Predictors of The Timing and Number of Antenatal Care Visits among Unmarried Compared To Married Youth in Uganda Between 1995 And 2011

Peninah Agaba\textsuperscript{1}\textsuperscript{*}; Cyprian Misinde\textsuperscript{1}

\textsuperscript{1}Department of Population Studies, School of Statistics, College of Business and Management Sciences, Makerere University, Uganda

*Corresponding author

Email: pagaba@bams.mak.ac.ug/ agabapeninah@gmail.com

Abstract

Introduction

Inadequate use of maternal health services among the youth remains a serious health challenge in Uganda. The low use of maternal health services among youth partly explains the persistence high maternal mortality rate in the country. Yet, improved use of maternal health services by the youth would help reduce maternal deaths in the country. Therefore, this study examines predisposing and enabling factors associated with the timing and the number of antenatal care visits among unmarried compared to married youth aged 15-24 years between 1995 and 2011 in Uganda.

Methodology

Two-level binary logistic and linear regression models with district as a second level of analysis were conducted on pooled data of the 1995, 2000/01, 2006 and 2011 Uganda Demographic and Health Surveys. This analysis was among 581 unmarried, compared to 5,437 married youth, aged 15-24 years.

Results
Only 16% of unmarried youth and 18% of married youth had ANC in the first trimester. Education was the only factor that was significantly associated with early use of antenatal care among unmarried youth. Whereas high education was associated with higher odds of using antenatal care in the first trimester among married youth (OR=1.30, 95%CI=1.08-1.57), it was associated with late start among unmarried youth (OR=0.56, 95%CI=0.31-0.98). Higher parity, protestant membership and residence in eastern region were associated with late start of antenatal care, while access to radio and television, and education level of the husband were associated with higher odds of early use of antenatal care among married youth.

Overall, married youth were more likely to have more frequent antenatal care visits than unmarried youth. Among both groups, higher educational attainment and greater access to radio were associated with frequent antenatal care use. Residing in western region was associated with fewer antenatal care visits among both married and unmarried youth. Access to newspaper was associated with more antenatal care visits among married youth only.

**Conclusion**

This study presents the individual level predisposing and enabling factors that are important predictors of the use of antenatal health care services among youth that will guide policy to reduce maternal deaths among youth in Uganda.
Introduction

Maternal mortality reduction is one of the unfinished agenda of the Millennium Development Goals (1) and one of the goals and priorities of the global sustainable development goals (2, 3). Worldwide, maternal mortality is still high as 303,000 women were reported dead in 2015 due to maternal related causes (4, 5). This is worse in sub-Saharan Africa that accounts for 66 percent of these deaths (6). Comparably, the maternal mortality ratio in Uganda is still high at 336 per 100,000 live births in 2016 though it reduced from the highs of 540 deaths per 100,000 live births in 1995 (7, 8). The life-time risk of women in Uganda is also still high at 1 in 49 women at risk of dying from maternal causes compared to the global estimate of 1 in 190 (8, 9).

Early and frequent antenatal care use has been found to be associated with reduced maternal and child deaths and morbidity (10-16) and better obstetric outcomes through early identification and management of complications (12, 14, 17, 18). On the other hand, late ANC start has been observed to be associated with poor pregnancy outcomes like low birth weight and pre-mature births (19). Timely and frequent ANC benefits include provision of preventive health services such as vaccination, malaria prophylaxis, iron supplementation, nutrition counselling, and HIV counselling and testing (14, 20-22). Antenatal use also influences the use of subsequent maternal health services, such as delivery in the health facilities, or under the supervision of the trained birth attendant (21, 23-31), and postnatal check-ups (26-29, 31-33).

The Focused ANC model of World Health organisation (WHO) recommends at least four ANC visits, and the first one should be in the first three months of the pregnancy (34-37). Historical patterns indicate that achievement of SDG 3.1 will require 91 percent coverage of ever use of ANC and 78 percent of at least four antenatal care visits together with 81 percent of in-facility delivery as well as 87 percent of skilled birth attendance (38). Even though use of at least one
ANC visit among women of reproductive age is almost universal (97%) in Uganda, 60 percent and 48 percent had at least four ANC visits in 2016 and 2011 respectively, while only 30 percent and 21 percent had ANC in the first trimester in 2016 and 2011 respectively (8, 39). This is lower among adolescents as 93 percent and 97 percent of them ever had ANC in 2011 and 2016 respectively, while a much lower proportion (14%) had at least four ANC visits in 2011.

Previous studies show that the determinants of ANC use among youth has been influenced by predisposing, enabling, environment, need and health provider factors, although the influence is mixed. Antenatal care use has been associated with age of the youth (40), education level (25, 40, 41), pregnancy desire (42, 43), and parity (25, 40, 44). Wealth quintile (26, 30, 45), employment status (46), region of residence (47-49) and urban residence were also associated with early and frequent ANC use (40, 41).

Studies have found that some girls especially the unmarried wait to disclose their pregnancy until onset of labour due to fear of family and society reaction to the pregnancy which affects ANC use (42, 50). Partner violence against women also leads to late start or infrequent use of ANC among youth (51, 52). Prior experiences and quality of care at earlier ANC visits, service availability and accessibility also influence use. Lack of privacy for the youth, poor attitudes of health staff, uncomfortable waiting areas, and long waiting hours discourage the youth from attending ANC (43, 53, 54). These studies clearly indicate that beyond predisposing and enabling factors, there are quality, environmental, need, and health provider factors, and individual perceptions that influence the youth to use ANC. However, these are most times not segregated by marital status thus hiding certain vulnerabilities, yet unmarried youth never use or use ANC late compared to the married or formerly married youth (44, 51, 54).
This literature analysis further identified that use of ANC among youth can be influenced by service availability and accessibility, waiting time, service quality, youth’ autonomy; domestic violence prevalence and attitudes of health staff (42, 50, 51, 53-58). However, the unavailability of these factors in the UDHS data sets do not allow the researcher to examine these factors in this analysis.

The behavioural model of access to healthcare as proposed by Andersen (59) and modified by Aday & Andersen and Andersen and others (60-63) guided the analysis of factors for the use of antenatal care. This model suggests that the use of medical care depends on predisposing factors, need for health care, and enabling factors, environmental, and health provider characteristics, and health outcomes like consumer satisfaction and quality of life. However, some factors except predisposing and enabling factors are missing in the Demographic and Health Surveys data and they are not included in this analysis.

