Individual-level and community-level factors associated with eight or more antenatal care contacts in sub-Saharan Africa: evidence from 36 sub-Saharan African countries

Zemenu Tadesse Tessema, Getayehn Antehunegn Tessema, Lake Yazachew

ABSTRACT

Objective To reduce maternal mortality, the WHO has been introducing several antenatal care (ANC) measures. Pregnancy-related preventable morbidity and mortality, on the other hand, remain alarmingly high. This study was conducted to estimate the magnitude and the factors associated with eight or more ANC visits in sub-Saharan Africa.

Design A population-based, cross-sectional investigation was conducted.

Setting Sub-Saharan African countries.

Participants A total of 300,575 women from recent Demographic and Health Surveys (DHS) conducted in 36 sub-Saharan African countries from 2006 to 2018 were included in this study.

Methods The data were sourced from sub-Saharan African countries’ recent DHS data set from 2006 to 2018. A multilevel logistic regression model was fitted to identify factors associated with ANC use. Adjusted OR, with 95% CI and a p value of less than 0.05, was employed to determine parameters linked to ANC use.

Results The pooled magnitude of eight or more ANC visits in sub-Saharan African countries was 6.8% (95% CI 6.7% to 6.9%). Residence, maternal education, husband’s education, maternal occupation, wealth index, media exposure, contraceptive use and desired pregnancy were all positively associated with eight or more ANC visits in the multilevel logistic regression analysis, whereas birth order was negatively associated with eight or more ANC visits.

Conclusions Compliance with the WHO guidelines on the minimum number of ANC contacts in sub-Saharan Africa is poor. We recommend that mother and child health programmes review existing policies and develop new policies to adopt, execute and address the obstacles to maintaining the WHO-recommended minimum of eight ANC interactions. Women’s education, economic position, media exposure and family planning uptake should be prioritised and improved. Urgent intervention is required to meet the minimum of eight ANC contacts in sub-Saharan Africa.

BACKGROUND

In 2001, the WHO advised that low-income and middle-income nations employ focused antenatal care (FANC) instead of the traditional antenatal care (ANC) strategy (defined by 7–16 visits). Travel times to and from clinics, waiting time, transportation cost where clinics are located far away, loss of working hours and care of other children at home were all expected to be addressed by the FANC. A major challenge in the world, including in sub-Saharan Africa (SSA), is the difficulty of improving maternal and child health condition. SSA accounted for 66% of global maternal deaths according to a WHO report in 2017. A previous study also supported this finding, with maternal mortality in low-income and middle-income countries 14 times higher than in high-income countries in 2014.

Pregnancy-induced avoidable morbidity and mortality remained excessively high at introducing the Sustainable Development Goals (SDGs) in 2016.” by "Pregnancy-induced avoidable morbidity and mortality remained excessively high by the time the Sustainable Development Goals (SDGs) introduced in 2016. Although significant progress has been accomplished, countries need to integrate and enhance these advances and extend their priorities beyond survival to boost the health and productivity
of their citizens.\textsuperscript{1} Thus, in 2016, the WHO further revised its recommended minimum number of ANC visits from four to eight contacts.\textsuperscript{7} The guidelines include a new approval that pregnant women should have eight contacts with the health system during their pregnancy.\textsuperscript{2,8} The first contact should be made up to 12 weeks after conception and the eighth contact up to 40 weeks after conception.\textsuperscript{2,8}

By providing good maternal healthcare, most maternal and pregnancy-related deaths can be managed through early detection of complications. ANC is among the maternal and child health service packages designed to reduce preventable maternal and childhood mortalities is ANC.\textsuperscript{3} According to the WHO 2016 recommendation, a pregnant woman is considered to have used ANC when she has made eight contacts and above with a skilled healthcare provider during her pregnancy.\textsuperscript{7} ANC can reduce maternal morbidity and mortality through diagnosis and management of pregnancy-related illness.\textsuperscript{9} ANC takes the lion’s share, along with other maternal health services.\textsuperscript{2} Nonetheless, it is unusual to see pregnant women who deny ANC service.\textsuperscript{10}

