

Factors Associated with the Continuum of Prenatal Care in the Post-Ebola Context in Guinea

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Abstract

Background: The 2018 demographic and health survey reports low coverage in the continuum of antenatal care over the period 2013 to 2018. However, little remains known about this indicator since the Ebola epidemic crisis was over. This epidemic has been reported to decrease utilization of maternal health services. This study aims to determine the coverage and factors associated with four or more antenatal care visits in Guinea in the post-Ebola context.

Methods: This was a cross-sectional study using secondary data from the most recent (2018) Guinea Demographic and Health Survey. Women aged 15 to 49 years constituted our study population. Our sample included women who had their most recent birth over the last 24 months preceding data collection and whether or not they had performed 4 antenatal care (ANC) visits. Factors associated with performing four or more antenatal visits were assessed through a multivariate logistic regression analysis using Stata software version 15.1. The final model was constructed using the bottom-up stepwise method. Hosmer and Leeshawn's goodness-of-fit test was used for model specification. **Results:** Among the 2634 women in the sample, 41% had four or more ANC visits. Factors associated with attending four or more ANC visits included education level, poverty quintile and region. Women with a secondary or higher education were 44% more likely to attend four or more ANC visits (OR = 1.44, 95% CI = [1.07 - 1.92]). Those whose spouses had secondary or education level were 1.66 times more likely to attend four or more ANC visits. Women from moderately wealthy households were 76% more likely to attend four or more ANC visits (OR = 1.76, 95% CI = [1.30 -

2.39]. Women from wealthier households were 2.52 times more likely to attend four or more ANC visits (OR = 2.52, 95% CI = [1.30 - 2.39]). Women living in Boké and Nzérékoré regions were 44% and 47% less likely to attend four or more ANC visits, respectively (OR = 0.56, IC 95% = [0.35 - 0.94]) and (OR = 0.53, IC 95% = [0.31 - 0.89]). **Conclusion:** Attending four or more ANC visits declined in the post-Ebola epidemic context in Guinea from 57% in 2012 to 41% in 2018. To improve coverage in four or more ANC visits in this context, there is a need for policies and programs to address education, poverty and administrative region factors.

Keywords

Associated Factors, Antenatal Care, Post-Ebola, Guinea

1. Plain English Summary

Many efforts have been made in Guinea to promote free use of maternal health services such as obstetric and neonatal care. However, according to the 2018 Demographic and Health Survey (DHS), there is a shortfall in use of antenatal care services from 81% for women attending one ANC visit to 35% for those attending the World Health Organization (WHO) recommended four or more ANC visits. In Guinea, the Ebola epidemic has contributed to the decline in attendance to four or more ANC visits. In fact, this indicator dropped from 57% in 2012 (before the Ebola epidemic) to 35% just after the epidemic. The data used in this study are from the 2018 DHS and are nationally representative. The results from this research show that educated women and those living in wealthy households were more likely to attend four or more ANC visits. Improving the use of ANC services requires raising community awareness about the benefits of these services for pregnant women and their babies. In addition, there is a need for greater engagement of health professionals to promote women's attendance to at least four ANC visits for good pregnancy outcomes.

2. Background

Every day, more than 800 women die worldwide during pregnancy or as a result of childbirth [1]. Sub-Saharan Africa and South Asia bear the greatest burden of these maternal and neonatal deaths. Yet, scientific evidence shows that most maternal deaths, as well as pregnancy-related complications, can be prevented if pregnant women have access to quality maternal health services during pregnancy, delivery, and the first hours following delivery [2] [3]. A key indicator of the quality of maternal health services is the completion of antenatal care (ANC) visits. Indeed, ANC plays an essential role in reducing maternal and perinatal morbidity and mortality through the detection and treatment of pregnancy-related complications. It also allows the identification of women at increased risk of developing complications during labor and delivery, and their timely referral to

appropriate health facility [4]. Many studies have reported the contribution of ANC to good pregnancy outcomes. Indeed, ANC services include the screening of diseases such as human immunodeficiency virus (HIV), the checkup of the fetus and preventive medication [5] [6]. ANC provided by skilled care providers thus contributes to the reduction of maternal and infant deaths, thereby to the achievement of the targets of the Millennium Development Goals 4 and 5 [7].

