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Regional disparities and socio-demographic factors associated with eight or more antenatal care visits in Ghana



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Abstract

Background Antenatal care is vital for maternal health and wellbeing, with the World Health Organization recommending a minimum of eight visits during pregnancy. In this study, we examined the regional disparities and factors associated with eight or more antenatal care visits in Ghana.

Methods We performed a cross-sectional analysis of data from the 2022 Ghana Demographic and Health Survey. Our study comprised 3,893 women of reproductive age with birth history in the last two years before the survey. Regional disparities in the proportion of eight or more antenatal care visits were visualised using a spatial map. A mixed-effect multilevel binary logistic regression analysis was conducted to determine the factors associated with eight or more antenatal care visits were presented as adjusted odds ratios (aOR) with a 95% confidence interval (CI).

Results The prevalence of eight or more antenatal care visits in Ghana was 38.4% [95% CI=36.0-41.0]. The regions with the highest prevalence were Eastern, Greater Accra, Western, and Volta. Those with the lowest prevalence were Northern, North East, Savannah, and Oti. The odds of eight or more antenatal care visits were lower among women aged 40-49 [aOR=0.42, 95% CI=0.18-0.96], women with four or more children [aOR=0.57, 95% CI=0.36-0.93], women who wanted pregnancy later [aOR=0.63, 95% CI=0.46-0.85], and women in five regions: Western North [aOR=0.43, 95% CI=0.19-0.94], Bono [aOR=0.33, 95% CI=0.14-0.76], Northern [aOR=0.29, 95% CI=0.13-0.66], Savannah [aOR=0.30, 95% CI=0.14-0.65] and North East [aOR=0.33, 95% CI=0.14-0.75]. Women in the richer [aOR=1.99, 95% CI=1.19-3.33] and richest [aOR=4.82, 95% CI=2.45-9.51] wealth index showed a higher likelihood of completing eight or more antenatal care visits relative to women in the poorest wealth index.

Conclusion A significant proportion of women in Ghana fall short of the recommended eight or more antenatal care visits. Age, parity, desired pregnancy timing, wealth status, and region of residence are associated with the number of antenatal care visits. Women in five regions (Bono, Northern, North East, Savannah, and Western North) are significantly less likely to have eight or more antenatal care visits than those in the Western region. The government and policymakers should design programs to address the needs of older women, those with high parity, and women

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who want to delay pregnancy. Increased healthcare resources, educational campaigns, and addressing regional barriers to antenatal care access are crucial. Promoting public health initiatives to emphasise the importance of completing the recommended number of antenatal care visits for a healthy pregnancy is essential.

Keywords Antenatal care visits, Prevalence, Factors, Demographic and Health Survey, Ghana

Text box 1. Contribution to the literature

• Our study used empirical data to examine the regional disparities and factors associated with eight or more antenatal care visits among women in Ghana.

• Eight or more antenatal care visits prevalence is low among women in Ghana.

• Factors influencing the completion of eight or more antenatal care visits include the age of the women, parity, wanted last pregnancy later, wealth index, and region of residence.

Introduction

Antenatal care (ANC) is an essential and specialised healthcare service provided to women throughout pregnancy [1]. Maternal mortality is a global health concern, leading to around 810 deaths due to complications during pregnancy [2]. In 2017, the World Health Organization (WHO) recorded a total of 295,000 maternal deaths, with 94% occurring in sub-Saharan Africa (SSA) and 86% in Southern Asia [3]. As a result, the Sustainable Development Goal (SDG) 3, target 3.1 aims to reduce the global maternal mortality ratio to below 70 per 100,000 live births by 2030 [4, 5]. Optimising the use of prenatal care, particularly in SSA, is a crucial strategy for reducing these fatalities [6, 7]. In Ghana, there is a decline in maternal mortality, with the number of deaths per 100,000 live births decreasing from 398 in 2003 to 308 in 2017 [8]. However, the maternal mortality ratio remains higher than the target of the SDG 3.

ANC is often the first point of contact for pregnant women accessing formal health services, offering opportunities for health promotion and preventive services [9]. The objective of ANC is to enhance the wellbeing of expectant mothers and their unborn babies, promoting improved health outcomes and a seamless transition to the postnatal phase. Therefore, timely and sufficient ANC visit is essential for expectant mothers to enhance their pregnancy experience. The timing of the initial ANC appointment is crucial for scheduling subsequent visits [10]. The previous guidelines from the WHO, namely the Focused Antenatal Care (FANC) Framework, suggested a minimum of four ANC visits throughout pregnancy [11].