However, as per the new recommendation of the WHO on the number of ANC contacts, an analysis of Demographic and Health Survey (DHS) data showed only 17.4% of pregnant women in Nigeria made eight contacts and above with skilled healthcare providers,\textsuperscript{11} whereas a previous study showed that nearly 80% and 40% of pregnant mothers in SSA attended at least one and four ANC visits, respectively, in 2016.\textsuperscript{6} A disappointing approach during ANC counselling may disrupt continuity of care and affect the health of both children and women.\textsuperscript{12}

Studies conducted in different countries have reported that maternal age, number of living children, educational status, place of residence, occupation, religion, socioeconomic status and obstetric history were factors significantly associated with use of ANC services.\textsuperscript{7,13,14} Similarly, in low-income and middle-income countries, a recent study described pregnant women’s level of education and their husbands’ as the most considerable factor influencing health service utilisation.\textsuperscript{15,16} All over SSA countries, however, little is known about the influence of routine ANC on early access, utilisation and quality of ANC services. This work aims to close this knowledge gap.\textsuperscript{17}

This analysis aimed to estimate the pooled prevalence and the factors associated with ANC visits during pregnancy in SSA countries using recent DHS data. The current information is essential for policy planners and programme managers when designing strategies to improve maternal and child health. This analysis aimed to summarise the magnitude of ANC utilisation and the associated factors among pregnant women or women who had given a minimum of one birth 5 years prior to the survey in SSA.

### Table 1

**Pooled Demographic and Health Surveys (DHS) data from 36 sub-Saharan countries, 2006–2018**

| Country                        | DHS year | Sample size (300 575) |
|--------------------------------|----------|-----------------------|
| Southern region                |          |                       |
| Lesotho                        | 2014     | 2575                  |
| Namibia                        | 2013     | 3813                  |
| Swaziland                      | 2006/2007| 2130                  |
| South Africa                   | 2016     | 3036                  |
| Central region                 |          |                       |
| Angola                         | 2015/2016| 14 379                |
| Democratic Republic of the Congo | 2013/2014| 18 827                |
| Congo                          | 2011/2012| 10 819                |
| Cameroon                       | 2011     | 15 426                |
| Gabon                          | 2012     | 8422                  |
| Sao Tome and Principe          | 2008/2009| 2615                  |
| Chad                           | 2014/2015| 19 917                |
| Eastern region                 |          |                       |
| Burundi                        | 2010     | 8940                  |
| Ethiopia                       | 2016     | 7590                  |
| Kenya                          | 2014     | 14 141                |
| Comoros                        | 2012     | 2064                  |
| Madagascar                     | 2008/2009| 8661                  |
| Malawi                         | 2015/2016| 13 515                |
| Mozambique                     | 2011     | 7874                  |
| Rwanda                         | 2014/2015| 6059                  |
| Tanzania                       | 2015/2016| 7078                  |
| Uganda                         | 2011     | 10 152                |
| Zambia                         | 2018     | 7324                  |
| Zimbabwe                       | 2013/2014| 4987                  |
| Western region                 |          |                       |
| Burkina Faso                   | 2010     | 10 487                |
| Benin                          | 2017     | 9030                  |
| Cote d’Ivoire                  | 2011     | 5229                  |
| Ghana                          | 2014     | 4141                  |
| Gambia                         | 2013     | 5293                  |
| Guinea                         | 2018     | 5487                  |
| Liberia                        | 2013     | 4769                  |
| Mali                           | 2018     | 6622                  |
| Nigeria                        | 2018     | 21 911                |
| Niger                          | 2012     | 8002                  |
| Sierra Leone                   | 2010/2011| 8647                  |
| Senegal                        | 2010/2011| 7678                  |
| Togo                           | 2013/2014| 4851                  |

### METHODS

#### Data source

The most recent DHS data from 36 countries in SSA were used in this study (Table 1). These statistics were combined to determine the prevalence of ANC visits in
SSA and the factors that influence them. The DHS is a national survey that collects information on basic health indicators such as mortality, morbidity, family planning service use, fertility, and mother and child health. The data came from the Measure DHS programme. Men, women, children, birth and household data sets are all included in each country’s survey; in this study, an Individual Record (IR) file was employed.

