



SCHOOL OF STATISTICS AND PLANNING
**DETERMINANTS OF ADEQUATE ANTENATAL CARE UTILIZATION (FOUR OR
MORE VISITS) AMONG WOMEN IN UGANDA**

BABIRYE PEACE

**A DISSERTATION SUBMITTED TO THE SCHOOL OF STATISTICS AND PLAN-
NING IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD
OF THE DEGREE OF BACHELOR OF STATISTICS OF MAKERERE UNIVERSITY**

JULY 2026

DECLARATION

I, **BABIRYE PEACE**, hereby declare that this dissertation is my original work and has not previously been submitted for the award of any degree or any other academic qualification in any university or institution of higher learning.

Signed.....



Date:.....

8th/07/26

BABIRYE PEACE

23/U/0347

APPROVAL

This dissertation has been submitted with my approval.

Signature:  Date: 08.07.2020

DR. WANDIEMBE SYMON

Lecturer, Department of Statistical methods and Actuarial Science

School of Statistics and Planning

DEDICATION

This dissertation is dedicated to my parents for their love, encouragement, and unwavering support throughout my academic journey.

ACKNOWLEDGEMENTS

I would like to express my sincere gratitude to Almighty God for granting me life, strength, wisdom, and good health throughout the course of my studies and during the completion of this dissertation.

My heartfelt appreciation goes to my supervisor for the invaluable guidance, constructive criticism, patience, and continuous support throughout this research. Their advice and encouragement greatly contributed to the successful completion of this study.

I am deeply grateful to my parents for their unwavering love, sacrifices, encouragement, financial support, and belief in my abilities throughout my academic journey. Their constant support has been my greatest source of motivation.

I also extend my appreciation to the lecturers in the Department of Statistics at Makerere University for the knowledge and skills they imparted during my studies. My sincere thanks go to my classmates and friends for their encouragement, cooperation, and moral support.

Finally, I acknowledge the Uganda Bureau of Statistics and ICF for making the Uganda Demographic and Health Survey 2022 data available, which made this study possible.

ABSTRACT

This study examined the determinants of adequate ANC utilization, defined as attending four or more ANC visits, among women in Uganda using data from UDHS 2022. Although antenatal care coverage in Uganda is nearly universal at initiation, completion of the recommended number of visits remains a public health concern. The study aimed to identify the socioeconomic, demographic, and regional factors associated with adequate ANC utilization.

A cross-sectional study design was used based on secondary data from 7,513 women aged 15–49 years who had a live birth within two years preceding the survey. Data were analyzed using STATA version 15. Descriptive statistics, Chi-square tests, and binary logistic regression were employed to examine associations between ANC utilization and selected explanatory variables.

Results showed that 72.6% of women completed at least four ANC visits. Bivariate analysis revealed significant associations between ANC utilization and age, education level, marital status, and region, while wealth status and place of residence were not significant. Multivariate logistic regression showed that several factors significantly influenced the likelihood of completing four or more ANC visits. Place of residence was not statistically significant after controlling for other variables. Women with higher education had about 1.5 times the odds of completing at least four ANC visits as compared to those with no education (OR = 1.46, 95% CI: 1.03-2.05). Region was a strong predictor with women residing in West Nile having about 2.3 times the odds of completing at least four ANC visits as compared with those in Kampala (OR = 2.26, 95% CI: 1.62-3.15). Women aged 40-44 years had about 1.8 times the odds of completing at least four ANC visits as compared to those aged 15-19 years (OR = 1.75, 95% CI: 1.21-2.53). For every additional child ever born, the odds of completing at least four ANC visits decreased by approximately 11% (OR = 0.89, 95% CI: 0.86-0.93).

The study concludes that ANC utilization in Uganda is influenced mainly by demographic, socioeconomic and regional factors. It recommends strengthening female education, addressing regional disparities and improving economic empowerment to enhance maternal health service utilization.

Table of Contents

DECLARATION.....	Error! Bookmark not defined.
APPROVAL	Error! Bookmark not defined.
DEDICATION.....	iii
ACKNOWLEDGEMENTS	iv
ABSTRACT.....	v
CHAPTER ONE: INTRODUCTION	1
1.1 Background.....	1
1.2 Problem Statement.....	2
1.3 Objectives of the Study	2
1.3.1 General Objective.....	2
1.3.2 Specific Objectives.....	2
1.4 Hypotheses	3
1.5 Significance of the Study	3
1.6 Scope of the Study	4
Content Scope	4
The study focuses on factors associated with completion of at least four ANC visits among women in Uganda. It examines demographic and socioeconomic factors such as age, education level, wealth status, region, marital status, parity, and place of residence.	4
Geographical Scope.....	4
The study is conducted in Uganda using data from the UDHS 2022. The data are nationally representative and include women from different regions of the country, covering both urban and rural areas.	4
Time Scope	4
The study uses data collected during the UDHS 2022. It focuses on women aged 15–49 years who had a live birth within two years preceding the survey.	4
CHAPTER TWO: LITERATURE REVIEW.....	5
2.0 Introduction	5
2.1 Concept of Antenatal Care	5
2.2 Global and Regional Trends in ANC Completion.....	6
2.3 Factors Influencing ANC Completion.....	7
Education Level.....	7

Household Wealth	7
Place of Residence	8
Region of Residence	8
Age of the Mother.....	8
Parity (Number of Children Ever Born).....	8
Marital Status	9
2.4 Empirical Evidence from Uganda	9
2.5 Theoretical Framework	10
Predisposing Factors	10
Enabling Factors	10
Need Factors	11
2.6 Research Gap.....	11
CHAPTER THREE: METHODOLOGY	13
3.0 Introduction	13
3.1 Study Area	13
3.2 Research Design.....	13
3.3 Data Source.....	13
3.4 Study Population	13
3.5 Sampling Design	14
3.6 Study Variables	14
Dependent Variable.....	14
3.7 Data Analysis	15
3.8 Model Specification	15
3.9 Regression Diagnostic test	16
3.9.1 Goodness of Fit Test.....	16
3.10 Data Quality Control	17
3.11 Ethical Considerations.....	17
3.12 Limitations of the Study	17
CHAPTER FOUR: DATA PRESENTATION, ANALYSIS AND INTERPRETATION ...	18
4.0 INTRODUCTION.....	18
4.1 Descriptive Analysis	18
4.2 Bivariate analysis.....	20