Although the WHO revised its guidelines in 2016 to emphasise the necessity of at least eight ANC visits for adequate childbirth preparation and problem prevention [5, 12–14], more than 69% of pregnant women in SSA only attend a single ANC appointment. This demonstrates a significant failure to follow the ANC schedules advised by the WHO, underscoring a severe lack of progress in achieving the minimum number of ANC visits in most countries in SSA [15].

Ghana has also adopted the WHO FANC model, which suggests four ANC visits [16] and the 2022 Ghana Demographic and Health Survey (GDHS) report shows that 88% of women aged 15–49 attended at least four ANC appointments for their most recent childbirth [17].

The majority (63%) of women initiated their first ANC visit during the first trimester [17]. However, budgetary limitations, unfavourable socio-cultural customs, and inadequate transportation infrastructure impede compliance [18–20]. Despite Ghana's prolonged use of the FANC model for almost a decade, the country still faces a significant maternal death ratio of 343 per 100,000 live births [21]. This raises concerns about the practicality of implementing the existing advice of having eight or more ANC appointments.

Several factors have been identified to influence to influence health service utilisation, including ANC services [19–33]. Prior studies in Ghana [19–26] identified factors influencing ANC visits, including individual, household, community, and health system factors. Maternal age, education, occupation, parity, health insurance coverage, media exposure, contraceptive use, and pregnancy goals are among the individual level factors. Household characteristics such as the husband's level of education, wealth index, and decision-making autonomy play a significant role in pregnant women's completion of ANC visits. Community level variables include residential location, region, proximity to healthcare facilities, presence of trained birth attendants, and healthcare standards. Health system factors influencing ANC visits include cost, supply, and demand of ANC services [19-26].

A recent study conducted in Ghana investigated the correlates of late initiation and underutilisation of eight or more ANC visits [27]. Another study examined the frequency of these characteristics and the socioeconomic inequalities linked to them [28]. However, both studies used data from the 2019 Ghana Malaria Indicator Survey. This highlights the importance of conducting a comprehensive and up-to-date study using the most recent 2022 GDHS dataset. This study aims to determine the regional disparities and factors associated with pregnant women's completion of eight or more ANC visits in Ghana.

Methods

Data source

We performed a cross-sectional analysis of data sourced from the 2022 GDHS. The 2022 GDHS is part of the international Demographic and Health Survey (DHS) program which collects health and demographic data on women, men, and children globally [17]. Since the inception of the DHS, more than 350 surveys have been conducted in over 90 low-and middle-income countries [34]. Ghana's 2022 DHS marks the seventh standard DHS since the initial survey in 1988 [17]. Data collection involved structured questionnaires following a cross-sectional design with a multistage sampling technique. Detailed information on the DHS methodology can be found in previous studies [35, 36]. A sample of 3,893 women of reproductive age with birth history in the last two years before the survey comprised our study. In writing this paper, we adhered to the Strengthening the Reporting of Observational Studies in Epidemiology checklist for reporting guidelines [37].

Variables

The outcome variable was eight or more ANC visits. The number of ANC visit was a continuous variable in the GDHS, which was later coded into a binary form according to the WHO recent recommendation of eight or more ANC visits for pregnancy outcomes [38]. Per the 2016 WHO recommendation for the number of ANC contacts, pregnant women are required to attend eight or more ANC visits before delivery [38]. Per this guideline, our study categorised the number of pregnant women who attended eight or more ANC visits as 1=completed eight or more ANC visits (yes), while those with less than 8 ANC visits were coded as 0=no, following the question in the GDHS that asked pregnant women to indicate the number of ANC visits made for their most recent births [2, 39, 40].

Explanatory variables

Following an extensive literature search on factors influencing ANC visits and their availability in the GDHS, we included fourteen (14) explanatory variables [2, 39, 41–43]. The variables were age of the women, current working status, educational level, religion, marital status, parity, health insurance coverage, exposure to mass media, wanted last pregnancy, barriers to access healthcare, wealth index, sex of household head, type of place of residence, and region. Further, the variables were segregated into individual and contextual levels. Aside from the latter four variables grouped as contextual (household and community level variables), the remaining were individual-level variables [42, 43].

