Individual and contextual factors associated with antenatal care utilization among women of reproductive age in South Africa

MM Malatji

orcid.org/0000-0002-5179-0538

Mini-dissertation accepted in partial fulfilment of the requirements for the degree *Master of Social Sciences in Population Studies and Sustainable Development* at the North-West University

Supervisor: Dr M Tsawe

Graduation: July 2023

Student number: 30116724

ABSTRACT

***Background*:** The main objective of this study was to determine the individual and contextual determinants of using eight or more antenatal visits among women of reproductive age in South Africa. Over eight in ten pregnant women worldwide receive antenatal care (ANC) from a qualified practitioner at least once, whereas 65% receive about four visits. For most countries, not much is known about the new recommendations of eight or more ANC visits.

***Methods*:** This study used secondary data from the 2016 South African Demographic and Health Survey (SADHS). Three types of analyses were chosen; these included univariate, bivariate, and multivariate analyses.

***Results*:** The findings showed that age at birth, birth order, population group, marital status, employment status, media exposure, place of residence, household wealth and province were statistically associated with 8+ ANC visits ($p<0.05$). The findings also showed that the use of 8+ ANC visits fluctuates with age at birth. There was a high prevalence (18.5%) of 8+ ANC visits among women whose first birth was at age 20-34 and those whose first birth was at age 35-49 (16.0%). Women with birth order 2-3 had the highest prevalence of 8+ ANC visits (18.4%), followed by those with birth order 1 (16.8%). Women from the 'other' population group had a higher prevalence of 8+ ANC visits (31.2%), followed by those from the coloured population group (25.9%), while women from the black population group had the lowest prevalence of 8+ ANC visits (16.0%). In reference to marital status, women who were currently in union had a higher prevalence of 8+ ANC visits (19.2%) and those who were formerly in union had a 17.9% prevalence of 8+ ANC visits.

***Conclusion*:** The findings show that the use of 8+ ANC visits is low among women of reproductive age in South Africa. The study findings revealed that factors such as age at birth, birth order, population group, marital status, employment status, media exposure, place of residence, household wealth and province were important factors in the use of 8+ ANC visits. The findings further revealed that community-level factors were important in explaining the use of 8+ ANC visits among women in the country. There should be a provision of more clinics in rural areas; this will improve women's accessibility to maternal health facilities and shorten the travelling time between their home and the nearby clinic, and therefore this will increase their ANC attendance.

Keywords: antenatal care; eight antenatal visits; reproductive age; multilevel analysis

DECLARATION

I, Mashapa Marinkie Malatji (30116724), declare that this work titled "Individual and contextual factors associated with antenatal care utilization among women of reproductive age in South Africa" is my original research work, and has never been submitted for any degree or examination in any other university or institution. I declare that the information contained in this document is a true copy of my thesis and has been approved for submission by my thesis supervisor. This work was supervised by Dr Mluleki Tsawe from the Department of Population Studies and Demography. This work is submitted in partial fulfilment of the requirements for the degree Master of Social Science in Population Studies and Sustainable Development at the North-West University, Mafikeng Campus, South Africa.

Name (student): Mashapa Marinkie Malatji

Signature: M.M Malatji

Date: April 2023

Name (supervisor): Dr Mluleki Tsawe

Signature: M. Tsawe

Date: April 2023

ACKNOWLEDGEMENTS

First and foremost, I'd like to thank God for providing me with the strength to overcome this year's challenges. Thank you for giving me the courage to continue with my studies. Thank you, God, for this wonderful life and everything else. Thank you for giving me the motivation to complete my research.

I would also like to express my heartfelt gratitude to my supervisor, Dr Mluleki Tsawe, for his unwavering support of my master's research, as well as his perseverance, encouragement, enthusiasm, and extensive knowledge. His guidance was immensely valuable throughout the research and writing of this thesis. I could not have asked for a better supervisor and mentor for my master's degree. Your enormous contribution to shaping my career in Population Studies will live in my memory for the rest of my life. Thank you for helping me grow, may God bless you.

Last but not least, I want to express my gratitude to my family, especially my parents Marcus Malatji and the late Getrude Malatji, who gave me life in the first place and supported me spiritually throughout my life. Aside from my late brother Andries Malatji, I should also mention my sisters Mmakosha Malatji, Pheladi Malatji and Mpho Malatji Mukhuba.

This research is dedicated to my Dad. Your child nailed it.

TABLE OF CONTENTS

ABSTRACT I
DECLARATION II
ACKNOWLEDGEMENTS III
LIST OF FIGURES VI
LIST OF TABLES VII
LIST OF APPENDICES VIII
ABBREVIATIONS/ACRONYMS IX
CHAPTER ONE 1
INTRODUCTION 1
1.1 Background to the study 1
1.2 Statement of the problem 2
1.3 Main objective of the study 2
1.3.1. Specific objectives of the study 3
1.4 Research questions 3
1.5 Significance of the study 3
1.6 Scope of the study 3
1.7 Definition of concepts 4
1.8 Organisation of the study 4
CHAPTER TWO 5
LITERATURE REVIEW 5
2.1 Introduction 5
2.2 Current debates on antenatal care in Sub-Saharan Africa: a brief review 5
2.3 Determinants of antenatal care use 5
2.4 Theoretical framework 10
2.5 Conceptual framework 10
CHAPTER THREE 12
METHODOLOGY 12
3.1 Study location 12
3.2 Research design 12
3.3 Data source 12
3.4 Study sample 13
3.4.1 Study inclusion and exclusion criteria 13
3.5 Description of study variables 13
3.6 Method of analysis 15
3.7 Limitations 16
3.8 Ethical considerations 16
CHAPTER FOUR 17
DATA ANALYSIS AND RESULTS 17
4.1 Introduction 17
4.2 Characteristics of the study population 17
4.3 Prevalence of using eight or more antenatal visits 19
4.4 Multilevel determinants of using eight or more antenatal visits 22
CHAPTER FIVE 25
DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS 25
5.1 Introduction 25
5.2 Discussions 25

5.3 Conclusion 27
5.4 Recommendations 27
APPENDICES 36

LIST OF FIGURES

Figure 2.1: Conceptual framework depicting the multilevel determinants of antenatal care 11
Figure 4.1: Percentage distribution of eight or more antenatal care visits 19

LIST OF TABLES

Table 3.1: Description of the study variables 13
Table 4.1: Percentage distribution of background characteristics of the study population 18
Table 4.2: Presents the prevalence of eight or more antenatal visits by background factors 21
Table 4.3: Random effects and model fit statistics for 8+ ANC visits 22
Table 4.4: Multilevel logistic regression results for the determinants of 8+ ANC visits among women of reproductive age in South Africa 23

LIST OF APPENDICES

Appendix A1: Ethics approval letter 36
Appendix A2: Prevalence of eight or more antenatal visits among women of reproductive age (map) 38

ABBREVIATIONS/ACRONYMS

AIC	-	Akaike Information Criterion
ANC	-	Antenatal care
BaSSREC	-	Basic and Social Sciences Research Ethics Committee
CI	-	Confidence Interval
DUs	-	Dwelling Units
GP	-	General Practitioner
HIV	-	Human Immunodeficiency Virus
ICC	-	Intra-cluster Correlation Coefficient
MOR	-	Median Odds Ratio
PCV	-	Proportional Change in Variance
PSUs	-	Primary Sampling Units
RSA	-	Republic of South Africa
SADHS	-	South African Demographic and Health Survey
SSA	-	Sub-Saharan Africa
STATA	-	Statistics and Data
UNICEF	-	The United Nations International Children's Emergency Fund
VIF	-	Variance Inflation Factor
WHO	-	World Health Organization

CHAPTER ONE

INTRODUCTION

1.1 Background to the study

According to research, 86% of pregnant women receive antenatal care (ANC) worldwide from a qualified practitioner at least once, whereas 65% receive about four visits (Adedokun & Yaya, 2020; World Health Organization, 2016). Every year, more than half a million maternal deaths and 2.6 million infant deaths occur worldwide (Blencowe et al., 2016; Tufa et al., 2020). Nearly 830 women die every day because of pregnancy-related problems, with underdeveloped countries accounting for 99% of these deaths (Tufa et al., 2020). For instance, higher maternal and infant mortality rates in underdeveloped countries have been attributable to limited access to services, illiteracy, and poor service as a result of scarcity of qualified medical professionals. In Africa, the occurrence of at least eight ANC visits depends on the country. The prevalence varies from 8% in the Republic of Benin to 17% in Nigeria (Ekholuenetale, Benebo, et al., 2020; Ekholuenetale, Nzoputam, et al., 2020). The World Health Organization (WHO) encourages ANC and recommends about eight visits, with the first one occurring during the first month of pregnancy (Moller et al., 2017; World Health Organization, 2016). South Africa has also adopted the WHO recommendations of at least eight ANC visits by pregnant women (Hlongwane et al., 2021). The South African Department of Health advocates that pregnant women access ANC services as early as early as they discover they are pregnant or as early as they miss their monthly cycle (Jinga et al., 2019).

The use of quality ANC has been acknowledged as among the most successful ways of decreasing maternal deaths (Adedokun & Yaya, 2020; Bhutta et al., 2014). ANC helps women in preparing for childbirth and understand pregnancy and childbirth warning signs (UNICEF, 2019). Furthermore, ANC offers prenatal vitamins, hypertension medications to prevent eclampsia, and tetanus vaccination, as well as medications to help stop the spread of HIV from mother to child in the situation that pregnant women are HIV positive (UNICEF, 2019). For instance, ANC is essential for the normal development of the infant inside the mother's womb; it helps in the formation of a healthy baby who is immunized against diseases. To guarantee adequate and appropriate care for women throughout pregnancy, the WHO formerly suggested

around four ANC appointments for each pregnant woman, which has now been increased to eight sessions during the pregnancy (Adedokun & Yaya, 2020).

1.2 Statement of the problem

Even though the WHO proposes that women receive a minimum of eight ANC appointments throughout their pregnancy to improve birth outcomes, there are presently very limited statistics to show how many South African women are following this new recommendation of eight or more ANC visits. The current information available in South Africa is derived from the outdated recommendation of four or more antenatal visits (National Department of Health et al., 2019; Odusina et al., 2021). ANC was made freely available in South Africa's public health system to overcome the problem of rising maternal and infant deaths. Conversely, women who are pregnant, yet do not attend ANC services account for most of these deaths (World Health Organization, 2016). The government recommended that women of reproductive age begin ANC appointments at 14 weeks into their pregnancy, however, most women wait until 20 weeks to do so, as a result, the government's efforts to considerably increase ANC uptake in South Africa continue to be challenging (Ebonwu et al., 2018). Even though the government increased the number of appointments from four to eight since April 2017, booking delays have been observed in South Africa, where women arrive early at clinics but were offered an appointment to start ANC later (Solarin & Black, 2013); Although this is an issue, this study does not focus on it.

In any case, South Africa has proven a higher level of ANC coverage, yet, late ANC initiation remains a concern, as proven by studies from throughout the continent (Kaswa et al., 2018). Nevertheless, information on women's ANC experiences was limited, more especially among those who use public ANC services. As a result, it was essential to look into the factors that contributed to the utilization of eight or more ANC to help in the establishment of policies that can effectively prevent maternal deaths and deliver healthy newborns. The study focuses on the use of eight or more antenatal care visits among women of reproductive age.

