using the likelihood ratio test.

The qualitative analysis involved translating the transcribed Hausa audio files into English, uploading them into NVivo (v14), and then analysing them using a thematic framework approach based on the Andersen Behavioural Model of Health Services Use as depicted below;

Analytical Framework (NVivo 14 Workflow)

Qualitative data analysis was followed a hybrid **Deductive-Inductive Thematic Framework Approach**:

QUALITATIVE ANALYSIS WORKFLOW



Ethical Safeguards for Qualitative Fieldwork

1. **Anonymity:** No participant names or identifiable personal details will be included in transcripts or publications. Unique alphanumeric codes (e.g., FGD-MIS-RURAL-01, KII-PHC-03) was assigned.
2. **Sensitive Topic Handling:** Discussions around obstetric complications, home delivery failures, or healthcare mistreatment may cause emotional distress. Facilitators are trained to offer supportive debriefing and refer participants to counselor services at secondary facilities if required.

Results

1.0 The prevalence and pattern of ANC-Delivery mismatch

Figure 1: The bar chart highlights a significant mismatch between antenatal care booking and place of delivery, showing that over half of the women who booked ANC at a PHC facility ultimately delivered at home, while only about 11% delivered at their booked PHC. Only about 7% delivered at SHC or private facilities after booking at the PHC.

>> Insert Figure 1 >>

2.0 Association between participants’ characteristics and ANC-delivery mismatch

Table 1 demonstrates statistically significant associations between all evaluated socio-demographic and obstetric characteristics and the ANC-delivery mismatch pattern among participants. The propensity to deliver at home after booking ANC at a PHC facility (Category D) was highest among women with informal education (67.5%), rural residents (63.5%), full-time housewives (60.3%), informal KSCHMA enrollees (58.3%), those attending fewer than four ANC visits (64.7%), and late ANC bookers (64.0%). Conversely, proper coordination with PHC delivery (Category A) was most prevalent among tertiary-educated women (26.5%), urban dwellers (21.8%), grand multiparous women (22.1%), and those completing at least four ANC visits (16.9%).

>> Insert Table 1 >>

3.0 Determinants of ANC-delivery mismatch

Using Category C (booked and delivered elsewhere - SHC or private facility) as the reference category, multinomial logistic regression was performed to identify factors associated with Category A (delivered at the booked PHC), Category B (booked at a PHC but delivered at a SHC or private facility), and Category D (booked at a PHC but delivered at home). **Tables 2–4**

As shown in **Table 2**, place of residence was the only significant independent predictor of delivery at the booked PHC. Compared with urban residents, women living in semi-rural areas had more than 23-fold higher odds of delivering at their booked PHC. Other demographic and obstetric characteristics, including age, education, occupation, insurance status, OOP expenditure, parity, ANC attendance, and timing of ANC booking, were not significantly associated with this outcome.

Table 3 shows that occupation and place of residence were the only independent predictors of upgrading delivery care to an SHC or private facility. Full-time housewives had significantly higher odds of delivering at an SHC or private facility compared with women in other occupations. Compared with urban residents, women living in semi-rural and rural areas also had substantially higher odds of this delivery mismatch, with the highest odds observed among semi-rural residents. Other demographic and obstetric factors were not independently associated with upgrading delivery care.

As shown in **Table 4**, rural residence was the only significant independent predictor of PHC-to-home delivery mismatch. Compared with urban residents, women living in rural areas had more than fivefold higher odds of delivering at home despite booking ANC at a PHC. Semi-rural residence was also associated with increased odds of home delivery, although the association did not reach statistical significance.

Maternal age, occupation, education, insurance status, OOP expenditure, parity, ANC attendance, and timing of ANC booking were not independently associated with PHC-to-home delivery mismatch.

>> **Insert Tables 2, 3 and 4**>>

Table 5: Multicollinearity diagnostics showed no evidence of problematic multicollinearity among the predictor variables. Tolerance values ranged from 0.276 to 0.981, while VIF values ranged from 1.020 to 3.629, indicating acceptable levels of collinearity among the predictors.