Statistical analyses

The statistical analyses were carried out in three stages using Stata version 17.0 (Stata Corporation, College Station, TX, USA). In the first stage, we used a spatial map in Stata to present the regional disparities in the proportion of eight or more ANC visits among the women. Next, we performed a bivariate analysis to examine the distribution of eight or more ANC visits across the 14 individual and contextual level variables. Percentages with confidence intervals (CI) were used to present the results of the distribution of eight or more ANC visits. Also, p-value was used to show the level of significance of the individual and contextual level variables. The regression analysis included all the variables with a p-value less than or equal to 0.05. In the third stage, a mixed-effect multilevel binary logistic regression analysis was performed to determine the strength of the association between the individual and contextual level variables and eight or more ANC visits using a four-modelled approach. Before the regression analysis, we checked for evidence of high collinearity among the variables using the variance inflation factor. The mean, minimum, and maximum variance inflation factor were 1.35, 1.02, and 2.30, respectively. Hence, there was no evidence of high collinearity among the studied variables. In performing the multilevel analysis, the first model (Model I) had no explanatory variable, and its results demonstrated the variations in eight or more ANC visits attributed to the clustering at the primary sampling units (PSU). Model II and III contained the individual and contextual level variables, respectively. Model IV contained all the explanatory variables. Fixed- and random-effects were the results of the regression analysis. The results on the fixed effect showed the association between the explanatory variables and eight or more ANC visits. We presented the results as an adjusted odds ratio (aOR) with their respective 95% CI. The random effect results, on the other hand, imply the variations in eight or more ANC visits. This variation was indicated by the intra-cluster correlation coefficient (ICC) values across the four models. The results from the last model were interpreted and discussed. Before generating the results, we weighted the dataset, and the surveyset command in Stata was used throughout the study.

Ethical consideration

We did not seek ethical approval for this study since the GDHS dataset is publicly available for use. We were granted access to download and use the GDHS for publication from the Monitoring and Evaluation to Assess and Use Results Demographic and Health Surveys (MEA-SURE DHS) before using the dataset.

Results

Prevalence of eight or more antenatal care contacts among women in Ghana

Across the 16 regions, there were disparities in the prevalence of eight or more ANC visits. As shown in the redshaded regions of the spatial map, the regions with the highest prevalence were Eastern, Greater Accra, Volta, and Western. The regions with the lowest prevalence were Oti, Northern, Savannah, and North East (Fig. 1). The prevalence of eight or more ANC visits in Ghana was 38.4% [36.0, 41.0] (Table 1).

Table 1 presents the bivariable analysis of factors associated with eight or more ANC visits among women in Ghana. Eight or more ANC visits was higher among women aged 30-34 (43.0%), women with higher education (56.6%), women who were Christians (40.8%), women working (39.7%), women with two children (43.8%), and women covered by health insurance (39.4%). In addition, women who were exposed to mass media (41.1%), women who wanted pregnancy then (42.0%), women who had no barrier to access healthcare (44.5%), women who were in richest wealth index (60.7%), women who were urban dwellers (45.9%), and women residing in the Greater Accra region (48.7%) had higher eight or more ANC visits respectively. All the explanatory variables except marital status and sex of household head were significantly associated with eight or more ANC visits at p < 0.05.

Factors associated with eight or more antenatal care visits *Fixed effect results*

Model IV of Table 2 displays the factors associated with eight or more ANC visits among women in Ghana. The odds of eight or more ANC visits were lower in women aged 40-49 [aOR=0.42, 95% CI=0.18-0.96] than those aged 15-19. Women with four or more children [aOR=0.57, 95% CI=0.36-0.93] had lower odds of completing eight or more ANC visits than those with one child. In terms of wanted last pregnancy, women who wanted pregnancy later had lower [aOR=0.63, 95% CI=0.46-0.85] likelihood of completing eight or more ANC visits relative to those who wanted pregnancy then. Women in the richer [aOR=1.99, 95% CI=1.19-3.33] and richest [aOR=4.82, 95% CI=2.45-9.51] wealth index showed a higher likelihood of completing eight or more ANC visits relative to women in the poorest wealth index. With regards to region, women residening in the Western North [aOR=0.43, 95% CI=0.19-0.94], Bono [aOR=0.33, 95% CI=0.14-0.76], Northern [aOR=0.29, 95% CI=0.13-0.66], Savannah [aOR=0.30, 95% CI=0.14-0.65] and North East [aOR=0.33, 95% CI=0.14-0.75] regions were less likely to complete eight or more ANC visits relative to those in the Western region.