1.3 Main objective of the study

This study aims to determine the individual and contextual determinants of using eight or more antenatal visits among women of reproductive age in South Africa.

1.3.1. Specific objectives of the study

The study aims to answer the following specific objectives:

- To examine the prevalence of using eight or more antenatal visits among women of reproductive age by individual and contextual factors in South Africa.
- To investigate the multilevel factors associated with using eight or more antenatal visits among women of reproductive age in South Africa.

1.4 Research questions

The study aims to answer the following research questions:

- What is the prevalence of using eight or more antenatal visits among women of reproductive age in South Africa?
- What are the multilevel factors associated with using eight or more antenatal visits among women of reproductive age in South Africa?

1.5 Significance of the study

The study's findings will help the society considering that ANC plays an essential part in preventing and treating epidemics that may be harmful to women of reproductive age and their unborn babies' wellbeing. The widespread use of ANC by pregnant women justifies the demand for more effective healthcare services. Thus, mothers who use this study as a motivation and follow the recommendations of eight or more visits will minimize maternal and infant mortality rates. Additionally, the study will help South African health planners to examine other factors which prevent women from completing a minimum of eight ANC appointments and therefore implement strategies to strengthen the health of women and children in country.

1.6 Scope of the study

The Study focused on a sample of 3036 women of childbearing age, using the South Africa Demographic and Health Survey (SADHS) 2016. This was a weighted sample of women of reproductive age.

1.7 Definition of concepts

Antenatal care - ANC is a means of detecting and educating women about high-risk pregnancies so that they might have healthy childbirth outcomes (McNellan et al., 2019). It entails a series of one-on-one sessions at a hospital or clinic with a midwife, an obstetrician, or a general practitioner (GP) (Catling et al., 2015). This study focuses on the use of eight or more ANC visits by women during pregnancy.

Women of reproductive age - In this study, women of reproductive age are identified as those between the ages of 15-49, this is the period when women begin their menstrual cycle until they reach menopause (Baheiraei et al., 2013).

1.8 Organisation of the study

This study is divided into five chapters, which include the following: the first chapter describes the general background, problem statement, study's objectives, research questions, significance and scope of the study, along with definition of concepts. The second chapter reviews the literature. The third chapter underlines the research methodology used for the study. It consists of the study setting, data source, study design, description of the study variables, method of analysis, limitations as well as ethical considerations. The fourth chapter provides the interpretation of the results. The fifth chapter presents the research's discussion, conclusion, and recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviews the literature on individual and contextual determinants of using eight or more antenatal visits among women in South Africa. Moreover, the chapter provides debates and discussions on the determinants of ANC from both individual and contextual perspectives around the world.

2.2 Current debates on antenatal care in Sub-Saharan Africa: a brief review

In Sub-Saharan Africa (SSA), several countries have significantly improved ANC visits, however, maternal and infant deaths remains high (Musarandega et al., 2021). SSA has a higher incidence of infant and maternal mortality despite having access to effective interventions (Obse & Ataguba, 2021). For instance, ANC is a treatment that enhances the well-being of women who are pregnant and their babies. However, between 2011 and 2016, only half of those who were pregnant in SSA had about four ANC visits (Obse & Ataguba, 2021). Although there have been reports of significant socio-economic disparities in ANC visits that disadvantage the poor, there was insufficient information regarding the provision of ANC services and related disparities (Obse & Ataguba, 2021). Several studies have examined factors influencing ANC utilization in SSA countries, yet not many have been systematically summarized in SSA (Afulani, 2015; Haruna-Ogun, 2018). Factors influencing ANC utilization in SSA occur at different levels, including predisposing, enabling, and need factors (Okedo-Alex et al., 2019). These factors also highlight the significance of multi-stakeholder inter-sectoral collaboration in reducing low ANC utilization in SSA (Okedo-Alex et al., 2019).

2.3 Determinants of antenatal care use

2.3.1 Maternal age and age at birth

A study undertaken in South Africa proved that age was a determinant of ANC use (Juqu, 2021). It had been discovered that women aged 35-40 had higher odds of using four or more ANC as compared to women aged 15-19 years. Equally, in rural Zambia, women aged 35 and over were

even more likely to seek ANC, demonstrating a correlation between women's age and ANC attendance (Jacobs et al., 2017; Muyunda et al., 2016). In comparison to these research results, the younger women in Botswana were more aware and knowledgeable of ANC due to their education and media coverage of essential services that educate on primary healthcare patterns, whereas their older counterparts were intertwined with cultural and traditional values that limited conversation on delivery experiences (Mathe, 2014, 2017). Meanwhile in Ghana, first-time mothers had higher odds to begin ANC in the first month of pregnancy. The average age at birth at which first-time mothers began attending ANC was three months (Manyeh et al., 2020).

2.3.2 Birth order

The number of ANC appointments was influenced by the child's birth order (Nketiah-Amponsah et al., 2013). Malawian, Ugandan, as well as Zimbabwean women were more likely to receive four or more ANC visits for first-order births than for higher birth order (Makate, 2016; Tessema & Minyihun, 2021). On the other hand, in Haitian cities, as the birth order increased, the likelihoods of having completed ANC appointments declined (Babalola, 2014). In SSA, birth order was a good determinant of the utilization of ANC (Tessema et al., 2021). Correspondingly, in Ethiopia, the child's birth order was correlated with attending four or more ANC services (Muchie, 2017). The probability of initiating the first ANC visit on time was reduced when there were six or more birth orders. Furthermore, in South Africa, women who had been pregnant more than once or had a higher birth order delayed ANC initiation and, as a result, they attended less visits (Ebonwu et al., 2018).

2.3.3 Population Group

In Sub-Saharan Africa, ethnic variations affected the attendance of ANC services (Okedo-Alex et al., 2019). Wabiri et al. (2016) discovered that in South Africa, Black African women had lower access to services than women of other races, which led to fewer visits for at least four or more ANC visits. Statistics South Africa (2020) showed that women in the White population and those from Asian or Indian backgrounds had an increased likelihood of having four or more ANC appointments, whilst Black or African women had lower chances of doing so. In the Benin Republic, ethnicity significantly influenced ANC use (Dansou et al., 2017). In Nigeria, Yoruba and Igbo women had increased chances of ANC use when pregnant, and yet Hausa women had lower odds to make the required frequency of visits (Nghargbu & Olaniyan, 2019).

2.3.4 Marital Status

A study in Botswana found that ANC visits improved with marriage, implying that married women used ANC services more frequently, particularly in the initial stages of pregnancy than women who were never married (Mathe, 2017). However, in South Africa, multiple married women visited ANC facilities about four times, whereas unmarried ones had five or more (Ebonwu et al., 2018; Juqu, 2021). In Rwanda, women who were unmarried, divorced or widowed, had three times less the number of ANC visits than those in unions (Kpienbaareh et al., 2022; Rurangirwa et al., 2017). Women in marriages said that their spouses encouraged them to maintain a healthy lifestyle (Laksono et al., 2020). Moreover, in Ghana, unmarried women were less likely than women in unions to make about four ANC appointments (Afaya et al., 2020; Sakeah et al., 2017). For example, in Ghana, unmarried women were required to abstain from sexual activities until marriage in hopes of avoiding public humiliation; as a result, most women who may have been pregnant with no husband delayed ANC visits to avoid shame and humiliation (Afaya et al., 2020).

2.3.5 Education

Educated women had higher odds of using ANC services, to effectively prepare for their pregnancies, to use ANC services frequently and consistently, and to utilize trained providers and medical facilities, positively linking a solid education background with safe delivery (Efendi et al., 2017; Juqu, 2021). In South Africa, better educated women had increased chances of ANC use in contrast to women with no formal education (Juqu, 2021). More than a quarter of women who accessed ANC at the beginning of their pregnancy had a secondary and higher education degree. Conversely, educated Zambian women had increased likelihood of ANC attendance as opposed to uneducated women (Jacobs et al., 2017; Sserwanja et al., 2021). Furthermore, Afaya et al. (2020) discovered that in rural Ghana, educational level had a high relationship with the use of ANC services four or more times.

2.3.6 Employment status

The literature shows that one's employment status has a major impact on ANC services and attendance. In South Africa, about 70% of self-employed women followed the 2016 recommended ANC visits (Tsawe & Susuman, 2014). Meanwhile, Rwabilimbo et al. (2020) discovered that in Tanzania, women who were legally employed had at least four or more ANC

visits, whereas informally employed women had about one to three ANC visits. A Cambodian study revealed that women who held office positions had high probabilities of using ANC on time and adequately (Chanda et al., 2020; Zhou et al., 2020). Additionally, women with employment had easier access to ANC than those without employment (Ahuru & Omon, 2019; Muhwava et al., 2016). This could be related to failure to cover the expenses related to ANC visits, such as transportation and meals, although primary healthcare is offered completely for free. In South Africa, transportation was highlighted as being the most expensive aspect of ANC (Muhwava et al., 2016).

2.3.7 Media exposure

The use of mass media has been proven to be a successful method of reaching out to mothers on a global scale and increasing the demand for maternal healthcare services, particularly in countries that are still in the process of development (Acharya et al., 2015). Pregnant women with media exposure experience were more likely than non-exposed women to seek maternal healthcare during ANC visits, labor, and postpartum (Fatema & Lariscy, 2020). In Bangladesh, women who read newspaper articles or started to watch live television had increased chances of ANC use (Shahjahan et al., 2013). Likewise, in Ethiopia, women who used the radio and watched television were more likely to begin ANC within the preferred timespan (Geta & Yallew, 2017). Similarly, India and South Asia also observed a substantial connection between the media and using ANC services during all three essential pregnancy stages (Dhawan et al., 2020; Fatema & Lariscy, 2020).

2.3.8 Household wealth

Several studies found significant correlations between ANC and wealth (Fagbamigbe & Idemudia, 2017; Feng et al., 2021). Women from upper socioeconomic quintiles were more likely to receive ANC eight times as advised by the WHO (Feng et al., 2021). Likewise, it was revealed in Ethiopia that participants from the upper socioeconomic class had a higher probability of receiving the required ANC visits (Tsegaye & Ayalew, 2020; Yaya et al., 2017). As shown in the studies, women in high-income households in South Africa had the recommended ANC visits in 2016 than women in low-income households (Ousman et al., 2019). In Indonesia, Laksono et al. (2020) reported that the wealthier a woman is, the greater her chances of receiving four or more ANC appointments. Nevertheless, in Ghana individual wealth

status, affected the use of ANC services, although maternal healthcare services were provided at no cost (Fagbamigbe & Idemudia, 2017; Feng et al., 2021).

2.3.9 Place of residence

The occurrence of ANC visits varies depending on where you live. In Sub-Saharan Africa, rural areas had a negative impact on ANC service utilization (Banke-Thomas et al., 2017; Okedo-Alex et al., 2019). This was ascribed to the restricted allocation of healthcare services in rural areas, as well as the considerable distances to travel and transport expenses that impede ANC service utilization regularly (Muhwava et al., 2016; Okedo-Alex et al., 2019). In South Africa, both rural and urban women improved their attendance, nonetheless, rural women had lesser rates of attending ANC services in comparison to urban women (Ousman et al., 2019). Correspondingly, Noh et al. (2019) showed in Pakistan, women living in urban areas had a higher percentage of receiving about four ANC appointments in comparison to those who live in rural settings.