>> **insert table 5**>>

Qualitative Results: Thematic Analysis Results ANC -delivery mismatch

The qualitative analysis of the 3 FDGs and 12 Key Informant Interviews identified 5 primary themes and 11 sub-themes that explain the operational systems behind mismatch, especially PHC bypassing, as depicted in Table 6 below.

>> **Insert Table 6**>>

Detailed Qualitative Narrative & Direct Key Informant Quotes

Theme 1: Human Resources for Health and Night-time Coverage Gaps

Key informants all noted that although PHC facilities have enough qualified staff on duty during the morning to run regular ANC clinics, this skilled staffing disappears in night shifts, especially in semi-urban and rural LGAs. As a result, a serious bottleneck occurs when labour begins outside normal working hours.

“At our primary health centre, we have only two qualified midwives to look after more than 15,000 residents. These midwives run all antenatal clinic sessions during the day, then become completely exhausted at night and go home. Although the facility is in principle open around the clock, if a woman goes into labour at 2:00

in the morning, she will only find a CHEW [Community Health Extension Worker] or a security guard. Families are aware of this, which is why none of them takes the risk of coming to the health centre at night". (KII 03, PHC Officer-in-Charge, Rural LGA)

"The insurance scheme led to thousands of women turning for care at the ANC, but the government failed to recruit additional midwives to meet the increased workload. One midwife cannot carry out 40 ANC consultations in the morning and still be on call for night deliveries. The human body has its limits". (KII 07, KSCHMA Facility Desk Officer, Semi-Urban General Hospital)

Theme 2: Infrastructure and Utility Failures at the Primary Level

Unsafe care delivery is seriously affected by an unreliable power supply and weaknesses in primary care organisation. According to key informants, labour wards commonly lack working lighting or a steady water supply when the hospital is not in operation, rendering it difficult to maintain infection control and provide emergency care.

"It is dangerous for both the mother and the midwife to deliver a baby in the dark with a kerosene lamp or the flashlight on a mobile phone. When the municipal power is cut off, no fuel is provided to us from our capitation fees in order to keep the generator going overnight. How can a woman have confidence in a facility which cannot guarantee that there will be light during the delivery?" (KII 01, Facility Manager, Semi-Urban PHC)

"The supply of water is always a difficulty. During the time when water is being delivered, we still need clean water for hygiene and for sterilisation purposes. When our borehole pump broke down, the enrollees were obliged to purchase water from vendors who were outside the area until it could be delivered. Some of them went straight to the General Hospital". (KII 09, Chair of the Community Health Development Committee, Urban LGA)

"At clinics run by ANC, the staff are polite, but if you turn up in labour at night you will come across staff who are tired and who shout at you when you say that you are in pain. Since my sister was humiliated during her delivery, I have decided to have my own birth at home with a traditional birth attendant who treats me with respect". (FGDs P03-Women, Rural Kano)

Theme 3: Scheme Financial & Supply Chain Bottlenecks

Although KSCHMA is intended to offer zero-cost point-of-care delivery services, administrative delays in paying out claims and distributing monthly capitation funds leave facilities short of working capital. As a result, the facility dispensaries frequently suffer from out-of-stock situations of essential maternal supplies (including oxytocin, delivery kits, suture materials and intravenous fluids).

"Whenever KSCHMA says that reimbursements are delayed by two or three months, our revolving drug fund runs out. If a woman who is enrolled comes into labour, we are forced to give her family a prescription slip

so that they can buy the delivery kits and the drugs at a commercial pharmacy next door". (KII 05, Pharmacy Lead and KSCHMA Officer at the Secondary Hospital)

"KSCHMA scheme has significantly improved ANC attendance in our PHC. However, informal payments have again started to appear in practice. When a woman is asked to pay 3,000 Naira for emergency oxytocin since the insured supply is used up because of massive turnout, that is why some may decide to deliver at home". (KII 11, CHDC Chair, Rural LGA)

"While they said that delivery was fully covered by KSCHMA during ANC, when labour began at night and my husband took me to the health facility, the nurse gave him a prescription slip so that he could buy gloves, bleach, and oxytocin from a private pharmacy. Since we did not have any cash at that time, we had to go back home". (FGDs P08-women Rural LGA Kano)

Theme 4: Referral Logistics & System Fragmentation

The lack of organised emergency transport systems linking PHC y facilities with comprehensive emergency obstetric care (CEmONC) centres leads to bypassing behaviour, as families actively avoid primary care to prevent being left stranded should a complication occur during labour.

