RESEARCH ARTICLE

Women's progression through the maternal continuum of care in Guinea: Evidence from the 2018 Guinean Demographic and Health Survey

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Abstract

Objective: To examine women's progression through the antenatal, birth, and post-partum maternal care in Guinea in 2018.

Methods: Using the Guinea Demographic and Health Survey of 2018, we analysed data on most recent live births in the 24 months preceding the survey among women aged 15–49 and the determinants (health system, quality of care, reproductive and sociodemographic factors) of women's progression through three steps of the continuum of care, using multivariable logistic regression.

Results: In the sample of 3,018 women, 87% reported at least one ANC visit (ANC1) with a health professional and 36% reported ANC4+, at least one of which was with a health professional. In the study, 26% of women reported ANC4+ plus birth in a health facility, and 20% reported ANC4+, birth in a health facility, plus post-partum check-up. Predictors of woman's progression from ANC1 to ANC4+ visits included living in the administrative regions of Kindia (AOR: 1.96, 95% CI: 1.23–3.14) and Nzérékoré (AOR: 0.50, 95% CI: 0.32–0.79) vs. Kankan, being aged 15 to 17 (AOR: 0.55, 95% CI: 0.35–0.86) vs. aged 25 to 34, having primary or more education (AOR: 1.37, 95% CI: 1.09–1.72), and being from a middle (AOR: 1.52, 95% CI: 1.18–1.96) or wealthier (AOR: 2.38, 95% CI: 1.67–3.39) household vs. a poor household. Living in the administrative regions of Nzérékoré (AOR: 6.27, 95% CI: 1.57–25.05) vs. Kankan, in a middle (AOR: 1.64, 95% CI: 1.05–2.57) or wealthier (AOR: 3.23, 95% CI: 1.98–5.29) household vs. a poor household, nulliparity (AOR: 1.75, 95% CI: 1.03–2.97) vs. 2–4 previous births, the distance to health facility perceived as not being a problem (AOR: 1.75, 95% CI: 1.23–2.50), and higher ANC content score (AOR: 1.29, 95% CI: 1.10–1.52) remained independently associated with progression from ANC4+ to birth in a health facility. Predictors of progression from birth in the health facility to post-partum check-up included residing in the administrative regions of Labé (AOR: 0.22, 95% CI: 0.09–0.51) or Faranah (AOR: 0.43, 95% CI: 0.19–0.96) vs. Kankan, higher ANC content score (AOR: 1.76, 95% CI: 1.36–2.28),

skin-to-skin contact after birth (AOR: 3.00, 95% CI: 1.70–5.31), and being attended at birth by a health professional (AOR: 17.52, 95% CI: 4.68–65.54).

Conclusions: Removing financial barriers and improving quality of care appear to be important to increase the percentage of women receiving the full maternal continuum of care.

KEYWORDS
continuum of care, Guinea, maternal health

INTRODUCTION

Most global maternal deaths occur in sub-Saharan Africa [1]. Maternal deaths are mainly caused by birth complications such as haemorrhage, pre-eclampsia, obstructed labour and post-partum infections [2]. Increasing the utilisation of maternal health services throughout the maternal continuum of care (CoC) has become a key recommendation from WHO and researchers to improve maternal health [3] To prevent maternal deaths, WHO recommends that a pregnant woman have at least eight antenatal care (ANC) visits with a health professional, give birth in a health facility or with a skilled birth attendant, and have at least four post-partum check-ups with a health professional, one within 24 h of birth, one on day 3 after birth, one between days 7 and 14 and one six weeks after birth [4–6]. These recommendations are adapted to local contexts across countries [4], with many aligning with a recommendation of a minimum of four ANC visits, birth in a health facility or with a skilled birth attendant, and at least one post-partum check-up within first 48 h of birth [7–9]. Deriving from WHO's definition of the continuum of care (CoC) for reproductive, maternal, newborn and child health [10], maternal CoC is defined as provision of integrated care for a mother from pregnancy to delivery and the immediate post-partum period. Such care is provided by families and communities, through outpatient services, clinics and other health facilities [10].

Little is known about the proportion of women receiving all essential recommended maternal services throughout the CoC in sub-Saharan Africa, since most studies analyse utilisation of each maternal service separately. For example, in Ethiopia in 2019, 74% of women had at least one ANC visit with a health professional, 48% gave birth in a health facility and 34% had a post-partum check-up within two days of birth [11]. In Mali in 2018, such proportions were 80%, 67% and 56% respectively [12]. Although these statistics give an overview of the proportion of women receiving care at each step, they do not track individuals throughout the CoC. This masks underutilisation of certain services by individual women, preventing the identification of meaningful gaps in the utilisation of essential maternal health services. For instance, one study tracking individuals throughout the maternal CoC reported that in three regions of Ghana between 2011 and 2013, only 8% of 1500 women achieved all critical steps of the CoC, that is, four ANC visits or more (ANC4+),

had birth attended by a health professional and received post-partum care within 48 h of birth [13].

Furthermore, there are still considerable challenges to the implementation of the CoC; health care systems are poorly organised for taking account of the continuum approach, hampering efforts to ensure consistent care across the various providers involved in ANC, birth and post-partum services [3]. Frequency and quality of care at each step of the continuum are critical determinants of progression to the next step of the CoC. A 2012 systematic review in low- and middle-income countries reported that ANC use was strongly predictive of subsequent birth in a health facility, with women who met the WHO-recommended 4 or more ANC contacts 7.3 times more likely to give birth in a facility [14]. The review also found utilisation of skilled birth attendants was lower among women who achieved fewer than the recommended number of ANC contacts [14]. Inconsistent quality of care has been reported in Ghana as a major barrier to continuation along the CoC [15]. In Uganda, lack of counselling during ANC consultations was strongly predictive of lower likelihood of giving birth in a facility [16].

In Guinea, where the maternal mortality ratio is amongst the highest in the world (576 [95% CI 437–779] deaths per 100,000 live births in 2017) [17], improving the CoC for maternal health is a priority within the National Strategic Plan for Maternal, Newborn, Child, Adolescent and Youth Health 2016–2020 [18]. This plan recommends that every pregnant woman should attend at least four ANC visits, give birth in health facility or with a trained health professional, and receive a post-partum check-up with a health professional within the 48 h of giving birth [18]. In 2011, the Guinean government adopted a user fee exemption policy for maternal care, including ANC, birth and post-partum care at public health facilities [19]. This policy improved access to obstetric care in rural Guinea [19]. The most recent national estimates from the Demographic and Health Survey (DHS) conducted in 2018 show that 81% of pregnant women had at least one ANC visit (ANC1), 51% gave birth in a health facility, and 49% were checked by a health professional within the first two days post-partum [20]. Understanding levels and predictors of progression through the maternal CoC is urgently needed in high maternal mortality contexts such as Guinea to understand the actual gaps in coverage for essential maternal health services. Secondly, it provides some understanding of the link between maternal care coverage and

maternal care quality to continue prioritising high-quality services.