2.3.10 Province

In South Africa, there were differences in the frequency of ANC attendance between provinces (Mohamed, 2019). Nonetheless, one of the most prominent elements of this country's society is inequality. This appears to be more noticeable in the area of healthcare access (Mohamed, 2019). Research carried out by (Obuaku-Igwe, 2015) showed that there were clear healthcare disparities between South African regions, with the Western Cape, which is dominated by white people, providing exceptional healthcare services. ANC in South Africa is signified by major spatial inequalities that are intimately connected to inequalities in socioeconomic status. All nine provinces differ in terms of environment, population distribution, and development. Poor provinces such as Limpopo and Mpumalanga have the poor infrastructure (including healthcare facilities) along with poor health services (Juqu, 2021), in contrast, rich and detailed regions like the Western Cape and some parts of Gauteng have superior infrastructural developments (Juqu, 2021).

2.4 Theoretical framework

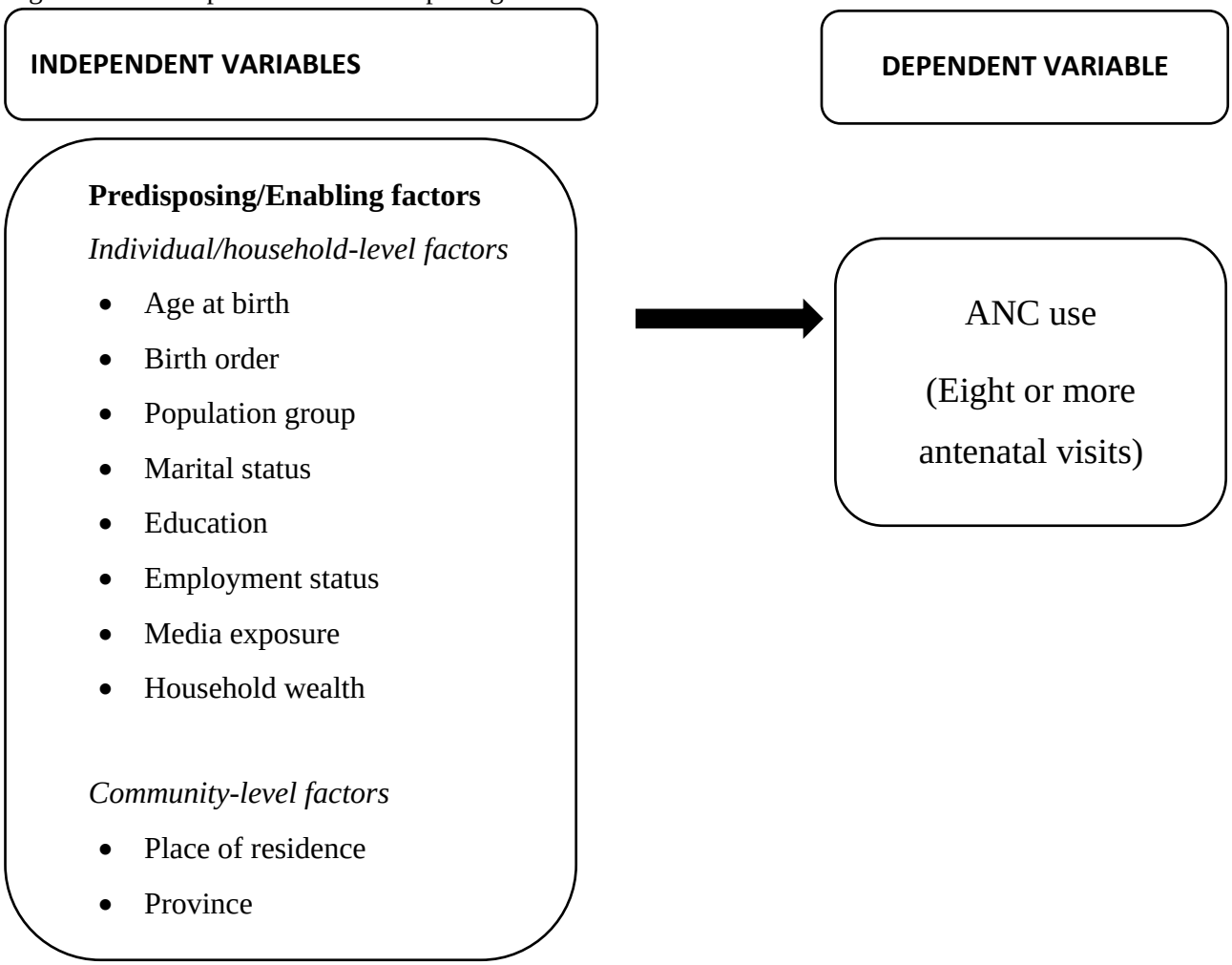
Andersen Behavioural Health Model

The theoretical framework used in this study was the behavioural model of health service utilization developed by Andersen in 1968 (Andersen, 1968; Neupane et al., 2020). Andersen built a model of health care utilization that examines three areas of health utilization determinants: (ii) predisposing factors (ii) enabling factors (iii) need-based factors. The predisposing factors include individual demographic and socioeconomic variables such as age, gender, education, marital status occupation, and family size (Ntoimo et al., 2022). The enabling factors comprise of resources present in both the family and the community (Feng et al., 2021). Examples of family resources include socioeconomic level and geographic location of the family. Community resources include the availability of healthcare providers and accessibility to healthcare facilities (Feng et al., 2021). On the other hand, need-based factors include people's perceptions of their own healthcare needs, whether they are private, social, or professionally evaluated (Wolinsky, 1988). This shows that a woman's perspective on the general significance of contemporary maternal care services versus traditional care practices can impact her decision to use a health facility for maternity care requirements. This study focuses on the predisposing and enabling factors.

2.5 Conceptual framework

The Andersen Behavioural Model Framework was used to classify the individual and contextual factors associated with the use of ANC visits among women in South Africa. Andersen established this multilevel model in 1968, incorporating individual and contextual determinants of healthcare utilization (Andersen, 1968; Neupane et al., 2020). There were several layers to it, which includes the external world, demographic traits, health behaviour, and outcomes. The study variables related to those of Andersen include predisposing factors namely, age, education, marital status, and employment status. In addition, it includes enabling factors, namely, household wealth. This method examines access indicators along with the external and internal healthcare environments that affect who can access and use healthcare services.

Figure 2.1: Conceptual framework depicting the multilevel determinants of antenatal care



CHAPTER THREE

METHODOLOGY

3.1 Study location

This study was based among women in the Republic of South Africa (RSA), which has nine provinces divided into two sections: urban and rural areas. South Africa's mid-year population in 2020 was 59.62 million, with roughly 30.5 million females (Statistics South Africa, 2020). The urban population accounts for 67.4%, while the rural population accounts for the remaining 32.6%. The majority of South Africans are black, accounting for 48.64% of the overall population. Coloureds and whites account for 10% of the population, with Indians accounting for 1.545% (Statistics South Africa, 2020). According to Statistics SA, between 2019 and 2020, South Africa's life expectancy was 64.7 years (Statistics South Africa, 2020).

3.2 Research design

This study utilized a descriptive cross-sectional research design. Descriptive research design is beneficial since it helps gathering information that depicts characteristics of the phenomenon by asking individuals about their views, attitudes, and values (Veal, 2017). The design depicts things as they are. In this case, the descriptive research design was utilized to fulfil the study's primary objective. This study used the quantitative approach. The quantitative approach is dependent on quantity and amount measurement. A quantitative approach is a statistical method for describing and quantifying the observation of materials or attributes (Wilson et al., 2017).

3.3 Data source

This study used data from the 2016 South Africa Demographic and Health Survey (SADHS) (National Department of Health et al., 2019). The (SADHS) is the country's third Demographic and health survey (DHS), following surveys in 1998 and 2003. The SADHS adopted a two-stage stratified sample design with primary sampling units (PSUs) being sampled using probability equivalent to size in the first stage and dwelling units (DUs) being sampled using systematic random sample during the second (National Department of Health et al., 2019). It generated a representative sample of 9878 women who were qualified to take part in the individual women

survey (National Department of Health et al., 2019). However, 8514 women aged 15–49 completed the survey, yielding an 86.2% response rate (National Department of Health et al., 2019).

3.4 Study sample

The study was restricted to 3036 South African women of childbearing age. The sample is based on women who had a live birth five years preceding the survey.

3.4.1 Study inclusion and exclusion criteria

Women aged 15-49 years as of the survey's commencement who answered the question about the number of times they had ANC during their pregnancy were included in this study, and all those who did not fall within this category were excluded.

3.5 Description of study variables

Dependent variable

The dependent variable used in this study was the use of eight or more ANC visits. The dependent variable was based on the question directed to women asking, "*How many times did you receive antenatal care during this pregnancy?*" Based on their response, women who reported that they attended eight or more ANC were coded as 1 and 0 otherwise. The variable used to create the dependent variable is based on variable m14 on the women's file.

Independent variables

The independent variables selected for this study were: age at birth, birth order, population group, marital status, education, employment status, media exposure, household wealth, place of residence and province. These variables are briefly described in Table 3.1.

Table 3.1: Description of the study variables

Variable Definition Code	**Variable Definition Code**	**Variable Definition Code**
Received eight or more ANC visits	Women who reported that they received eight or more ANC	0= No

Variable Definition Code	Variable Definition Code	Variable Definition Code
		1= Yes
Age at birth	Age of respondents at birth	1= <20 2= 20-34 3= 35-49
Birth order	Birth order of respondents	1= 1 2= 2-3 3= 4-5 4= 6+
Population group	Population group (race) of the respondents (other includes Indian/Asian as well as white population groups)	1= Black, 2= Coloured 3= Other
Marital status	Respondents were asked whether they were married/in a union or not	0= Never in union 1= Currently in union 2= Formerly in union
Education level	Highest level of education attained by the respondents	0= No education 1= Primary 2= Secondary+
Employment status	Current employment status of the respondents	0= Not employed 1= Employed
Household wealth	Household socioeconomic status	1= Poor 2= Average 3= Rich
Media exposure	Respondents were asked whether they were exposed to the media (radio, TV, newspaper) or not	0= No, 1= Yes
Place of residence	Respondent's place of residence	1= Urban 2= Rural
Province	Respondent's province of residence	1= Western Cape 2= Eastern Cape 3= Northern Cape 4= Free State 5= KwaZulu-Natal 6= North West 7= Gauteng 8= Mpumalanga 9= Limpopo

3.6 Method of analysis

Stata version 14 was used for the study. The study focused on women aged 15 to 49 when the survey was conducted. For this study, three types of analyses were chosen; these include univariate, bivariate, and multivariate analysis. The bivariate analysis, with a chi-square test (χ^2), was used to estimate the use of eight or more antenatal care visits. Multivariate multilevel logistic regression was used to analyse individual/household-level and community factors in determining eight or more antenatal use due to the data set's hierarchical structure. Multilevel modeling was used because it answers research questions about how outcomes at the individual level can be influenced by the interplay of individual and contextual factors (Odimegwu et al., 2023)For the dissemination of results, the author plans to publish parts of this research in a peer-reviewed academic journal with the supervisor.