The World Health Organization (WHO) recommends at least four ANC visits for low-risk pregnancies. These should ideally take place at the weeks 16, 24, 28, 32 and 36 of the pregnancy [8]. Many studies have shown an association between maternal education level, place of residence, ethnicity, partner education, and completion of four or more ANC visits [9] [10] [11].

In Guinea, the most recent demographic and health survey (2018) reported that 81% of women aged 15 - 49 years who had a live birth in the 5 years preceding the survey received attended an ANC provided by skilled health personnel. In the same period, the percentage of women who attended the recommended four or more ANC visits was 35%. Coverage in four or more ANC visits has thus declined as compared to previous years, *i.e.*, in 2012 (57%) and in 2005 (49%) [12] [13] [14]. Despite the Guinean government's efforts to promote the use of maternal health services, ANC coverage declines, indicating a persisting problem that prevents women starting ANC from completing it as WHO recommends. In addition, the Ebola epidemic context has been reported to negatively affect ANC coverage in Guinea [15] [16]. However, little is known about the post-Ebola ANC indicators in the country, as the prevalence of performing 4 or more ANCs declined with the onset of the Ebola epidemic (2014-2016) from 57% in 2012 to 35% in 2018 [12] [13]. The objective of this study is to determine coverage and factors associated with attending four or more ANC visits in Guinea in the post-Ebola context.

3. Methods

Study setting

The Republic of Guinea is located in the western part of the African continent and covers an area of 245,857 km² with a population of nearly 13 million people, the majority of whom live in rural areas (63%). The country has 33 prefectures. The health system is based on a three-tier pyramid. The primary level includes health posts and centers; the secondary level includes regional and prefectural hospitals and communal medical centers; as for the tertiary level, it includes three national hospitals. ANC is provided at the primary and secondary levels. In 2014, the country had a ratio of about two physicians and one nurse per 10,000 inhabitants with a disparity between rural and urban areas.

Study design and period: We analyzed data of the 2018 DHS, which is a national cross-sectional household survey. The study covers the post-Ebola period (2016-2018).

Study population and sampling: Data from individual women's question-

naire as designed by the DHS were used.

The study population consisted of women aged 15 - 49 who gave birth over the last 24 months preceding data collection, attended at least one ANC visits. Overall 2634 women were included in this study.

Inclusion criteria

All women who had given birth in the 2 years before the collection of data, who had made at least one ANC visits and who were present in households during data collection were included in this study.

Exclusion criteria

All women who had their last birth 2 years before data collection and who had not performed ANC, those who were absent, and women who refused to complete the questionnaire when the interviewers visited were excluded from this study.

Study variables

The dependent variable for this study was attendance to four or more ANC visits. It is was dichotomous variable, constructed as follows: all women who attended one to three ANC visits were grouped and coded as 0 and those who attended four or more ANC visits were coded as 1.

The explanatory variables included the woman's and her husband's individual characteristics: age, education level, marital status, parity, region of residence, residence area (rural/urban), household size, occupation, wealth quintile.

Data Analysis

Data were analyzed using Stata software version 15.1. A descriptive analysis of all the selected variables constituted the first stage of our analysis. Then univariate analysis was performed to assess association between the dependent variable and each of the selected independent variables. Crude Odds Ratios with 95% confidence intervals were derived from the univariate analysis. To build the multivariate logistic regression model, all variables with a p value less than 20% the univariate analysis were included in the model. In the multivariate analysis, a significance level of 5% was used and Adjusted Odds Ratios (AOR) were derived along with their confidence intervals. For the specification of our model, we used the Hosmer and Lemeshow's goodness-of-fit test.

4. Results

Table 1 shows that females aged 15 - 24 years were the most represented with 43%. Three quarters of the women (72%) had no education. Almost all (94%) of them were married and those with 2 to 4 children were the most represented (43%). Two thirds of the women (69%) lived in rural areas.

Coverage in four or more ANC visits

Among the 2634 women in our sample, 1080 women (41%) of women attended four or more ANC visits (**Figure 1**).