Source: Researcher’s construct

Figure 1: A conceptual framework for the analysis of determinants of antenatal care use among youth
Based on the insights from the literature review, several studies have tried to document the factors that influence the use of antenatal care among youth (25, 29-31, 57, 64, 65), but none has presented factors for use among unmarried youth in Uganda. Therefore, this study used pooled data from the 1995, 2000/01, 2006, and 2011 UDHS data to examine the predisposing and enabling predictors of the timing of antenatal care visits among unmarried compared to married youth aged 15-24 years in Uganda.

Methods

Data source

Secondary analysis of the pooled 1995, 2000/01, 2006, and 2011 Uganda Demographic and Health Survey (UDHS) data was done. This UDHS data was retrieved with permission from MEASURE DHS (dhsprogram.com). These surveys were majorly implemented by Uganda Bureau of Statistics (UBOS) with technical support from Macro International, ICF Macro, ICF incorporation, Ministry of Health, and Makerere University. The four surveys were population-based household surveys that used two stage sampling where clusters (Enumeration Areas) and households from each cluster were randomly selected.

The Uganda Demographic and Health Surveys (UDHSs) collect data on socio-economic and demographic characteristics of women, and their use and timing of maternal health services. The pooled sample was among 31,521 women aged 15-49 years of whom 18,456 of them had had a birth within the last five years before each survey. A total of 6,018 (weighted cases) female youth aged 15-24 years, each one of whom had given birth in the preceding five years before each survey were selected. Five hundred eighty-one (581) of them were unmarried and 5,437 were married youth. The multivariate analysis was among 485 unmarried and 5,228 married youth due to exclusion of missing cases prior to running the multilevel analysis in
Measures of the outcome variable

Antenatal care is measured by two variables; the number of visits and the timing of the first ANC visit. This data was captured from women who sought ANC during the last pregnancy in the last five years before the survey. Women were asked if they had ANC for their last pregnancy. Those who consulted a trained health provider for ANC were asked how many times they did receive antenatal care during that pregnancy. They were also asked how many months pregnant they were, the first time they received ANC for that pregnancy. World Health Organisation (WHO) recommends that pregnant women in resource poor countries attend ANC at least four times, and the first visit should be in the first three months of the pregnancy, to identify pregnancy related problems and mitigate them (WHO, 2006). For this study, a binary outcome was constructed for timing of antenatal care; youth who initiated ANC visits in the first three months of the pregnancy were coded as one ‘1’, while those who never attended or started after the three months were coded as zero ‘0’. The number of ANC visits was treated as a continuous variable and ranged from zero for those who did not have any ANC visit to 20 ANC visits.

Measures of predictor variables

Based on the Anderson behavioural model of access to medical care, previous empirical literature, and their availability in the Uganda Demographic and Health Survey data, predisposing and enabling factors were included in the analysis. These include individual, husband, and district level predisposing and enabling factors relating to demographic and socio-economic factors, and include:
Predisposing factors: age of the youth (15-19 and 20-24 years), parity (1. One, 2. Two and above), pregnancy desire (1. Wanted to get pregnant then, 2. Did not want to get pregnant or wanted to get pregnant later), education level (1. No education and primary education, 2. Secondary and above) and religion (1. Catholics, 2. Protestants, 3. Other religions).

Enabling factors: wealth index (1. Poorest, 2. Poorer, 3. Middle, 4. Richer, 5. Richest), woman’s occupation (1. Not working, 2. Professionals, 3. Agriculture, 4. Labourers), region (1. Central, 2. East, 3. North, 4. West) and place of residence (1. Rural, 2. Urban), frequency of access to radio (1. No access, 2. Less frequent access, 3. More frequent access), television (TV) access (1. No access, 2. Less frequent access, 3. More frequent access), and reading newspapers (1. No access, 2. Less frequent access, 3. More frequent access). Contextual district level factors of education level, wealth level and mass media access were developed from the available related population level variables in the datasets using aggregation method. Contextual variables were categorised into low, middle and high levels.

Statistical analysis

Frequency distributions to show the characteristics of the respondents and the levels of the use of antenatal care were done. For timing of antenatal care, cross tabulations to show the relationship between each predisposing and enabling variable with the timing of the first ANC visit was done. The probability level for statistical significance using p-values was set at p<0.05.

Two-level logistic regression models with district as the second level were done to find individual and district level factors for timing of antenatal care among unmarried compared to married youth in Uganda. This is because UDHS data is hierarchical, since UDHS follows a multistage sampling procedure. This approach assumes that youth in the same district may have similar characteristics and access similar resources, therefore, may have equal chances of use.
of antenatal care services (66, 67). Results are presented in terms of adjusted odds ratios, reporting 95% confidence interval. The level of statistical significance using p-values was set at p<0.05. The multilevel logistic regression equation takes the form:

\[
\text{Logit} \Pi_{ij} = \log \left[ \frac{\Pi_{ij}}{1 - \Pi_{ij}} \right] = \beta_0 + \beta X_{ij} + u_{ij}
\]

Where \( \Pi_{ij} \) is the probability of youth \( i \) in the \( j \)th district accessing ANC in the first trimester. \( \beta_0 \) is the regression intercept, \( X_{ij} \) are vectors of individual or district level covariates; \( \beta \) is the associated vector of estimated parameter estimates and is shared by all districts.

For the analysis of number of antenatal care visits, analysis of variance was done to show the differences in the mean number of antenatal care visits. Since the number of ANC visits is a continuous variable with ANC numbers ranging from zero to twenty and the predictor variables are categorical, multilevel linear regression was used to find factors for ANC numbers among the unmarried and married female youth. Several linearity assumptions were carried out and it was observed that the number of ANC visits did not violate the most crucial assumptions of normal distribution of either residuals or linearity between variables and homoscedasticity (results not presented). Some outliers were identified but these do not affect the outcome although they may make the model unstable. The multilevel linear regression equation takes the form below:

\[
y_{ij} = \beta_0 + \beta_x x_{ij} + u_{ij} + \varepsilon_{ij}
\]

Where \( y_{ij} \) is the multilevel regression model for the number of ANC visits for person \( i \) in district \( j \), \( \beta_0 \) is the regression intercept, \( x_{ij} \) are vectors of the individual or district level characteristics. \( \beta_{ij} \) is the vectors of estimated parameter coefficients, and is shared by all
districts, while the random effect $u_{ij}$ is specific to district j and $\varepsilon_{ij}$ is the error term at individual and district levels.

Quasi-Likelihood estimation methods were relied on for the multilevel estimation procedure for discrete data. Initially, the first-order Marginal Quasi-Likelihood (MQL) estimates were fitted. The second-order Predictive/ Penalised Quasi-Likelihood (PQL) approximate estimation procedure was fitted and only results of the second order are presented. This is because the second order PQL estimates are a considerable improvement, especially for the level 2 standard deviation, and the fixed parameter estimates have been found to be less biased (66, 68).