Model specification

The study used multilevel analysis approaches to cater for the hierarchical structure of the Demographic and Health Survey data as well as the dualistic nature of the dependent variable. In this study, a two-level model was used, with individuals/households (level 1) clustered within communities (level 2). The level 1 model investigates the correlations between individual/household-level factors and eight or more antenatal care visits, whereas the level 2 model investigates the impact of community-level factors on eight or more antenatal care visits.

The two-level model is denoted as:

$$logit\left(\pi_{ij}\right) = log\left[\frac{\pi_{ij}}{1-\pi_{ij}}\right] = \beta_0 + \beta_1 x_{ij} + \beta_2 x_{ij} \ldots + u_{0j} + e_{0ij}$$

Where πij is the probability of an *ith* woman in the *jth* community using eight or more antenatal care visits, $\beta 0$ is the intercept, βn is the regression coefficient, xij indicates the independent variables, $u0j$ is the community level errors and $e0ij$ indicates the individual-level errors. The study fitted four models. Model 0 is the null model, which did not add any independent variable. Model 1 added the individual/household-level factors. Model 2 looked at the community-level factors. Model 3 (the full model) added the individual/household-level and community-level factors. We used the Intra-class correlation (ICC), median odd ratio (MOR) and proportional change in variance (PCV) to measure the presence of clustering. The study used the Akaike

Information Criterion (AIC) to estimate the goodness of fit in the model; the [-2 log-likelihood was used to measure the deviance in the models]. A multicollinearity test was conducted and there was no collinearity between the independent variables; the mean VIF was 1.30, the minimum VIF was 1.07 and the maximum VIF was 1.63.

3.7 Limitations

The study's limitations were strongly linked to its cross-sectional design, which cannot measure causation between variables. Moreover, there could be under- or over-reporting of ANC services received by pregnant women. Likewise, women who are unaware of the value of antenatal care may not see the necessity of keeping track of their visits, which could skew the study's findings. Attendance and visitation at an ANC facility do not guarantee the quality of care. Furthermore, receiving ANC throughout pregnancy do not mean that an individual will always receive prevention efforts that will improve the pregnancy outcomes.

3.8 Ethical considerations

This study used secondary data from the South African Demographic and Health Survey, 2016 datasets. Permission to download the dataset was requested from Measure DHS, and the dataset was downloaded when the request was approved. There were no privacy issues as no personally identifiable information such as the respondent's name was disclosed in the dataset. Application for ethical clearance was requested and conferred by the North-West University ethics committee, Basic and Social Sciences Research Ethics Committee (BaSSREC) with ethics number: NWU-01010-22-A7.

CHAPTER FOUR

DATA ANALYSIS AND RESULTS

4.1 Introduction

The findings of the study are presented in this chapter. It has three subsections: the first subsection presents the results of the univariate analyses, the second subsection presents the results of the bivariate analyses, and the third subsection presents the results of the binary logistic regression.

4.2 Characteristics of the study population

Table 4.1 presents the background characteristics of the study population. In terms of age at birth, the highest percentage of women were those whose age at birth was 20-34 (72.5%), followed by those whose age at first birth was <20 (14.2%) and the least was for those whose age at birth was 35-49 (13.3%). In relation to birth order, most respondents had birth order 2-3 (52.2%), followed by those who had birth order 1 (34.4%), and those who had birth order 4-5 (10.7%) – the lowest was found among those with birth order 6+ (2.8%). Regarding population group, the vast majority of women belonged to the black population (90.6%), followed by the coloured population group (6.8%) and the lowest were from 'other' population groups (2.8%). In relation to marital status, the majority of women were unmarried (51.9%), whereas 44.2% were currently in a union and the least were those who were formerly in a union (3.9%). In terms of mother's education, about 90.4% of respondents had secondary education, 8.2% had primary education and 1.4% had no education.

Regarding employment status, the majority of respondents were not employed (66.8%) and about 33.2% were employed. In reference to media exposure, the majority of respondents had no media exposure (71.9%) while 28.0% had media exposure. In terms of household wealth, the majority (45.8%) came from poor households, 32.1% were from rich households, and the smallest proportion came from average-wealth households (22.1%). In relation to place of residence, about 64.0% of women resided in urban areas whereas 36.0% resided in rural areas. Regarding the provinces, the percentage distributions indicated that the highest proportion of women were located in Gauteng (27.7%), followed by 18.3% in KwaZulu-Natal. Just over ten percent of

women were located in the Eastern Cape province (11.0%); the lowest percentage of women were located in Northern Cape (2.0%).

Table 4.1: Percentage distribution of background characteristics of the study population

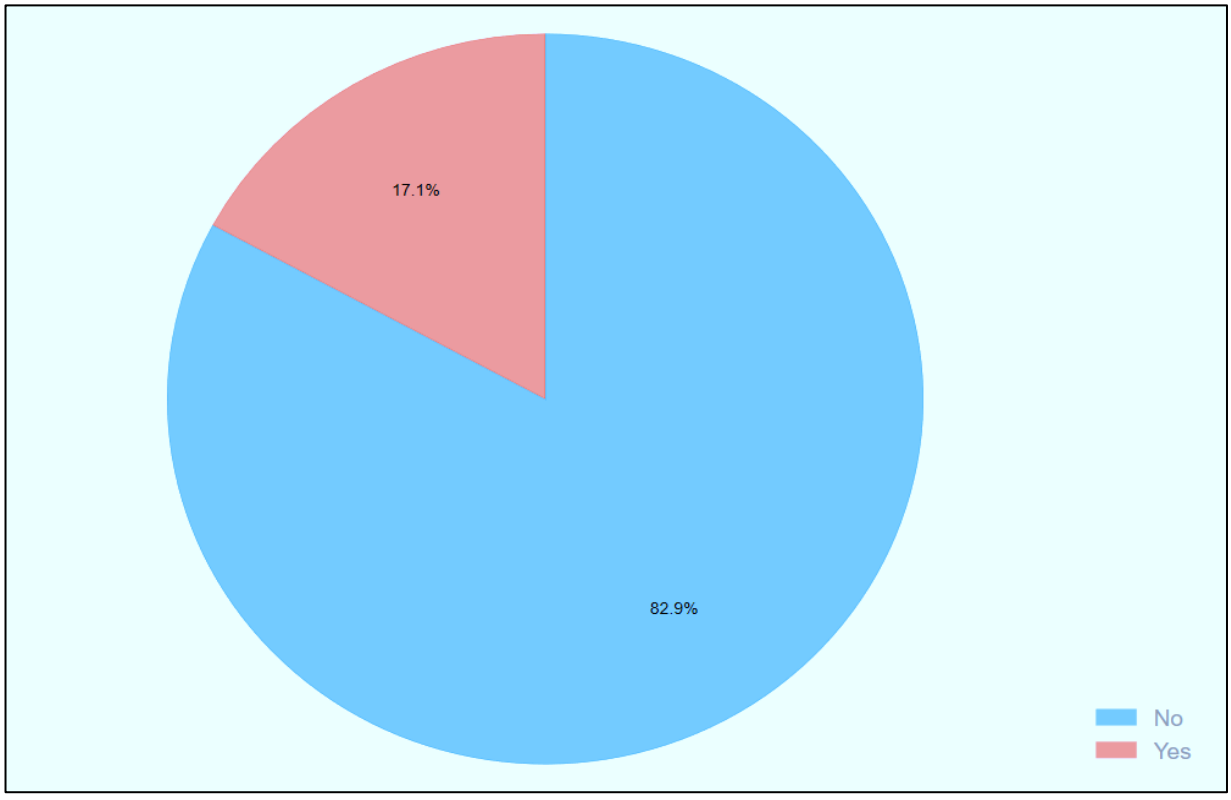
Variable	**Number**	**Percentage**
Individual/household level factors		
Age at birth		
<20	432	14.2
20-34	2200	72.5
35-49	404	13.3
Birth order		
1	1040	34.3
2-3	1586	52.2
4-5	326	10.7
6+	84	2.8
Population group		
Black	2751	90.6
Coloured	206	6.8
Other	80	2.6
Marital status		
Never in union	1576	51.9
Currently in union	1343	44.2
Formerly in union	118	3.9
Education level		
No education	42	1.4
Primary	249	8.2
Secondary+	2745	90.4
Employment status		
Not employed	2027	66.8
Employed	1009	33.2
Media exposure		
No	2184	71.9
Yes	851	28.0
Household wealth		
Poor	1389	45.8
Average	671	22.1
Rich	975	32.1
Community level factors		
Place of residence		
Urban	1942	64.0
Rural	1094	36.0
Province		
Western Cape	276	9.1
Eastern Cape	335	11.0
Northern Cape	61	2.0
Free State	145	4.8
KwaZulu-Natal	555	18.3
North West	244	8.0
Gauteng	842	27.7
Mpumalanga	278	9.2

Variable	Number	Percentage
Limpopo	301	9.9
Total	3036	100.0

4.3 Prevalence of using eight or more antenatal visits

Figure 4.1 presents the percentage distribution of eight or more (8+) antenatal care visits (ANC). In terms of 8+ ANC visits, 82.9% of women did not attend the recommendation of 8+ ANC services while 17.1% received the recommended 8+ ANC visits. These findings show that the use of 8+ ANC is generally low in the country.

Figure 4.1: Percentage distribution of eight or more antenatal care visits



Own computations from the South Africa 2016 DHS

Table 4.2 shows the prevalence of 8+ ANC visits by background characteristics. The results show that age at birth, birth order, population group, marital status, employment status, media exposure, household wealth, place of residence and province were statistically significant with 8+ ANC visits ($p<0.05$). The findings showed that the use of 8+ ANC visits fluctuates with age at birth. There was a higher prevalence (18.5%) of 8+ ANC appointments among women whose

first birth was at age 20-34 and those whose first birth was at age 35-49 (16.0%). Women with birth order 2-3 had a higher prevalence of 8+ ANC visits (18.4%), followed by those with birth order 1 (16.8%). Women from the 'other' population group had the overall prevalence of 8+ ANC visits (31.2%), followed by those from the coloured population group (25.9%), while women from the black population group had the least prevalence of 8+ ANC visits (16.0%). In reference to marital status, women who were currently in union had a higher prevalence of 8+ ANC visits (19.2%) and those who were formerly in union had a 17.9% prevalence of 8+ ANC visits.

Furthermore, the findings showed that the use of 8+ ANC visits improved with educational attainment. Women with secondary or more education had the highest prevalence of 8+ ANC visits (17.4%), followed by those with primary education (15.1%), and those without education had a lower prevalence of 8+ ANC visits. Employed women had a higher prevalence (21.4%) of 8+ ANC visits and those who were not employed had a lower prevalence (14.9%) of 8+ ANC visits. Women with media exposure had the highest prevalence of 8+ ANC visits (22.3%). The findings further revealed that the use of 8+ ANC visits improved with household wealth status. Women from rich households had a higher prevalence (24.2%) of 8+ ANC visits, while those from poor households had a lower prevalence (13.2%) of 8+ ANC visits. In relation to the place of residence, women from urban areas had a higher prevalence (17.7%) of 8+ ANC visits, while those from rural areas had a lower prevalence (16.0%) of 8+ ANC visits. Women from the Western Cape province had a higher prevalence (33.8%) of 8+ ANC visits, followed by those from Free State province (29.2%), North West province (23.4%) and Limpopo province (19.0%). The prevalence of 8+ ANC attendance was lower among women from KwaZulu-Natal (13.5%), Northern Cape (11.5%) and Gauteng (10.3%).