Factors associated with completing four or more antenatal care visits

Variables significantly associated with attendance to four or more ANC visits

Table 1. Socio-demographic characteristics of the participating women.

| Variables | n = 2634 | (%) |
|-------------------------------------|-----------------|------------|
| Age groups (years) | | |
| 15 - 24 | 1124 | 43% |
| 25 - 34 | 1122 | 42% |
| 35 - 49 | 388 | 15% |
| Woman's level of education | | |
| None | 1898 | 72% |
| Primary | 345 | 13% |
| Secondary/Higher education | 391 | 15% |
| Marital status | | |
| Single/Not in union | 158 | 6% |
| Married/Common-law | 2476 | 94% |
| Administrative region | | |
| Boké | 369 | 14% |
| Conakry | 239 | 9% |
| Faranah | 366 | 14% |
| Kankan | 450 | 17% |
| Kindia | 372 | 14% |
| Labé | 308 | 12% |
| Mamou | 246 | 9% |
| Nzérékoré | 284 | 11% |
| Residence area | | |
| Urban | 819 | 31% |
| Rural | 1815 | 69% |
| Parity | | |
| Childless | 515 | 20% |
| Only one child | 504 | 19% |
| More than one child | 1148 | 43% |
| Lots of children | 467 | 18% |
| Women currently working | | |
| No | 908 | 34% |
| Yes | 1726 | 66% |
| Husband's level of education | | |
| None | 1713 | 65% |

Continued

| | | |
|----------------------------|------|-----|
| Primary | 203 | 8% |
| Secondary/Higher education | 525 | 20% |
| Does not know | 193 | 7% |
| Poverty level | | |
| Poorest | 564 | 29% |
| Poorer | 576 | 22% |
| Middle wealth | 521 | 20% |
| Wealthier | 545 | 21% |
| Wealthiest | 428 | 16% |
| Level household | | |
| Little | 774 | 29% |
| Weak | 1337 | 51% |
| High | 523 | 20 |

*Women with at least one birth in the last 24 months preceding data collection.

Prevalence four or more antenatal care visits in Guinea

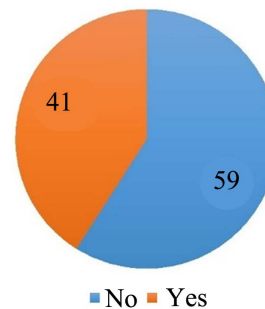


Figure 1. Prevalence four or more antenatal care visits in Guinea.

included woman's education level, the husband's education level, the administrative region, the residence area, and the poverty quintile (**Table 2**).

Table 3 on the multivariate analysis reports that the woman's education level, the husband's education level, the poverty quintile and the administrative region were factors independently associated with attending four or more ANC visits. However, other variables including parity, residence area and marital status were not statistically associated with attending four or more ANC visits.

Regarding factors associated with attending four or more ANC visits, women who had secondary or higher education level were 44% more likely to attend four or more ANC visits than those with no education (AOR = 1.44, CI 95% = [1.07 - 1.92] and $p = 0.01$). Women whose husbands had secondary or higher education level were 1.66 times more likely to attend four or more ANC visits. (AOR = 1.66, CI 95% = [1.27 - 2.16] and $p < 0.001$).

Table 2. Univarial analysis of related factors to prenatal care of the participating women.

| Variables | ORbrut | IC 95% | p value |
|-------------------------------------|--------|---------------|---------|
| Age groups (years) | | | |
| 15 - 24 | 1 | | |
| 25 - 34 | 1.04 | [0.83 - 1.19] | 0.98 |
| 35 - 49 | 0.87 | [0.67 - 1.13] | 0.31 |
| Woman's level of education | | | |
| None | 1 | | |
| Primary | 1.37 | [1.03 - 1.83] | 0.03 |
| Secondary/Higher education | 2.64 | [2.06 - 3.40] | 0.00 |
| Marital status | | | |
| Single/Not in union | 1 | | |
| Married/Common-law | 0.76 | [0.53 - 1.09] | 0.13 |
| Administrative region | | | |
| Conakry | 1 | | |
| Boké | 0.28 | [0.18 - 0.45] | 0.00 |
| Faranah | 0.32 | [0.20 - 0.52] | 0.00 |
| Kankan | 0.41 | [0.26 - 0.66] | 0.00 |
| Kindia | 0.68 | [0.42 - 1.09] | 0.11 |
| Labé | 0.37 | [0.23 - 0.60] | 0.00 |
| Mamou | 0.35 | [0.21 - 0.56] | 0.00 |
| Nzérékoré | 0.24 | [0.15 - 0.39] | 0.00 |
| Residence area | | | |
| Urban | 1 | | |
| Rural | 0.41 | [0.33 - 0.52] | 0.00 |
| Parity | | | |
| Childless | 1 | | |
| Only one child | 0.99 | [0.75 - 1.31] | 0.96 |
| More than one child | 0.92 | [0.74 - 1.14] | 0.44 |
| Lots of children | 0.76 | [0.57 - 1.01] | 0.06 |
| Women currently working | | | |
| No | 1 | | |
| Yes | 1.11 | [0.91 - 1.36] | 0.28 |
| Husband's level of education | | | |
| None | 1 | | |
| Primary | 1.65 | [1.13 - 2.41] | 0.01 |