The IR file contains all the information obtained for de facto women in the woman’s questionnaire, as well as some variables from the household questionnaire. This file contains repeated variables for up to 20 births in the birth history and up to 6 children under the age of 5, for whom pregnancy and postnatal care, immunisation, health and nutrition data were gathered. Most women-level analyses, such as on marriage and sexual activity, fertility and fertility choices, family planning, anthropometry and anaemia in women, HIV/AIDS, women empowerment, adult and maternal mortality, and domestic violence, are conducted using this data set.

To choose research participants, the DHS employed a two-stage stratified selection procedure. To begin, we combined data from 36 DHS conducted in SSA countries, resulting in a weighted sample of 300,575 reproductive-age women who had at least one child in the 5 years prior to the survey.

Measurement of variables
Outcome variable
The ‘number of ANC visits’ was the study’s outcome variable. The percentage of women aged 15–49 who had a live birth at a specific time and got ANC services during pregnancy was used to calculate the number of ANC in this study. The question ‘How many times did you receive antenatal treatment throughout this pregnancy?’ was the source of this variable. In SSA, responses varied from 0 to 30. According to the revised WHO standards, the number of ANC visits of pregnant women should be divided into two categories: zero visit and one visit.7 11

Explanatory variables
We evaluated both individual-level and household-level factors/community-level factors in our analysis based on theoretical and practical significance and the availability of the variables in the data set. In addition, factors were chosen based on their degree of correlation with frequency of ANC visits from prior studies.7 11 13 14

Maternal current age (15–24, 25–34, 35 and above), maternal level of education (no education, primary, secondary and above), husband’s level of education (no education, primary, secondary and above) and marital status (currently married, cohabitating) were the individual-level factors. Working status (working vs not working), healthcare access (major problem vs minor problem), media exposure (no vs yes), desired pregnancy (yes vs no), contraceptive use (yes vs no) and birth order (1, 2–4 and 5+) were also evaluated, along with community-level factors including living region (East, West, Central, South) and residence (urban, rural).

Data management and analysis
After extracting the variables based on the literature, we combined the data from the 36 SSA countries. To restore the representativeness of the survey and take sample design into account when generating SEs and reliable estimates, the data were weighted using sampling weight, primary sampling unit and strata before any statistical analysis. STATA V.14 was used to perform cross- tabulations and summary statistics. From 2006 to 2018, 95% CI was given for the pooled prevalence of prenatal care utilisation in SSA countries.

Statistical modelling
The DHS data have a hierarchical structure, which contradicts the classic logistic regression model’s independence of observations and equal variance assumption. As a result, women are nested within a cluster based on the assumption that women in the same cluster are more similar. This means that advanced models should be used to account for between-cluster heterogeneity. A total of four models were fitted. Model 1 (community-level variables), model 2 (individual-level variables) and model 3 are examples of null models (models without explanatory variables) (both individual-level and community-level variables). Model 3 was chosen because it has the highest log-likelihood ratio and the smallest deviation and contains both individual-level and community-level variables.

Fixed and random effect estimates
The variables included in the model, both individual-level and community-level variables, were used in the fixed effect analysis. Variations between clusters (EAs) were analysed using intraclass correlation coefficient (ICC), proportional change in variance (PCV) and median OR (MOR) in the random effect analysis.10 ICC is the proportion of variance explained by the population’s group structure. It was calculated as follows: ICC=σ2π3/σ2π3+σ2µ. where the variance of the standard logit distribution is σ2π3 and σ2µ indicates cluster variance.

PCV measures the total variation attributed by individual-level and community-level factors in the multilevel model as compared with the null model. It was computed as follows: variance of null model–variance of full model variance of null model. When randomly selecting two clusters, MOR is defined as the median value of the OR between the cluster at high risk and the cluster at lower risk of recommended ANC usage (EAs). It was calculated as follows: MOR=exp(√2*σ2µ*0.6745) ~ MOR=exp(0.95*σ2µ).