Table 4.2: Presents the prevalence of eight or more antenatal visits by background factors

Variable	Attended 8+ ANC visits				Total	Chi-square	
	No		Yes			Value	P-value
	%	CI	%	CI			
Individual/household level factors							
Age at birth						15.1	0.001
<20	89.0	[85.5-91.7]	11.0	[8.3-14.5]	100.0		
20-34	81.5	[79.3-83.5]	18.5	[16.5-20.7]	100.0		
35-49	84.0	[78.9-88.0]	16.0	[12.0-21.1]	100.0		
Birth order						9.3	0.025
1	83.2	[80.2-85.8]	16.8	[14.2-19.8]	100.0		
2-3	81.6	[79.0-83.9]	18.4	[16.1-21.0]	100.0		
4-5	86.6	[81.5-90.5]	13.4	[9.5-18.5]	100.0		
6+	89.3	[79.4-94.8]	10.7	[5.2-20.6]	100.0		
Population group						11.3	0.004
Black	84.0	[82.1-85.7]	16.0	[14.3-17.9]	100.0		
Coloured	74.1	[66.7-80.3]	25.9	[19.7-33.3]	100.0		
Other	68.8	[54.7-80.2]	31.2	[19.8-45.3]	100.0		
Marital status						10.5	0.005
Never in union	84.7	[82.4-86.8]	15.3	[13.2-17.6]	100.0		
Currently in union	80.8	[77.6-83.6]	19.2	[16.4-22.4]	100.0		
Formerly in union	82.1	[72.4-88.9]	17.9	[11.1-27.6]	100.0		
Education level						1.8	0.403
No education	90.1	[77.5-96.0]	9.9	[4.0-22.5]	100.0		
Primary	84.9	[79.0-89.4]	15.1	[10.6-21.0]	100.0		
Secondary+	82.6	[80.7-84.4]	17.4	[15.6-19.3]	100.0		
Employment status						12.0	0.001
Not employed	85.1	[83.1-86.9]	14.9	[13.1-16.9]	100.0		
Employed	78.6	[75.0-81.7]	21.4	[18.3-25.0]	100.0		
Media exposure						23.9	0.000
No	84.9	[82.9-86.7]	15.1	[13.3-17.1]	100.0		
Yes	77.7	[73.9-81.0]	22.3	[19.0-26.1]	100.0		
Household wealth						36.5	0.000
Poor	86.8	[84.5-88.8]	13.2	[11.2-15.5]	100.0		
Average	85.2	[81.5-88.3]	14.8	[11.7-18.5]	100.0		
Rich	75.8	[72.1-79.1]	24.2	[20.9-27.9]	100.0		
Community level factors							
Place of residence						10.1	0.001
Urban	82.3	[79.7-84.6]	17.7	[15.4-20.3]	100.0		
Rural	84.0	[81.5-86.2]	16.0	[13.8-18.5]	100.0		
Province						83.3	0.000
Western Cape	66.2	[59.0-72.6]	33.8	[27.4-41.0]	100.0		
Eastern Cape	83.1	[78.4-86.9]	16.9	[13.1-21.6]	100.0		
Northern Cape	88.5	[84.3-91.7]	11.5	[8.3-15.7]	100.0		
Free State	70.8	[64.8-76.2]	29.2	[23.8-35.2]	100.0		
KwaZulu-Natal	86.5	[82.0-90.0]	13.5	[10.0-18.0]	100.0		
North West	76.6	[71.3-81.2]	23.4	[18.8-28.7]	100.0		
Gauteng	89.7	[85.1-93.0]	10.3	[7.0-14.9]	100.0		
Mpumalanga	84.0	[80.2-87.2]	16.0	[12.8-19.8]	100.0		
Limpopo	81.0	[76.8-84.6]	19.0	[15.4-23.2]	100.0		
Total	**82.9**	**[81.1-84.6]**	**17.1**	**[15.4-18.9]**	**100.0**		

Note: CI = Confidence Interval

4.4 Multilevel determinants of using eight or more antenatal visits

Model fit statistics

Table 4.3 presents the random effects and model fit statistics for the individual and contextual factors associated with 8+ ANC visits among women of reproductive age. In the null model, the intra-class correlation coefficient (ICC) was 9.94%, implying that about 9.94% of the differences in 8+ ANC visits were attributed to the difference at the community-level factors. The null model's median odds ratio (MOR) value of 1.78 demonstrated unexplained clusters' heterogeneity. The unexplained community-level difference in 8+ ANC visits declined to a MOR of 1.46 when the final model was adjusted for both individual and community-level factors. This demonstrated that even after considering all factors, the effect of clustering remained constant in the full model (model 3). After incorporating both individual and community-level factors into the full model, the proportional change in variance (PCV) showed that about 56.47% of differences in the use of 8+ ANC visits were attributable to both individual and community-level factors. For model comparison or fitness statistics, the AIC and deviance (-2LL) were used. The best-fitted model was the one with the lowest AIC and deviance, which is model three. Therefore, in the regression results (Table 4.4), model three is interpreted.

Table 4.3: Random effects and model fit statistics for 8+ ANC visits

Random effects result	**Model 0 (*empty model*)**	**Model 1**	**Model 2**	**Model 3**
PSU variance (95% CI)	0.363 [0.19-0.70]	0.281 [0.13-0.62]	0.183 [0.06-0.55]	0.158 [0.05-0.54]
ICC %	9.94	7.88	5.28	4.57
MOR	1.78	1.66	1.50	1.46
PCV %	Ref	22.59	49.59	56.47
Model fitness				
-2LL	2843	2778	2769	2714
AIC	2847	2812	2791	2766
PSU	671	671	671	671

Note: Ref = reference; ICC = intra-cluster correlation coefficient; MOR = median odds ratio; PCV = proportional change in variance; -2LL = deviance [-2 log-likelihood]; AIC = Akaike Information Criterion; PSU = Primary Sampling Unit

Multilevel determinants of 8+ ANC

Table 4.4 presents the multilevel logistic regression results for the relationship between 8+ ANC visits and background factors among women of reproductive age. The results showed that women whose age at birth was 20-34 had 1.58 [95% CI: 1.13-2.23] increased chances of using 8+ ANC visits in contrast to those whose age at birth was less than 20. Women with media exposure were 1.32 [95% CI: 1.05-1.68] times more likely to use 8+ ANC visits compared to

those who weren't exposed to the media. Moreover, the likelihoods of using 8+ ANC improved with household wealth status. Women from rich households had 1.49 [95% CI: 1.11-2.00] greater chances of using 8+ ANC visits in comparison to those from poor households. The findings further showed provincial differences in 8+ ANC use. Women from the Western Cape 4.23 [95% CI: 2.4-7.45], Eastern Cape 2.55 [95% CI: 1.54-4.23], Free State 4.13 [95%CI: 2.54-6.72], KwaZulu-Natal 1.73 [95% CI 1.04-2.86], North West 3.25 [95% CI: 1.95-5.33], Mpumalanga 2.01 [95% CI 1.22-3.34] and Limpopo 2.88 [95% CI 1.71-4.85] were more likely to use 8+ ANC services in comparison to their Gauteng counterparts.

Table 4.4: Multilevel logistic regression results for the determinants of 8+ ANC visits among women of reproductive age in South Africa

Variable	Model 1		Model 2		Model 3	
	AOR	95% CI	AOR	95% CI	AOR	95% CI
Individual/household level factors						
Age at birth						
<20®	1.00				1.00	
20-34	1.59**	[1.13-2.24]			1.58**	[1.13-2.23]
35-49	1.50	[0.94-2.38]			1.44	[0.90-2.28]
Birth order						
1®	1.00				1.00	
2-3	0.95	[0.75-1.22]			0.97	[0.76-1.23]
4-5	0.70	[0.46-1.05]			0.72	[0.48-1.09]
6+	0.50	[0.23-1.07]			0.51	[0.24-1.10]
Population group						
Black®	1.00				1.00	
Coloured	0.92	[0.64-1.33]			0.83	[0.54-1.29]
Other	1.31	[0.72-2.41]			1.49	[0.81-2.73]
Marital status						
Never in union®	1.00				1.00	
Currently in union	1.24	[1.00-1.54]			1.24	[0.99-1.54]
Formerly in union	0.90	[0.53-1.53]			0.80	[0.47-1.35]
Education level						
No education®	1.00				1.00	
Primary	1.08	[0.41-2.85]			1.00	[0.38-2.63]
Secondary+	0.97	[0.39-2.45]			0.91	[0.36-2.29]
Employment status						
Not employed®	1.00				1.00	
Employed	1.20**	[0.97-1.49]			1.19	[0.96-1.48]
Media exposure						
No®	1.00				1.00	
Yes	1.38	[1.09-1.73]			1.32*	[1.05-1.68]
Household wealth						
Poor®	1.00				1.00	
Average	1.11	[0.85-1.45]			1.06	[0.81-1.40]
Rich	1.55***	[1.19-2.00]			1.49**	[1.11-2.00]
Community level factors						
Place of residence						

Variable	Model 1		Model 2		Model 3	
	AOR	**95% CI**	**AOR**	**95% CI**	**AOR**	**95% CI**
Urban®			1.00		1.00	
Rural			0.76*	[0.6-0.97]	0.98	[0.74-1.29]
Province						
Western cape			4.33***	[2.59-7.25]	4.23***	[2.4-7.45]
Eastern cape			2.10*	[1.28-3.46]	2.55***	[1.54-4.23]
Northern cape			1.28	[0.74-2.24]	1.49	[0.82-2.69]
Free state			3.79***	[2.34-6.14]	4.13***	[2.54-6.72]
KwaZulu-Natal			1.49	[0.91-2.45]	1.73*	[1.04-2.86]
North west			2.93***	[1.79-4.79]	3.25***	[1.98-5.33]
Gauteng®			1.00		1.00	
Mpumalanga			1.77*	[1.07-2.92]	2.01**	[1.22-3.34]
Limpopo			2.51***	[1.5-4.21]	2.88***	[1.71-4.85]

Note: * = p<0.05; ** = p<0.01; *** = p<0.001; ® = reference category; AOR = adjusted odds ratio; CI = confidence interval

CHAPTER FIVE

DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter provides a summary of the findings and conclusions based on the data analysed in the previous chapter. It further includes recommendations based on the conclusions and purpose of the study. This chapter discusses the results for both the bivariate and multivariate analyses.

5.2 Discussions

The study aimed to determine the individual and contextual determinants of using eight or more antenatal visits among women of reproductive age in South Africa. Generally, the use of 8+ ANC was found to be low among reproductive women. This finding is similar to recent studies in other developing countries which have found low rates of 8+ ANC uptake (Ekholuenetale et al., 2021; Fagbamigbe & Idemudia, 2015; Islam & Masud, 2018; Sui et al., 2021). The factors that were associated with eight or more ANC visits included age at birth, birth order, population group, employment status, media exposure, place of residence, household wealth as well as province. Other studies have also found that these factors are important in explaining the use of antenatal care (Alem et al., 2022; Istifa et al., 2021; Nketiah-Amponsah et al., 2013; Wang & Hong, 2015). On the multivariate analysis, the findings showed that there was a statistical relationship between age at birth, media exposure, household wealth, province and the use of eight or more antenatal visits.