The effects of individual-level and district-level determinants for the use of ANC in the first trimester and the mean number of ANC visits were reported in terms of odds ratios and estimates respectively, whereas the measures of district variation in the use of ANC (random effects) are represented by the intra-district correlation coefficient (IDC) and variance partition coefficients (VPC). The Intra-district correlation shows the proportion of the total unexplained variation in the outcome that is attributable to district level factors (67, 69). It is a measure of the degree of dependency or similarity or homogeneity of individuals in the same district (70).

**Research Ethics statement**

With DHS, informed consent was thought from all participants before each interview. ICF institutional review board and a Uganda institutional review board approved the UDHS questionnaires. ICF IRB ensured that the survey complies with the U.S. Department of Health and Human Services regulations for the protection of human subjects, while the host country IRB ensured that the survey complies with laws and norms of the nation. Privacy, anonymity, and confidentiality were ensured during the interviews, data storage and analysis. No approval for using UDHS data was required since UDHS is a secondary data source and is available in the public domain. However, to access the data, we sought permission from MEASURE DHS.
Results

Descriptive characteristics of the respondents

Table one shows that more than half of the unmarried respondents lived in rural areas (72.2%), were aged 20-24 years (58.8%), had attained primary education (47.4%), and a higher proportion were Catholics (38.2%). Most married youth just like unmarried youth were aged 20-24 (76.5%), lived in rural areas (86%), had no or primary education (84%), and were Catholics (42%). The main source of information for both was the radio (48% unmarried compared to 46% among married youth) and most were engaged in agriculture (43% for unmarried Vs 59% married youth). However, most married youth wanted the pregnancy at that time (59.8%), and a bigger proportion had had two or more births (63.8%); compared to the unmarried who mostly wanted the pregnancy later (78%) and most had had one birth (84%).

Cross tabulations show that the significant difference in ANC timing was observed only in terms of education level among unmarried youth; no significant difference was observed by other predisposing and enabling factors. While among married youth, significant differences in the timing of antenatal care were observed by parity, region, education level, religion, wealth index, and occupation type, access to the radio, newspapers and television, and the husband’s education level and his occupation (Table 1).

The mean number of ANC visits significantly varied by pregnancy desire, parity, education level, place of residence, region, occupation, access to newspapers and radio among unmarried youth while it varied by parity, education level, religion, residence, region, wealth index, occupation, access to newspapers, radio and television, age of husband, his education level and his occupation. No differences in mean ANC visits were seen by age for both groups.
Table 1: Distribution of respondents by background characteristics

| Variable                              | Unmarried youth | Married youth | p-value | Married youth | p-value |
|---------------------------------------|-----------------|---------------|---------|---------------|---------|
|                                      | Yes, first trimester visit | Total youth |         | Yes, first trimester visit | Total youth |         |
| Age                                   | 16.1 (40)       | 249           | 17.3 (221) | 1,275         | 18.5 (769) | 4,161 |
| 15-19                                 |                 |               |          |               |          |
| 20-24                                 | 16.3 (54)       | 332           | 18.5 (769) | 4,161         | 18.5 (769) | 4,161 |
| Pregnancy wanted                      | p = 0.188       |               | p = 0.007* |               |         |
| Then                                  | 12.8 (19)       | 149           | 19.2 (668) | 3,480         |         |
| Later or not anymore                  | 17.4 (75)       | 432           | 16.3 (319) | 1,957         |         |
| Birth order/Parity                    | p = 0.728       |               | p = 0.001* |               |         |
| One                                   | 16.1 (76)       | 473           | 20.5 (406) | 1,980         |         |
| Two or more                           | 17.4 (19)       | 108           | 17.4 (585) | 3,437         |         |
| Total                                 | 581             |               |          | 5,437         |         |
| Education level                       | p = 0.021*      |               | p = 0.000* |               |         |
| No education or Primary Education     | 17.8 (61)       | 342           | 17.2 (782) | 4,544         |         |
| Secondary                             | 13.9 (33)       | 239           | 23.2 (207) | 893           |         |
| Religion                              | p = 0.652       |               | p = 0.000* |               |         |
| Catholic                              | 17.6 (40)       | 227           | 19.8 (448) | 2,261         |         |
| Protestant                            | 16.0 (37)       | 231           | 16.0 (283) | 1,850         |         |
| Others                                | 13.8 (17)       | 123           | 13.8 (259) | 1,327         |         |
| Type of Residence                     | p = 0.847       |               | p = 0.092  |               |         |
| Urban                                 | 15.7 (24)       | 153           | 20.4 (159) | 780           |         |
| Rural                                 | 16.4 (70)       | 428           | 17.9 (832) | 4,657         |         |
| Region                                | p = 0.901       |               | p = 0.000* |               |         |
| Central                               | 16.4 (39)       | 238           | 21.5 (326) | 1,512         |         |
| Eastern                               | 14.2 (17)       | 112           | 11.4 (184) | 1,617         |         |
| Northern                              | 16.0 (12)       | 75            | 21.7 (230) | 1,061         |         |
| Western                               | 17.6 (26)       | 148           | 20.1 (251) | 1,247         |         |
| Wealth index                          | p = 0.935       |               | p = 0.000* |               |         |
| Poorest                               | 18.2 (12)       | 66            | 19.4 (166) | 857           |         |
| Poorer                                | 19.4 (13)       | 67            | 18.0 (148) | 822           |         |
| Middle                                | 13.9 (12)       | 79            | 17.7 (122) | 690           |         |
| Richer                                | 15.5 (14)       | 89            | 23.2 (149) | 642           |         |
| Richest                               | 18.4 (30)       | 163           | 19.8 (177) | 896           |         |
| Woman’s Occupation                    | p = 0.084       |               | p = 0.002* |               |         |
| Not working                           | 15.3 (27)       | 177           | 18.6 (267) | 1,435         |         |
| Professionals                         | 18.4 (23)       | 125           | 23.6 (147) | 625           |         |
| Agriculture                           | 15.6 (39)       | 249           | 17.0 (543) | 3,202         |         |
| Labourers                             | 16.2 (5)        | 30            | 18.2 (32)  | 176           |         |
| Frequency1 of reading newspapers      | p = 0.420       |               | p = 0.016* |               |         |
| Not at all                            | 16.0 (46)       | 287           | 18.7 (616) | 3,292         |         |
| Less frequent                         | 20.9 (32)       | 153           | 23.1 (128) | 553           |         |