Patient and public involvement
This study did not include any patient.
Table 2  Distribution of postnatal service utilisation in sub-Saharan Africa region

| Variable                      | ANC utilisation | Total (%) | $\chi^2$ value | P value |
|-------------------------------|-----------------|-----------|----------------|---------|
|                               | Yes             | No        |                |         |
| **African region**            |                 |           |                |         |
| Southern                      | 10 044          | 1509      | 11 553 (3.84)  | 54.23   | <0.001* |
| Central                       | 79 304          | 8902      | 88 207 (29.35) |         |         |
| Eastern                       | 91 782          | 6680      | 98 663 (32.62) |         |         |
| Western                       | 88 165          | 13 986    | 102 151 (33.99)|         |         |
| **Residence**                 |                 |           |                |         |
| Rural                         | 165 566         | 25 463    | 191 029 (63.55)| 82.35   | <0.001* |
| Urban                         | 103 730         | 5815      | 109 546 (36.45)|         |         |
| **Age group**                 |                 |           |                |         |
| 15–24                         | 91 025          | 8708      | 99 733 (33.18) | 361.45  | <0.001* |
| 25–34                         | 111 984         | 13 824    | 125 808 (41.66)|         |         |
| 35–49                         | 66 287          | 8746      | 75 033 (24.96) |         |         |
| **Maternal education**        |                 |           |                |         |
| No education                  | 84 928          | 20 746    | 105 657 (36.16)| 81.89   | <0.001* |
| Primary education             | 92 800          | 6620      | 99 420 (33.08) |         |         |
| Secondary and above           | 91 567          | 3912      | 95 480 (31.77) |         |         |
| **Husband education**         |                 |           |                |         |
| No education                  | 72 138          | 17 711    | 89 849 (36.18) | 196.83  | <0.001* |
| Primary education             | 61 978          | 5504      | 67 482 (27.55) |         |         |
| Secondary and above           | 82 953          | 5015      | 87 608 (35.77) |         |         |
| **Maternal occupation**       |                 |           |                |         |
| Had occupation                | 192 557         | 21 407    | 86 610 (28.82) | 286.55  | <0.001* |
| Had no occupation             | 76 739          | 9871      | 86 610 (71.18) |         |         |
| **Wealth index**              |                 |           |                |         |
| Poor                          | 102 762         | 19 080    | 121 842 (40.54)| 120.51  | <0.001* |
| Middle                        | 53 829          | 5654      | 59 483 (19.79) |         |         |
| Rich                          | 112 705         | 6544      | 119 249 (39.67)|         |         |
| **Media exposed**             |                 |           |                |         |
| Yes                           | 189 649         | 13 366    | 97 537 (32.45) | 54.59   | <0.001* |
| No                            | 79 630          | 17 906    | 203 016 (67.55)|         |         |
| **Accessing healthcare**      |                 |           |                |         |
| Big problem                   | 112 299         | 11 293    | 175 471 (58.67)| 458.11  | <0.001* |
| Not a big problem             | 155 618         | 19 852    | 123 592 (41.33)|         |         |
| **Wanted pregnancy**          |                 |           |                |         |
| Yes                           | 207 875         | 28 706    | 17 448 (6.87)  | 1.56    | 0.211   |
| No                            | 15 259          | 2188      | 236 582 (93.13)|         |         |
| **Contraceptive use**         |                 |           |                |         |
| Yes                           | 79 345          | 4210      | 83 555 (28.51) | 84.39   | <0.001* |
| No                            | 182 744         | 26 730    | 209 474 (71.49)|         |         |
| **Birth order**               |                 |           |                |         |
| 1                             | 53 639          | 4608      | 582 547 (19.38)| 537.22  | <0.001* |
| 2–4                           | 117 344         | 13 447    | 130 792 (43.51)|         |         |
| 5+                            | 98 312          | 13 223    | 111 535 (37.11)|         |         |

*Significant association between ANC visit and independent variables. ANC, antenatal care.
RESULTS
This study comprised 300,575 women from 36 SSA countries who had at least one child 5 years before the survey. Majority of the study participants (102,151, 33.99%) were from Western Africa, while the least number of study participants (11,553, 3.84%) came from Africa’s southern regions. Majority of the participants (191,029, 63.55%) were from rural areas. The median age of women in this study was 28.8 (IQR=7.2) years, with 125,808 (41.86%) between the ages of 25 and 34. Thirty-three per cent of women and 36 per cent of men lacked high school diploma. More than a third of women (121,842, 40.54%) lived in poverty (table 2).