The objective of this paper is to analyse women's progression through the CoC from pregnancy through the post-partum period in Guinea. Specifically, we describe the likelihood of women's progression through the three steps (ANC1 to ANC4+; ANC4+to birth; ANC4+ and birth to post-partum care) of the CoC stratified by region, and assess determinants of women's progression from one step to another of the CoC.

METHODS

Data

We conducted a secondary analysis of the most recent DHS data, collected between March and June 2018. The DHS is a cross-sectional nationally representative household survey using a multi-stage cluster sampling strategy. It includes questions on household and individual characteristics; maternal and child health knowledge, behaviours, and outcomes; and details on antenatal, childbirth and post-partum care received.

Population

We analysed data self-reported by women of reproductive age (aged 15–49) who had had a live birth within the 24 months preceding the survey to examine the CoC for the most recent live birth. For women who gave birth to multiples (twins, triplets), inclusion within the analytic sample was defined by the outcome of the last-born baby.

Definitions

Continuum of care for maternal health

Women's self-report of having received all three sequential recommended care services within the CoC, that is, ANC4+ (at least one of which was with a health professional), birth in a health facility, and a post-partum check-up within 48 h of birth. The CoC is measured in this study as the percentage of women achieving all the three sequential recommended care services among all women in the sample. We constructed three binary variables representing each individual care step in the maternal CoC.

ANC4+: women's self-report of four or more ANC visits, at least one of which was with a health professional (a subset of ANC1). WHO recommends pregnant women have at least eight ANC contacts with a health professional [6]. However, at the time of these pregnancies, the Guinea national guidelines recommended at least four ANC visits during which the woman is physically examined and provided curative and preventive services.

Birth in a health facility: women's self-report of having given birth in a health facility. We defined facility-based birth as a birth occurring in a public or private hospital, communal medical centre, health centre, private clinic, midwife's private cabinet, family planning clinic, or a public or private health post, regardless of the cadres of health professionals who were reported to have assisted with the birth.

Post-partum check-up: women's self-report of having been checked by a health professional (medical doctor, nurse, midwife, or technical health officer) within 48 h after the birth, regardless of the location of this post-partum check-up. We categorised women's responses about the timing of their first post-partum check and defined receipt of post-partum care within 48 h after birth as (a) if woman gave birth in a health facility, had a length of hospital stay less than 48 h, and reported having been checked by a health professional before discharge from facility; (b) delivered in a health facility, had a length of hospital stay <48 h, was not checked by a health professional before discharge from facility, but checked after discharge by a health professional within 48 h of birth; (c) delivered in a health facility, had a length of stay more than 48 h, and was checked by a health professional within 48 h of birth while still in the health facility; or (d) gave birth outside of a health facility, and reported having been checked by a health professional within 48 h of birth. Nearly 1% (*n* = 28) of women who delivered in a health facility had missing data on their length of stay; such women were categorised as having stayed more than 48 h. Among women who gave birth in a health facility, 13% (*n* = 203) did not know the timing of their first post-partum check. We categorised these women as not having been checked by a health professional within 48 h of birth.

Conceptual framework

We developed our conceptual framework (Figure 1) based on published literature [21–23]. The three references cited are all papers looking at numerous sub-Saharan African countries, each looking at use of one of the three CoC services. Together these papers include: a systematic review of ANC, including 74 studies from 23 countries; an analysis of childbirth care in 34 countries; and an analysis of postnatal care in 36 countries. Therefore, we feel that we derived our conceptual approach from a sufficiently broad and recent body of literature, which also includes studies/data from Guinea. We also accept that the variables we were able to include in our framework were limited by the secondary nature of our data.

This literature supports three major domains of influence: sociodemographic factors, reproductive characteristics, and health systems factors. Sociodemographic factors include maternal age at the time of index birth, household wealth, maternal educational attainment, religion, ethnic group and the residence area (rural/urban), which might influence woman's utilisation of ANC visits with a health professional, giving birth in a health facility and receiving a post-partum
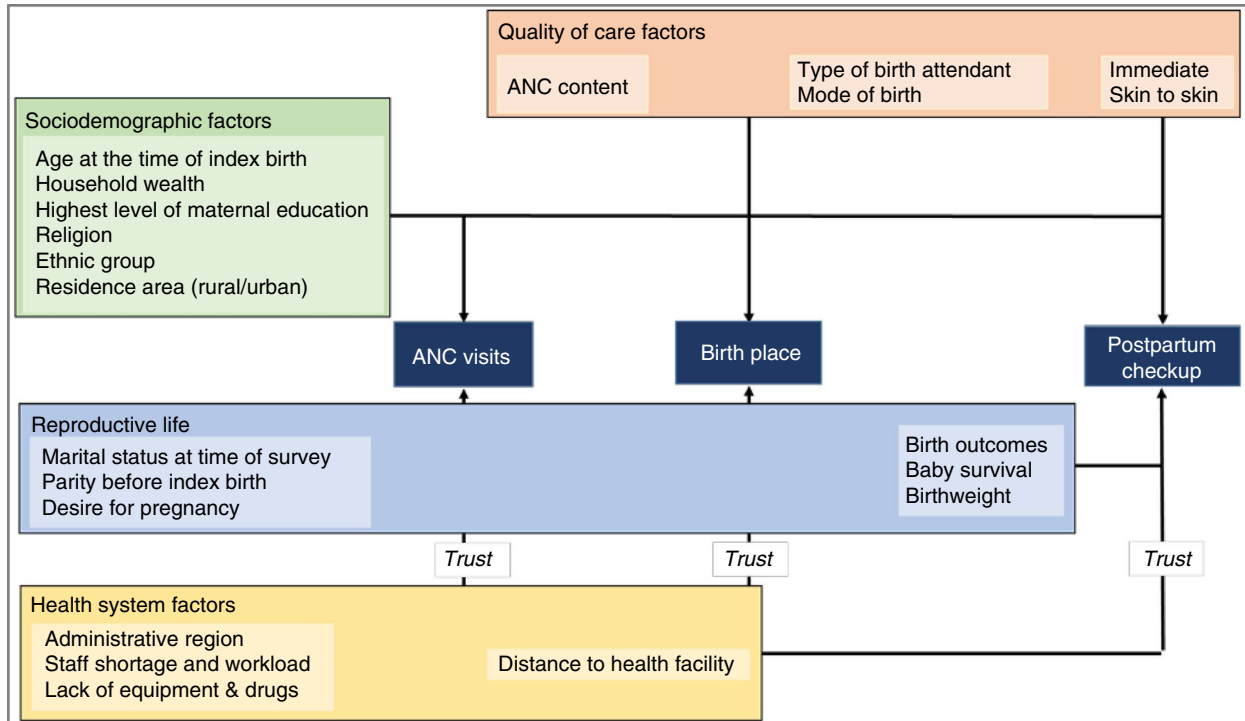
FIGURE 1 Conceptual framework of factors influencing progression through maternal continuum of care. ANC, antenatal care
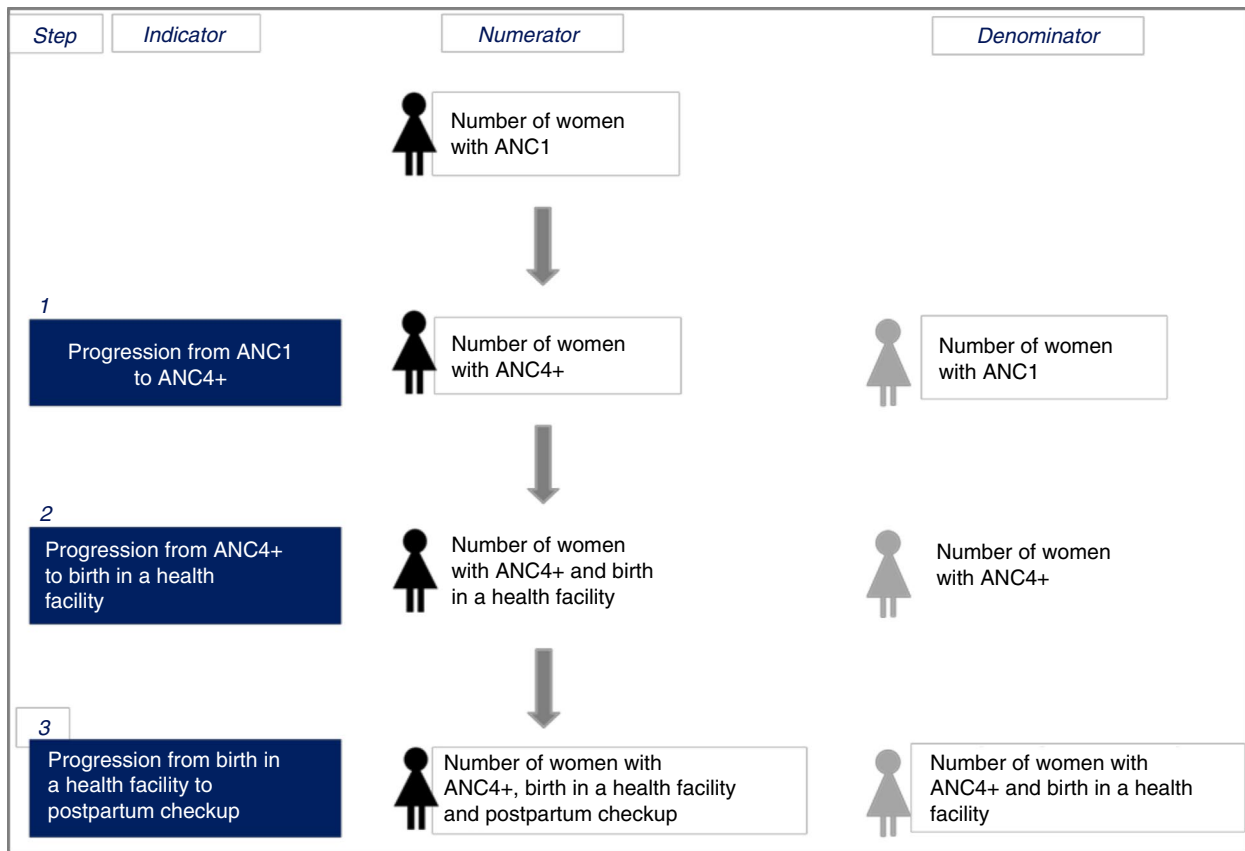