Random effect results

Table 2 indicates considerable disparities in the factors associated with eight or more ANC visits among the clusters (σ 2=3.43, 95% CI=2.62–4.49) in Model I. Approximately 51% of the proportion of eight or more ANC visits was credited to the disparities between the clusters (ICC=0.51). The between-cluster variation dropped to 49.0% in Model II, and further decreased to 47.0% in Model III, and marginally reduced to 46.0% in Model IV. These ICC values suggest that the disparities in the completing eight or more ANC visits can be attributed to the differences across the clusters.

Discussion

In this study, we assessed the regional disparities and socio-demographic factors associated with eight or more ANC visits among Ghanaian women. Our findings revealed a low prevalence (38.4%) of eight or more ANC visits among women in Ghana. Women's age, parity, wanted last pregnancy later, wealth index, and region were associated with eight or more ANC visits in Ghana.

The study revealed that 38.4% of women in the study visited the ANC eight or more times for their recent birth. This finding implies that majority of the women (61.6%) in Ghana did not complete the recommended eight or more ANC visits. The prevalence of eight or more ANC visits in this study is lower than those of earlier studies in Ghana (41.9%) [28] and Ethiopia (43.1%) [44]. Notwithstanding, the prevalence surpasses those of prior research, which included 17.4% in Nigeria [45], 6.1% in Bangladesh [46], 1.0% in Senegal, 8.0% in Cameroon, and 9.0% in Benin [47]. The low prevalence of eight or more ANC visits among pregnant women in Ghana may be due to some women with lower socioeconomic status facing challenges in affording transportation, childcare, or taking time off work for antenatal care appointments [29]. Women residing in remote areas may encounter distances issues while accessing clinics, and the availability of clinic hours or personnel may be limited [30]. Other women may lack comprehensive knowledge regarding ANC's significance or may have misunderstandings about it [31]. Also, traditional practices or beliefs may discourage frequent ANC visits for pregnant women [32].

This study also revealed that several factors were considerably connected with women in Ghana having eight or more ANC visits. These factors include women's age, number of children, desire to delay the last pregnancy, wealth, and region. When comparing different age groups, we observed that women aged 40–49 had lower odds of completing eight or more ANC visits than those aged 15–19. Our results contradict the findings of a study



Fig. 1 Regional distribution of eight or more antenatal care visits in Ghana

Table 1 Bivariable analysis of eight or more antenatal care visits among women in Ghana

| Variables | Weighted | Eight or more antenatal care visits | p-value |
|------------------------------|--------------|-------------------------------------|---------|
| | N (%) | 38.4% [36.0-41.0] | |
| Women's age (years) | | | 0.007 |
| 15–19 | 263 (6.8) | 26.5 [20.3–33.8] | |
| 20–24 | 847 (21.8) | 35.8 [31.6–40.2] | |
| 25–29 | 945 (24.3) | 38.3 [34.1–42.6] | |
| 30–34 | 921 (23.6) | 43.0 [38.9–47.3] | |
| 35–39 | 631 (16.2) | 39.9 [34.6–45.5] | |
| 40–49 | 286 (7.3) | 39.7 [32.0–48.0] | |
| Educational attainment | | | < 0.001 |
| No education | 813 (20.9) | 27.0 [22.4–32.1] | |
| Primary | 610 (15.7) | 31.4 [26.3–37.0] | |
| Secondary | 2.103 (54.0) | 41.7 [38.6-44.9] | |
| Higher | 367 (9.4) | 56.6 [49.4–63.6] | |
| Marital status | | | 0.226 |
| Never in union | 501 (12 9) | 34 1 [27 7-41 0] | 0.220 |
| Married | 2 341 (60 1) | 40.2 [37.1-43.3] | |
| Cobabiting | 871 (22 4) | 371[327_418] | |
| Previously married | 180 (4.6) | 34.2 [25.5_44.1] | |
| Peligion | 100 (4.0) | JT.Z [ZJ.J TT.1] | < 0.001 |
| Christians | 2 730 (70 1) | 40.8 [38.0, 43.7] | < 0.001 |
| Muslims | 2,750 (70.1) | 36.0 [32.3 41.6] | |
| Traditionalist | 121 (2.1) | 9.1 [2.0, 16.4] | |
| | 121 (3.1) | 0.1 [3.7 10.4] | |
| | 00 (2.2) | 22.7 [12.2-30.1] | 0.020 |
| Current working status | 040 (24 2) | | 0.029 |
| | 940 (24.2) | 34.0 [30.8-38.5] | |
| working | 2,953 (75.8) | 39.7 [30.8-42.0] | 0.005 |
| Number of children (Parity) | 1 105 (20.4) | | 0.005 |
| Une | 1,105 (28.4) | 39.7 [35.7-43.9] | |
| IWO | 849 (21.8) | 43.8 [39.4–48.2] | |
| Inree | 591 (15.2) | 39.4 [34.4-44.6] | |
| Four or more | 1,348 (34.6) | 33.6 [29.6-37.9] | 0.004 |
| Covered by health insurance | 400 (5.4) | | < 0.001 |
| No | 199 (5.1) | 21.5 [14.4-30.7] | |
| Yes | 3,694 (94.9) | 39.4 [36.9-41.9] | |
| Exposed to mass media | | | < 0.001 |
| No | 584 (15.0) | 23.2 [18.9–28.2] | |
| Yes | 3,309 (85.0) | 41.1 [38.5-43.8] | |
| Wanted last pregnancy | / | | 0.001 |
| Wanted then | 2,334 (59.9) | 42.0 [39.0-45.2] | |
| Wanted later | 1,196 (30.7) | 32.2 [28.5–36.1] | |
| Wanted no more | 363 (9.3) | 35.8 [28.3–44.1] | |
| Barrier to access healthcare | | | < 0.001 |
| No | 1,741 (44.7) | 44.5 [41.1–47.9] | |
| Yes | 2,152 (55.3) | 33.6 [30.4–36.9] | |
| Sex of household head | | | 0.506 |
| Male | 2,674 (68.7) | 37.9 [35.1–40.9] | |
| Female | 1,219 (31.3) | 39.6 [35.5–43.7] | |
| Wealth index | | | < 0.001 |
| Poorest | 950 (24.4) | 23.5 [19.4–28.2] | |
| Poorer | 808 (20.8) | 33.9 [29.1–39.1] | |
| Middle | 785 (20.2) | 35.4 [31.1–39.9] | |
| Richer | 698 (17.9) | 46.7 [41.7–51.7] | |
| Richest | 652 (16.7) | 60.7 [53.8–67.3] | |