The study found that the use of eight or more ANC visits was highest among women aged 20-34 years. In South Africa, this is considered the youth cohort (National Youth Policy, 2020). Studies in other countries also found that younger women, mostly in their youthful ages had higher odds of using maternal health services (Islam & Masud, 2018; Saad–Haddad et al., 2016; Shitie & Azene, 2021). The motivation behind the increased use of antenatal services among younger women is that they often have less experience with pregnancy and birth, are very cautious about their pregnancies, and are usually pregnant with their first child, as a result, they attend more antenatal appointments to better understand pregnancy and prepare for childbirth (Birmeta et al., 2013; Riggs et al., 2017; Spiby et al., 2022). Moreover, the prevalence estimates revealed that eight or more ANC attendance declined with birth order for women with two or

more births. This finding is in line with previous studies which revealed that women's odds of having the recommended eight ANC visits decreased as their birth order increased (Ahinkorah et al., 2021; Kumar et al., 2019; Mlandu et al., 2022). This could be the result of increased confidence from a previous pregnancy or lack of financial support for ANC use, thus putting their lives and unborn children in danger (Aliyu & Dahiru, 2017; Anastasi et al., 2015; Miteniece et al., 2018).

The study also discovered that the use of eight or more ANC services significantly improved with socioeconomic background. This finding was similar to other studies which showed that the richest women and those with highest maternal education received the recommended 8+ ANC visits (Ekholuenetale, Nzoputam, et al., 2020; Sui et al., 2021; Tsegaye & Ayalew, 2020). This might be that individuals from wealthy families have access to private health insurance and good quality care (Weldesenbet et al., 2021) and educated women understand that good maternal health care is critical to a child's survival (Adedini et al., 2014; Muyunda et al., 2016). Additionally, the study reported that employed women had higher rates of ANC visits. Studies in other countries also revealed that employed women had increased likelihood of four or more ANC visits in contrast to women who were not employed (Assefa & Tadesse, 2017; Rwabilimbo et al., 2020). One possible explanation for higher use of ANC among employed women is that they can afford (Alanazy et al., 2019; Okonofua et al., 2018). On contrary, studies in other countries revealed that employed women had a tendency to present late for their first ANC visit (Ebonwu et al., 2018; Solarin & Black, 2013). This could be that employed women are busy compared to those who are not working, thus, attend ANC later in their pregnancy (Milne et al., 2015; Seidu, 2021). The findings from the study also indicated that the use of ANC was higher among women who had media exposure. This finding was comparable to other studies that found that media exposure increased the use of ANC services among reproductive women (Shibre et al., 2021; Sserwanja et al., 2021; Tekelab et al., 2019). This could be because communication via mobile phones, radios, television, and so on is beneficial for health promotion activities (Biswas et al., 2021; Khatiwada et al., 2020; Pulok et al., 2016).

Moreover, the study confirmed that women from urban areas had higher chance of completing eight ANC services. This result was substantiated by other studies which showed that there was a consistent increase in eight or more ANC visits among urban women (Ekholuenetale, 2021; Islam & Masud, 2018). Lower ANC attendance among rural women may be connected to rural

women's lower socioeconomic status, limited healthcare services, and lower ease of access to healthcare services because of inadequate or non-existent transportation services (Islam & Masud, 2018; Konje et al., 2018; Tadesse, 2020). The study's findings also showed that there were provincial variations in the use of eight or more ANC visits. Other studies also found that the quality of ANC varied significantly across provinces or regions (Lee et al., 2016; Sahito & Fatmi, 2018). In the case of South Africa, Western Cape was found to have a higher prevalence of ANC visits while Gauteng was found to have a lower prevalence. One possible justification can be that the Western Cape has been one of the better-funded provinces in the country, and it still has a better healthcare system than most of the other provinces in the country (Lavin & Pattinson, 2018; Ned et al., 2020). On the other hand, in Gauteng there was poor health care delivery; clinic booking procedures, such as long waiting times and opening hours, aggravate the situation (Schultz, 2016; Solarin & Black, 2013). Similarly, pregnant women are dismissed from clinics because of limited staff to see all patients (Jinga et al., 2019; Solarin & Black, 2013). Furthermore, the results of this study are related to the study's theoretical framework (Andersen Behavioural Health Model) because they showed that factors such as age at birth, media exposure, household wealth, and province were associated with eight or more ANC visits among women of reproductive age in South Africa.

5.3 Conclusion

The study's findings showed that the use of 8+ ANC visits was low among reproductive women in South Africa. The study further indicated that age at birth, birth order, population group, marital status, employment status, media exposure, household wealth, place of residence and province were important factors in the utilization of 8+ ANC visits. The findings further revealed that community-level factors were essential in clarifying the utilization of 8+ ANC attendance among women in the country. Moreover, women under the age of twenty, those from the black population group, with lower socioeconomic status, from rural areas, as well as Gauteng had a lower prevalence of 8+ ANC use.

5.4 Recommendations

The study’s recommendations are intended to increase the use of ANC by black women, those with low levels of education, those younger than age twenty, and those with birth order two or more. This might be in the form of campaigns and media communication, where programmes

encourage and emphasize the importance of ANC visits. Further to that, there should be a provision of more clinics in rural areas; this will improve women's accessibility to maternal health facilities and shorten the travelling time between their home and the nearby clinic, and therefore this will increase their ANC attendance. Women in provinces such as Gauteng, the Northern Cape, and KwaZulu-Natal require increased health-care spending as compared to women in the Western Cape Province. There should be financial support for maternal health which focuses on addressing the needs of women who face socioeconomic, demographic, and geographic impediments. Women who follow the recommendation of eight or more visits will reduce the incidences of maternal and infant mortality rates.

REFERENCES

Acharya, D., Khanal, V., Singh, J. K., Adhikari, M., & Gautam, S. (2015). Impact of mass media on the utilization of antenatal care services among women of rural community in Nepal. *BMC research notes*, *8*(1), 1-6.

Adedini, S. A., Odimegwu, C., Bamiwuye, O., Fadeyibi, O., & Wet, N. D. (2014). Barriers to accessing health care in Nigeria: implications for child survival. *Global health action*, *7*(1), 23499.

Adedokun, S. T., & Yaya, S. (2020). Correlates of antenatal care utilization among women of reproductive age in sub-Saharan Africa: evidence from multinomial analysis of demographic and health surveys (2010–2018) from 31 countries. *Archives of Public Health*, *78*(1), 1-10.

Afaya, A., Azongo, T. B., Dzomeku, V. M., Afaya, R. A., Salia, S. M., Adatara, P., Kaba Alhassan, R., Amponsah, A. K., Atakro, C. A., & Adadem, D. (2020). Women's knowledge and its associated factors regarding optimum utilisation of antenatal care in rural Ghana: A cross-sectional study. *Plos one*, *15*(7), e0234575.

Afulani, P. A. (2015). Rural/urban and socioeconomic differentials in quality of antenatal care in Ghana. *Plos one*, *10*(2), e0117996.

Ahinkorah, B. O., Ameyaw, E. K., Seidu, A.-A., Odusina, E. K., Keetile, M., & Yaya, S. (2021). Examining barriers to healthcare access and utilization of antenatal care services: evidence from demographic health surveys in sub-Saharan Africa. *BMC health services research*, *21*(1), 1-16.

Ahuru, R. R., & Omon, I. J. (2019). Predictors of Antenatal Care Utilization in Primary Healthcare Centers in Eight Rural Communities in Delta State, Nigeria. *African Journal of Health Economics*, *8*, 1-22.

Alanazy, W., Rance, J., & Brown, A. (2019). Exploring maternal and health professional beliefs about the factors that affect whether women in Saudi Arabia attend antenatal care clinic appointments. *Midwifery*, *76*, 36-44.

Alem, A. Z., Yeshaw, Y., Liyew, A. M., Tesema, G. A., Alamneh, T. S., Worku, M. G., Teshale, A. B., & Tessema, Z. T. (2022). Timely initiation of antenatal care and its associated factors among pregnant women in sub-Saharan Africa: A multicountry analysis of Demographic and Health Surveys. *Plos one*, *17*(1), e0262411.

Aliyu, A. A., & Dahiru, T. (2017). Predictors of delayed Antenatal Care (ANC) visits in Nigeria: secondary analysis of 2013 Nigeria Demographic and Health Survey (NDHS). *The Pan African medical journal*, *26*.

Anastasi, E., Borchert, M., Campbell, O. M., Sondorp, E., Kaducu, F., Hill, O., Okeng, D., Odong, V. N., & Lange, I. L. (2015). Losing women along the path to safe motherhood: why is there such a gap between women's use of antenatal care and skilled birth attendance? A mixed methods study in northern Uganda. *Bmc Pregnancy and Childbirth*, *15*(1), 1-15.

Andersen, R. (1968). A behavioral model of families' use of health services. *A behavioral model of families' use of health services.*(25).

Assefa, E., & Tadesse, M. (2017). Factors related to the use of antenatal care services in Ethiopia: application of the zero-inflated negative binomial model. *Women & health*, *57*(7), 804-821.

Babalola, S. O. (2014). Factors associated with use of maternal health services in Haiti: a multilevel analysis. *Revista Panamericana de Salud Pública*, *36*, 1-09.

Baheiraei, A., Mirghafourvand, M., Charandabi, S. M.-A., & Mohammadi, E. (2013). Facilitators and inhibitors of health-promoting behaviors: the experience of Iranian women of reproductive age. *International journal of preventive medicine*, *4*(8), 929.

Banke-Thomas, A., Banke-Thomas, O., Kivuvani, M., & Ameh, C. A. (2017). Maternal health services utilisation by Kenyan adolescent mothers: analysis of the demographic health survey 2014. *Sexual & Reproductive Healthcare*, *12*, 37-46.