FIGURE 2 Indicators of the maternal continuum of care through its three steps. ANC1, at least one antenatal care visit; ANC4+, at least four antenatal care visits

check-up. Health system factors also influence utilisation of maternal health services at these three different stages of the CoC. Health system factors such as the administrative region (in Guinea, the health system is based on administrative division), distance to the health facility, staff shortage and workload and lack of equipment and drugs can affect women's utilisation of and trust in the three maternal health services, as well as the quality of care (here captured through ANC content, type of birth attendant, mode of birth and immediate skin-to-skin). Woman's reproductive characteristics are also influential on progression through the CoC; marital status and parity, as well as woman's wantedness of the pregnancy resulting in the index birth can influence attendance to ANC visits, on birth place, and post-partum check-up. Birth outcomes including neonatal survival and birthweight can influence uptake of post-partum care. While we developed the framework broadly, we were able to examine only variables or proxies for variables depending on their availability on the DHS.

Outcome variables

The outcome variables are a woman's progression through the CoC for maternal health, a set of three binary variables measured at the three steps of CoC: (1) if the woman with at least one ANC reported receiving four or more ANC visits; (2) if the woman with at least one ANC reported receiving four or more ANC and giving birth in a health facility; and (3) if the woman with at least one ANC reported receiving full maternal CoC, that is, four or more ANC, giving birth in a health facility, and receiving a post-partum check-up within 48 h (Figure 2).

Independent variables

We identified explanatory variables at the three different stages of outcome measurement, based on our conceptual framework (Figure 1) and availability in the DHS data. For all three outcomes, some variables were selected *a priori*. These included sociodemographic variables notably, woman's age group at the time of the index birth in 5-year intervals, household wealth, highest level of maternal education level (none, primary or more), religion (Muslim, Christian or other), woman's ethnic group (Soussou, Malinké, Forestier, Foreigner), residence area (rural, urban); variables related to the health system: administrative region, whether or not the distance to a health facility was a big problem for the woman; and woman's reproductive characteristics: marital status at the time of survey (single, married/cohabiting), her parity at the time of the most recent pregnancy (no birth, 1 birth, 2 to 4 births, 5 or more births), whether she wanted to become pregnant or not at the time of the most recent pregnancy. The household wealth variable was constructed by categorising the available household wealth

quintiles in the DHS dataset into three groups [24]. The richest and richer quintiles were grouped as 'wealthy', and the poorest and poorer quintiles grouped as 'poor'. The 'middle' quintile remained as in the DHS dataset. We wished to include health system variables such as staff shortages, staff workload and lack of equipment and or drugs; however, the DHS dataset does not include such variables.

We also used explanatory variables capturing content of care received. ANC content score was assessed for women's progression from ANC 4+ visits to facility childbirth and from facility childbirth to post-partum check-up. ANC content score ranged from 0 (receipt of no content) to 6 (uptake of all six measured elements of care). ANC elements of care were based on women's self-report of whether or not they received the following elements of ANC at least once at any point during their pregnancy: blood pressure measured, urine sample taken, blood sample taken, iron tablets or syrup given, drugs against intestinal parasites given and malaria prophylaxis (sulfadoxine-pyrimetamine/fansidar) tablets given.