Continued

| | | | |
|----------------------------|------|---------------|------|
| Secondary/Higher education | 2.45 | [1.99 - 3.13] | 0.00 |
| Does not know | 1.91 | [1.36 - 2.68] | 0.00 |
| Poverty level | | | |
| Poorest | 1 | | |
| Poorer | 1.39 | [0.99 - 1.96] | 0.06 |
| Middle wealth | 1.86 | [1.36 - 2.53] | 0.00 |
| Wealthier | 3.23 | [2.37 - 4.40] | 0.00 |
| Wealthiest | 4.82 | [3.43 - 6.77] | 0.00 |
| Level household | | | |
| Little | 1 | | |
| Weak | 0.94 | [0.75 - 1.19] | 0.63 |
| High | 1.22 | [0.93 - 1.61] | 0.14 |

Note: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 3. Multilevel analysis of related factors to the prenatal care of the participating women.

| Variables | AOR | IC 95% | p value |
|-----------------------------------|------|---------------|---------|
| Woman's level of education | | | |
| None | 1 | | |
| Primary | 1.05 | [0.79 - 1.40] | 0.73 |
| Secondary/Higher education | 1.44 | [1.07 - 1.92] | 0.01 |
| Poverty level | | | |
| Poorest | 1 | | |
| Poorer | 1.36 | [0.97 - 1.89] | 0.08 |
| Middle wealth | 1.76 | [1.30 - 2.39] | 0.000 |
| Wealthier | 2.52 | [1.30 - 2.39] | 0.000 |
| Wealthiest | 2.91 | [1.71 - 3.71] | 0.000 |
| Administrative region | | | |
| Conakry | 1 | | |
| Boké | 0.57 | [0.35 - 0.94] | 0.02 |
| Faranah | 0.80 | [0.47 - 1.34] | 0.39 |
| Kankan | 0.87 | [0.53 - 1.43] | 0.58 |
| Kindia | 1.38 | [0.81 - 2.36] | 0.23 |
| Labé | 0.91 | [0.54 - 1.53] | 0.71 |
| Mamou | 0.78 | [0.46 - 1.33] | 0.35 |
| Nzérékoré | 0.53 | [0.31 - 0.89] | 0.01 |

Continued

| | | | |
|-------------------------------------|------|---------------|-------|
| Residence area | | | |
| Urban | 1 | | |
| Rural | 1.01 | [0.72 - 1.43] | 0.93 |
| Husband's level of education | | | |
| None | 1 | | |
| Primary | 1.41 | [0.98 - 2.03] | 0.06 |
| Secondary/Higher education | 1.66 | [1.27 - 2.16] | 0.000 |
| Does not know | 2.35 | [1.06 - 5.20] | 0.03 |
| Marital status | | | |
| Single/Not in union | 1 | | |
| Married/Common-law | 1.72 | [0.69 - 4.29] | 0.24 |
| Parity | | | |
| Childless | 1 | | |
| Only one child | 1.07 | [0.79 - 1.45] | 0.65 |
| More than one child | 1.12 | [0.88 - 1.44] | 0.35 |
| Lots of children | 1.09 | [0.80 - 1.52] | 0.58 |

Note: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

As for the poverty quintile, women from middle-wealth, wealthier and wealthiest households were more likely to attend four or more ANC visits compared to women from poorer households (AOR = 1.76, CI 95% = [1.30 - 2.39] and $p < 0.001$, (AOR = 2.52 CI, 95% = [1.30 - 2.39] and $p < 0.001$, (AOR = 2.91, CI 95% = [1.71 - 3.71] and $p < 0.001$). At the level of administrative regions, compared to women living in Conakry, those living in the region of Boké (AOR = 0.56, IC 95% = [0.35 - 0.94] and $p = 0.02$) and Nzérékoré (AOR = 0.53, IC 95% = [0.31 - 0.89] and $p = 0.01$) were respectively 44% and 47% less likely to attend four or more ANC visits (**Table 3**).