4.3 MULTIVARIATE ANALYSIS.....	23
4.3.1 Test for goodness of fit.....	23
4.4 Binary logistic regression.....	23
Age: Compared to women aged 15–19 years, women aged 20–24, 25–29, 30–34, 35–39, and 40–44 years were 1.31, 1.64, 1.68, 1.69, and 1.75 times more likely, respectively, to complete four or more ANC visits ($p < 0.05$). Women aged 45–49 years did not differ significantly from those aged 15–19 years ($p = 0.144$).....	25
Education level: Compared to women with no formal education, women with secondary education were 1.3 times more likely to complete four or more ANC visits ($OR = 1.30$, $p = 0.031$), while those with higher education were 1.46 times more likely ($OR = 1.46$, $p = 0.031$). Primary education was not significantly associated with adequate ANC utilization ($p = 0.287$).	25
Wealth index: Compared to women in the lowest wealth status women in the middle, fourth, and highest wealth status were 1.26, 1.31, and 1.32 times more likely, respectively, to complete four or more ANC visits ($p < 0.05$). The second wealth quintile was not statistically significant ($p = 0.061$).....	25
Place of residence: Place of residence was not significantly associated with adequate ANC utilization ($OR = 1.08$, $p = 0.285$).....	25
CHAPTER 5: SUMMARY OF FINDINGS, DISCUSSION, CONCLUSION, AND RECOMMENDATION.....	27
5.1 Summary of Findings.....	27
5.2 Discussion.....	27
5.3 Conclusion.....	28
5.4 Recommendations	28
5.5 Areas for Further Research	29
References.....	30
Appendix.....	Error! Bookmark not defined.

CHAPTER ONE: INTRODUCTION

1.1 Background

Antenatal care is an important health service for pregnant women because it helps in checking the health of both the mother and the baby. During ANC visits, health workers monitor how the pregnancy is progressing, detect any possible problems early, and also give advice on things like nutrition, preparing for delivery, and general care during pregnancy.

The World Health Organization recommends that a pregnant woman without complications should attend at least four ANC visits. This is meant to make sure the pregnancy is properly monitored and risks are reduced for both the mother and child (World Health Organization, 2016).

However, in many low- and middle-income countries, completing all the recommended ANC visits is still a challenge. Although many women attend at least one visit, fewer manage to complete all four. This shows that starting ANC is common, but continuing with the visits throughout pregnancy is still a problem.

In Sub-Saharan Africa, ANC use is influenced by social and economic factors. Studies have shown that women who are more educated or have better financial status are more likely to complete ANC visits compared to those with lower education or low income (Titaley, Dibley, & Roberts, 2010). Women in rural areas also face challenges like long distances to health facilities, transport costs, and fewer health workers.

In Uganda, maternal health services have improved over time, and most women now attend at least one ANC visit. According to the Uganda Demographic and Health Survey (UBOS & ICF, 2023), nearly all women attend at least one visit. However, only a smaller number complete the recommended four or more visits. This shows that while access is high, completion is still low.

Overall, ANC use is not only about availability of services, but also about social and economic conditions. Because of this, it is important to understand the factors that influence whether women complete ANC visits.

1.2 Problem Statement

Even though antenatal care services are available in Uganda, many women do not complete the recommended four ANC visits. This reduces the effectiveness of ANC in preventing complications during pregnancy and improving health outcomes for both mothers and babies.

Data from the Uganda Demographic and Health Survey (UBOS & ICF, 2023) show that most women attend at least one ANC visit, but fewer complete all four visits. This means many women start ANC but do not continue with the full schedule.

ANC use also varies among women depending on factors like education level, wealth status, region, and place of residence. These factors are believed to influence ANC completion, but many studies in Uganda have mainly focused on just describing the differences instead of looking at how these factors work together.

Because of this, it is not very clear which factors independently affect ANC completion when all factors are considered at the same time. There is also limited recent evidence using statistical models like logistic regression based on UDHS 2022 data making it hard for policymakers to know the main factors affecting ANC completion. Therefore, this study uses a statistical model to find out the factors associated with adequate antenatal care use among women in Uganda.

1.3 Objectives of the Study

1.3.1 General Objective

To determine the factors associated with completion of four or more antenatal care visits among women in Uganda.

1.3.2 Specific Objectives

1. To determine the proportion of women in Uganda who complete four or more ANC visits.
2. To examine the association between demographic and socioeconomic factors and ANC completion.

3. To identify factors associated with ANC completion using binary logistic regression.

1.4 Hypotheses

1. Age of the mother has no significant association with completion of four or more ANC visits among women in Uganda.
2. Education level has no significant association with completion of four or more ANC visits among women in Uganda.
3. Household wealth status has no significant association with completion of four or more ANC visits among women in Uganda.
4. Region of residence has no significant association with completion of four or more ANC visits among women in Uganda.

1.5 Significance of the Study

This study is important because it helps explain why some women complete antenatal care visits while others do not. The findings can help policymakers design better maternal health programs that focus on women who are more likely to have inadequate ANC utilization.

Health workers can also benefit from understanding the challenges faced by different groups of women, especially those in rural and low-income areas, and this can help improve service delivery.

For women, the study highlights the importance of completing all recommended ANC visits instead of just initiating ANC but failing to complete the recommended visits.

Finally, the study adds to existing knowledge by using recent national data (UDHS 2022) and applying statistical methods to better understand ANC use in Uganda.

1.6 Scope of the Study

Content Scope

The study focuses on factors associated with completion of at least four ANC visits among women in Uganda. It examines demographic and socioeconomic factors such as age, education level, wealth status, region, marital status, parity, and place of residence.

Geographical Scope

The study is conducted in Uganda using data from the UDHS 2022. The data are nationally representative and include women from different regions of the country, covering both urban and rural areas.