The following variables were assessed specifically for progression from facility childbirth to post-partum care within 48 h after birth: mode of birth (vaginal or C-section), baby's birthweight (small, normal, large), type of birth attendant (health professional – medical doctor, nurse, midwife, or technical health officer, or not), whether the baby was put skin-to-skin with the mother immediately after birth or not, and whether the baby survived until 48 h after birth or not. We used the type of birth attendant as a proxy for potential occurrence of complications (women with complications might be more likely to be attended by a health professional), which can influence woman's likelihood of receiving post-partum care within 48 h after birth. In addition, baby's birthweight can be used as a risk factor for birth or post-partum complication for both the mother and the baby, thereby influencing the chance for post-partum care. After cross-checking women's report of baby's size as 'very small', 'small', 'normal', 'large' and 'very large' with recorded birthweight basing on WHO's definition of birthweight [25], we categorised baby's recorded birthweight as small (<2500 g), normal (2500–3999 g) or large (>3999 g). For babies with information missing on recorded birthweight ($n = 313$; 10%), we used mother's report of baby size. Thus, we considered 'very small' or 'small' size as reported by mothers as 'small' weight, 'normal' size as 'normal' weight, 'large' or 'very large' size as 'large' weight. Few babies ($n = 11$; 0.4%) were missing both recorded birthweight and mother's report of size. We categorised such babies as 'normal' birthweight.

Analysis

The data were analysed using Stata Software version 15.1 (College Station, TX, USA). Descriptive analyses were presented as percentages with 95% confidence intervals

TABLE 1 Characteristics of women aged 15–49 years, with at least one birth occuring within the previous 24 months, Guinea, 2018 (*N* = 3018)

Characteristics	Number	Weighted %	95% CI
Residence areas			
Rural	2165	71.4%	69.0–73.1
Urban	853	28.6%	26.3–31.1
Administrative regions			
Boké	417	10.3%	9.2–11.7
Conakry	249	11.0%	9.5–12.8
Faranah	423	11.0%	9.5–12.7
Kankan	503	18.9%	16.2–21.8
Kindia	404	15.1%	13.2–17.1
Labé	380	11.9%	10.3–13.7
Mamou	289	7.3%	6.3–8.5
Nzérékoré	353	14.6%	12.8–16.6
Ethnic group			
Peulh	1185	34.8%	31.5–38.2
Malinke	957	33.2%	29.8–36.8
Soussou	563	19.1%	16.4–22.2
Forestier	303	12.7%	10.3–15.4
Foreigner	10	0.1%	0.1–0.6
Religion			
Muslim	2741	88.1%	85.4–90.4
Christian or other religion	277	11.9%	9.6–14.6
Age groups at birth (years)			
15–17	256	8.8%	7.7–10.1
18–24	1000	33.3%	31.5–35.1
25–34	1279	42.0%	40.1–44.0
35–49	483	15.8%	14.4–17.4
Highest educational level			
None	2243	74.1%	72.0–76.2
Primary	370	12.2%	10.9–13.6
Secondary	341	11.3%	9.9–12.9
Higher	64	2.4%	1.9–3.1
Socio-economic level			
Poor	1403	46.6%	43.3–49.8
Middle	595	19.4%	17.6–21.5
Rich	1020	34.0%	31.1–37.0
Marital status			
Married/ Cohabiting	2848	94.2%	93.1–95.1
Single	170	5.8%	4.9–6.9
Parity before the most recent birth			
No previous birth	567	19.1%	17.6–20.7
1 previous birth	564	18.7%	17.1–20.3

(Continues)

TABLE 1 (Continued)

| Characteristics	Number	Weighted %	95% CI
2 to 4 previous births	1327	44.1%	42.1–46.1
5 or more previous births	560	18.2%	16.6–19.8
ANC attendance			
No ANC visit	384	12.7%	10.5–15.4
1 to 3 ANC visits	1568	51.6%	49.2–54.0
4 or more ANC visits	1066	35.7%	33.2–38.3
Delivered in a health facility			
Yes	1587	54.1%	50.8–57.3
No	1431	46.0%	42.7–49.2
Delivered by caesarean section			
Yes	89	2.9%	2.3–3.7
No	2929	97.1%	96.3–97.7
Was checked by health professional within 48 h after birth			
Yes	1274	43.6%	40.7–46.5
No	1744	56.4%	53.5–59.3

ANC, antenatal care.

(CI). Women's progression through the three stages of the CoC for maternal health––showing drop in progression from one step to the other––was described and stratified by the administrative region, presented as diagram bars. Pearson's chi square test was used for comparison of descriptive statistics. To identify factors associated with progression through the CoC, we first ran bivariate analyses comparing progression through the CoC at each of the three levels with all independent variables. Then, three multivariate logistic regression models––one for each step in the CoC––were built beginning with all *a priori* independent variables, and additional variables added based on their relevance at a step of the CoC. The significance level for inclusion of additional variables in multivariable analysis was set at a *p* value ≤0.05. Adjusted odd ratios (AOR) were then derived with 95% CI from final models. Descriptive and analytical analyses were adjusted for survey-specific weighting, clustering and stratification using the *svyset* command.

RESULTS

Characteristics of the sample

Overall, 3018 women with a live birth in the 24 months preceding the survey were included in the analysis. They were predominantly from rural areas (71%), Muslim (88%) and with no education (74%) (Table 1). They were mostly married/cohabiting (94%), with parity 2–4 before the index live birth analysed in this study (44%). For the most recent live
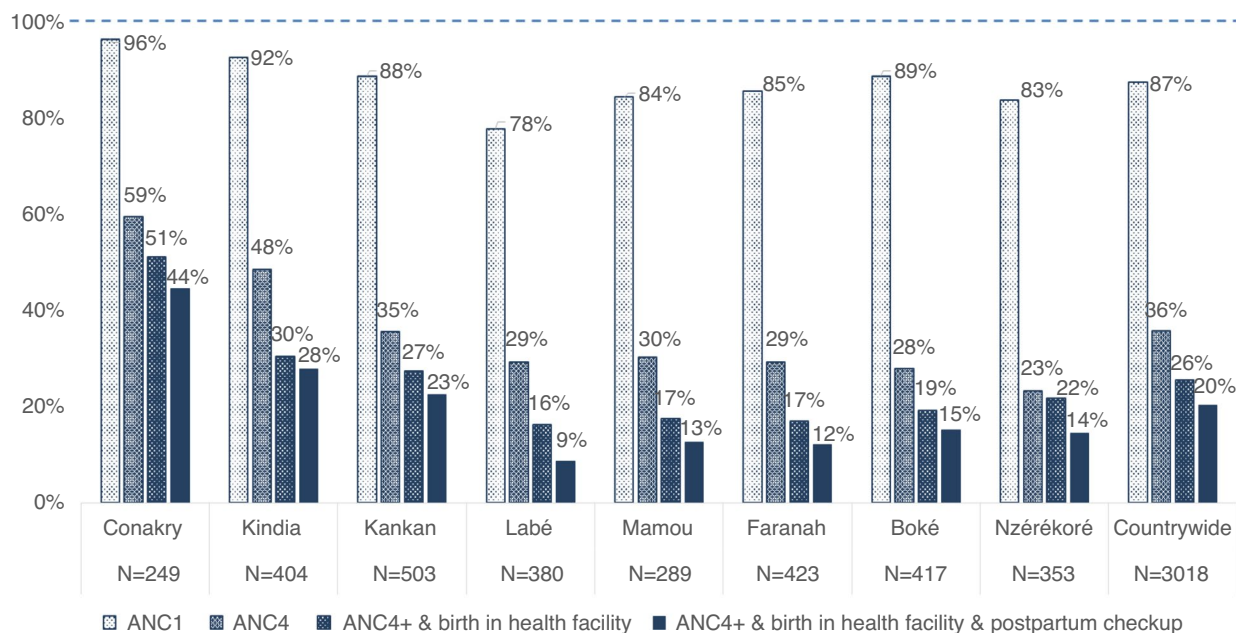
FIGURE 3 Maternal continuum of care from ANC1 through post-partum check-up for their most recent birth, countrywide and by administrative region, 2018 Guinea DHS (*n* = 3018). ANC1, first antenatal visit; ANC4, four or more antenatal visits

birth, the majority of women had at least one ANC contact (87%), and 54% gave birth in a health facility, with 3% of all live births reported by caesarean section. More than half of women (56%) reported having been checked by a health professional within 48 h of birth.