1 Not at all- No access to any, Less frequent- once or less than once; More frequent- Almost daily access
| Variable                       | Unmarried youth | Married youth | Total youth | Married youth |
|--------------------------------|-----------------|---------------|-------------|---------------|
|                                | Yes, first trimester visit | Total youth | Yes, first trimester visit | Total youth |
| More frequent                  | 15.4(4)         | 25            | 27.0(17)    | 63            |
| Frequency of listening to the radio | $P=0.853$          |               | $P=0.000^*$ |               |
| Not at all                     | 14.8(23)        | 155           | 14.1(271)   | 1,920         |
| Less frequent                  | 17.1(25)        | 146           | 17.6(183)   | 1,038         |
| More frequent                  | 16.4(46)        | 280           | 21.7(537)   | 2,479         |
| Frequency of watching TV       | $P=0.208$       |               | $P=0.000^*$ |               |
| Not at all                     | 15.7(68)        | 433           | 17.3(831)   | 4,802         |
| Less frequent                  | 22.2(18)        | 81            | 23.1(84)    | 364           |
| More frequent                  | 11.9(8)         | 67            | 27.7(75)    | 271           |
| Husband’s age                  |                 |               |             |               |
| 15-24                          |                 |               |             |               |
| 25-29                          |                 |               |             |               |
| 30+                            |                 |               |             |               |
| Husband’s Education level-     |                 |               |             |               |
| No education                   |                 |               |             |               |
| Primary Education              |                 |               |             |               |
| Secondary                      |                 |               |             |               |
| Husband’s Occupation           |                 |               |             |               |
| Not working                    |                 |               |             |               |
| Professionals                  |                 |               |             |               |
| Agriculture                    |                 |               |             |               |
| Labourers                      |                 |               |             |               |
| Total                          | 581             |               |             | 5,437         |

Levels and trends in the timing of antenatal care among unmarried youth in Uganda, 1995-2011

Almost all youth who had birth in the last five years before each survey had some antenatal care (93% among unmarried and 95% among married) though very low proportions had antenatal care within the first three months (16% for unmarried & 18% for married). Almost half of both unmarried and married youth had at least four ANC visits (47%) (Table 2).
Table 2: Distribution of ANC use among unmarried youth between 1995 and 2011

| Parameter                  | Unmarried Youth | Percentage | Married youth | Percentage |
|----------------------------|-----------------|------------|---------------|------------|
| ANC use                    |                 |            |               |            |
| No ANC                     | 41              | 7.0        | 259           | 4.8        |
| Some ANC                   | 540             | 93.0       | 5,578         | 95.2       |
| **Timing of first ANC** (Dichotomous)* |                 |            |               |            |
| First Trimester            | 94              | 16.2       | 991           | 18.3       |
| Never had or Second or third Trimester | 487            | 83.8       | 4,446         | 81.7       |
| **Number of ANC visits**   |                 |            |               |            |
| No ANC visit               | 41              | 7.0        | 259           | 4.8        |
| 1-3                        | 269             | 46.4       | 2,644         | 48.6       |
| 4+                         | 271             | 46.6       | 2,534         | 46.6       |
| Total                      | 581             |            | 5,437         |            |

**Trends in the use of antenatal care among unmarried compared to married youth aged 15-24 years in Uganda between 1995-2011**

The levels of the use of ANC in the first trimester were low but increased over the years (Table 3). It increased from 13 percent to 21 percent between 1995 and 2011; a total percentage increase of 7.8% among unmarried youth. It increased by 9% from 16% to 25% among married youth. This increment was not significant among unmarried youth (p=0.454) but was significant among married youth (P= 0.007). Almost half of the youth had at least four ANC visits across the survey years and this was significantly different at p= 0.012 and p= 0.000 for unmarried and married youth respectively.
Table 3: Trends in the use of antenatal care among unmarried compared to married youth aged 15-24 years in Uganda between 1995-2011

| ANC timing per survey year | Unmarried Youth | Had ANC in the first trimester | Married youth | Had ANC in the first trimester |
|---------------------------|----------------|-------------------------------|---------------|-------------------------------|
|                           | p=0.454        |                               | p=0.007*      |
| 1995                      | 117            | 13.1(15)                      | 1.530         | 16.1(246)                     |
| 2000/01                   | 124            | 16.8(24)                      | 1.367         | 16.7(228)                     |
| 2006                      | 171            | 17.2(29)                      | 1.313         | 19.4(255)                     |
| 2011                      | 169            | 20.9(35)                      | 1.227         | 25.2(309)                     |
| Percent having at least four ANC visits | p=0.012* |                               | p=0.000*      |
| 1995                      | 117            | 45.2(53)                      | 1.530         | 49.0(750)                     |
| 2000/01                   | 124            | 51.9(64)                      | 1.367         | 46.8(640)                     |
| 2006                      | 171            | 50.6(87)                      | 1.313         | 47.8(628)                     |
| 2011                      | 169            | 46.7(79)                      | 1.227         | 51.2(628)                     |
| Total                     | 581            | 5,437                         |               |                               |

*Significant at 95% confidence interval

Predictors of antenatal care use among unmarried compared to married youth in Uganda

With multivariate analysis, the variables were introduced successively into the model to show potential pathways of the factors influencing timing of antenatal care. The first model (model 0) has no covariates, the second model (model 1) controlled for predisposing variables and model three controlled for predisposing and enabling variables. For married youth, we ran a fourth model controlling for husband factors. A model controlling for district level factors was not ran because the variance partition component (VPC) among unmarried youth was zero, thus for uniformity, this was not run among married youth too.

Predictors of the timing of antenatal care among unmarried youth in Uganda

Model 1 controlled for predisposing factors and it is observed that no predisposing variable had a significant relationship with the use of ANC in the first trimester. However, controlling for predisposing factors increased the impact of year of survey. There were increased odds of
having an ANC visit in the first trimester in the year 2011 compared to 1995 (OR=2.00, 95\% CI=1.01-3.97).

When enabling factors are controlled for (Model 2), no enabling factor showed any significant influence on timing of antenatal care among unmarried youth. However, education level (predisposing factor) becomes significant and is negatively associated with the use of ANC in the first trimester. It is observed that the odds of using ANC in the first trimester were reduced with having a secondary education level. Unmarried youth who had at least a secondary level of education were 44 percent less likely to attend ANC in the first trimester compared to those with no education or primary level education only (OR=0.56, 95\%CI= 0.31-0.98). There is no evidence that other predisposing factors or enabling factors play a significant role in influencing the timing of antenatal care, except for education level (Table 4). Controlling for enabling factors reduced the impact of year of survey. The significance of use in the year 2011 was reduced and there was no longer a significant difference in unmarried youth having an ANC visit between 2011 compared to unmarried youth in 1995.