"At the primary health centre there is no ambulance to be found. If a woman experiences a prolonged labour or suffers a postpartum haemorrhage at our centre, we have to ask commercial drivers or our neighbours for a vehicle, and this takes several hours. In order to avoid these hazardous delays, the husbands insist on taking their wives directly from the start of labour to the General Hospital." (KII 04, PHC Officer-in-Charge, Rural LGA)

"The secondary hospitals are being overwhelmed by cases of ordinary, straightforward deliveries because the referral system is completely unorganised. Women refer themselves immediately since there is no penalty and because they know that the General Hospital has doctors on duty throughout the night." (KII 08, Medical Director, Secondary General Hospital)

Theme 5: Trust, Perception, & Community Dynamics

Those who provided information stressed that how people in the community view the clinical competence of healthcare providers strongly influences where women choose to give birth. While routine antenatal care clinics at primary health care centres help build trust in preventive care, community members still regard secondary hospitals as the normal place for a safe delivery. Women intending to deliver at facilities were often constrained by household decision-making systems, particularly when labour began at night in the absence of their spouse.

"In our community women tend to go to the PHC for their routine ANC visits because it is conveniently situated and friendly. But when it comes to delivery—which the community sees as a matter of life and death—they believe that true safety can only be ensured in the presence of doctors; it is for this reason that

insurance enrollment has given women the means to make a choice, and so they naturally choose the General Hospital.” (KII 12, Community Leader & CHDC Member, Urban LGA)

“A woman will not go out of the house on her own just because labour has begun; she has to wait for her husband or her elders to give their permission before moving and to have transport arranged. If her husband is away, then she has no choice but to ask for a home delivery.” (KII 10, Community Leader).

Discussion

This study evaluated the pattern and determinants of ANC-delivery mismatch among women enrolled in a state-level social insurance scheme in northern Nigeria. We found that despite ANC attendance under KSCHMA, 50.7% of insured women delivered at home outside a health facility. This shows that health insurance coverage alone is insufficient to guarantee full utilisation across the maternal continuum of care.

Our findings correspond with wider literature from sub-Saharan Africa (SSA), which shows that user fee exemptions or health insurance schemes do not ensure institutional delivery when point-of-care quality and supply chains are compromised [5, 8, 10]. The important determinants of mismatch, especially PHC bypassing in our study, were rural place of residence. Geographic and logistical limitations further contribute to delivery mismatch. Night-time labour onset combined with transport deficits increased the odds of mismatch, which is reported by many qualitative themes and supported by quantitative data. The high proportion of home deliveries among rural dwellers may be attributed to the lack of organised emergency transport systems linking primary healthcare facilities with secondary or private facilities, which may encourage PHC bypassing and lead families to perceive home delivery as the more feasible option. This was similarly reported in a previous study as a barrier to facility delivery [10]. This reinforces the requirement for structured community emergency transport schemes, such as partnerships with local transport unions, to address pre-hospital transport bottlenecks [11].

We reported informal education and full-time housewives as associated with mismatch; this is supported by qualitative findings, where community dynamics, such as spousal consent, remain influential, especially among uneducated women. This emphasises the importance of engaging men in birth preparedness and complication readiness planning during ANC visits [12]. In contrast, tertiary education, urban and semi-urban residence, grand multiparity, and completed ANC visits favoured delivery at a booked PHC among participants. Several studies in SSA similarly report that higher education, urban residence, and ANC attendance promote maternal healthcare utilisation [7,8,10].

The out-of-pocket expenditure forced by drug and supply stockouts was associated with home delivery. When insured enrollees face unexpected point-of-care costs during labour, health insurance's financial risk protection is negated, driving women back to non-institutional care options. This highlights the necessity of strategic purchasing reforms, such as KSCHMA's AbbaCare Maternal Initiative, which emphasises bundled care delivery and milestone-linked provider payments to secure essential intrapartum supplies [6].