5. Discussion

This study is one of the first to analyze indicators of the continuum of ANC in the specific post-Ebola context in Guinea. It reports that over the two years (2017-2018) following the end of the Ebola epidemic in Guinea, 41% of women attended the WHO-recommended four or more ANC visits. Factors predicting attendance to four or more ANC visits included education level, household poverty quintile, and administrative region.

The results show lower coverage in four or more ANC visits in the post-Ebola context compared to the pre-Ebola coverage, which was 57% as reported by the 2012 DHS [13]. Decline in ANC coverage the post-Ebola context could be explained by persistent underutilization of health facilities in general and maternal

health services in particular, due to fear of infectious risk. Other studies in Guinea have also reported underutilization of maternal health services following the Ebola epidemic [15] [16] [17]. A study in Liberia in 2017 also reported a 9% decrease in the achievement of four or more ANC visits in 2014 during the Ebola epidemic. This decline was attributed to low utilization of services due to poor care-seeking behavior, as well as the closure of most health facilities during Ebola epidemic [18]. However, other African countries that have not experienced epidemics, particularly Ebola, have prevalence rates of ANC those reported in Guinea in the post-Ebola period such Nigeria (54% - 57%), Benin (52%) and Mali (43%) than Guinea [19] [20] [21] [22].

Furthermore, the multivariate analysis in our study reveals that women living in the administrative regions of Boké and Nzérékoré are 44% - 47% less likely to have 4 or more ANC visits compared to women living in the city of Conakry. This finding could be explained by the fact that the Ebola epidemic affected different regions. The results of another study conducted in Guinea also show a disparity between the region in the use of ANC services with the performance of ANC4 at 9% in the region of Labé compared to 28% in the region of Kindia and 44% in Conakry [23]. To improve overall utilization of ANC services, the authors recommended collaboration with community actors, availability of health workers, performance of health facilities, levels of trust in the health system, or cost and payment of user fees may vary from region to region [23].

The study found that women from poorest households were less likely to attend four or more ANC visits than those from middle-wealth wealthier and wealthiest households. Thus, women from wealthier households are almost three times more likely to perform 4 or more ANC than women from poorer households. Indeed, the Ebola epidemic has a prolonged negative effect on access to health services that is linked to economic accessibility (household income). Our results are similar with those of a multi-country study covering 7 countries from Africa, Asia, and Latin America; this study found that women from poorer households were less likely to attend four or more ANC visits compared with wealthier women. To this end, the authors suggest that despite free care, unexpected charges for prescribed drugs or tests, and indirect costs associated with transportation to the facility could influence the continuum of ANC [10].

6. Strengths and Limitations

This research is the first to explore factors associated with the continuum of ANC in the post-Ebola epidemic context in Guinea. This, it strongly contributes to understanding use of ANC services in this specific post-epidemic context.

However, as this study based on a secondary analysis of the DHS data, it could not assess properly potential factors related to the quality and accessibility of health services. As the study included women who gave birth two years then, it may have led to some recall bias. However, despite these limitations, the findings of this study can contribute to a better understanding of the factors influencing achievement of the continuum of maternal care during pregnancy in Guinea. It

thereby contributes to better guiding maternal health policies in Guinea.

7. Implications for Practices and Research

This research has shown a low coverage in four or more ANC visits in the post-Ebola period in Guinea and identified the determinants of this low coverage. This study's findings will help guide decision makers in planning and implementing promising strategies. One of these strategies would be community awareness raising campaigns, training of community health workers on the importance of ANC visit, and involvement of the media in awareness raising around ANC services.

However, there is need for future research using mixed-methods (qualitative and quantitative data) to better explore the determinants of low coverage in the continuum of ANC, from the perspectives of users and providers of ANC services.

8. Conclusions

The Ebola epidemic in Guinea has had an impact on maternal and neonatal health indicators. Analysis of data limited to the post-Ebola period, showed lower coverage in four or more ANC visits, compared to the pre-Ebola period. Factors associated with this coverage included education level, poverty quintile, and region. Women from poor and poorer households were much less likely to attend four or more ANC visits. Also, the lack of formal education negatively influences achievement of four or more ANC visits. The strategies to be adopted should account for these factors.