Prevalence of eight or more ANC contacts
In SSA, the pooled prevalence of ANC use was 6.8% (95% CI 6.7 to 6.9) (table 3).

Determinants of ANC utilisation
Multilevel multivariable logistic regression was used to fit the model for this study. The random effects estimates and the fixed estimates are the two types of estimations in this model. Fitting four models revealed the fixed and random effects estimates (null model, model 1, model 2, model 3). Within SSA, the empty model revealed a substantial variance in the likelihood of ANC use (model 2=0.46, p=0.001). The ICC in the empty model implied that the difference across countries was responsible for 12.49% of the entire variation in ANC use. ICC and MOR that the difference across countries was responsible for 39.87% of the variation in ANC usage. The PCV in this analysis, urban residence and media exposure were statistically relevant predictors were 1.89 times more likely to use ANC than their counterparts (AOR=1.22, 95% CI 1.15 to 1.30) (table 4).

When compared with rural women, the likelihood of urban women receiving ANC increased by 32% (adjusted OR (AOR)=1.32, 95% CI 1.27 to 1.37). When compared with women with no formal education, the odds of receiving ANC were 2.19 (AOR=2.19, 95% CI 2.11 to 2.28) and 2.46 (AOR=2.46, 95% CI 2.33 to 2.60) times higher for women with primary and secondary education. When compared with women whose husbands had no formal education, the odds of ANC use were 1.75 (AOR=1.75, 95% CI 1.66 to 1.80) and 1.71 (AOR=1.71, 95% CI 1.64 to 1.79) times higher for women whose husbands had primary and secondary and above education. Women with occupation were 1.26 (AOR=1.71, 95% CI 1.64 to 1.79) times more likely to use ANC than women without occupation. Women of middle and rich wealth status were 1.32 (AOR=1.71, 95% CI 1.28 to 1.37) and 1.38 (AOR=1.38, 95% CI 1.32 to 1.43) times more likely than poor women to use ANC. Those who were exposed to media were 1.97 times more likely to use ANC than women who were not (AOR=1.97, 95% CI 1.91 to 2.03). Women who said obtaining healthcare was not a large difficulty were 1.08 times more likely to use ANC than women who said accessing healthcare was a big problem (AOR=1.08, 95% CI 1.05 to 1.11). When compared with women with the first birth order, the odds of receiving ANC were 15% (AOR=0.85, 95% CI 0.81 to 0.76) and 24% (AOR=0.24, 95% CI 0.72 to 0.81) lower for women with birth orders 2–4 and 5+. Women who desired conception were 1.22 times more likely to use ANC than women who were not (AOR=1.22, 95% CI 1.15 to 1.30) (table 4).

DISCUSSION
This study carried out an assessment of the magnitude and the factors that influence use of ANC among women of SSA, showing that the pooled magnitude of ANC utilisation in SSA countries was 6.8%. This finding is lower than a meta-analysis reported elsewhere (63.77%),6 the 2016 Ethiopian DHS (62.8%),19 a study conducted in Ethiopia (94.9%)30 and an analysis of Ugandan DHS data from 2007 to 2011. The possible explanation for this may be due to the wider geographical coverage of this study compared with all other studies.

In this analysis, we identified a range of determinants of ANC use in SSA. The current analysis identified that socioeconomic and reproductive status as well as knowledge on the value of ANC service are important factors that influence ANC use in SSA.

In this analysis, urban residence and media exposure were the community-level variables positively correlated with ANC utilisation. Similarly, women’s and their husbands’ advanced level of education, contraceptive use among women, occupation among women, improved economic status among women and wanted pregnancy were the individual-level variables positively correlated with ANC utilisation, whereas birth order was the
### Table 4  Results of the multilevel logistic regression analysis of ANC visits in sub-Saharan Africa