Time Scope

The study uses data collected during the UDHS 2022. It focuses on women aged 15–49 years who had a live birth within two years preceding the survey.

CHAPTER TWO: LITERATURE REVIEW

2.0 Introduction

This chapter reviews existing literature on determinants of antenatal care utilization. It discusses the concept of antenatal care, global and regional trends in ANC completion, factors influencing completion of the recommended ANC visits, empirical evidence from Uganda, the theoretical framework guiding the study, and the research gap. The chapter provides a foundation for understanding the demographic and socioeconomic factors associated with whether women complete at least four ANC visits during pregnancy.

2.1 Concept of Antenatal Care

Antenatal care refers to the healthcare services provided to pregnant women during pregnancy to ensure the health and wellbeing of both the mother and the unborn child. ANC involves regular interaction between pregnant women and healthcare providers for monitoring pregnancy progress, identifying complications, providing preventive interventions, and offering health education on issues such as nutrition, birth preparedness, and danger signs during pregnancy (World Health Organization, 2016).

ANC services include important interventions such as tetanus vaccination, malaria prevention, HIV testing and counselling, screening for pregnancy-related complications, and provision of essential supplements such as iron and folic acid. These interventions contribute to reducing maternal and neonatal morbidity and mortality by allowing early detection and management of pregnancy-related conditions (World Health Organization, 2016).

The World Health Organization recommends that pregnant women receive regular ANC contacts throughout pregnancy. In 2016, WHO updated its recommendations from the previous four-visit focused antenatal care model to eight ANC contacts to improve the quality of care and promote a positive pregnancy experience. The updated model emphasizes early detection of complications, preventive care, and increased contact between pregnant women and healthcare providers (World Health Organization, 2016).

However, many low- and middle-income countries, including Uganda, continue to use completion of four or more ANC visits as an important measure of adequate ANC utilization because achieving the recommended eight contacts remains challenging due to healthcare access limitations and health system constraints (World Health Organization, 2016).

Completing ANC visits is important because some pregnancy complications may occur without obvious symptoms. Regular attendance increases opportunities for healthcare providers to identify risks early, provide appropriate interventions, and improve maternal and newborn outcomes.

2.2 Global and Regional Trends in ANC Completion

Globally, antenatal care coverage has improved over time due to increased investment in maternal health programs and improved access to healthcare services. However, there remains a considerable difference between women who attend ANC at least once and those who complete the recommended number of visits. This indicates that although many women begin ANC, maintaining attendance throughout pregnancy remains a challenge (World Health Organization, 2016).

Evidence from low- and middle-income countries shows that ANC utilization is influenced by socioeconomic inequalities. Benova et al. (2018) found that although ANC coverage has increased in many countries, differences remain in the content and quality of care received. Some women attend ANC but do not receive all recommended components of care, showing that attendance alone does not always guarantee adequate maternal healthcare.

A systematic review by Simkhada et al. (2008) identified several factors associated with ANC utilization in developing countries. The review showed that maternal education, household economic status, accessibility of healthcare facilities, and availability of health information influence whether women use ANC services.

In Sub-Saharan Africa, ANC completion remains a challenge despite improvements in ANC initiation. Women may fail to complete the recommended visits due to financial barriers, transportation difficulties, long distances to health facilities, and social factors affecting healthcare-seeking behavior (Finlayson & Downe, 2013).

These findings demonstrate that improving ANC completion requires more than increasing access to healthcare facilities. Addressing social, economic, and health-system barriers is necessary to ensure women continue attending ANC throughout pregnancy.

2.3 Factors Influencing ANC Completion

Several demographic, socioeconomic, and healthcare-related factors influence whether women complete the recommended ANC visits.

Education Level

Education is one of the important determinants of maternal healthcare utilization. Women with higher levels of education are more likely to use maternal healthcare services because education improves knowledge about pregnancy care, increases awareness of pregnancy risks, and enhances decision-making ability. Simkhada et al. (2008) found that maternal education was consistently associated with increased utilization of ANC services in developing countries. Educated women are more likely to understand the benefits of ANC attendance, recognize pregnancy-related risks, and seek healthcare services when necessary. In Uganda, improving women's educational attainment may therefore contribute to increased ANC completion by improving knowledge and empowering women to make informed decisions regarding maternal healthcare.

Household Wealth

Household wealth influences ANC completion because accessing healthcare services often involves direct and indirect costs. Although ANC services may be provided free of charge in public facilities, women may still incur expenses related to transportation, laboratory services, medical supplies, and time away from work or household activities. Benova et al. (2018) reported that socioeconomic inequalities affect maternal healthcare utilization in low- and middle-income countries. Women from wealthier households are generally more likely to access and continue using ANC services because they have greater ability to overcome financial barriers. Poorer women may delay ANC attendance or fail to complete recommended visits because of difficulties meeting the costs associated with accessing healthcare.

Place of Residence

Place of residence is an important factor influencing ANC completion because access to healthcare services differs between urban and rural settings. Women living in urban areas often have better access to healthcare facilities, transportation, and skilled healthcare providers. However, rural women may face barriers such as long distances to health facilities, poor transport networks, and limited availability of healthcare services. These challenges can reduce the likelihood of completing the recommended ANC visits (Simkhada et al., 2008).

Region of Residence

Region of residence may influence ANC completion due to differences in access to healthcare services, availability of health facilities, and socioeconomic conditions across areas. Women living in regions with better healthcare access may have higher chances of completing the recommended ANC visits compared to those in underserved regions (UBOS & ICF, 2023).

Age of the Mother

Maternal age may influence ANC utilization through differences in knowledge, experience, and healthcare-seeking behavior. Younger women, particularly adolescents, may experience challenges such as limited knowledge about pregnancy care and reduced ability to make independent healthcare decisions. Older women may have more experience with pregnancy and childbirth, which may influence their perception of the need for ANC services. However, previous uncomplicated pregnancies may sometimes lead some women to underestimate the importance of regular ANC attendance. Social and personal factors influencing women's healthcare decisions have been identified as important contributors to ANC utilization (Finlayson & Downe, 2013).