Our qualitative findings also identified deficits in Respectful Maternity Care (RMC) through delivery mismatch. Verbal abuse or neglect during labour acts as an effective psychological barrier, causing women who attended ANC to bypass PHC facilities when labour begins [13-15]. Institutionalising RMC training and establishing reporting systems for patient mistreatment are essential to preserving trust in facility-based care [12].

Implications for practice and policy

1. **Supply-chain integrity:** KSCHMA and the Kano State Ministry of Health should set up specific supply buffer stocks for the accredited primary health care centres so that patients will not have to make out-of-pocket payments for care during childbirth if the supplies run out.
2. **Respectful maternity care enforcement:** Make sure that maternal health workers receive compulsory training in respectful maternity care and put in place clear administrative procedures for reporting any mistreatment.
3. **Emergency transport networks:** Establish partnerships with community transport unions in an official manner so as to ensure reliable night-time transportation for women who work in manual labour.
4. **Men's involvement in ANC:** Reform ANC services so that husbands are actively involved in birth planning and obtain prior authorization for delivery at a facility well before labour begins [16].

Limitations/ Strengths

This study has limitations. First, the cross-sectional design precludes establishing temporal causality. Second, recall bias may affect self-reported experiences during delivery, though we minimised this by restricting inclusion to women who delivered within the preceding 12 months. However, the strengths of our mixed-methods study add credibility by linking measurable outcomes to real-world implementation stories on what, why, and how social health insurance will promote maternal healthcare utilisation.

Conclusions

Financial protection through SHI is an important entry point for Universal Health Coverage, but it cannot independently ensure facility-based delivery. In Kano State, ANC-delivery mismatch among KSCHMA enrollees is driven by geography, point-of-care supply chain failures, respectful care deficits, infrastructure and transportation barriers, and gendered decision-making norms. Translating ANC coverage into facility deliveries and improved maternal outcomes requires pairing health insurance schemes with supply-chain reliability, health-system accountability, and community-based support networks.

List of abbreviations

ANC – Antenatal Care

CHDC-Community Health Development Committee

KSCHMA - Kano State Contributory Healthcare Management Agency

PHC – Primary Health Care

RMC - Respectful Maternity Care

SHC – Secondary Health Care

Declarations

Ethics Approval and Consent to Participate

The Health Research Ethics Committee of the Kano State Ministry of Health approved the study (NHREC/17/03/2018 Reference number: shrec/2026/8335). We received administrative clearance from KSCHMA and the health facility managers. We combined data extracted from the facility HMIS logs and the administrative claims databases, then fully anonymised it before analysis. We obtained written informed consent from each participant.

Consent for publication

Not applicable.

Availability of data and materials

The data sets that were produced and analysed in the current study can be obtained from the corresponding author on reasonable request upon approval from KSCHMA and Kano State Ministry of Health.

Competing interests

They have no competing interests to declare.

Funding

The study was fully funded by KSCHMA no any funding agency in the public, commercial, or non-profit sectors supported the research.

Authors' contributions

ZA, ALO, and RAM conceptualized the study, developed the method, supervised quantitative data gathering, performed statistical analysis, and drafted the manuscript. ZA, ALO, JM, IUH assisted in study design, coordinated qualitative data collection, and conducted thematic analysis. ZA and ALO contributed to statistical modelling and critically revised the manuscript. ZA, ALO, RAM and JM

contributed to study design and administrative coordination with KSCHMA. All authors read and approved the final manuscript.

Acknowledgements

The authors thank the management and staff of the Kano State Contributory Healthcare Management Agency (KSCHMA), facility desk officers, data collectors, and all participating women for their participation during this study.

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Tables

Table 1: Association between participants characteristics and ANC-delivery mismatch (n = 1080)