Bhutta, Z. A., Das, J. K., Bahl, R., Lawn, J. E., Salam, R. A., Paul, V. K., Sankar, M. J., Blencowe, H., Rizvi, A., & Chou, V. B. (2014). Can available interventions end preventable deaths

in mothers, newborn babies, and stillbirths, and at what cost? *The Lancet*, *384*(9940), 347-370.
Birmeta, K., Dibaba, Y., & Woldeyohannes, D. (2013). Determinants of maternal health care utilization in Holeta town, central Ethiopia. *BMC health services research*, *13*(1), 1-10.
Biswas, R. K., Rahman, N., Islam, H., Senserrick, T., & Bhowmik, J. (2021). Exposure of mobile phones and mass media in maternal health services use in developing nations: evidence from urban health survey 2013 of Bangladesh. *Contemporary South Asia*, *29*(3), 460-473.
Blencowe, H., Cousens, S., Jassir, F. B., Say, L., Chou, D., Mathers, C., Hogan, D., Shiekh, S., Qureshi, Z. U., & You, D. (2016). National, regional, and worldwide estimates of stillbirth rates in 2015, with trends from 2000: a systematic analysis. *The Lancet Global Health*, *4*(2), e98-e108.
Catling, C. J., Medley, N., Foureur, M., Ryan, C., Leap, N., Teate, A., & Homer, C. S. (2015). Group versus conventional antenatal care for women. *Cochrane Database of Systematic Reviews*(2).
Chanda, S. K., Ahammed, B., Howlader, M. H., Ashikuzzaman, M., Shovo, T.-E.-A., & Hossain, M. T. (2020). Factors associating different antenatal care contacts of women: A cross-sectional analysis of Bangladesh demographic and health survey 2014 data. *Plos one*, *15*(4), e0232257.
Dansou, J., Adekunle, A. O., & Arowojolu, A. O. (2017). Factors associated with antenatal care services utilisation patterns amongst reproductive age women in Benin Republic: an analysis of 2011/2012 Benin Republic's demographic and health survey data. *Nigerian Postgraduate Medical Journal*, *24*(2), 67.
Dhawan, D., Pinnamaneni, R., Bekalu, M., & Viswanath, K. (2020). Association between different types of mass media and antenatal care visits in India: a cross-sectional study from the National Family Health Survey (2015–2016). *BMJ open*, *10*(12), e042839.
Ebonwu, J., Mumbauer, A., Uys, M., Wainberg, M. L., & Medina-Marino, A. (2018). Determinants of late antenatal care presentation in rural and peri-urban communities in South Africa: A cross-sectional study. *Plos one*, *13*(3), e0191903.
Efendi, F., Chen, C.-M., Kurniati, A., & Berliana, S. M. (2017). Determinants of utilization of antenatal care services among adolescent girls and young women in Indonesia. *Women & health*, *57*(5), 614-629.
Ekholuenetale, M. (2021). Prevalence of eight or more antenatal care contacts: findings from multi-country nationally representative data. *Global Pediatric Health*, *8*, 2333794X211045822.
Ekholuenetale, M., Benebo, F. O., & Idebolo, A. F. (2020). Individual-, household-, and community-level factors associated with eight or more antenatal care contacts in Nigeria: Evidence from Demographic and Health Survey. *Plos one*, *15*(9), e0239855. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7518602/pdf/pone.0239855.pdf
Ekholuenetale, M., Nzoputam, C. I., & Barrow, A. (2021). Prevalence and socioeconomic inequalities in eight or more antenatal care contacts in Ghana: findings from 2019 population-based data. *International journal of women's health*, *13*, 349.
Ekholuenetale, M., Nzoputam, C. I., Barrow, A., & Onikan, A. (2020). Women's enlightenment and early antenatal care initiation are determining factors for the use of eight or more antenatal visits in Benin: further analysis of the Demographic and Health Survey. *Journal of the Egyptian Public Health Association*, *95*(1), 1-12.
Fagbamigbe, A. F., & Idemudia, E. S. (2015). Assessment of quality of antenatal care services in Nigeria: evidence from a population-based survey. *Reproductive health*, *12*(1), 1-9.
Fagbamigbe, A. F., & Idemudia, E. S. (2017). Wealth and antenatal care utilization in Nigeria: policy implications. *Health care for women international*, *38*(1), 17-37.
Fatema, K., & Lariscy, J. T. (2020). Mass media exposure and maternal healthcare utilization in South Asia. *SSM-Population Health*, *11*, 100614.
Feng, Y., Ahuru, R. R., Anser, M. K., Osabohien, R., Ahmad, M., & Efegbere, A. H. (2021). Household economic wealth management and antenatal care utilization among

business women in the reproductive-age. *African Journal of Reproductive Health*, *25*(6), 143.
Geta, M. B., & Yallew, W. W. (2017). Early initiation of antenatal care and factors associated with early antenatal care initiation at health facilities in southern Ethiopia. *Advances in Public Health*, *2017*.
Haruna-Ogun, O. A. (2018). Geographical differentials in uptake of antenatal care services in Nigeria. *Health care for women international*, *39*(1), 34-49.
Hlongwane, T. M., Bozkurt, B., Barreix, M. C., Pattinson, R., Gülmezoglu, M., Vannevel, V., & Tunçalp, Ö. (2021). Implementing antenatal care recommendations, South Africa. *Bulletin of the World Health Organization*, *99*(3), 220.
Islam, M. M., & Masud, M. S. (2018). Determinants of frequency and contents of antenatal care visits in Bangladesh: Assessing the extent of compliance with the WHO recommendations. *Plos one*, *13*(9), e0204752.
Istifa, M. N., Efendi, F., Wahyuni, E. D., Ramadhan, K., Adnani, Q. E. S., & Wang, J.-Y. (2021). Analysis of antenatal care, intranatal care and postnatal care utilization: Findings from the 2017 Indonesian Demographic and Health Survey. *Plos one*, *16*(10), e0258340.
Jacobs, C., Moshabela, M., Maswenyeho, S., Lambo, N., & Michelo, C. (2017). Predictors of antenatal care, skilled birth attendance, and postnatal care utilization among the remote and poorest rural communities of Zambia: a multilevel analysis. *Frontiers in Public Health*, *5*, 11.
Jinga, N., Mongwenyana, C., Moolla, A., Malete, G., & Onoya, D. (2019). Reasons for late presentation for antenatal care, healthcare providers' perspective. *BMC health services research*, *19*(1), 1-9.
Juqu, F. Z. (2021). *Provincial differences in the number of antenatal care visits for pregnant women in South Africa: evidence from the 2016 South African Demographic and Health Survey*
Kaswa, R., Rupesinghe, G. F., & Longo-Mbenza, B. (2018). Exploring the pregnant women's perspective of late booking of antenatal care services at Mbekweni Health Centre in Eastern Cape, South Africa. *African Journal of Primary Health Care and Family Medicine*, *10*(1), 1-9.
Khatiwada, J., Muzembo, B. A., Wada, K., & Ikeda, S. (2020). Dimensions of women's empowerment on access to skilled delivery services in Nepal. *Bmc Pregnancy and Childbirth*, *20*(1), 1-13.
Konje, E. T., Magoma, M. T. N., Hatfield, J., Kuhn, S., Sauve, R. S., & Dewey, D. M. (2018). Missed opportunities in antenatal care for improving the health of pregnant women and newborns in Geita district, Northwest Tanzania. *Bmc Pregnancy and Childbirth*, *18*(1), 1-13.
Kpienbaareh, D., Kofinti, R. E., Konkor, I., Amoak, D., Kansanga, M. M., & Luginaah, I. (2022). Knowledge of pregnancy complications and utilization of antenatal care services in Rwanda. *The International Journal of Health Planning and Management*, *37*(3), 1680-1693.
Kumar, G., Choudhary, T. S., Srivastava, A., Upadhyay, R. P., Taneja, S., Bahl, R., Martines, J., Bhan, M. K., Bhandari, N., & Mazumder, S. (2019). Utilisation, equity and determinants of full antenatal care in India: analysis from the National Family Health Survey 4. *Bmc Pregnancy and Childbirth*, *19*(1), 1-9.
Laksono, A. D., Rukmini, R., & Wulandari, R. D. (2020). Regional disparities in antenatal care utilization in Indonesia. *Plos one*, *15*(2), e0224006.
Lavin, T., & Pattinson, R. C. (2018). Does antenatal care timing influence stillbirth risk in the third trimester? A secondary analysis of perinatal death audit data in South Africa. *BJOG: An International Journal of Obstetrics & Gynaecology*, *125*(2), 140-147.
Lee, E., Madhavan, S., & Bauhoff, S. (2016). Levels and variations in the quality of facility-based antenatal care in Kenya: evidence from the 2010 service provision assessment. *Health Policy and Planning*, *31*(6), 777-784.
Makate, M. (2016). Maternal health-seeking behavior and child's birth order: Evidence from Malawi, Uganda, and Zimbabwe.

Manyeh, A. K., Amu, A., Williams, J., & Gyapong, M. (2020). Factors associated with the timing of antenatal clinic attendance among first-time mothers in rural southern Ghana. *Bmc Pregnancy and Childbirth*, *20*(1), 1-7.

Mathe, M. (2014). FACTORS INFLUENCING UTILISATION OF ANTENATAL CARE SERVICES IN BOTSWANA.

Mathe, M. (2017). Socio-demographic factors affecting utilization of Antenatal Care Services in Botswana. *International Journal of Academic Research in Business and Social Sciences*, *7*(9), 477-520.

McNellan, C. R., Dansereau, E., Wallace, M. C., Colombara, D. V., Palmisano, E. B., Johanns, C. K., Schaefer, A., Ríos-Zertuche, D., Zúñiga-Brenes, P., & Hernandez, B. (2019). Antenatal care as a means to increase participation in the continuum of maternal and child healthcare: an analysis of the poorest regions of four Mesoamérican countries. *Bmc Pregnancy and Childbirth*, *19*(1), 1-11.

Milne, L., van Teijlingen, E., Hundley, V., Simkhada, P., & Ireland, J. (2015). Staff perspectives of barriers to women accessing birthing services in Nepal: a qualitative study. *Bmc Pregnancy and Childbirth*, *15*, 1-11.

Miteniece, E., Pavlova, M., Shengelia, L., Rechel, B., & Groot, W. (2018). Barriers to accessing adequate maternal care in Georgia: a qualitative study. *BMC health services research*, *18*(1), 1-12.

Mlandu, C., Matsena-Zingoni, Z., & Musenge, E. (2022). Trends and determinants of late antenatal care initiation in three East African countries, 2007–2016: A population based cross-sectional analysis. *PLOS Global Public Health*, *2*(8), e0000534.

Mohamed, N. (2019). *Sustainability Transitions in South Africa*. Routledge Abingdon and New York.

Moller, A.-B., Petzold, M., Chou, D., & Say, L. (2017). Early antenatal care visit: a systematic analysis of regional and global levels and trends of coverage from 1990 to 2013. *The Lancet Global Health*, *5*(10), e977-e983.

Muchie, K. F. (2017). Quality of antenatal care services and completion of four or more antenatal care visits in Ethiopia: a finding based on a demographic and health survey. *Bmc Pregnancy and Childbirth*, *17*(1), 1-7.

Muhwava, L. S., Morojele, N., & London, L. (2016). Psychosocial factors associated with early initiation and frequency of antenatal care (ANC) visits in a rural and urban setting in South Africa: a cross-sectional survey. *Bmc Pregnancy and Childbirth*, *16*(1), 1-9.

Musarandega, R., Nyakura, M., Machekano, R., Pattinson, R., & Munjanja, S. P. (2021). Causes of maternal mortality in sub-Saharan Africa: a systematic review of studies published from 2015 to 2020. *Journal of global health*, *11*.

Muyunda, B., Makasa, M., Jacobs, C., Musonda, P., & Michelo, C. (2016). Higher educational attainment associated with optimal antenatal care visits among childbearing women in Zambia. *Frontiers in Public Health*, *4*, 127.

National Department of Health, Statistics South Africa, South African Medical Research Council, & ICF. (2019). *South Africa demographic and health survey 2016* (Pretoria, South Africa and Rockville, Maryland, USA, Issue.

National Youth Policy. (2020). *National Youth Policy 2020-2030*.

Ned, L., Tiwari, R., Buchanan, H., Van Niekerk, L., Sherry, K., & Chikte, U. (2020). Changing demographic trends among South African occupational therapists: 2002 to 2018. *Human resources for health*, *18*(1), 1-12.

Neupane, B., Rijal, S., Gc, S., & Basnet, T. B. (2020). Andersen's model on determining the factors associated with antenatal care services in Nepal: an evidence-based analysis of Nepal demographic and health survey 2016. *Bmc Pregnancy and Childbirth*, *20*(1), 1-11.

Nghargbu, R., & Olaniyan, O. (2019). *Determinants of antenatal care utilization in Nigeria*. African Development Bank.