Table 1 (continued)

| Variables | Weighted | Eight or more antenatal care visits | <i>p</i> -value |
|--------------------|--------------|-------------------------------------|-----------------|
| | N (%) | 38.4% [36.0-41.0] | |
| Place of residence | | | < 0.001 |
| Urban | 1,809 (46.5) | 45.9 [42.5–49.4] | |
| Rural | 2,084 (53.5) | 32.0 [28.5–35.6] | |
| Region | | | < 0.001 |
| Western | 229 (5.9) | 46.5 [38.7–54.5] | |
| Central | 402 (10.3) | 44.4 [36.1–53.0] | |
| Greater Accra | 463 (11.9) | 48.7 [40.8–56.7] | |
| Volta | 144 (3.7) | 45.0 [36.2–54.1] | |
| Eastern | 274 (7.1) | 44.9 [35.6–54.6] | |
| Ashanti | 703 (18.1) | 38.4 [31.6–45.8] | |
| Western North | 106 (2.7) | 30.0 [23.9–36.8] | |
| Ahafo | 86 (2.2) | 41.7 [33.1–50.8] | |
| Bono | 124 (3.2) | 36.8 [27.2–47.5] | |
| Bono East | 211 (5.4) | 33.6 [26.6–41.4] | |
| Oti | 137 (3.5) | 25.1 [18.3–33.4] | |
| Northern | 438 (11.3) | 27.5 [19.0–38.1] | |
| Savannah | 117 (3.0) | 20.2 [15.1–26.0] | |
| North East | 126 (3.2) | 28.7 [21.9–36.6] | |
| Upper East | 213 (5.5) | 42.2 [35.0–49.8] | |
| Upper West | 117 (3.0) | 32.5 [25.9–39.9] | |

*P-values were generated from a Chi-square test

conducted in SSA [48]. Women aged 40 and above may have a different risk perception compared to younger mothers. They might feel they have a lower risk of complications due to previous pregnancies or age-related factors [49]. Older mothers might prioritise different aspects of prenatal care compared to younger women. They might focus on specific health concerns or screenings relevant to older pregnancies [50]. Older women may experience limitations due to health challenges or reduced mobility, making frequent clinic visits difficult [51].