Progression through the continuum of care for maternal health

Progression through the maternal CoC is presented overall and by region in Figure 3. Countrywide, 87% of all sampled women reported at least 1 ANC visit with a health professional, ranging regionally from 78% in Labé to 96% in Conakry. Among all sampled women, pregnant women who had ANC4+ represented 36%; 26% had ANC4+ and gave birth in a health facility. However, 20% of women received all three services within the CoC, ranging from 9% in Labé to 44% in Conakry. Nationally, the largest drop out within the CoC happened between ANC1 and ANC4+ (51 percentage point difference). Regionally, drop out from ANC1 to ANC4+ was most pronounced in the region of Boké (61 percentage points) and least pronounced in Conakry (37 percentage points). The dropout between ANC4+ and facility-based birth was 10 percentage points nationwide and highest in Kindia (18 percentage points). The dropout between facility-based birth and post-partum check-up within 48 h was 6 percentage points nationwide; and largest in the Nzérékoré region (8 percentage points).

Predictors of progression through the continuum of care

Bivariate analyses showed that residence area, administrative region, religion, maternal age group at index birth, educational level, household wealth, and perceived distance to health facility were associated with progression from ANC1 to ANC4+ (Table 2). However, in multivariable analysis, only the administrative region, woman's age group at index birth, educational level and household wealth remained independent predictors of this progression (Table 3). Compared to those aged 25–34 years, women aged 15–17 had 45% reduced odds of continuing care from ANC1 to ANC4+ (AOR: 0.55, 95% CI: 0.35–0.86). Women living in Nzérékoré region had 50% reduced odds of continuing care from ANC1 to ANC4+ compared to residents of Kankan (AOR: 0.50, 95% CI: 0.32–0.79). Women with primary level of education or above had significantly higher odds of continuing care from ANC1 to ANC4+ (AOR: 1.37, 95% CI: 1.09–1.72) compared to those with no education. Women from middle and wealthy households had 1.52 and 2.38 times the odds, respectively, of continuing care from ANC1 to ANC4+, compared to women from poor households.

Predictors of progression from ANC4+ to birth in health facility identified in bivariate analysis included residence area, administrative region, ethnic group, religion, educational level, household wealth, parity, perception of the distance to health facility, and ANC content score (Table 2). In multivariable analysis, the administrative region, household wealth, lower parity, perception of the distance to health

TABLE 2 Bivariate analysis of factors associated with women's progression through the continuum of care from (1) ANC1 to ANC4+, (2) ANC4+ to facility-based birth, and (3) facility-based birth to postpartum check within 48 h after birth, among women aged 15–49 years, with at least one birth within the previous 24 months, Guinea, 2018

Characteristics	Retention from ANC1 to ANC4 (Yes) (N = 2634)				Retention from ANC4 to facility-based birth (Yes) (N = 1066)				Retention from facility-based birth to postpartum check (Yes) (N = 750)			
	n	Weighted %	95% CI	p value	n	Weighted %	95% CI	p value	n	Weighted %	95% CI	p value
All	1066	40.9%	38.4–43.4	NA	750	71.6%	68.3–74.6	NA	591	79.4%	75.8–82.6	NA
Residence area												
Rural	614	34.0%	31.3–36.9	<0.001	360	60.7%	56.0–65.3	<0.001	264	72.6%	66.8–77.8	<0.001
Urban	452	55.7%	51.0–60.3		390	85.9%	81.1–89.6		327	85.7%	81.4–89.2	
Administrative region												
Boké	118	3.5%	26.4–37.2	<0.001	80	68.7%	56.7–78.6	<0.001	64	79.2%	69.7–86.2	<0.001
Conakry	150	61.8%	52.3–70.4		131	85.8%	76.2–91.9		114	4.0%	79.4–92.4	
Faranah	130	34.3%	28.2–40.8		76	57.9%	45.8–69.1		55	71.5%	58.5–81.8	
Kankan	182	40.1%	33.8–46.7		138	76.9%	67.9–83.9		112	82.9%	75.9–87.7	
Kindia	200	52.3%	45.5–59.2		127	62.7%	54.7–70.0		117	91.4%	81.1–96.4	
Labé	117	37.7%	31.5–44.3		68	55.6%	45.1–65.6		36	53.5%	40.0–66.5	
Mamou	93	35.9%	29.6–42.7		59	57.6%	45.6–68.8		43	72.3%	58.4–83.0	
Nzérékoré	76	27.7%	22.2–34.0		71	93.7%	84.8–97.6		50	66.4%	50.8–79.1	
Ethnic group												
Soussou	242	46.1%	39.9–52.4	0.060	164	67.6%	59.4–74.9	<0.001	140	86.2%	79.0–91.2	0.017
Peulh	386	39.8%	36.2–43.5		243	61.5%	55.9–66.9		179	74.7%	68.5–79.8	
Malinké	338	41.4%	37.0–46.0		260	78.7%	73.0–83.4		212	82.5%	77.0–86.9	
Forestier	98	34.4%	28.4–41.0		82	86.8%	77.9–92.5		59	69.5%	55.3–80.8	
Foreigner	2	21.1%	4.8–58.6		1	46.3%	5.1–93.3		1	0.0%	NA	
Religion												
Muslim	981	41.9%	39.2–44.6	0.017	677	69.7%	66.1–73.0	0.001	540	81.1%	77.5–84.2	0.036
Christian or other	85	33.6%	27.7–40.1		73	88.1%	78.4–93.7		51	67.9%	53.1–79.8	
Age group at birth (years)												
15–17	77	32.2%	25.9–39.2	0.021	58	75.6%	63.6–84.6	0.106	43	75.1%	60.8–85.4	0.873
18–24	393	43.9%	39.9–47.8		286	73.9%	68.7–78.5		223	79.6%	74.1–84.1	
25–34	450	41.3%	37.7–45.0		315	71.6%	66.9–75.9		253	80.2%	74.8–84.7	
35–49	146	38.1%	32.9–43.6		91	62.8%	54.1–70.8		72	78.6%	75.8–82.6	
Marital status												
Single	72	47.2%	38.6–55.9	0.132	55	77.6%	65.7–86.2	0.258	47	88.6%	78.0–94.4	0.073

(Continues)

TABLE 2 (Continued)