As observed from the variance components model (that is, the empty model) in table 4, variation in timing of antenatal care among unmarried youth was only at the individual level. There were no district-level variations as indicated by zero random variance in timing of ANC in the first trimester across districts. In addition, the variance partition coefficient (VPC) and the intra-district correlation (IDC) is zero in all the models. Thus, the total unexplained variation in having an ANC visit in the first three months among unmarried youth could be attributed to unobservable individual–level factors. The zero IDC indicates that unmarried youth in each district have no similarity.

**Table 4: Adjusted odds of first trimester antenatal timing among unmarried youth from Multilevel Logistic Regression Model (confidence intervals in brackets)**
| Variable                      | Estimate | Odds Ratio (95% CI) | Odds Ratio (95% CI) |
|-------------------------------|----------|---------------------|---------------------|
|                               | Model 0  | Model 1             | Model 2             |
| Year of survey (1995)         |          |                     |                     |
| 2000/01                       | 1.59 (0.77-3.26) | 1.65(0.80-3.42)    | 0.77 (0.40-1.49)   |
| 2006                          | 1.80 (0.91-3.53) | 1.93(0.97-3.84)    | 0.91(0.52-1.59)    |
| 2011                          | 1.87(0.96-3.64)  | 2.00(1.01-3.97)*   | 1.00 (1.00-1.00)   |
| Predisposing factors          |          |                     |                     |
| Age (15-19)                   |          |                     |                     |
| 20-24                         |          | 1.24(0.78-1.99)     | 1.32(0.77-2.24)    |
| Education (No education or primary education) |          |                     |                     |
| Secondary+                    | 0.78(0.49-1.23) | 0.56(0.31-0.98)*   |                     |
| Random Variance (SE)          | 0.000(0.000) | 0.000(0.000)       | 0.000(0.000)       |
| IDC                           | 0        | 0                   | 0                   |
| VPC=IDC*100                   | 0        | 0                   | 0                   |

VPC=Variance Partition Coefficient, IDC=intra-district correlation, *Level of significance at 5% level p<0.05, Reference categories are in brackets after the names of the characteristic being considered, Sample size at level 1 (Individual)=485, level 2 (District) =54
Model 0- No covariates controlled for except year of survey
Model 1- Controlling for predisposing factors
Model 2- Controlling predisposing and enabling factors

Predictors of the timing of antenatal care among married youth in Uganda

Model 1 (Table 5) controlled for predisposing factors and it is observed that the use of ANC in the first trimester was associated with higher parity, higher education level and protestant religion membership among married youth. With parity, married youth who were pregnant at least twice were 21 percent less likely to have their first ANC visit in the first trimester compared to married youth who were pregnant for the first time. Married youth with at least secondary education were 30 percent more likely to attend ANC in the first trimester than those who had no education or had primary education (OR=1.30, 95%CI=1.08-1.57). This is different from what was found among unmarried youth where higher levels of education were related with lower odds of having an ANC visit in the first trimester (OR=0.56, 95%CI=0.31-0.98). Use of ANC in the first trimester was also significantly associated with religion among married youth. Protestants had 20 percent reduced odds (OR=0.80, 95%CI=0.72-0.95) of
having an ANC in the first trimester compared to their catholic counterparts. Parity and religion were not observed as an influence on timing of ANC among unmarried youth. Age and desire to have a child had no influence on ANC timing among both groups.

Model 2 (Table 5) controlled for enabling factors and among married youth, region and media exposure were observed to be associated with ANC visits in the first trimester. Among unmarried youth, no enabling variable was significantly related to ANC use in the first trimester. Married youth in the eastern region were 40 percent (OR=0.60, 95%CI=0.40-0.89) less likely to have their first ANC visit in the first trimester compared to those in central region. More frequent access to radio was associated with 40 percent (OR=1.40, 95%CI=1.11-1.76) higher chances of ANC visit in the first trimester compared to married youth who had no access to radio. Married youth with more frequent access (almost daily) to television were 57% (OR=1.57, 95%CI=1.11-2.22) more likely to have their first ANC visit within the first trimester than those who did not have access to the television.

Controlling for enabling factors reduced the impact of year of survey. There were reduced odds of having an ANC visit in the first trimester in the year 2000/01 (OR=0.72, 95%CI=0.57-0.90) and 2006 (OR=0.79, CI=0.64-0.97) compared to 1995. The significance of early use in the year 2011 was reduced and there was no longer a significant difference in married youths having an ANC visit between 2011 compared to married youths in 1995.

Among married youth, the final model (model 4) controlled for husband factors of age, education and occupation. Education was the only husband variable that significantly influenced the use of ANC in the first trimester and the pattern is as expected. The odds of married youth having an ANC visit in the first trimester were 68 percent higher (OR=1.68, 95%CI=1.20-2.35) for youth with husbands with secondary education compared to married youth with husbands with no education. Controlling for partner factors considerably reduced
the estimate for year of survey such that year of survey was no longer significant among married youths in having an ANC visit in the first trimester.

For married youth, the results in Table 4 indicate that most of the variations in ANC visit in the first trimester occurred at the individual level. However, some variations at the district level were observed as indicated by the significant random variance in reporting of having ANC in the first three months across districts. As shown by the variance partition coefficient (VPC), the ICC was estimated at about 3.3-7.5%, even after controlling for predisposing and enabling factors. Thus, about 3% of the total unexplained variation in the use of ANC in the first trimester could be attributed to unobserved district-level effects with the remaining unexplained variation attributable to individual–level factors.

**Determinants of numbers of antenatal care among unmarried youth in Uganda**

Table 5 presents the factors for the mean number of antenatal care visits among unmarried youth. Model one controlled for individual predisposing factors. Results show higher mean ANC numbers with higher education levels. Unmarried youth with at least secondary level education had 0.7 more ANC visits (Estimate= 0.720, SE=0.214) compared to those with no education or primary level education. Unmarried youth of other religions had 0.5 fewer ANC visits (Estimate= -0.509, SE= 0.261) compared to their catholic counterparts. There is no evidence of other predisposing factors having an influence on the mean number of ANC visits.

The final model among unmarried youth (model 2) controlled for predisposing and enabling factors and it can be seen from Table 5 that the mean number of ANC visits was significantly related to region, wealth index and access to radio. Unmarried youth who lived in western Uganda had 0.7 fewer ANC visits (Estimate= -0.662, SE=0.333) than the unmarried youth in central Uganda. Unmarried youth in middle income households had almost one (0.9) more mean ANC visits (Estimate= 0.889, SE=0.424) compared to those in the poorest households.
In addition, those who listened to the radio almost daily had 0.6 more ANC visits compared to youth who did not have any access to the radio at all. Controlling for predisposing factors in model two reduced the significant impact of religion and education of unmarried youth on ANC frequency. Unmarried youth of other religions are no longer significantly different from Catholics. The estimates for education also reduced considerably that at least secondary level education was no longer significantly associated with the number of ANC visits for unmarried youth.