Another significant factor influencing ANC visits is the number of children a mother has. Our finding, along with previous studies [18, 52, 53] indicates that women with higher parity are less likely to use ANC services. The likelihood of attending ANC visits decreased with increasing parity, as these women may perceive ANC as less important compared to women with only one child [54]. This may be because multiparous women have previous pregnancy experiences that enable them to handle issues independently and require fewer ANC visits. On the other hand, primiparous women, who lack such experiences, may be more inclined to seek ANC services. Moreover, systemic constraints such as time and financial expenses, which arise from a larger child dependency ratio, may hinder women with greater parity from accessing ANC services. The size of the family and the confidence gained from previous pregnancies and deliveries could also contribute to the lower usage of recommended ANC services by these women [39, 52, 55].

Additionally, wealth index was associated with eight or more ANC visits. Compared to women from the poorest wealth quntile households, those in the richest quintiles had a higher likelihood of completing eight or more ANC visits. This aligns with the findings of similar studies conducted in different countries [41, 48, 56]. These findings suggest that wealth status is a significant factor influencing ANC visit frequency. One possible reason is that low income women may struggle to pay for transport costs to reach a healthcare institution for ANC services. In Ghana, women in the mid and rich quintiles are more likely to have ANC visits from medical experts compared to women in the poorest quintiles [18]. In spite of ANC services being free of charge, poor women still face barriers to usage, including lack of information, additional costs for supplies and medications, transportation expenses, and discrimination from some healthcare providers [18]. In contrast to women from low-income households, a previous study found that women from wealthier relations have a higher probability of accessing and utilising maternal healthcare services [1]. Additionally, women from affluent households can afford out-ofpocket medical expenses when necessary [57]. Alongside interventions promoting eight or more ANC visits, prioritising the improvement of mothers' wealth status is crucial. The idea of Universal Health Coverage (UHC), which seeks to improve overall life expectancy by promoting health and well-being and providing equitable access to high-quality healthcare, has been proposed to

Table 2 Factors associated with eight or more antenatal care visits among women in Ghana

| Variables | Model I Empty model | Model II aOR [95% CI] | Model III aOR [95% CI] | Model IV aOR [95% CI] |
|------------------------------|------------------------|-------------------------------|---------------------------|--------------------------|
| Fixed effect results | | | | |
| Women's age (years) | | | | |
| 15–19 | | 1.00 | | 1.00 |
| 20–24 | | 0.69 [0.40-1.20] | | 0.71 [0.40–1.26] |
| 25–29 | | 0.76 [0.43–1.35] | | 0.80 [0.44-1.46] |
| 30–34 | | 0.53 [*] [0.29–0.99] | | 0.59 [0.31-1.12] |
| 35–39 | | 0.43* [0.22-0.83] | | 0.52 [0.26-1.01] |
| 40–49 | | 0.33** [0.15-0.75] | | 0.42* [0.18-0.96] |
| Educational attainment | | | | |
| No education | | 1.00 | | 1.00 |
| Primary | | 0.96 [0.65–1.44] | | 0.97 [0.65–1.44] |
| Secondary | | 1.24 [0.87–1.76] | | 1.04 [0.73-1.49] |
| Higher | | 2.00 [*] [1.05–3.82] | | 1.09 [0.55-2.16] |
| Religion | | | | |
| Christians | | 1.00 | | 1.00 |
| Muslims | | 1.01 [0.67–1.52] | | 1.07 [0.71-1.60] |
| Traditionalist | | 0.34 [0.10-1.19] | | 0.38 [0.10-1.42] |
| No religion or other | | 0.72 [0.28-1.82] | | 0.76 [0.28-2.02] |
| Current working status | | | | |
| Not working | | 1.00 | | 1.00 |
| Working | | 1.26 [0.96-1.66] | | 1.20 [0.92–1.57] |
| Number of children (Parity) | | | | |
| One | | 1.00 | | 1.00 |
| Two | | 0.75 [0.50–1.13] | | 0.80 [0.53-1.20] |
| Three | | 0.65 [0.42-1.00] | | 0.68 [0.43-1.06] |
| Four or more | | 0.52** [0.32-0.84] | | 0.57* [0.36–0.93] |
| Covered by health insurance | | | | |
| No | | 1.00 | | 1.00 |
| Yes | | 1.81 [0.96-3.42] | | 1.70 [0.93-3.12] |
| Exposed to mass media | | | | |
| No | | 1.00 | | 1.00 |
| Yes | | 1.04 [0.72–1.51] | | 0.95 [0.65–1.38] |
| Wanted last pregnancy | | | | |
| Wanted then | | 1.00 | | 1.00 |
| Wanted later | | 0.63** [0.46–0.85] | | 0.63** [0.46–0.85] |
| Wanted no more | | 0.64 [0.38-1.09] | | 0.72 [0.42-1.24] |
| Barrier to access healthcare | | | | |
| No | | 1.00 | | 1.00 |
| Yes | | 0.76 [0.57-1.02] | | 0.84 [0.62-1.14] |
| Wealth index | | | | |
| Poorest | | | 1.00 | 1.00 |
| Poorer | | | 1.31 [0.88–1.96] | 1.19 [0.80–1.78] |
| Middle | | | 1.32 [0.83-2.10] | 1.16 [0.72–1.85] |
| Richer | | | 2.61***[1.55–4.37] | 1.99** [1.19–3.33] |
| Richest | | | 7.17***[3.74–13.75] | 4.82*** [2.45–9.51] |
| Place of residence | | | | |
| Urban | | | 1.00 | 1.00 |
| Rural | | | 0.74 [0.50–1.10] | 0.77 [0.52–1.15] |
| Region | | | | |
| Western | | | 1.00 | 1.00 |
| Central | | | 1.06 [0.51-2.22] | 1.20 [0.57–2.54] |
| Greater Accra | | | 0.53 [0.25-1.12] | 0.55 [0.26-1.15] |