Characteristics	Retention from ANC1 to ANC4 (Yes) (N = 2634)				Retention from ANC4 to facility-based birth (Yes) (N = 1066)				Retention from facility-based birth to postpartum check (Yes) (N = 750)			
	n	Weighted %	95% CI	p value	n	Weighted %	95% CI	p value	n	Weighted %	95% CI	p value
Married/Cohabiting	994	40.2%	37.9–43.1		695	71.1%	67.8–74.2		544	78.6%	74.8–82.1	
Educational level				<0.001				<0.001				0.003
None	682	36.3%	33.5–39.1		443	66.1%	61.8–70.0		335	75.4%	70.2–79.9	
Primary level or more	384	52.6%	48.2–57.1		307	81.2%	76.7–85.0		256	85.2%	80.4–88.9	
Household wealth index				<0.001				<0.001				<0.001
Poor	325	28.6%	25.6–31.8		151	50.5%	44.6–56.3		106	69.0%	59.6–77.0	
Middle	192	38.4%	33.5–43.4		132	70.1%	62.2–76.9		96	73.5%	62.8–82.0	
Rich	549	56.4%	52.0–60.7		467	84.4%	80.3–87.8		389	84.8%	80.9–88.0	
Parity before most recent birth				0.179				<0.001				0.570
No birth	228	43.0%	38.4–47.7		182	80.2%	74.1–85.2		142	81.0%	74.5–86.1	
1 birth	217	42.8%	38.0–47.8		158	73.0%	66.2–79.0		127	78.5%	69.8–85.2	
2 to 4 births	455	40.9%	37.4–44.5		317	71.8%	67.0–76.0		252	80.6%	74.9–85.3	
5 or more births	166	36.3%	31.6–41.3		93	57.2%	48.9–65.1		70	73.6%	62.0–82.6	
Wanted to become pregnant for this birth				0.767				0.741				0.292
Yes	891	40.7%	38.0–43.4		627	71.3%	67.8–74.6		498	80.1%	76.4–83.4	
No	175	41.7%	35.9–47.7		123	72.7%	64.6–79.5		93	75.9%	67.2–82.9	
Distance to the health facility was a big problem for her				<0.001				<0.001				0.286
Yes	425	35.5%	32.3–38.9		236	56.9%	51.3–62.4		183	76.6%	69.2–82.7	
No	641	45.2%	41.9–48.5		514	80.7%	76.9–84.1		408	80.6%	76.6–84.1	
ANC content score, Mean (SD)					750	5.1 (1.1)	5.2–5.3	<0.001	591	5.2 (0.9)	5.1–5.3	<0.001
Mode of delivery												0.553
Vaginal									549	79.1%	75.4–82.4	
C-section									42	83.4%	66.7–92.7	
Baby's birthweight												0.942
Small									40	79.2%	63.4–89.4	
Normal									389	79.0%	74.7–82.8	
Large									162	80.3%	73.2–85.9	
Type of birth attendant												<0.001
Skilled birth attendant									584	82.1%	78.8–85.0	

(Continues)

TABLE 2 (Continued)

Characteristics	Retention from ANC1 to ANC4 (Yes) (N = 2634)				Retention from ANC4 to facility-based birth (Yes) (N = 1066)				Retention from facility-based birth to postpartum check (Yes) (N = 750)			
	n	Weighted %	95% CI	p value	n	Weighted %	95% CI	p value	n	Weighted %	95% CI	p value
Non skilled birth attendant									7	23.1%	8.0–50.9	<0.001
The baby was put skin to skin with the mother at birth												
Yes									272	88.5%	83.3–92.2	
No									319	73.0%	68.1–77.4	
Neonatal survival within 48 h after birth												
The baby survived									579	79.3%	75.6–82.4	0.381
The baby died									12	89.0%	59.3–97.8	

ANC1, first antenatal care visit; ANC4, four or more antenatal care visits.
P-value of Wald test.

facility not being a problem, and higher ANC content score remained independently associated with progression to this step of the continuum (Table 3). Compared to women living in Kankan, women residing in Nzérékoré had 6.27 times the odds of continuing care from ANC4+ to facility-based birth. Women from middle and wealthy households had 1.64 and 3.23 times the odds, respectively, of continuing care from ANC4+ to birth in a health facility, compared to those from poor households. Women with no previous birth had higher odds of progression to this step of the CoC than women with 2 to 4 prior births (AOR: 1.75; 95% CI: 1.03–2.97). There was a 29% increase in the adjusted odds of continuing care from ANC4+ to facility birth with every additional element of ANC content (AOR: 1.29, 95% CI: 1.10–1.52). Compared to those who did not, women who reported that distance to health facility was a big problem were less likely to continue care from ANC4+ to birth in a health facility (AOR: 0.57; 95% CI:0.40–0.82).

Variables associated with progression from birth in health facility to post-partum check-up within 48 h of birth identified in bivariate analysis included residence area, administrative region, religion, education level, household wealth, ANC content, type of birth attendant and skin-to-skin contact at birth (Table 2). However, in multivariable analysis, only administrative region, ANC content score, skin-to-skin contact, and type of birth attendant were associated with this progression. The adjusted odds ratio of receiving postpartum check-up after receiving ANC4+ and giving birth in a health facility was lower among women living in the administrative region of Labé (AOR: 0.22, 95% CI: 0.09–0.51) or Faranah (AOR: 0.43, 95% CI: 0.19–0.96), and those whose facility birth was attended by a non-skilled health professional (AOR: 0.06, 95% CI: 0.02–0.21), compared to women living in the administrative region of Kankan or women who were attended at birth in a health facility by a health professional, respectively. However, uptake of every additional ANC content (AOR: 1.76, 95% CI: 1.36–2.28) or putting the baby skin-to-skin with the mother (AOR: 3.00, 95% CI: 1.70–5.31) was associated with an increase in the odds of continuing care from birth in a health facility to post-partum check-up within 48 h following birth. Birth by caesarean section carried adjusted odds of 1.57 compared to vaginal birth, but 95% CI (0.51–4.83) showed no significant difference, possibly due to the small sample size of caesarean section births.

Given that the three steps of the CoC consist of sequential subsets of women, we present a comparison of the factors independently associated with each successive step (Figure 4). Sociodemographic factors (household wealth, highest maternal education level, and maternal age) and health system factors/accessibility (administrative region, distance to health facility) played an important role in predicting progression from ANC1+ to ANC4+, and from ANC4+ to facility-based birth. However, in the last step of the CoC (post-partum check-up among women who received ANC4+ and gave birth in a health facility), the content of care indicators (ANC content score, skin-to-skin, type of attendant) were main factors associated with remaining in the CoC).