| Variable                  | Null model AOR (95% CI) | Model 1 AOR (95% CI) | Model 2 AOR (95% CI) | Model 3 AOR (95% CI) |
|---------------------------|--------------------------|-----------------------|-----------------------|-----------------------|
| Residence                 |                          |                       |                       |                       |
| Rural                     | 1                        |                       | 1                     |                       |
| Urban                     | 2.18 (2.70 to 2.87)      | 1.32 (1.27 to 1.37)*   |                       |                       |
| Age group                 |                          |                       |                       |                       |
| 15–24                     | 1                        | 1                     | 1                     |                       |
| 25–34                     | 1.14 (1.09 to 1.18)      | 1.09 (0.98 to 1.13)   |                       |                       |
| 35–46                     | 1.16 (1.10 to 1.22)      | 1.07 (0.97 to 1.11)   |                       |                       |
| Maternal education        |                          |                       |                       |                       |
| No education              | 1                        | 1                     | 1                     |                       |
| Primary education         | 2.02 (1.95 to 2.10)      | 2.19 (2.11 to 2.28)*   |                       |                       |
| Secondary and above       | 2.11 (2.00 to 2.22)      | 2.46 (2.33 to 2.60)*   |                       |                       |
| Husband education         |                          |                       |                       |                       |
| No education              | 1                        | 1                     | 1                     |                       |
| Primary education         | 1.72 (1.66 to 1.79)      | 1.73 (1.66 to 1.80)*   |                       |                       |
| Secondary and above       | 1.48 (1.42 to 1.54)      | 1.71 (1.64 to 1.79)*   |                       |                       |
| Maternal occupation       |                          |                       |                       |                       |
| Had no occupation         | 1                        | 1                     | 1                     |                       |
| Had occupation            | 1.36 (1.32 to 1.40)      | 1.26 (1.23 to 1.30)*   |                       |                       |
| Wealth index              |                          |                       |                       |                       |
| Poor                      | 1                        | 1                     | 1                     |                       |
| Middle                    | 1.35 (1.30 to 1.40)      | 1.32 (1.28 to 1.37)*   |                       |                       |
| Rich                      | 1.55 (1.50 to 1.61)      | 1.38 (1.32 to 1.43)*   |                       |                       |
| Media exposed             |                          |                       |                       |                       |
| No                        | 1                        | 1                     | 1                     |                       |
| Yes                       | 2.26 (2.20 to 2.32)      | 1.97 (1.91 to 2.03)*   |                       |                       |
| Accessing healthcare      |                          |                       |                       |                       |
| Big problem               | 1                        | 1                     | 1                     |                       |
| Not a big problem         | 1.00 (0.98 to 1.03)      | 1.08 (1.05 to 1.11)*   |                       |                       |
| Wanted pregnancy          |                          |                       |                       |                       |
| No                        | 1                        | 1                     | 1                     |                       |
| Yes                       | 1.24 (1.14 to 1.28)      | 1.22 (1.15 to 1.30)*   |                       |                       |
| Contraceptive use         |                          |                       |                       |                       |
| No                        | 1                        | 1                     | 1                     |                       |
| Yes                       | 2.14 (2.05 to 2.23)      | 1.89 (1.81 to 1.97)*   |                       |                       |
| Birth order               |                          |                       |                       |                       |
| 1                         | 1                        | 1                     | 1                     |                       |
| 2–4                       | 0.80 (0.76 to 0.84)      | 0.85 (0.81 to 0.89)*   |                       |                       |
| 5+                        | 0.67 (0.64 to 0.71)      | 0.76 (0.72 to 0.81)*   |                       |                       |
| Variance                  | 0.469 (0.416 to 0.529)   | 0.47 (0.417 to 0.527)  | 0.487 (0.426 to 0.555) | 0.658 (0.581 to 0.740) |
| ICC                       | 12.49 (11.22 to 13.87)   | 12.48 (11.25 to 13.81) | 12.89 (11.48 to 14.45) | 16.63 (15.02 to 18.37) |
| PCV, %                    | 1                        | 0.106                  | −3.85                 | −39.87                |
| MOR                       | 1.91 (1.84 to 1.99)      | 1.91 (1.84 to 1.99)    | 1.94 (1.85 to 2.02)   | 2.15 (2.06 to 2.26)   |
| LL                        | −101 995                 | −97 879                | −75 286               | −73 353               |
| Deviance                  | 203 990                  | 195 758                | 150 572               | 146 706               |
| AIC                       | 203 994                  | 195 771                | 150 607               | 146 749               |
| BIC                       | 204 016                  | 195 834                | 150 782               | 146 966               |

Continued
individual-level variable negatively associated with ANC utilisation in the study area.