The results for the intercept model and model one in table 5 show that most of the variation in the mean number of ANC visits was at an individual-level and the variation at district level was not significant, as indicated by the non-significant district level variance. Model three shows that the variation in the number of ANC visits was at an individual level. The variance partition component for the final model was estimated at zero, thus the unexplained variation in the number of ANC visits among unmarried youth is explained by individual-level factors.

Table 5: Multilevel Linear Regression parameter estimates of the number of ANC visits among unmarried youth (standard errors given in brackets)

| Variable                      | Model 0             | Model 1             | Model 2             |
|-------------------------------|---------------------|---------------------|---------------------|
| Year of survey (1995)         |                     |                     |                     |
| 2000/01                       | 0.617(0.308)*       | 0.5843(0.306)*      | 1.018(0.294)*       |
| 2006                          | 0.478(0.293)        | 0.3917(0.294)       | 0.505(0.255)*       |
| 2011                          | 0.027(0.291)        | -0.057(0.293)       | 0.000(0.000)        |
| Predisposing factors          |                     |                     |                     |
| Age (15-19)                   |                     |                     |                     |
| 20-24                         | 0.2756(0.215)       | 0.284(0.239)        |                     |
| Parity (One)                  |                     |                     |                     |
| Two+                          | -0.1526(0.273)      | -0.290(0.317)       |                     |
| Education (No education or primary education) |                     |                     |                     |
| Secondary & above             | 0.720(0.214)*       | 0.211(0.260)        |                     |
| Religion (Catholic)           |                     |                     |                     |
| Protestant                    | -0.177(0.227)       | -0.068(0.254)       |                     |
Table 6 presents the results for factors impacting on ANC visits among married youth and these results differ somewhat from those of unmarried youth. Model 1 controlled for predisposing factors and some results differ for married youth compared to unmarried youth. Married youth with higher parity had 0.2 lower mean ANC visits (Estimate= -0.241, SE=0.070) than married youth who were pregnant for the first time. However, parity was not significant among unmarried youth. Education was similarly significantly related with mean ANC visits among married youth as among unmarried youth and the mean increase was almost the same (Estimate=0.720, SE=0.214 among unmarried compared to Estimate=0.705, SE=0.085 among married youth). Religion was not significant.
among married youth while among unmarried youth, being a follower of other religions was associated with lower mean ANC visits (Estimate=-0.510, SE=0.261).

Model two controlled for enabling factors and significant differences were seen among unmarried and married youth. Among married youth, more variables are significantly related with the mean number of ANC visits. Eastern and western regions had fewer mean ANC visits compared to married youth in the central region, whereas among the unmarried, it was only those in the western region that had lower mean ANC visits compared to unmarried youth in the central region. As expected, married youth in professional positions had higher mean ANC visits compared to non-working youth (estimate=0.282, SE=0.116). Labourers also had higher mean ANC visits (estimate=0.529, SE=0.188) compared to their non-working counterparts. Occupation of unmarried youth was found to have no significant influence on the number of ANC visits. Contrary to what I had expected, married youth in the richest households have lower mean ANC visits (estimate=-0.292, SE=0.131) compared to married youth in poorest households, while among the unmarried as observed in literature, youth in middle income households had higher mean ANC visits (estimate=0.889, SE=0.424) compared to unmarried youth in the poorest households.

Some access to newspapers also significantly influenced the number of ANC visits among married youth while this was not significant among unmarried youth. Married youth with access to newspapers at least once a week had 0.3 more mean ANC visits (estimate=0.262, SE=0.109) and those who had almost daily access to the newspaper had 0.6 more mean ANC visits (estimate=0.572, SE=0.265) compared to married youth who had no access to the newspapers at all. Almost daily access to the radio was also associated with higher mean ANC visits among married youth compared to those with no access to the radio (estimate=0.404, SE=0.093). The trend was comparable to what was observed among unmarried youth (estimate=0.635, SE=0.319). More frequent access to the television was also associated with
higher mean ANC visits among married youth but this was not observed to be associated with
ANC numbers among unmarried youth. Married youth with daily access to television had 0.4
more mean ANC visits (estimate=0.412, SE=0.160) than married youth with no access to
television.

Model three controlled for husband factors and it is seen from Table 6 that mean number of
ANC visits was associated with age and education level of the husband. Married youth with
husbands aged 30 years and above were able to attend on average 0.2 (estimate=0.194,
SE=0.098) more ANC visits compared to those with husbands aged 15-24 years. More so,
youth with husbands who had at least secondary level education had 0.5 more ANC visits
(estimate=0.480, SE=0.133) while those with primary level education had 0.3 more ANC visits
(estimate= 0.293, SE=0.123) compared to youth with husbands who had no formal education.
The results provided no evidence of association between the number of ANC visits and
husbands’ occupation.

The results observed in Table 6 suggest that most of the variation in mean number of ANC
visits was at the individual level. However, there was also some variation at the district level
as indicated by the significant random variance in the reporting of number of ANC visits across
districts. As shown by the variance partition coefficient (VPC), the IDC was estimated at about
2.2-5.5%, even after controlling for individual predisposing and enabling factors. Thus, a large
percentage of the total unexplained variation in number of ANC visits among married youth is
attributable to individual–level factors.

Table 6: Multilevel Linear Regression parameter estimates of the number of ANC visits
among married youth (standard errors given in brackets)