TABLE 3 Multivariate analysis of factors associated with women's progression through the continuum of care from (1) ANC1 to ANC4+, (2) ANC4+ to facility-based birth, and (3) facility-based birth to postpartum checkup within 48 h after birth, among women aged 15 to 49 years, with at least one birth within the previous 24 months, Guinea, 2018

Characteristics	Retention from ANC 1 to ANC 4+ (Yes) (N = 2634) AOR	95% CI	p value	Retention from ANC 4+ to facility birth (Yes) (N = 1066) AOR	95% CI	p value	Retention from facility birth to postpartum care (Yes) (N = 750) AOR	95% CI	p value
Residence area									
Rural	0.95	0.69–1.34	0.817	0.76	0.43–1.36	0.358	1.21	0.62–2.34	0.574
Urban	1			1			1		
Administrative region									
Boké	0.79	0.49–1.26	0.316	1.07	0.43–2.67	0.884	0.9	0.42–1.94	0.789
Conakry	1.37	0.82–2.31	0.232	0.78	0.30–2.02	0.602	0.88	0.39–1.99	0.755
Faranah	0.92	0.62–1.36	0.663	0.56	0.26–1.20	0.135	0.43	0.19–0.96	0.038
Kankan	1			1			1		
Kindia	1.96	1.23–3.14	0.005	0.75	0.33–1.70	0.494	1.42	0.50–4.06	0.510
Labé	1.15	0.69–1.92	0.585	0.64	0.28–1.48	0.297	0.22	0.09–0.51	0.001
Mamou	1.03	0.63–1.69	0.910	0.65	0.28–1.52	0.321	0.43	0.18–1.00	0.050
Nzérékoré	0.5	0.32–0.79	0.003	6.27	1.57–25.05	0.01	0.47	0.17–1.36	0.164
Ethnic group									
Soussou	0.93	0.68–1.26	0.622	0.97	0.53–1.76	0.912			
Peulh	1			1					
Malinké	1.11	0.77–1.60	0.589	1.34	0.75–2.39	0.325			
Forestier	1.36	0.61–3.04	0.446	1.21	0.41–3.56	0.723			
Foreigner	0.29	0.55–1.57	0.152	0.19	0.14–2.54	0.207			
Religion									
Muslim	1			1			1		
Christian or other	1.18	0.54–2.57	0.68	1.15	0.37–3.53	0.811	0.96	0.41–2.26	0.929
Age group at birth (years)									
15–17	0.55	0.35–0.86	0.008	1.05	0.44–2.48	0.919	0.54	0.19–1.50	0.236
18–24	1.01	0.80–1.29	0.891	0.86	0.56–1.32	0.488	0.92	0.50–1.71	0.803
25–34	1			1			1		
35–49	1.03	0.74–1.44	0.854	1.08	0.62–1.87	0.791	1.69	0.72–3.95	0.223
Marital status									
Single	1.14	0.73–1.76	0.564	0.62	0.30–1.27	0.189	2.21	0.81–6.04	0.122
Married/ Cohabiting	1			1			1		
Educational level									
None	1			1			1		
Primary level or more	1.37	1.09–1.72	0.007	1.19	0.81–1.74	0.372	1.5	0.92–2.44	0.101
Household wealth index									
Poor	1			1			1		
Middle	1.52	1.18–1.96	0.001	1.64	1.05–2.57	0.03	0.84	0.43–1.66	0.623
Rich	2.38	1.67–3.39	<0.001	3.23	1.98–5.29	<0.001	0.86	0.42–1.77	0.68
Parity before most recent birth									
No birth	1.13	0.84–1.52	0.432	1.75	1.03–2.97	0.039	0.93	0.44–1.95	0.843
1 birth	0.99	0.75–1.32	0.968	1.12	0.71–1.78	0.616	0.78	0.42–1.48	0.452
2 to 4 births	1			1			1		
5 or more births	0.94	0.70–1.28	0.708	0.64	0.38–1.07	0.089	0.65	0.29–1.50	0.316

(Continues)

TABLE 3 (Continued)

Characteristics	Retention from ANC 1 to ANC 4+ (Yes) (N = 2634)			Retention from ANC 4+ to facility birth (Yes) (N = 1066)			Retention from facility birth to postpartum care (Yes) (N = 750)		
	AOR	95% CI	p value	AOR	95% CI	p value	AOR	95% CI	p value
Wanted to become pregnant for this birth									
Yes	1			1			1		
No	0.97	0.74–1.26	0.804	0.91	0.56–1.47	0.685	0.77	0.45–1.30	0.329
Distance to health facility was a big problem for her									
Yes	0.9	0.74–1.26	0.293	0.57	0.40–0.82	0.002	0.75	0.46–1.23	0.254
No	1			1			1		
ANC content score, Mean (SD)				1.29	1.10–1.52	0.002	1.76	1.36–2.28	<0.001
Mode of delivery									
Vaginal							1		
C-section							1.57	0.51–4.83	0.428
Baby's birthweight									
Small							0.79	0.29–2.12	0.636
Normal							1		
Large							1.12	0.65–1.91	0.686
The baby was put skin to skin with the mother at birth									
Yes							3.00	1.70–5.31	<0.001
No							1		
Type of birth attendant									
Skilled birth attendant							1		
Non skilled birth attendant							0.06	0.02–0.21	<0.001
Neonatal survival within 48 h after birth									
The baby survived							1		
The baby died							2.45	0.22–27.51	0.466

ANC1, first antenatal care visit; ANC4, four or more antenatal care visits.

p-value of Wald test.

DISCUSSION

The results of this study suggest that achievement of the full maternal CoC remains low in Guinea at 20%, with important regional variations (from 9% in Labé to 44% in Conakry). Determinants independently associated with women's likelihood of remaining in each successive step of the CoC included sociodemographic, health systems, and quality of care factors, though the importance of these varied across the steps. Progression from ANC1 to ANC4+ was associated with mainly sociodemographic (household wealth, education and age) and health system (administrative region) factors. Progression from ANC4+ to birth in heath facility was influenced by administrative region, sociodemographic (household wealth), health system (distance to the health facility) and quality of care (ANC score) factors. Progression to post-partum check-up, among women with ANC4+ and facility-based birth was influenced by a health system factor (administrative region) and quality of care (ANC score, skin-to-skin, type of birth attendant).

While we were not able to explore the role of regional health system characteristics in detail, the large variability in maternal health CoC coverage observed across administrative regions suggests important differences across regional health systems. Though health facilities across regions are all theoretically following the national guidelines for maternal health, it is probable that the health system organisation and practices are adapted regionally according to local realities. For instance, collaboration with community actors to improve utilisation of ANC services, availability of health workers, performance of health facilities, levels of trust in the health system, or cost and payment modalities of user fees could vary from one region to another [23,26]. Such variation in maternal health service access and provision might underlie the differential impact on women's progression through the CoC across regions, explaining at least some of the regional differences observed in our study. Our

ANC1 ➜ ANC4+	ANC4+ ➜ birth in health facility	ANC4+ & birth in health facility ➜ postpartum check
Administrative region (compared to Kankan, Kindia higher, Nzérékoré lower)	Administrative region (compared to Kankan, Nzérékoré higher)	Administrative region (compared to Kankan, it was lower in Faranah, Labé, Mamou)
Age (youner women less likely)	Distance a problem (if problem women less likely to deliver in facility)	
Education (more likely with any education)	ANC score (women with higher score of ANC content more likely to give birth in facility)	ANC score (women with higher content of care score more likely to get postpartum care)
		Birth attendant (more likely if health professional)
Household wealth (more likely from wealthier households)	Household wealth (more likely from wealthier households)	Skin to skin (more likely if performed)

■ Continuum of care   ■ Health system factor   ■ Sociodemographic factor   ■ Quality of care

FIGURE 4 Factors independently associated with each progressive step of the maternal continuum of care, among women who had at least one ANC visit with a health professional, Guinea, 2018 DHS. ANC1, first antenatal visit; ANC4+, four or more antenatal visits

findings suggest that improvements need to be made across all regions, with targeted investment in certain regions particularly critical.