Table 2 (continued)

| Variables | Model I | Model II | Model III | Model IV |
|------------------------------------|--------------------------------|------------------|--------------------|--------------------|
| | Empty model | aOR [95% CI] | aOR [95% CI] | aOR [95% CI] |
| Volta | | | 0.67 [0.30–1.49] | 0.68 [0.30–1.53] |
| Eastern | | | 0.79 [0.36-1.72] | 0.75 [0.35-1.62] |
| Ashanti | | | 0.51 [0.25-1.02] | 0.54 [0.27-1.09] |
| Western North | | | 0.45* [0.21-0.95] | 0.43* [0.19-0.94] |
| Ahafo | | | 1.08 [0.53-2.23] | 1.00 [0.48-2.06] |
| Bono | | | 0.39* [0.17-0.91] | 0.33** [0.14-0.76] |
| Bono East | | | 0.61 [0.32-1.19] | 0.56 [0.29–1.07] |
| Oti | | | 0.46* [0.22-0.97] | 0.47 [0.22-1.01] |
| Northern | | | 0.32** [0.15-0.71] | 0.29** [0.13-0.66] |
| Savannah | | | 0.33** [0.16-0.68] | 0.30** [0.14-0.65] |
| North East | | | 0.40* [0.18-0.89] | 0.33** [0.14-0.75] |
| Upper East | | | 0.92 [0.48-1.77] | 0.74 [0.38-1.44] |
| Upper West | | | 0.68 [0.33-1.39] | 0.57 [0.27-1.21] |
| Random effect results | | | | |
| PSU variance (95% Cl) | 3.43 [2.62-4.49] | 3.12c[2.36-4.13] | 2.87 [2.18-3.78] | 2.85 [2.16-3.76] |
| ICC | 0.51 [0.44-0.58] | 0.49 [0.42-0.56] | 0.47 [0.40-0.53] | 0.46 [0.40-0.53] |
| Total sample | 3893 | 3893 | 3893 | 3893 |
| Number of clusters | 616 | 616 | 616 | 616 |
| Exponentiated coefficients: 95% co | nfidence intervals in brackets | | | |

*p<0.05, **p<0.01, ***p<0.001

Model I was an empty model with no explanatory variable

Model II contained the individual level variables

Model III included the contextual level variables

Model IV was fitted to include the individual and contextual level variables

address poverty and low utilisation of healthcare services, particularly ANC services [58]. This approach aims to ensure all-inclusiveness. By realising UHC, we can guarantee economic danger protection and universal contact to high-quality medical services for all.

We also found that the region of residence was strongly associated with eight or more ANC visits in Ghana. Women in the Western North, Bono, Northern, Savannah, and North East regions of Ghana are less likely than those in the Western Region to have eight or more ANC visits. The use of ANC varies significantly between the Western North, Bono, Northern, Savannah, and North East areas of the country because of unequal access to health resources in the former (including Savannah and Northern) and latter (including the Western region) [59–61]. Inaccessibility to health facilities in the country's northern parts mainly due to deficient road network, an ineffective transportation system, or extremely long travel distances could have accounted for the women's lower likelihood of completing eight or more ANC visits [59]. Moreover, health personnel find it challenging to recruit and remain in northern areas of the country due to low incentives and limited access to social amenities [45]. Additionally, women living in northern parts of the country might have a poorer socioeconomic position than women living in Southern parts, which could reduce the likelihood that they will use ANC services [6, 45]. Women staying in Northern areas of the country can be more susceptible to traditional convictions and societal expectations that dissuade them from seeking skilled maternity care services [7]. This cound have accounted for the regional variances in term of accessing ANC services [45, 62]. Moreover, insurgency-related security issues in some northern regions may also be a factor in the observed variation [63, 64].