| Parameter          | Model 0 | Model 1 | Model 2 | Model 3 |
|--------------------|---------|---------|---------|---------|
| Year of survey     |         |         |         |         |
| (1995)             |         |         |         |         |
| Parameter                        | Model 0       | Model 1       | Model 2       | Model 3       |
|--------------------------------|---------------|---------------|---------------|---------------|
| 2000/01                         | 0.040(0.087)  | 0.030(0.086)  | 0.653(0.095)* | 0.694(0.339)* |
| 2006                            | -0.210(0.089)*| -0.245(0.089)*| 0.318(0.090)* | 0.371(0.339)  |
| 2011                            | -0.363(0.092)*| -0.472(0.093)*| 0.000(0.000)  | 0.000(0.000)  |
| **Predisposing factors**        |               |               |               |               |
| Age (15-19)                     |               |               |               |               |
| 20-24                           | 0.140(0.082)  | 0.051(0.093)  | 0.025(0.096)  |               |
| **Parity (One)**                |               |               |               |               |
| Two+                            | -0.241(0.072)*| -0.278(0.081)*| -0.290(0.081)*|               |
| Education (No education or primary education) |               |               |               |               |
| Secondary+                      | 0.705(0.085)* | 0.396(0.101)* | 0.314(0.103)* |               |
| **Region (Central)**            |               |               |               |               |
| East                            | -0.357(0.160)*| -0.407(0.159)*|               |               |
| North                           | 0.025(0.173)  | 0.025(0.172)  |               |               |
| West                            | -0.563(0.164)*|               | -0.580(0.163)*|               |
| **Enabling factors**            |               |               |               |               |
| Occupation (Not working)        |               |               |               |               |
| Professionals                   | 0.282(0.116)* | 0.245(0.116)* |               |               |
| Agriculture                     | -0.073(0.098) | -0.057(0.099) |               |               |
| Labourers                       | 0.529(0.188)* | 0.505(0.187)* |               |               |
| **Wealth Index (Poorest)**      |               |               |               |               |
| Poorer                          | 0.187(0.113)  | 0.161(0.113)  |               |               |
| Middle                          | 0.014(0.121)  | -0.023(0.121) |               |               |
| Richer                          | -0.124(0.131) | -0.170(0.131) |               |               |
| Richest                         | -0.291(0.131)*| -0.334(0.131)*|               |               |
| Newspapers (No access)         |               |               |               |               |
| Less frequent access            | 0.262(0.109)* | 0.219(0.109)* |               |               |
| More frequent access            | 0.572(0.262)* | 0.538(0.264)* |               |               |
| **Radio (No access)**           |               |               |               |               |
| Less frequent access            | 0.186(0.101)  | 0.160(0.101)  |               |               |
| More frequent access            | 0.404(0.093)* | 0.356(0.094)* |               |               |
| **Television (No access)**      |               |               |               |               |
| Less frequent access            | 0.116(0.123)  | 0.131(0.123)  |               |               |
| Parameter                                      | Model 0   | Model 1   | Model 2    | Model 3    |
|-----------------------------------------------|-----------|-----------|------------|------------|
| Parameter                                    | Model 0   | Model 1   | Model 2    | Model 3    |
| Model 0                                       |           |           |            |            |
| Model 1                                       |           |           |            |            |
| Model 2                                       |           |           |            |            |
| Model 3                                       |           |           |            |            |
| Model 0- No covariates controlled for         |           |           |            |            |
| Model 1- Controlling for predisposing factors |           |           |            |            |
| Model 2- Controlling for predisposing and enabling factors |           |           |            |            |
| Model 3- Controlling for predisposing, enabling and husband factors |           |           |            |            |
| Husband factors                               |           |           |            |            |
| Age of husband (15-24)                        |           |           |            |            |
| 25-29                                         |           |           |            |            |
| 30+                                           |           |           |            |            |
| Education level of husband (No Education)     |           |           |            |            |
| Primary Education                             |           |           |            |            |
| Secondary+                                    |           |           |            |            |
| Random variance(SE)                           | 0.242(0.063)* | 0.191(0.052)* | 0.0755(0.029)* | 0.073(0.028)* |
| IDC                                           | 0.046     | 0.055     | 0.022      | 0.022      |
| VPC=IDC*100                                   | 4.6       | 5.5       | 2.2        | 2.2        |

VPC=Variance Partition Coefficient, IDC=intra-district correlation, *Level of significance at 5% level \( p<0.05 \). Reference categories are in brackets after the names of the characteristic being considered. Sample size at level 1 (Individual)=3,788, level 2 (District) =56

Discussion of key findings for the use of antenatal care among unmarried compared to married youth in Uganda

The study aimed at understanding the predisposing and enabling factors associated with the timing and number of antenatal care visits among unmarried compared to unmarried youth aged 15-24 years in Uganda. Pooled data from the 1995, 2000/01, 2006 and 2011 Uganda Demographic and Health Surveys was analysed. This was among 581 unmarried and 5,437 married youth. Multilevel logistic regression models with district as the second level were done to show the predictors of timing of antenatal care among unmarried youth.

It was observed that there was an increase in early initiation of prenatal care from 13% to 20% and 16% to 25% among unmarried and married youth respectively. However, this is still low
but is consistent with the national level of 21 percent in 2011 and 29 percent in 2016 (8, 39).

Low levels of early start of ANC are also observed among sub-Saharan Africa countries such as Tanzania (24%) (71), Kenya (20%) (72), and Malawi (24%) (73). Low levels have also been reported in prior studies in Uganda (74, 75) and in Ethiopia (76). This could be because youth are accessing ANC from informal sources like Traditional Birth Attendants in Uganda (77) or because mothers had no pregnancy complications and take pregnancy as a normal life event (75, 78-80).

Compared to married youth, it was also observed that unmarried youth had lower proportions of initiating ANC in the first trimester across the years compared to married youth. Hueston (25) revealed that married youth were associated with early use of ANC than unmarried youth. Married youth might have an advantage of husband support and health systems which favour married women over the unmarried ones (81). Also, since most pregnancies among unmarried women are unwanted, they tend to hide the pregnancies due to fear of negative family and society reaction to their pregnancies until late stages (33, 42, 50, 51, 54). Some unmarried youth might also be planning an abortion in the early stages of the pregnancy before it is realised by others, therefore, they will not access ANC early (80). Therefore, societal and familial attitudes change to support unmarried youth will help them to disclose their pregnancies early and thus receive the support to seek ANC early.

Previous studies among youth have shown that higher woman’s education level was associated with greater odds of the use of antenatal care (25, 26, 29, 30, 40, 41, 47, 64). The current study also found that higher education levels were associated with greater odds of seeking ANC in the first trimester among married youth compared to those with no education or primary education and increased odds of frequent ANC use among unmarried and married youth. Women empowerment (64, 82-84), increased likelihood of communication with partners and family members regarding their health (85, 86), and higher levels of knowledge on the benefits...
of seeking maternal healthcare have been found to be the mediating factors for increased use
of ANC (82, 87-89). Contrarily, limited knowledge of the benefit of ANC use was associated
with delayed or non-use of ANC among adolescents in Bulawayo, Zimbabwe (50). In this
analysis, the impact of education on the number of ANC visits ceased to be significant among
unmarried youth after controlling for predisposing factors, thus the impact of education could
be explained by wealth index and access to health information through the mass media among
unmarried youth.

However, education level although being the only significant predictor of early ANC among
unmarried youth, this was contradictory to what has been found in the literature. At least
secondary level education was associated with reduced odds of the use of ANC in the first
trimester compared to unmarried youth with no education or primary education. Previous
studies found that higher education levels were associated with greater odds of seeking ANC
in the first trimester among youth compared to those with no or primary education (25, 26, 29,
30, 40, 41, 47, 64). Stigmatisation of unmarried pregnancies in Uganda might make unmarried
youth to hide the pregnancies until the later stages (90). Also, since most of the youth in this
age range are still in school, they could have continued with school as much as possible, a
situation that competes for time for antenatal care (Ehlers et al., 2000).