The likelihood of ANC use among urban women increased by 32% compared with their counterparts, a finding supported by studies elsewhere.2122 It could be justified by the lack of access to health facilities, and awareness is much easier for urban dwellers. The likelihood of ANC use among women who attended primary and secondary and above education was 2.19 and 2.46 times higher compared with women with no formal education, respectively, a result supported by findings elsewhere.1525 This can be driven by the fact that educated women tend to be more aware of the significance of ANC services. Education increases women’s autonomy, decision-making power within the household, and trust and ability to decide about their safety.2426 Likewise, women whose husbands had primary and secondary and above education were 1.73 and 1.71 times more likely to use ANC than women whose husbands had no formal education, a finding consistent with other studies.1522 The authors clarified that this could be because more educated husbands are more conscious of the value of ANC.27 Women with occupation were 1.26-fold more likely to use ANC than ANC, a finding supported by studies elsewhere.625 2122 It could be justified by the lack of access to health facilities, and awareness is much easier for urban dwellers. The likelihood of ANC use among urban women increased by 32% compared with their counterparts, a finding supported by studies elsewhere.2122 It could be justified by the lack of access to health facilities, and awareness is much easier for urban dwellers. The likelihood of ANC use among urban women increased by 32% compared with their counterparts, a finding supported by studies elsewhere.2122 It could be justified by the lack of access to health facilities, and awareness is much easier for urban dwellers. The likelihood of ANC use among urban women increased by 32% compared with their counterparts, a finding supported by studies elsewhere.2122 It could be justified by the lack of access to health facilities, and awareness is much easier for urban dwellers. The likelihood of ANC use among urban women increased by 32% compared with their counterparts, a finding supported by studies elsewhere.2122 It could be justified by the lack of access to health facilities, and awareness is much easier for urban dwellers. The likelihood of ANC use among urban women increased by 32% compared with their counterparts, a finding supported by studies elsewhere.2122 It could be justified by the lack of access to health facilities, and awareness is much easier for urban dwellers. The likelihood of ANC use among urban women increased by 32% compared with their counterparts, a finding supported by studies elsewhere.2122 It could be justified by the lack of access to health facilities, and awareness is much easier for urban dwellers. The likelihood of ANC use among urban women increased by 32% compared with their counterparts, a finding supported by studies elsewhere.2122 It could be justified by the lack of access to health facilities, and awareness is much easier for urban dwellers. The likelihood of ANC use among urban women increased by 32% compared with their counterparts, a finding supported by studies elsewhere.2122 It could be justified by the lack of access to health facilities, and awareness is much easier for urban dwellers. The likelihood of ANC use among urban women increased by 32% compared with their counterparts, a finding supported by studies elsewhere.2122 It could be justified by the lack of access to health facilities, and awareness is much easier for urban dwellers. The likelihood of ANC use among urban women increased by 32% compared with their counterparts, a finding supported by studies elsewhere.2122 It could be justified by the lack of access to health facilities, and awareness is much easier for urban dwellers. The likelihood of ANC use among urban women increased by 32% compared with their counterparts, a finding supported by studies elsewhere.2122 It could be justified by the lack of access to health facilities, and awareness is much easier for urban dwellers. The likelihood of ANC use among urban women increased by 32% compared with their counterparts, a finding supported by studies elsewhere.2122 It could be justified by the lack of access to health facilities, and awareness is much easier for urban dwellers. The likelihood of ANC use among urban women increased by 32% compared with their counterparts, a finding supported by studies elsewhere.2122 It could be justified by the lack of access to health facilities, and awareness is much easier for urban dwellers.
The research was based on a secondary analysis of existing survey data that had been stripped of any identifying information. Through an online request to http://www.measuredhs.com, permission for data access was gained from Measure DHS.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available in a public, open access repository. Data are available upon reasonable request. Data may be obtained from a third party and are not publicly available. All data relevant to the study are included in the article or uploaded as supplementary information. Data are available online and can be accessed at www.measuredhs.com.

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ORCID iDs Zemenu Tadesse Tessema http://orcid.org/0000-0003-3878-7956
Gatyenehy Antahuneg Tesma http://orcid.org/0000-0001-6812-1659
Lake Yaszchew http://orcid.org/0000-0001-8863-1701

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