Parity (Number of Children Ever Born)

Parity may influence ANC completion because women's previous pregnancy experiences can affect their perception of the need for ANC services. Women with higher parity may be less likely to complete ANC visits because they may feel more experienced or have competing responsibilities from childcare and household duties (Simkhada et al., 2008).

Marital Status

Marital status may influence ANC completion because women's access to financial and emotional support may differ depending on their marital situation. Women who are married or living with partners may receive support that facilitates healthcare seeking, while those without partner support may face additional challenges in accessing maternal healthcare services (Finlayson & Downe, 2013).

2.4 Empirical Evidence from Uganda

Uganda has made progress in improving access to antenatal care services; however, completion of the recommended number of ANC visits remains a challenge. According to the Uganda Demographic and Health Survey (UDHS) 2022, approximately 99% of women aged 15–49 years who had a live birth in the two years preceding the survey received antenatal care from a skilled provider at least once during pregnancy. However, completion of four or more ANC visits remains lower, indicating challenges in continued ANC attendance (UBOS & ICF, 2023).

The difference between ANC initiation and completion indicates that while access to ANC services in Uganda is high, some women experience challenges that prevent them from continuing with the recommended number of visits. Understanding the factors associated with ANC completion is therefore important for improving maternal healthcare outcomes.

Evidence from Uganda shows that maternal knowledge and awareness influence maternal healthcare practices. Kabakyenga et al. (2011) found that knowledge of pregnancy-related danger signs and birth preparedness practices were important aspects of maternal health behavior among women in rural Uganda. This suggests that improving women's awareness about pregnancy risks and available healthcare services may encourage appropriate use of maternal healthcare.

Kawungezi et al. (2015) examined attendance and utilization of ANC services in different parts of Uganda and identified factors affecting ANC attendance, including timing of ANC initiation and challenges related to accessibility of healthcare services. The study highlighted that some women delay seeking ANC, reducing their opportunity to complete the recommended number of visits before delivery.

Other challenges affecting continued ANC attendance in Uganda include transportation difficulties, long waiting times, limited availability of healthcare workers, and perceived quality of care. These barriers may reduce women's willingness or ability to return for subsequent ANC visits. Therefore, improving ANC completion requires addressing both individual socioeconomic factors and healthcare system challenges.

Although previous studies have contributed important information about ANC utilization in Uganda, there remains a need for updated national-level analysis examining the independent effects of different demographic and socioeconomic factors on completion of four or more ANC visits.

2.5 Theoretical Framework

This study is guided by Andersen's Behavioral Model of Health Service Utilization. The model was developed to explain factors influencing healthcare utilization and proposes that healthcare use is influenced by three main categories of factors: predisposing factors, enabling factors, and need factors (Andersen, 1995).

Predisposing Factors

Predisposing factors are characteristics that exist before the need for healthcare services arises and influence an individual's tendency to use healthcare. These include demographic and social characteristics such as age, education level, marital status, and cultural beliefs. In this study, maternal age, education level, and marital status are considered predisposing factors because they may influence women's decisions and ability to complete ANC visits.

Enabling Factors

Enabling factors refer to resources and conditions that allow individuals to access healthcare services. These include financial resources, availability of healthcare facilities, transportation, and geographical location. Women with greater economic resources and better access to healthcare facilities are more likely to overcome barriers associated with ANC attendance. In this study,

household wealth index, place of residence, and region represent enabling factors that may influence ANC completion.

Need Factors

Need factors refer to perceived or actual health conditions that influence an individual's need to seek healthcare services. These may include pregnancy complications, perceived pregnancy risks, and previous pregnancy experiences. Although this study mainly focuses on demographic and socioeconomic determinants, need factors are recognized as important influences of healthcare utilization behavior. The Andersen model is relevant to this study because it provides a framework for understanding how individual characteristics and available resources influence ANC utilization. The model supports the examination of how demographic and socioeconomic factors affect the likelihood of completing four or more ANC visits among women in Uganda.

2.6 Research Gap

Previous studies have identified several factors associated with antenatal care utilization; however, important gaps remain. Many studies have examined ANC attendance generally rather than specifically focusing on completion of four or more ANC visits, which is an important indicator of adequate ANC utilization.

In Uganda, existing studies have provided valuable information on maternal healthcare practices and barriers affecting ANC attendance. However, some studies have focused on specific geographical areas or used older datasets, limiting their ability to provide current nationally representative evidence.

The Uganda Demographic and Health Survey (UDHS) 2022 provides recent nationally representative data on maternal healthcare utilization. However, there is limited evidence on the independent effects of demographic and socioeconomic factors on completion of four or more ANC visits using this updated dataset.

Therefore, this study addresses this gap by using UDHS 2022 data and applying binary logistic regression to identify factors associated with adequate ANC utilization among women aged 15–

49 years in Uganda. The findings will contribute to a better understanding of the factors influencing ANC completion and may support interventions aimed at improving maternal healthcare utilization.

CHAPTER THREE: METHODOLOGY

3.0 Introduction

This chapter describes the methods used in the study. It includes the study area, research design, data source, study population, sampling design, variables, model specification, data analysis methods, and ethical considerations. The study uses secondary data from the Uganda Demographic and Health Survey 2022 to examine factors influencing adequate antenatal care utilization among women in Uganda.

3.1 Study Area

The study is conducted in Uganda, an East African country with diverse socioeconomic and regional characteristics. Despite improvements in maternal health services, inequalities in antenatal care utilization still exist across regions, residence, and socioeconomic groups.

3.2 Research Design

The study uses a cross-sectional research design. This is appropriate because it allows analysis of data collected at a single point in time. The study relies on secondary data from the UDHS 2022, which is nationally representative.

3.3 Data Source

The study uses secondary data from the Uganda Demographic and Health Survey 2022 conducted by the Uganda Bureau of Statistics in collaboration with ICF. The dataset contains information on maternal health indicators such as antenatal care, delivery care, and postnatal care.

3.4 Study Population

The study population consists of women aged 15–49 years who had a live birth within two years preceding the UDHS 2022 survey. This group is appropriate because it provides recent and relevant information on antenatal care utilization.