Policy and public health implications

The study's results have implications for public health policy. The study presents practical data on the reportage of eight or more ANC vists through pregnancy, as recommended by the WHO. Policymakers who are drafting national guidelines on ANC utilisation based on WHO recommendations can benefit from this information. However, simply establishing the criteria may not be enough to ensure compliance. Our analysis shows disparities in the completion of eight or more ANC visits, emphasising the need to focus on regions with low attendance to upsurge ANC visits and make sure that women receive the full benefits. Additionally, it is imperative to consider disparities in maternal age and socioeconomic disparities related to ANC visits. Primary health care should be developed and strengthened to offer ANC treatments to older pregnant women and those with multiple children. To

increase ANC attendance among the poorest women and those without health insurance, the government could consider implementing a policy that makes ANC visits mandatory and free, perhaps through the basic healthcare provision budget. The government should enhance the accessibility and availability of ANC services, particularly in underserved regions such as the Savannah and Northern areas. Establishing more health facilities and mobile clinics in remote areas to reduce the distance and travel time for pregnant women seeking ANC could be useful. The government should implement policies that provide financial support and incentives for pregnant women to attend ANC visits, such as conditional cash transfers or subsidies for transportation. Expanding existing free maternity and child health care schemes to cover all ANC visits, ensuring that cost is not a barrier to accessing should also be considered an essential need.

Strengths and limitations

The study has some noteworthy strengths. First, because we utilized a nationwide representative dataset, the findings could be generalised to all pregnant women in Ghana who are of reproductive age. Additionally, the study's findings are trustworthy because the proper statistical modifications were made for the survey designs. Nevertheless, it is crucial to evaluate the results considering these limitations. Only associations may be deduced from the findings because of the cross-sectional design's inability to permit causal interpretation. The number of ANC contacts was self-reported in our analysis; therefore recall and social desirability biases cannot be eliminated. Once more, DHS samples are typically too small to yield estimations for less geographic zones-which are frequently required for tracking and assessing decentralised initiatives. Typically, DHS surveys in each nation are carried out every five, meaning that the surveys do not provide annual estimates of critical variables. Lastly, because the data analysis was limited to factors included in the DHS, certain variables may have been left out.

Conclusions

A significant proportion of women in Ghana fall short of the recommended eight or more ANC visits. This highlights a need for interventions to improve ANC utilisation. Age, parity, desired pregnancy timing, wealth status, and region of residence are associated with ANC visits. Women in five regions (Western North, Bono, Northern, Savannah, and North East) are significantly less likely to have eight or more ANC visits than those in the Western region. The government and policymakers should design programs to address the needs of older women, those with high parity, and women who want to delay pregnancy. Increased healthcare resources, educational campaigns, and addressing regional barriers to ANC access are crucial. Promoting public health initiatives to emphasise the importance of completing the recommended number of ANC visits for a healthy pregnancy is essential. By considering these recommendations, policymakers and healthcare providers can work towards ensuring more women in Ghana have access to adequate antenatal care.

Abbreviations

- aOR Adjusted Odds Ratios
- AIC Akaike Information Criterion
- ANC Antenatal Care
- CI Confidence Interval
- DHS Demographic and Health Survey
- FANC Focused Antenatal Care
- GDHS Ghana Demographic and Health Survey
- ICC Intra-Class Correlation Coefficient
- PSU Primary Sampling Unit
- SDG Sustainable Development Goal
- SSA Sub-Saharan Africa
- UHC Universal Health Coverage
- WHO World Health Organization

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Author contributions

RGA and BOA conceived the study. RGA, and BOA wrote the methods section and performed the data analysis. RGA, AO, TS, FGW, and BOA were responsible for the initial draft of the manuscript. All the authors reviewed and approved the final version of the manuscript.

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Data availability

No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate

No ethical clearance was sought for this study since we analysed a secondary dataset publicly available for its usage. The ICF International sought ethical approval before conducting the GDHS.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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