Improving coverage in four or more ANC visits in the post-Ebola epidemic context in Guinea requires efforts to rebuild community trust in healthcare providers through awareness-raising. Reorganizing provision of care across regions would be appropriate. Future research is needed to better understand the persisting low coverage in the continuum of ANC despite efforts to strengthen the health system.

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Contributions

AMS contributed to the design, statistical analysis, and preparation of the ma-

nuscript; MDB contributed to the design, review, and preparation of the manuscript; BSC contributed to the design and review of the manuscript. KK, AD, ISC participated in the analysis and interpretation of the data; AOS, AOT, RD, and SC revised the manuscript. All authors read and approved the final manuscript. All authors read and approved the final manuscript.

Ethics Declarations

Ethics approval and consent to participate.

Conflicts of Interest

The authors declare that they have no competing interests.

Availability of Data and Materials

The Guinea Demographic and Health Survey data used and/or analyzed in this study are available and accessible on the DHS program website (<http://dhsprogram.com>).

References

- [1] World Health Organization (2019) Trends in Maternal Mortality 2000 to 2017: Estimates by WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division: Executive Summary. <https://apps.who.int/iris/handle/10665/327596>
- [2] Ronsmans, C., Graham, W.J. and Group LMSS Steering (2006) Maternal Mortality: Who, When, Where, and Why. *The Lancet*, **368**, 1189-1200. [https://doi.org/10.1016/S0140-6736\(06\)69380-X](https://doi.org/10.1016/S0140-6736(06)69380-X)
- [3] World Health Organization (2005) The World Health Report: 2005: Make Every Mother and Child Count: Overview. Geneva.
- [4] Khawaja, A., *et al.* (2021) Frequency of Maternal & Perinatal Mortality and Maternal Morbidity among Obstetrical Patients Referred with History of Unattended Pregnancy. *The Professional Medical Journal*, **28**, 80-85. <https://doi.org/10.29309/TPMJ/2021.28.01.5823>
- [5] Mason, L., Dellicour, S., Ter Kuile, F., Ouma, P., Phillips-Howard, P., Were, F., Laerson, K. and Desai, M. (2015) Barriers and Facilitators to Antenatal and Delivery Care in Western Kenya: A Qualitative Study. *BMC Pregnancy and Childbirth*, **15**, Article No. 26. <https://doi.org/10.1186/s12884-015-0453-z>
- [6] Chimatiro, C.S., Hajison, P., Chipeta, E. and Muula, A.S. (2018) Understanding Barriers Preventing Pregnant Women from Starting Antenatal Clinic in the First Trimester of Pregnancy in Ntcheu District-Malawi. *Reproductive Health*, **15**, 158. <https://doi.org/10.1186/s12978-018-0605-5>
- [7] United Nations. Millennium Development Goals 2030—Google Search. United Nations Organization/Organisation des Nations Unies. Objectifs du millénaire pour le développement 2030—Recherche Google. Organisation des Nations Unies, 08-40769.
- [8] Villar, J., Ba'aqueel, H., Piaggio, G., Lumbiganon, P., Belizán, J.M., Farnot, U., Al-Mazrou, Y., Carroli, G., Pinol, A., Donner, A., Langer, A., Nigenda, G., Mugford, M., Fox-Rushby, J., Hutton, G., Bergsjø, P., Bakketeig, L. and Berendes, H. (2001) WHO Antenatal Care Randomised Trial for the Evaluation of a New Model of Rou-