3.5 Sampling Design

The UDHS 2022 used a two-stage stratified sampling design; in the first stage, enumeration areas (clusters) were selected across the country and in the second stage, households were systematically selected within each cluster. The survey is nationally representative. In addition, UDHS applies sampling weights to account for the complex survey design, non-response, and unequal probability of selection. This ensures that the results are representative of the national population.

3.6 Study Variables

The study variables were obtained from the UDHS 2022 dataset. The dependent variable was antenatal care completion, while independent variables included demographic, socioeconomic, geographic, social, and reproductive characteristics of women.

Dependent Variable

The dependent variable was adequate antenatal care utilization. It was measured based on the number of ANC visits attended during pregnancy. Women who attended fewer than four ANC visits were classified as having inadequate ANC utilization and were coded as 0, while women who attended four or more ANC visits were classified as having adequate ANC utilization and were coded as 1.

Independent Variables

The independent variables were obtained from questions asked in the UDHS 2022 questionnaire. Age of the mother; Respondents were asked their age at the time of the survey. Age was categorized into seven groups: 15–19, 20–24, 25–29, 30–34, 35–39, 40–44, and 45–49 years. Education level; Respondents were asked about their highest level of education attained. Education level was categorized as no education, primary, secondary, and higher education. Household wealth status; The wealth status of households was obtained from the UDHS wealth index, which classifies households into five categories: lowest, second, middle, fourth, and highest wealth quintiles. Place of residence; Respondents were classified according to their place of residence as either urban or rural. Region of residence; Respondents were classified according to their region of residence

based on where the survey was conducted. The regions included Kampala, Buganda, Busoga, Bukedi, Bugisu, Teso, Karamoja, Lango, Acholi, West Nile, Bunyoro, Tooro, Ankole, and Kigezi. Marital status; Respondents were asked their current marital status. The categories included never in union, married, living with partner, widowed, and divorced/separated. Parity; Respondents were asked the number of children they had ever given birth to. This variable was treated as a continuous variable.

Table 3.6: Description and Measurement of Variables Used to Assess Factors Associated with Completion of Four or More Antenatal Care Visits among Women in Uganda

Variable	Nature of Variable	Type of Variable
ANC attendance	Outcome variable	Binary dependent variable
Age of mother	Demographic factor	Ordinal
Education level	Socioeconomic factor	Ordinal
Wealth status	Socioeconomic factor	Ordinal
Place of residence	Geographic factor	Nominal
Region	Geographic factor	Nominal
Marital status	Social factor	Nominal
Parity	Reproductive factor	Continuous (discrete)

3.7 Data Analysis

Data will be analyzed using STATA version 15. The analysis will include: Descriptive statistics (frequencies and percentages) to summarize ANC utilization, bivariate analysis using chi-square tests to assess associations, multivariate analysis using binary logistic regression to identify independent predictors of ANC completion.

3.8 Model Specification

The study employs majorly two models that is Chi square test statistic to determine whether there was a statistically significant association between each independent variable and ANC completion and Binary logistic regression.

Chi square equation

$$\chi^2 = \frac{\sum_{i=1}^r \sum_{j=1}^c (O_{ij} - E_{ij})^2}{E_{ij}}$$

where χ^2 = Chi-square test statistic, O_{ij} = observed frequency in cell i,j, E_{ij} expected frequency in cell i,j, r = number of rows, c = number of columns

Binary logistic regression

$$\ln\left(\frac{p_i}{1-p_i}\right) = \beta_0 + \beta_1 Age_i + \beta_2 Education + \beta_3 Wealth_i + \beta_4 Residence_i + \beta_5 Region_i \\ + \beta_6 MaritalStatus_i + \beta_7 Parity_i$$

Where (p) = probability of completing ≥ 4 ANC visits, (1-p) = probability of < 4 ANC visits, β = coefficients to be estimated, results will be interpreted using odds ratios (ORs).

3.9 Regression Diagnostic test

Under this multi-collinearity and goodness of fit were conducted to show the goodness of the model used and the overall predictive power.

3.9.1 Goodness of Fit Test

The goodness of fit of the binary logistic regression model will be assessed using the Hosmer-Lemeshow test. This test is used to determine whether the model adequately fits the observed data. The test compares the observed outcomes with the predicted outcomes generated by the logistic regression model. A p-value greater than 0.05 will indicate that there is no significant difference between the observed and predicted values, suggesting that the model fits the data well. On the other hand, a p-value less than 0.05 will indicate that the model does not fit the data adequately.

Results will be presented in tables and interpreted in relation to study objectives.

3.10 Data Quality Control

The UDHS data are considered reliable because it uses standardized questionnaires, trained interviewers, and strict quality control procedures. Data cleaning and validation are done before the dataset is released for public use.

3.11 Ethical Considerations

The study uses secondary data obtained from the UDHS. Permission to use the dataset will be obtained from the DHS program. No personal identifiers will be used, and confidentiality of respondents will be maintained. The data is used strictly for academic purposes.

3.12 Limitations of the Study

The study has some limitations. Since secondary data were used, the analysis was limited to variables available in the UDHS dataset. The cross-sectional design limits the ability to establish causal relationships between factors and ANC completion. In addition, some information was self-reported, which may introduce recall bias.

CHAPTER FOUR: DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.0 INTRODUCTION

This chapter presents the findings of the study obtained from UDHS 2022 data for women aged 15-49 years who had a live birth within two years before the survey. It presents a summary of the analysis of the data involving univariate i.e., means, maximum, minimum, frequencies, and percentages, bivariate using Chi-square and multivariate analysis using logistic regression.