The importance of demographic and socio-economic factors in coverage of the recommended number of ANC visits suggests the need for continuing efforts to overcome persisting behavioural and financial barriers to ANC. Findings from other West African countries have also reported maternal education level and household wealth as predictors of achievement of ANC visits [27,28]. A key implication of these findings is that more efforts need to be made to increase awareness of pregnant women with lower educational level about the importance of ANC. Indeed, with the recent increased number of recommended ANC contacts from four to eight [6], priority might be given to ANC services such as drug distribution or medical check-ups, rather than counselling. A recent review reported that patient–provider interaction during maternal health services provision in sub-Saharan Africa is characterised by poor communication [29]. However, reducing supply-side barrier for vulnerable populations is key for achievement of CoC steps; financial barriers to ANC still need to be addressed in Guinea despite the context of user fees exemption policy for government maternal health services including ANC [30]. Despite a national user fee exemption policy for obstetric care, including for ANC, little is known about what is going on in individual government health facilities regarding user fees payment for ANC. Patients have been documented to be asked for payments for childbirth care in government hospitals in

Conakry, which is illegal according to this exemption [30]. It is also important to mention that indirect costs of care, for instance transportation costs, act as important barriers for poorer women to achieve all recommended ANC contacts in a context where outreach activities focus on childhood vaccination rather than reproductive and maternal care [30,31]. However, providing ANC outreach could require meeting conditions such as appropriate setting and equipment suitable and safe for a comprehensive, high-quality ANC contact, including counselling, preventive care, testing, treatment and clinical examination.

Progression from ANC4+ to birth in health facility requires considering financial barriers and ANC quality. Our study showed that despite having achieved all recommended ANC contacts, lower household wealth remains predictive of lower odds of giving birth in a health facility. Cost of care has been reported as a barrier to birth in a health facility [32]. Despite the user fee exemption policy adopted in 2011 [30] and consistent with other African contexts with such policies [33], women report still having to pay for maternal health services in Guinea. In the Conakry region, 95% of women giving birth in public hospitals reported paying for at least one birth care service [30]. Operational constraints due to lack of accompanying measures to properly achieve user fees exemption policies might be reasons for the persisting payment of user fees in countries where they are adopted [30,31].

Women with higher ANC content score were more likely to give birth in a health facility. A first possible explanation

to this finding is that women with pregnancy complications might have higher likelihood to both receive more ANC content and subsequent steps of care including birth care. However, the DHS does not collect extensive data on such complications; we were therefore unable to fully adjust for these. Second, association between ANC score and birth in a health facility implies that the higher the quality of ANC services women receive, the greater their satisfaction with ANC, and willingness to attend a health facility for birth. The data do not capture the name where ANC and facility birth occurred; it is likely that women, especially those in rural areas with limited access to facilities, would have used the same facility for both services. ANC quality has been reported to predict birth in health facility in Ghana [15]. While the number of ANC contacts matters to ensure good health of the mother, ANC content also plays a key role in achieving progression through the recommended CoC services. In Tanzania, a mixed methods study identified the absence of health facility staff or poor provider attitudes as perceived barriers to birth in health facility [34]. Poor communication and several types of mistreatment such as service denial, oppressive language, harsh words and rough examination have been reported to characterise patient–provider interactions during provision of maternal health services in sub-Saharan Africa [29].

This study also suggests that women who had a higher ANC content score, those whose birth was attended by a health professional, and those whose babies were put skin-to-skin with them were more likely to be checked by a health professional within 48 h of birth. Obviously, one important reason is that women with more complications get more care, so they may have been retained on the continuum because they or their babies needed more care or monitoring. However, the fact that skin-to-skin was a predictor of continuing care from birth in health facility to post-partum care might imply that birth complications are not the only reason for women's progression. Generally, women suffering from pregnancy/birth complications (e.g. pre-eclampsia, haemorrhage, etc.) or with babies that are unwell (low Apgar score) would not be prime candidates for skin-to-skin as clinical treatment takes priority. While we were not able to analyse this relationship fully, we therefore infer that quality of care also appears to be an important determinant of women's progression through the full continuum of care in Guinea. Thus, by improving quality of care, we can improve progression of women through the CoC from birth to the post-partum period.

Strength and limitations

Our study is the first to our knowledge to examine women's use of care across the continuum of care for maternal health in Guinea and assess the influences of individual, health systems and quality of care factors for their progression. This study used data from a recent large nationally representative dataset, which is important for generalisability of our results. However, some limitations must be considered in the interpretation of our findings. First, women who did not survive their pregnancy or childbirth were not included, neither were pregnancies resulting in stillbirth. Second, the study's cross-sectional design does not allow assessment of a causal relationship between the independent variables assessed and progression through the CoC. Third, women were interviewed retrospectively. This is a potential for social desirability and recall bias [35,36], and did not allow for the collection of detailed quality of care data. Studies assessing women's validity of reporting content of care during ANC, childbirth and the post-partum would better help to understand quality of maternal CoC. Fourth, the DHS dataset lacked data on pregnancy complications; given that the likelihood that women with pregnancy complications would receive more comprehensive ANC and birth care, residual confounding by complication experience might have therefore overestimated the influence of ANC content on giving birth in a health facility. Fifth, among women who delivered in a health facility, 13% (n=203) did not know the timing of their first post-partum check-up. We categorised these women as not having been checked by a health professional within 48 h of birth. This categorisation may lead to underestimating the proportion of women who received post-partum check-up within 48 h of birth. Sixth, we wished to include health system variables such as staff shortages, staff workload and lack of equipment and or drugs; however, the DHS dataset does not include such variables. As such, potential health system determinants of maternal CoC could not be assessed by the present study. But also there might be residual confounding since the estimates for the variables we do have might be somewhat biased as well.

CONCLUSIONS

This study shows that only 20% of women in Guinea who recently gave birth to a live baby received all three essential recommended services on the maternal continuum of care, with large geographic variations. Increasing women's progression through the full maternal health CoC requires targeted interventions to ensure their progression through each step of the continuum, focusing on the factors important to each step.

Efforts to improve progression from ANC1 to ANC4+ should address financial and education barriers preventing women from accessing care. Increasing progression from ANC4+ to birth in a health facility would require a focus on financial barriers, the distance to the health facility, and women's uptake of ANC services. To improve progression from birth in a health facility to post-partum check-up, care issues need attention, such as uptake of ANC services, being attended at birth by a health professional and putting the baby and the mother skin-to-skin at birth. Overcoming the important regional disparities will require different efforts across the different administrative regions due to the varying indicator achievement.

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