Variables	A	B	C	D	χ^2	P value
Age (years)					9.796	0.020
15-29	36(8.5%)	29(6.8%)	157(37.0%)	202(47.6%)		
30-49	78(11.9%)	44(6.7%)	188(28.7%)	346(52.7%)		
Occupation					146.689	<0.001
Full-time housewife	84(13.2%)	56(8.8%)	112(17.6%)	383(60.3%)		
Others	30(6.7%)	17(3.8%)	233(52.4%)	165(37.1%)		
Educational level					290.513	<0.001
Informal	21(5.3%)	6(1.5%)	101(25.6%)	266(67.5%)		
Primary	2(0.7%)	1(0.3%)	144(49.0%)	147(50.0%)		
Secondary	65(22.1%)	50(17.0%)	59(20.1%)	120(40.8%)		
Tertiary	26(26.5%)	16(16.3%)	41(41.8%)	15(15.3%)		
Place of residence					175.836	<0.001
Rural	29(4.6%)	17(2.7%)	183(29.2%)	398(63.5%)		
Semi-rural	29(14.3%)	13(6.6%)	94(48.0%)	60(30.6%)		
Urban	56(21.8%)	43(16.7%)	68(26.5%)	90(35.0%)		
Out-of-pocket					15.705	0.001
No	97(11.2%)	60(6.9%)	253(29.2%)	457(52.7%)		
Yes	17(8.0%)	13(6.1%)	92(43.2%)	91(42.7%)		
KSCHMA type					24.955	<0.001
Formal	66(12.3%)	41(7.6%)	199(37.0%)	232(43.1%)		
Informal	48(8.9%)	32(5.9%)	146(26.9%)	316(58.3%)		

Parity					183.046	<0.001
Primipara	2(0.7%)	1(0.3%)	144(49.0%)	147(50.0%)		
Para 2-4	47(9.6%)	22(4.5%)	142(28.9%)	281(57.1%)		
Para ≥ 5	65(22.1%)	50(17.0%)	59(20.1%)	120(40.8%)		
Number of ANC visits					133.063	<0.001
< 4 visits	39(6.1%)	21(3.3%)	164(25.8%)	411(64.7%)		
≥ 4visits	75(16.9%)	52(11.7%)	181(40.7%)	137(30.8%)		
ANC booking					34.218	<0.001
Early (≤ 14 weeks GA)	92(12.2%)	54(7.2%)	268(35.6%)	338(44.9%)		
Late (> 14 weeks GA)	22(6.7%)	19(5.8%)	77(23.5%)	210(64.0%)		

Bold – significant

Mismatch categories:

A: Delivered at booked PHC

B: Booked at PHC but delivered at SHC or private facility

C: Booked and delivered elsewhere (SHC or private facility)

D: Booked at PHC but delivered at home.

Table 2: Determinants of “Delivery at booked PHC” (category A)

Variable	OR	P-value	95% CI
Age (years)			
15-29	0.480	0.181	0.164 – 1.405
30-49	Reference		
Occupation			
Full-time housewife	3.970	0.160	0.580 – 27.158
Others	Reference		
Educational level			
Informal	0.241	0.425	0.007 - 7.918
Primary	0.032	0.092	0.001 - 1.758
Secondary	0.074	0.090	0.004 - 1.501
Tertiary	Reference		
Place of residence			
Rural	1.629	0.680	0.161 – 16.519
Semi-rural	23.163	0.013	1.951 – 274.972
Urban	Reference		
KSCHMA type			
Formal	2.591	0.512	0.151 – 44.591
Informal	Reference		
Out-of-pocket			
No	2.672	0.116	0.785 – 9.085
Yes	Reference		
Parity			
Primipara	0.614	0.227	0.186 – 3.743
Para 2-4	0.752	0.499	0.532 – 1.657
Para ≥ 5	Reference		
Number of ANC visits			
< 4 visits	2.439	0.288	0.471 – 12.635
≥ 4visits	Reference		

Variable	OR	P-value	95% CI
Age (years)			
15-29	0.735	0.587	0.243 – 2.229
30-49	Reference		
Occupation			
Full-time housewife	25.027	0.034	1.282 – 488.451
Others	Reference		
Educational level			
Informal	0.520	0.739	0.011 – 24.528
Primary	0.028	0.276	4.525 – 17.420
Secondary	0.984	0.992	0.038 – 25.324
Tertiary	Reference		
Place of residence			
Rural	14.314	0.021	1.485 – 137.973
Semi-rural	100.048	0.003	4.735 – 214.006
Urban	Reference		
KSCHMA type			
Formal	5.641	0.185	0.437 – 72.890
Informal	Reference		
Out-of-pocket			
No	1.064	0.932	0.260 – 4.355
Yes	Reference		
Parity			
Primipara	0.417	0.286	0.197 – 3.324
Para 2-4	0.773	0.539	0.632 – 1.977
Para ≥ 5	Reference		
Number of ANC visits			
< 4 visits	1.085	0.927	0.189 – 6.208
≥ 4weeks	Reference		

ANC booking			
Early (≤ 14 weeks GA)	0.556	0.542	0.084 – 3.633
Late (> 14 weeks GA)	Reference		

Bold – significant, 95% confidence interval (CI), OR = Odd ratio.