4.1 Descriptive Analysis

This is the first stage of analysis which provided a summary of all the variables that were used in the study with a total of 7,513 women

Table 4.1: Distribution of Demographic, Socioeconomic, and Reproductive Characteristics of Women Included in the Study and Their Antenatal Care Completion Status

Variable	Categories	Frequency	Percentage
Age	15-19	663	8.8
	20-24	2168	28.9
	25-29	1934	25.7
	30-34	1304	17.4
	35-39	927	12.3
	40-44	425	5.7
	45-49	92	1.2
Education level	No education	691	9.2
	Primary	4434	59.0
	Secondary	1995	26.6
	Higher	393	5.2
Wealth index	Lowest	1850	24.6
	Second	1614	21.5

	Middle	1325	17.6
	Fourth	1269	16.9
	Highest	1455	19.4
Residence	Urban	2187	29.1
	Rural	5326	70.9
Region	Kampala	431	5.7
	Buganda	1109	14.8
	Busoga	655	8.7
	Bukedi	516	6.8
	Bugisu	388	5.2
	Teso	561	7.5
	Karamoja	452	6.0
	Lango	505	6.7
	Acholi	446	5.9
	West Nile	597	8.0
	Bunyoro	581	7.7
	Tooro	529	7.0
	Ankole	409	5.4
	Kigezi	334	4.5
Marital status	Never in union	430	5.7
	Married	3183	42.4
	Living with partner	2991	39.8
	Widowed	81	1.08
	Divorced/Separated	828	11.02
ANC Attendance	ANC <4 visits	2060	27.4
	ANC 4+ visits	5453	72.6
Age	Mean = 27.82	Standard deviation = 6.82	Max=49 Min=15
Parity	Mean = 3.52	Standard deviation = 2.432	Max=16 Min= 0

Age: The respondents had a mean age of 27.82 years, with the largest proportion aged 20–29 years (28.9%), showing variation in age distribution (Standard deviation = 6.82).

Education: The study was largely composed of women with primary education (59.0%).

Wealth status: This showed variation across all wealth categories, although women from the lowest wealth category formed the largest group (24.6%).

Place of residence: The study population was predominantly rural with most respondents from rural areas (70.9%).

Region: Variation was also observed, with Buganda (14.8%) contributing the highest proportion of respondents and Kigezi the lowest (4.5%).

Marital status: Partnered women (married/living with partner) constituted the study population with married women having the highest percentage (42.4%).

ANC completion: Nearly three-quarters of women achieved the recommended four or more ANC visits (72.6%).

Parity: Most women had experienced multiple births (mean = 3.52), although parity varied among respondents (Standard deviation = 2.432)

4.2 Bivariate analysis

Bivariate analysis was done to check the relationship between ANC attendance and each of the selected factors. This helped to see whether different characteristics of women were linked to attending fewer than four or four and more ANC visits.

Cross-tabulations were used, and the Chi-square test was applied to test for statistical significance. Variables with a p-value less than 0.05 were considered to have a significant relationship with ANC attendance and were taken forward for multivariate analysis.

Table 4.2 Association between demographic and socioeconomic characteristics and antenatal care completion among women in Uganda

Variables	Categories	ANC_Attendance				Pearson Chi2	Pvalue
		ANC <4 visits		ANC 4+ visits			
Age	15-19	221	33.3	442	66.7	44.2367	0.000
	20-24	568	26.2	1600	73.8		
	25-29	464	24.0	1470	76.0		
	30-34	348	26.7	956	73.3		
	35-39	279	30.1	648	69.9		
	40-44	143	33.7	282	66.4		
	45-49	37	40.2	55	59.8		
Education level	No education	197	28.5	494	71.5	27.0532	0.000
	Primary	1296	29.2	3138	70.8		
	Secondary	488	24.5	1507	75.5		
	Higher	79	20.1	314	79.9		
Wealth status	Lowest	516	27.9	1334	72.1	3.4073	0.492
	Second	460	28.5	1154	71.5		
	Middle	370	27.9	955	72.1		
	Fourth	336	26.5	933	73.5		
	Highest	378	25.9	1077	74.0		
Place of residence	Urban	592	27.1	1595	72.9	0.1900	0.663
	Rural	1468	27.6	3858	72.4		
Marital status	Never in union	164	38.1	266	61.9	37.3394	0.000
	Married	819	25.7	2364	74.3		
	Living with partner	793	26.5	2198	73.5		
	widowed	26	32.1	55	67.9		
	Divorced/Separated	258	31.2	570	68.8		
Region	Kampala	124	28.8	307	71.2	113.4090	0.000
	Buganda	326	29.4	783	70.6		

Variables	Categories	ANC_Attendance				Pearson Chi2	Pvalue
		ANC <4 visits		ANC 4+ visits			
	Busoga	173	26.4	482	73.6		
	Bukedi	162	31.4	354	68.6		
	Bugisu	119	30.7	269	69.3		
	Teso	161	28.7	400	71.3		
	Karamoja	78	17.3	374	82.7		
	Lango	130	25.7	375	74.3		
	Acholi	92	20.6	354	79.4		
	West Nile	118	19.8	479	80.2		
	Bunyoro	235	40.5	346	59.6		
	Tooro	141	26.7	388	73.4		
	Ankole	102	24.9	307	75.1		
	Kigezi	99	29.6	235	70.4		

Age: Age was significantly associated with ANC attendance ($\chi^2_{val} = 44.2367$, $p < 0.001$). The proportion of women completing four or more ANC visits varied across age groups. Women aged 25–29 years had the highest proportion of adequate ANC attendance (76.0%), whereas women aged 45–49 years had the lowest proportion (59.8%).

Education level: Education level was significantly associated with ANC attendance ($\chi^2_{val} = 27.0532$, $p < 0.001$). The proportion of women completing four or more ANC visits generally increased with educational attainment. Women with higher education had the highest proportion of adequate ANC attendance (79.9%), while women with primary education had the lowest proportion (70.8%).

Wealth status: Wealth status was not significantly associated with ANC attendance ($\chi^2_{val} = 3.4073$, $p = 0.492$). Although women in the highest wealth category had a slightly higher proportion of attending four or more ANC visits (74.0%) compared with those in the lowest wealth category (72.1%), the observed differences were not statistically significant.

Place of residence: Place of residence was also not significantly associated with ANC attendance ($\chi^2_{val} = 0.1900$, $p = 0.663$). Women living in urban areas had a slightly higher proportion of attending four or more ANC visits (72.9%) compared with rural women (72.4%).