- tine Antenatal Care. *The Lancet*, **357**, 1551-1564.
[https://doi.org/10.1016/S0140-6736\(00\)04722-X](https://doi.org/10.1016/S0140-6736(00)04722-X)
- [9] Sagalova, V., Le Dain, A.-S., Bärnighausen, T., Zagre, N.M. and Vollmer, S. (2021) Does Early Childbearing Affect Utilization of Antenatal Care Services and Infant Birth Weight: Evidence from West and Central African Region. *Journal of Global Health*, **11**, 13003. <https://doi.org/10.7189/jogh.11.13003>
- [10] Saad-Haddad, G., DeJong, J., Terreri, N., Restrepo-Méndez, M.C., Perin, J., Vaz, L., Holly, N.H., Amouzou, A., Barros, A.J.D. and Bryce, J. (2016) Patterns and Determinants of Antenatal Care Utilization: Analysis of National Survey Data in Seven Countdown Countries. *Journal of Global Health*, **6**, Article ID: 010404.
<https://doi.org/10.7189/jogh.06.010404>
- [11] Ekholuenetale, M., Nzopotam, C.I., Barrow, A. and Onikan, A. (2020) Women's Enlightenment and Early Antenatal Care Initiation Are Determining Factors for the Use of Eight or More Antenatal Visits in Benin: Further Analysis of the Demographic and Health Survey. *Journal of the Egyptian Public Health Association*, **95**, 13. <https://doi.org/10.1186/s42506-020-00041-2>
- [12] National Institute of Statistics (INS) and ICF (2018) Guinea Demographic and Health Survey 2018. INS and ICF, Conakry, and Rockville.
- [13] National Institute of Statistics (INS), Ministry of Planning (2012) Demographic and Health Survey with Multiple Indicators (EDS-MICS). INS and ICF, Conakry, and Rockville.
- [14] National Institute of Statistics (INS) and ICF (2005) Guinea Demographic and Health Survey 2005. INS and ICF, Conakry, and Rockville.
- [15] Camara, B.S., Delamou, A., Diro, E., Béavogui, A.H., El Ayadi, A.M., Sidibé, S., Grovogui, F.M., Takarinda, K.C., Bouedouno, P. and Sandouno, S.D. (2017) Effect of the 2014/2015 Ebola Outbreak on Reproductive Health Services in a Rural District of Guinea: An Ecological Study. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, **111**, 22-29. <https://doi.org/10.1093/trstmh/trx009>
- [16] Delamou, A., El Ayadi, A.M., Sidibe, S., Delvaux, T., Camara, B.S., Sandouno, S.D., Beavogui, A.H., Rutherford, G.W., Okumura, J., Zhang, W.H. and De Brouwere, V. (2017) Effect of Ebola Virus Disease on Maternal and Child Health Services in Guinea: A Retrospective Observational Cohort Study. *The Lancet Global Health*, **5**, e448-e457. [https://doi.org/10.1016/S2214-109X\(17\)30078-5](https://doi.org/10.1016/S2214-109X(17)30078-5)
- [17] Camara, B.S., Okumura, J. and Delamou, A. (2020) Do Memories of the Ebola Virus Disease Outbreak Influence Post-Ebola Health Seeking Behaviour in Guéckédou District (Epicentre) in Guinea? A Cross-Sectional Study of Children with Febrile Illness. *BMC Public Health*, **20**, Article No. 1298.
<https://doi.org/10.1186/s12889-020-09359-0>
- [18] Shannon, F.Q., Horace-Kwemi, E., Najjemba, R., Owiti, P., Edwards, J., Shringarpure, K., Bhat, P. and Kateh, F.N. (2017) Effects of the 2014 Ebola Outbreak on Antenatal Care and Delivery Outcomes in Liberia: A Nationwide Analysis. *Public Health Action*, **7**, S88-S93. <https://doi.org/10.5588/pha.16.0099>
- [19] Dahiru, T. and Oche, O.M. (2015) Determinants of Antenatal Care, Institutional Delivery and Postnatal Care Services Utilization in Nigeria. *Pan African Medical Journal*, **22**, Article No. 321. <https://doi.org/10.11604/pamj.2015.21.321.6527>
- [20] National Population Commission (NPC) Nigeria and ICF (2019) Nigeria Demographic and Health Survey 2018 Key Indicators Report. NPC and ICF, Abuja and Rockville.
- [21] Ministry of Planning and Development, National Institute of Statistics and Eco-

- nomnic Analysis (INSAE) (2018) Demographic and Health Survey in Benin. Benign.
- [22] National Institute of Statistics (INSTAT), Sector Planning and Statistics Unit (2018) Health-Social Development and Family Promotion, (CPS/SS-DS-PF). Demographic and Health Survey. Mali.
- [23] Camara, B.S., Benova, L., Delvaux, T., Sidibé, S., El Ayadi, A.M., Grietens, K.P. and Delamou, A. (2021) Women's Progression through the Maternal Continuum of Care in Guinea: Evidence from the 2018 Guinean Demographic and Health Survey. *Tropical Medicine & International Health*, **26**, 1446-1461.
<https://doi.org/10.1111/tmi.13661>

Abbreviations

ANC: Antenatal Care; AOR: Adjusted Odds Ratios; DHS: Demographic Health Survey; HIV: Human Immunodeficiency Virus; WHO: World Health Organization.