Table 4: Determinants of “Booked at PHC but delivered at home” (category D)

Variable	OR	P-value	95% CI
Age (years)			
15-29	0.608	0.212	0.279 – 1.327
30-49	Reference		
Occupation			
Full-time housewife	2.056	0.297	0.531 – 7.967
Others	Reference		
Educational level			
Informal	0.571	0.645	0.053 – 6.199
Primary	0.170	0.132	0.017 – 1.703
Secondary	0.548	0.592	0.061 – 4.952
Tertiary	Reference		
Place of residence			
Rural	5.171	0.046	1.026 – 26.047
Semi-rural	7.163	0.055	0.959 – 53.477
Urban	Reference		
KSCHMA type			
Formal	2.182	0.338	0.442 – 10.765
Informal	Reference		
Out-of-pocket			
No	1.727	0.239	0.695 – 4.288
Yes	Reference		
Parity			
Primipara	0.317	0.176	0.156 – 3.973
Para 2-4	0.776	0.455	0.587 – 4.697
Para ≥ 5	Reference		
Number of ANC visits			
< 4 visits	1.237	0.730	0.370 – 4.141
≥ 4weeks	Reference		

ANC booking			
Early (≤ 14 weeks GA)	0.606	0.732	0.224 – 2.293
Late (> 14 weeks GA)	Reference		

Bold – significant, 95% confidence interval (CI), OR = Odd ratio.

Table 5: Multicollinearity Diagnostics for Predictors of ANC-Delivery Mismatch

Predictor Variable	Tolerance	VIF	Diagnostic Assessment
Age (years)	0.981	1.020	No problematic multicollinearity
Occupation	0.569	1.677	No problematic multicollinearity
Educational level	0.502	1.993	No problematic multicollinearity
Place of residence	0.482	2.075	No problematic multicollinearity
KSCHMA type	0.276	3.629	No problematic multicollinearity
Out-of-pocket	0.966	1.035	No problematic multicollinearity
Parity	0.511	1.959	No problematic multicollinearity
Number of ANC visits	0.470	2.126	No problematic multicollinearity
ANC booking	0.465	2.150	No problematic multicollinearity

Table 6: Qualitative thematic framework matrix Interviews (FDG/KII)

Primary Theme	Sub-Themes Identified	FDG/Key Informant Groups	Operational Impact on Maternal Care
1. Human Resources for Health (HRH) and Night-time Coverage Gaps	1.1 Severe rural human resource for health shortages 1.2 Absence of 24/7 skilled birth attendance at PHC level	Facility In-Charges, CHDC Chairs	Directly drives night-time PHC bypassing to secondary hospitals or home births.
2. Primary Care Infrastructure & Utility Failures	2.1 Unreliable grid power & lack of generator fuel 2.2 Inadequate water supply & dark labour wards	Facility In-Charges, KSCHMA Desk Officers, Women	Creates unsafe night-time delivery conditions; forces self-referral during active labour.
3. Scheme Financial & Supply Chain Bottlenecks	3.1 Delayed capitation & fee-for-service reimbursements 3.3 Out of stocks of essential delivery packs & drugs	KSCHMA Desk Officers, Facility Managers, Women	Reintroduces informal point-of-care payments; causes financial erosion for enrollees.
4. Referral Logistics & System Fragmentation	4.1 Lack of functional emergency transport at primary level 4.2 Weak gatekeeping & uncoordinated self-referrals	Facility In-Charges, CHDC Chairs	Causes dangerous delays during obstetric crises; overburdens secondary facility wards.
5. Trust, Perception, & Community Dynamics	5.1 Community perception of low PHC clinical capacity 5.2 Preference for secondary care relative to informal fees 5.3 Spousal consent	CHDC Chairs, KSCHMA Desk Officers	Motivates proactive bypassing during labour even among women attending ANC at PHCs.