Marital status: The proportion of women attending at least four ANC visits varied across the marital status. Marital status showed a statistically significant association with ANC attendance ($\chi^2_{val} = 37.3394$, $p < 0.001$).

Region: Region was significantly associated with ANC attendance ($\chi^2_{val} = 113.4090$, $p < 0.001$). Substantial differences were observed in ANC attendance across regions. Karamoja recorded the highest proportion of women attending four or more ANC visits (82.7%), followed by West Nile (80.2%) and Acholi (79.4%).

4.3 MULTIVARIATE ANALYSIS

This was the third stage of analysis which provided a summary of how the independent variables affected the dependent variable. Post-estimation test for goodness of fit for the model was carried out.

4.3.1 Test for goodness of fit

Table 4.3 Results of the Hosmer–Lemeshow goodness-of-fit test

Number of observations	7513
Number of Groups	10
Hosmer-Lemeshow $\chi^2(8)$	6.49
Prob> χ^2	0.5922

The results from the table above indicated p-value is greater than 0.05, indicating that the model fitted the data well.

4.4 Binary logistic regression

This was the last stage of data analysis, the significant factors that affect ANC attendance are used in the development of a Binary logistic model.

Number of observations	7,513
LR $\chi^2(32)$	269.80

Prob > chi2	0.0000
Pseudo R2	0.0306
Log likelihood	-4278.1119

The logistic regression model is statistically significant, indicating that the independent variables jointly explain variations in ANC attendance ($p < 0.05$). This suggests that the model as a whole provides a better fit compared to a null model with no predictors.

Table 4.4: Binary logistic regression results for factors associated with completion of four or more antenatal care visits among women in Uganda

Independent variables	Categories	Odds Ratio	Standard error	P-value	95% CI
Age	15-19	Ref	-	-	-
	20-24	1.31	0.133	0.008	(1.07,1.60)
	25-29	1.64	0.185	0.000	(1.31,2.04)
	30-34	1.68	0.219	0.000	(1.30,2.16)
	35-39	1.69	0.257	0.001	(1.25,2.27)
	40-44	1.75	0.329	0.003	(1.21,2.53)
	45-49	1.49	0.406	0.144	(0.87,2.54)
Education level	No Education	Ref	-	-	-
	Primary	1.12	0.121	0.287	(0.91,1.39)
	Secondary	1.30	0.160	0.031	(1.03,1.66)
	Higher	1.46	0.254	0.031	(1.03,2.05)
Wealth status	Lowest	Ref	-	-	-
	Second	1.17	0.096	0.061	(0.99,1.37)
	Middle	1.26	0.113	0.009	(1.06,1.51)
	Fourth	1.31	0.124	0.005	(1.09,1.57)
	Highest	1.32	0.151	0.014	(1.06,1.65)
Place of residence	Urban	Ref	-	-	-
	Rural	1.08	0.078	0.285	(0.94,1.24)
Marital status	Married	Ref	-	-	-
	Never In Union	0.53	0.062	0.000	(0.42,0.67)
	Living With Partner	1.04	0.066	0.494	(0.92,1.18)
	Widowed	0.78	0.195	0.329	(0.48,1.28)
	Divorced/Separated	0.78	0.070	0.006	(0.66,0.93)
Region	Kampala	Ref	-	-	-
	Buganda	1.12	0.152	0.414	(0.86,1.46)
	Busoga	1.52	0.245	0.009	(1.11,2.09)
	Bukedi	1.23	0.205	0.221	(0.88,1.70)
	Bugisu	1.10	0.190	0.597	(0.78,1.54)

Independent variables	Categories	Odds Ratio	Standard error	P-value	95% CI
	Teso	1.39	0.232	0.051	(1.00,1.92)
	Karamoja	3.06	0.616	0.000	(2.06,4.54)
	Lango	1.52	0.257	0.013	(1.09,2.11)
	Acholi	2.16	0.388	0.000	(1.52,3.07)
	West Nile	2.26	0.384	0.000	(1.62,3.15)
	Bunyoro	0.75	0.117	0.065	(0.55,1.02)
	Tooro	1.43	0.232	0.029	(1.04,1.96)
	Ankole	1.40	0.241	0.050	(1.00,1.96)
	Kigezi	1.13	0.204	0.480	(0.80,1.61)
Parity	Parity	0.89	0.017	0.000	(0.86,0.93)
Constant	Constant	1.42	0.294	0.092	(0.94,2.13)

Age: Compared to women aged 15–19 years, women aged 20–24, 25–29, 30–34, 35–39, and 40–44 years were 1.31, 1.64, 1.68, 1.69, and 1.75 times more likely, respectively, to complete four or more ANC visits ($p < 0.05$). Women aged 45–49 years did not differ significantly from those aged 15–19 years ($p = 0.144$).

Education level: Compared to women with no formal education, women with secondary education were 1.3 times more likely to complete four or more ANC visits ($OR = 1.30$, $p = 0.031$), while those with higher education were 1.46 times more likely ($OR = 1.46$, $p = 0.031$). Primary education was not significantly associated with adequate ANC utilization ($p = 0.287$).

Wealth index: Compared to women in the lowest wealth status women in the middle, fourth, and highest wealth status were 1.26, 1.31, and 1.32 times more likely, respectively, to complete four or more ANC visits ($p < 0.05$). The second wealth quintile was not statistically significant ($p = 0.061$).

Place of residence: Place of residence was not significantly associated with adequate ANC utilization ($OR = 1.08$, $p = 0.285$).

Marital status: Compared to married women, women who had never been in a union were 47% less likely to complete four or more ANC visits ($OR = 0.53$, 95% CI: 0.421,0.668), while divorced/separated women were 22% less likely to complete adequate ANC visits ($OR = 0.78$, 95% CI: 0.655–0.931). However, there was no significant difference between married women and those living with a partner or widowed women, as their confidence intervals included 1.

Region: Compared to women in Kampala, women from Busoga, Karamoja, Lango, Acholi, West Nile, Tooro, and Ankole were 1.52, 3.06, 1.52, 2.16, 2.26, 1.43, and 1.40 times more likely, respectively, to complete four or more ANC visits ($p < 0.05$).