Prior studies have found higher parity to be associated with fewer ANC visits and late start of
ANC (25, 31, 40, 41, 44). In this study, married youth of higher parity were less likely to start
ANC in the first trimester and more likely to have fewer ANC visits compared to married youth
of parity one but not among unmarried youth. High parity was found to be associated with
reduced excitement (91, 92), increased child care responsibilities for older children (15, 93),
limited resources in a family due to large family size (15) which reduce the chances to use
ANC. Youth with higher parity should hence be supported to solve the barriers that hinder them
from accessing ANC. Community outreach programmes may help bring the ANC services closer to the youth.

Research has shown that the level of education attained by the husband has an influence on married youth use of ANC services (26, 30, 47-49). Attainment of a secondary or even higher level of education by the husband was associated with increased chances of having both the first ANC visit in the first trimester and frequent ANC visits thereafter in this study. Studies have shown that higher education level is generally related with a greater amount of knowledge on the benefit of using ANC (82, 87) which could be the case for husbands with a higher education level, who then support their wives in seeking ANC both early and frequently.

Another husband factor that was significantly related to the number of antenatal care visits was the age of the husband. Youth who had husbands who were at least thirty years old were more likely to have higher ANC visits than those who had husbands aged 15-24 years. This points to the level of support older husbands offer to their wives as men are, in most cases, the financial controllers in the homes (94-96). Thus, with the financial support from husbands, married youth can afford to frequently go to the health facilities for antenatal care.

Similar to findings elsewhere (26, 27, 30), among unmarried youth, middle wealth index was associated with more ANC visits compared to those classified as the poorest unmarried youth. This might be because youth in middle wealth households could afford both direct and indirect costs to access antenatal care frequently (76). Unmarried youth in richer and richest households were not significantly different from unmarried youth in poorest households. However, married youth in the richest wealth index were associated with infrequent ANC visits compared to the poorest married women. This could be explained by the availability of alternative care during pregnancy, especially from traditional birth attendants and older women in the extended family
in Uganda (77). The joint decision from husbands and mothers-in-law has also been unfavourable to use of ANC by married women elsewhere (15, 82, 97).

Prior studies have found regional differences in the use of antenatal care elsewhere (26, 27, 47, 48). The current study found that youth in the central region were more likely to use ANC than those in other regions. The advantage that the central region has over other regions is its proximity to Kampala city, which is well served by social and health amenities including over 90 percent of all private health facilities, as well as the national referral hospital (MOH, 2013, 2016b). The short distances to health centres in Central region ease the use of ANC (42, 51, 54, 98-100).

Exposure to health information has been found to have a positive impact on ANC use among youth (26, 29, 32, 45, 47, 48, 64, 101). Our findings are in agreement with other studies as daily access to the radio and television and daily access to radio and newspapers were associated with early start and frequent use of antenatal care among married youth. Daily access to the radio was also associated with frequent ANC use among unmarried youth. Access to media is associated with increased knowledge about the benefit of using maternal health services which compels youth to better use antenatal care (15, 43, 50, 102). This study also helped identify the radio is a main source of information for the youth in Uganda since a large proportion of the population in Uganda has greater access to the radio as the main source of information (55.2%) compared to the television (7.2%) and newspapers (2.1%) (103).

Other predisposing and enabling factors that were controlled for in this analysis included age of the youth, pregnancy desire, region, religion but these had no significant influence on the use of antenatal care.

**Limitations of the study**
Uganda Demographic and Health surveys (UDHS) collect data from women for births in the last five years before the date of the study which may lead to inaccuracies due to memory lapse. The inattention given to some important variables that influence the use of maternal health services is a limitation common in secondary data analysis. The cross-sectional nature of data from UDHS is that, we are not able to establish the time sequencing of events of interest that is antenatal care use and socio-economic factors that is antenatal care use is asked for a birth in the last five years while socio-economic factors are as of the time of the interview. However, the UDHS remains one of the most robust data sets in understanding ANC use. Thus, this study increases knowledge about the predictors of ANC among unmarried and married youth in Uganda.

**Conclusion**

The results indicate that youth in Uganda have few ANC visits and very small proportions of less than 25 percent start ANC visits in the first trimester in Uganda. Lower proportions also had the minimum of four ANC visits. This is far below the WHO recommendation for universal use within the first three months of the pregnancy. The poor ANC use has an impact on the pregnancy outcomes, and the health and mortality of both the youth and their infants. Efforts should be geared towards improvements in the knowledge of the benefit of using ANC to encourage them to seek ANC early and more frequently. Policies aimed at removing barriers that delay or stop youth from seeking ANC frequently should also be formulated and implemented.

Education predicted the use of ANC in the first trimester among unmarried and married youth. Education was the only factor significantly associated with the use of ANC in the first trimester among unmarried youth. While high levels of education were associated with higher chances of using ANC in the first trimester among married youth, it was associated with late start of
ANC among unmarried youth. High parity, protestant membership and residence in the eastern Uganda were associated with late start of ANC while access to radio and television, and higher partner education were associated with early use of ANC in the first trimester among married youth.

Among unmarried and married youth, higher educational attainment and greater access to radio were associated with frequent ANC use. Although having a middle wealth index was associated with more ANC visits among unmarried youth, married youth in highest wealth quintile households were associated with infrequent ANC visits. Unmarried and married youth living in western Uganda had fewer ANC visits compared to those living in the central region. Additionally, married youth residing in the eastern region were associated with lower ANC visits among married youth, but this did not apply to unmarried youth. Membership of other religions was associated with lower ANC visits among unmarried youth compared to Catholics but not among married youth. More access to newspapers and higher levels of the husband’s education level were associated with more ANC visits among married youth only.

Overall, the multilevel results show no variation in ANC use among unmarried youth at district level. Therefore, individual predisposing and enabling factors explain the timing and frequency of ANC visits among unmarried youth. Thus, policy makers need to focus on factors at the individual level to improve ANC use among unmarried youth. More so, few variations were observed in terms of the individual factors, especially with the use of ANC in the first trimester among unmarried youth where only secondary education was associated with reduced odds of using ANC in the first trimester. Therefore, unmarried youth should be targeted as a whole to improve their ANC use in Uganda. Radio was also identified as the main source of ANC information among youth since it is widely available.

Declarations
Consent to publish

All authors (PA & CM) agreed that the article be published

Conflict of interest

The authors declare no conflict of interest

Availability of Data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Authors’ contributions

PA conceived of the study, acquired the data, determined the design and performed the statistical analysis. All authors interpreted the data and drafted the manuscript. All authors read and approved the final manuscript.

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