CHDC-Community Health Development Committee,

Figures

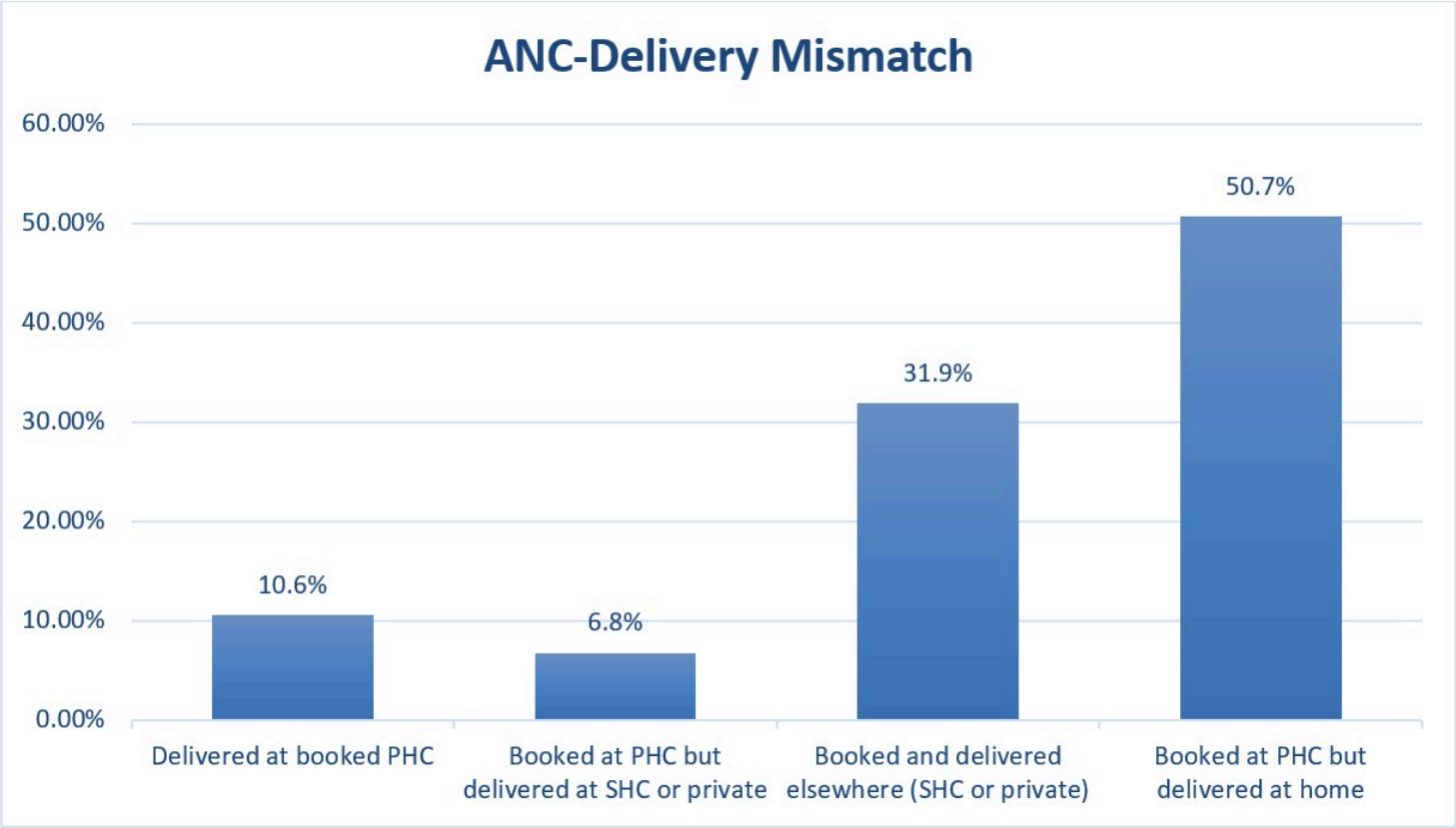


Figure 1

Showing the pattern of ANC-delivery mismatch (n = 1080)

Supplementary Files

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- [QUESTIONNAIREMHBMCPRY2.docx](#)