Parity: Parity was significantly associated with adequate ANC utilization. For every additional child, the odds of completing four or more ANC visits decreased by approximately 11% (OR = 0.89, $p < 0.001$), holding all other variables constant.

CHAPTER 5: SUMMARY OF FINDINGS, DISCUSSION, CONCLUSION, AND RECOMMENDATION

This chapter presents the summary of the findings, discussion, conclusions, recommendations, and areas for further research based on the study findings on factors associated with completion of four or more antenatal care visits among women in Uganda.

5.1 Summary of Findings

The main objective of the study was to determine the factors influencing completion of four or more antenatal care visits among women in Uganda using the UDHS 2022 data. Binary logistic regression was applied to identify the factors associated with adequate ANC utilization.

The findings showed that ANC utilization was generally high, with 72.6% of women completing four or more ANC visits, while 27.4% attended fewer than four visits. The bivariate analysis revealed significant associations between ANC attendance and maternal age, education level, marital status, and region of residence. However, at the bivariate level, wealth status and place of residence were not significantly associated with ANC attendance.

The multivariate logistic regression results showed that maternal age, education level, wealth status, marital status, region of residence, and parity were significant predictors of completing four or more ANC visits. Older women, women with secondary or higher education, and women from higher wealth categories had higher odds of adequate ANC utilization. Women who had never been in union and those who were divorced or separated had lower odds of completing four or more ANC visits than married women. Increasing parity was also associated with a reduced likelihood of adequate ANC attendance.

5.2 Discussion

The study found that age, education level, household wealth status, marital status, region of residence, and parity were significant determinants of completion of four or more antenatal care visits among women in Uganda. Older women and those with secondary or higher education were more likely to complete the recommended ANC visits, which is consistent with the findings of Simkhada

et al. (2008). Women from wealthier households also had higher odds of ANC completion, supporting the findings of Benova et al. (2018). Regional differences in ANC completion were observed, which are consistent with the Uganda Demographic and Health Survey (UBOS & ICF, 2023). In addition, women who had never been in union or were divorced/separated were less likely to complete ANC visits than married women, similar to the findings of Finlayson and Downe (2013). Higher parity was associated with lower odds of ANC completion, which agrees with Simkhada et al. (2008). However, place of residence was not significantly associated with ANC completion after controlling for other factors

5.3 Conclusion

The study concludes that ANC attendance is influenced by a combination of socioeconomic and demographic factors, with education, age groups, wealth status, marital status, and region playing the most significant roles. Overall, women with higher education levels, better economic status, and supportive marital relationships are more likely to utilize antenatal care services adequately. Regional disparities also indicate that access and uptake of maternal health services are not uniform across all areas.

5.4 Recommendations

Based on the findings of the study, several policy and programmatic recommendations are made to improve adequate ANC utilization among women in Uganda.

First, there is need to strengthen female education, as education was found to significantly improve the likelihood of completing the recommended ANC visits. Promoting girl-child education and ensuring retention of girls in school may have long-term benefits on maternal health-seeking behavior.

Second, improving women's economic empowerment is essential. Since wealth status was found to influence ANC utilization, interventions that enhance women's income-generating capacity can help reduce financial barriers such as transport costs and other indirect expenses associated with accessing maternal health services.

Third, targeted interventions should be designed for vulnerable groups, particularly women from lower socioeconomic backgrounds and those without stable partnerships. These groups may require additional support mechanisms to ensure they are not excluded from essential maternal health services.

Fourth, efforts should be made to reduce regional inequalities in ANC utilization. The findings show clear differences across regions, indicating the need for strengthened health service delivery and targeted maternal health programs in underperforming areas.

Lastly, continuous health education and awareness campaigns should be intensified at community level. Increasing awareness about the importance of completing the recommended four or more ANC visits can help improve utilization and encourage early and consistent attendance during pregnancy.

5.5 Areas for Further Research

This study was limited to the available variables and dataset on antenatal care attendance; therefore, future research could explore additional factors that may influence ANC utilization, such as cultural beliefs, distance to health facilities, quality of care received, and partner involvement. Further studies could also use qualitative approaches to better understand the personal and social reasons behind ANC attendance patterns.

References

- Andersen, R. (1995). Revisiting the behavioral model and access to medical care: Does it matter? *Journal of Health and Social Behavior*, 36(1), 1–10.
- Benova, L., Tunçalp, Ö., Moran, A. C., & Campbell, O. M. R. (2018). Not just a number: Examining coverage and content of antenatal care in low-income and middle-income countries. *BMJ Global Health*, 3(2), e000779.
- Finlayson, K., & Downe, S. (2013). Why do women not use antenatal services in low- and middle-income countries? A qualitative evidence synthesis of the literature. *PLoS ONE*, 8(1), e54918.
- Kabakyenga, J. K., Östergren, P. O., Turyakira, E., & Pettersson, K. O. (2011). Knowledge of obstetric danger signs and birth preparedness practices among women in rural Uganda. *Reproductive Health*, 8, 33.
- Kawungezi, P. C., AkiiBua, D., Aleni, C., Chitayi, M., Niwaha, A., Kazibwe, A., ... Mirembe, F. (2015). Attendance and utilization of antenatal care services among pregnant women in Uganda. *International Journal of Pregnancy & Child Birth*, 1(1), 1–7.
- Simkhada, B., Teijlingen, E. R., Porter, M., & Simkhada, P. (2008). Factors affecting the utilization of antenatal care in developing countries: Systematic review of the literature. *Journal of Advanced Nursing*, 61(3), 244–260.
- Titaley, C. R., Dibley, M. J., & Roberts, C. L. (2010). Factors associated with underutilization of antenatal care services in Indonesia: Results of Indonesia Demographic and Health Survey. *BMC Public Health*, 10, 485.
- Uganda Bureau of Statistics (UBOS) & ICF. (2023). *Uganda Demographic and Health Survey 2022*. Kampala, Uganda: Uganda Bureau of Statistics and ICF.
- World Health Organization. (2016). *WHO recommendations on antenatal care for a positive pregnancy experience*. Geneva, Switzerland: World Health Organization.