Nketiah-Amponsah, E., Senadza, B., & Arthur, E. (2013). Determinants of utilization of antenatal care services in developing countries: recent evidence from Ghana. *African Journal of Economic and Management Studies*.

Noh, J.-W., Kim, Y.-m., Lee, L. J., Akram, N., Shahid, F., Kwon, Y. D., & Stekelenburg, J. (2019). Factors associated with the use of antenatal care in Sindh province, Pakistan: A population-based study. *Plos one*, *14*(4), e0213987.

Ntoimo, L. F. C., Okonofua, F. E., Aikpitanyi, J., Yaya, S., Johnson, E., Sombie, I., Aina, O., & Imongan, W. (2022). Influence of women's empowerment indices on the utilization of skilled maternity care: evidence from rural Nigeria. *Journal of Biosocial Science*, *54*(1), 77-93.

Obse, A. G., & Ataguba, J. E. (2021). Explaining socioeconomic disparities and gaps in the use of antenatal care services in 36 countries in sub-Saharan Africa. *Health Policy and Planning*, *36*(5), 651-661.

Obuaku-Igwe, C. C. (2015). Health inequality in South Africa: A systematic review. *African Sociological Review/Revue Africaine de Sociologie*, *19*(2), 96-131.

Odimegwu, C., Muchemwa, M., & Akinyemi, J. O. (2023). Systematic review of multilevel models involving contextual characteristics in African demographic research. *Journal of Population Research*, *40*(2), 10.

Odusina, E. K., Ahinkorah, B. O., Ameyaw, E. K., Seidu, A.-A., Budu, E., Zegeye, B., & Yaya, S. (2021). Noncompliance with the WHO's Recommended Eight Antenatal Care Visits among Pregnant Women in Sub-Saharan Africa: A Multilevel Analysis. *BioMed Research International*, *2021*.

Okedo-Alex, I. N., Akamike, I. C., Ezeanosike, O. B., & Uneke, C. J. (2019). Determinants of antenatal care utilisation in sub-Saharan Africa: a systematic review. *BMJ open*, *9*(10), e031890.

Okonofua, F., Ntoimo, L., Ogungbangbe, J., Anjorin, S., Imongan, W., & Yaya, S. (2018). Predictors of women's utilization of primary health care for skilled pregnancy care in rural Nigeria. *Bmc Pregnancy and Childbirth*, *18*(1), 1-15.

Ousman, S. K., Mdala, I., Thorsen, V. C., Sundby, J., & Magnus, J. H. (2019). Social determinants of antenatal care service use in Ethiopia: changes over a 15-year span. *Frontiers in Public Health*, 161.

Pulok, M. H., Sabah, M. N.-U., Uddin, J., & Enemark, U. (2016). Progress in the utilization of antenatal and delivery care services in Bangladesh: where does the equity gap lie? *Bmc Pregnancy and Childbirth*, *16*(1), 1-16.

Riggs, E., Muyeen, S., Brown, S., Dawson, W., Petschel, P., Tardiff, W., Norman, F., Vanpraag, D., Szwarc, J., & Yelland, J. (2017). Cultural safety and belonging for refugee background women attending group pregnancy care: an Australian qualitative study. *Birth*, *44*(2), 145-152.

Rurangirwa, A. A., Mogren, I., Nyirazinyoye, L., Ntaganira, J., & Krantz, G. (2017). Determinants of poor utilization of antenatal care services among recently delivered women in Rwanda; a population based study. *Bmc Pregnancy and Childbirth*, *17*(1), 1-10.

Rwabilimbo, A. G., Ahmed, K. Y., Page, A., & Ogbo, F. A. (2020). Trends and factors associated with the utilisation of antenatal care services during the millennium development goals era in Tanzania. *Tropical Medicine and Health*, *48*(1), 1-16.

Saad–Haddad, G., DeJong, J., Terreri, N., Restrepo–Méndez, M. C., Perin, J., Vaz, L., Newby, H., Amouzou, A., Barros, A. J., & Bryce, J. (2016). Patterns and determinants of antenatal care utilization: analysis of national survey data in seven countdown countries. *Journal of global health*, *6*(1).

Sahito, A., & Fatmi, Z. (2018). Inequities in antenatal care, and individual and environmental determinants of utilization at national and sub-national level in Pakistan: a multilevel analysis. *International journal of health policy and management*, *7*(8), 699.

Sakeah, E., Okawa, S., Rexford Oduro, A., Shibanuma, A., Ansah, E., Kikuchi, K., Gyapong, M., Owusu-Agyei, S., Williams, J., & Debpuur, C. (2017). Determinants of attending antenatal care at least four times in rural Ghana: analysis of a cross-sectional survey. *Global health action*, *10*(1), 1291879.

Schultz, L. (2016). *Record-keeping in the antenatal care register in Tshwane district, Gauteng province*

Seidu, A.-A. (2021). Factors associated with early antenatal care attendance among women in Papua New Guinea: a population-based cross-sectional study. *Archives of Public Health*, *79*(1), 70.
Shahjahan, M., Chowdhury, H. A., Akter, J., Afroz, A., Rahman, M. M., & Hafez, M. (2013). Factors associated with use of antenatal care services in a rural area of Bangladesh. *South East Asia Journal of Public Health*, *2*(2), 61-66.
Shibre, G., Zegeye, B., Idriss-Wheeler, D., & Yaya, S. (2021). Factors affecting the utilization of antenatal care services among women in Guinea: a population-based study. *Family Practice*, *38*(2), 63-69.
Shitie, A., & Azene, Z. N. (2021). Factors affecting the initiation and continuation of maternal health service utilization among women who delivered in the past one year in Enemay district, East Gojjam, Ethiopia. *Archives of Public Health*, *79*(1), 1-9.
Solarin, I., & Black, V. (2013). "They told me to come back": women's antenatal care booking experience in inner-city Johannesburg. *Maternal and child health journal*, *17*(2), 359-367.
Spiby, H., Stewart, J., Watts, K., Hughes, A. J., & Slade, P. (2022). The importance of face to face, group antenatal education classes for first time mothers: A qualitative study. *Midwifery*, *109*, 103295.
Sserwanja, Q., Musaba, M. W., Mutisya, L. M., Olal, E., & Mukunya, D. (2021). Continuum of maternity care in Zambia: a national representative survey. *Bmc Pregnancy and Childbirth*, *21*(1), 1-10.
Statistics South Africa. (2020). Mid-Year Population Estimates. . *Statistics South Africa* (Pretoria)
Sui, Y., Ahuru, R. R., Huang, K., Anser, M. K., & Osabohien, R. (2021). Household socioeconomic status and antenatal care utilization among women in the reproductive-age. *Frontiers in Public Health*, *9*.
Tadesse, E. (2020). Antenatal care service utilization of pregnant women attending antenatal care in public hospitals during the COVID-19 pandemic period. *International journal of women's health*, *12*, 1181.
Tekelab, T., Chojenta, C., Smith, R., & Loxton, D. (2019). Factors affecting utilization of antenatal care in Ethiopia: a systematic review and meta-analysis. *Plos one*, *14*(4), e0214848.
Tessema, Z. T., & Minyihun, A. (2021). Utilization and determinants of antenatal care visits in east African countries: a multicountry analysis of demographic and health Surveys. *Advances in Public Health*, *2021*.
Tessema, Z. T., Teshale, A. B., Tesema, G. A., & Tamirat, K. S. (2021). Determinants of completing recommended antenatal care utilization in sub-Saharan from 2006 to 2018: evidence from 36 countries using demographic and health surveys. *Bmc Pregnancy and Childbirth*, *21*(1), 1-12.
Tsawe, M., & Susuman, A. S. (2014). Determinants of access to and use of maternal health care services in the Eastern Cape, South Africa: a quantitative and qualitative investigation. *BMC research notes*, *7*(1), 1-10.
Tsegaye, B., & Ayalew, M. (2020). Prevalence and factors associated with antenatal care utilization in Ethiopia: an evidence from demographic health survey 2016. *Bmc Pregnancy and Childbirth*, *20*(1), 1-9.
Tufa, G., Tsegaye, R., & Seyoum, D. (2020). Factors Associated with Timely Antenatal Care Booking Among Pregnant Women in Remote Area of Bule Hora District, Southern Ethiopia. *International journal of women's health*, *12*, 657.
UNICEF. (2019). Antenatal care 2018 Available: https://data. unicef. org/topic/maternal-health/antenatal-care. *View Article*.
Veal, A. J. (2017). *Research methods for leisure and tourism*. Pearson UK.
Wabiri, N., Chersich, M., Shisana, O., Blaauw, D., Rees, H., & Dwane, N. (2016). Growing inequities in maternal health in South Africa: a comparison of serial national household surveys. *Bmc Pregnancy and Childbirth*, *16*(1), 1-12.

Wang, W., & Hong, R. (2015). Levels and determinants of continuum of care for maternal and newborn health in Cambodia-evidence from a population-based survey. *Bmc Pregnancy and Childbirth*, *15*(1), 1-9.

Weldesenbet, A. B., Kebede, S. A., Ayele, B. H., & Tusa, B. S. (2021). Health insurance coverage and its associated Factors among reproductive-age women in East Africa: A multilevel mixed-effects generalized linear model. *Clinicoeconomics and Outcomes Research: CEOR*, *13*, 693.

Wilson, C., Lukowicz, R., Merchant, S., Valquier-Flynn, H., Caballero, J., Sandoval, J., Okuom, M., Huber, C., Brooks, T. D., & Wilson, E. (2017). Quantitative and qualitative assessment methods for biofilm growth: A mini-review. *Research & reviews. Journal of engineering and technology*, *6*(4).

Wolinsky, F. (1988). Seeking and using health services. *The sociology of health*, 117-144.

World Health Organization. (2016). *WHO recommendations on antenatal care for a positive pregnancy experience*. World Health Organization.

Yaya, S., Bishwajit, G., Ekholuenetale, M., Shah, V., Kadio, B., & Udenigwe, O. (2017). Timing and adequate attendance of antenatal care visits among women in Ethiopia. *Plos one*, *12*(9), e0184934.

Zhou, D., Zhou, Z., Yang, C., Ji, L., Ghose, B., & Tang, S. (2020). Sociodemographic characteristics associated with the utilization of maternal health services in Cambodia. *BMC health services research*, *20*(1), 1-12.

APPENDICES

Appendix A1: Ethics approval letter

Private Bag X1290, Potchefstroom South Africa 2520

NWU®
NORTH-WEST UNIVERSITY
NOORDWES-UNIVERSITEIT
YUNIBESITI YA BOKONE-BOPHIRIMA

Senate Committee for Research Ethics

Tel: 016 103 4446

Email: nkosinathi.machine@nwu.ac.za

24 August 2022

ETHICS APPROVAL LETTER OF STUDY

Based on approval by the **Basic and Social Sciences Research Ethics Committee (BaSSREC)** on **24/08/2022**, the Basic and Social Sciences Research Ethics Committee hereby **approves** your study as indicated below. This implies that the North-West University Senate Committee for Research Ethics (NWU- SERC) grants its permission that, provided the special conditions specified below are met and pending any other authorisation that may be necessary, the study may be initiated, using the ethics number below.

Study title: Individual and contextual factors associated with antenatal care utilization among Women of reproductive age in South Africa

Study Leader/Supervisor (Principal Investigator)/Researcher: Dr Mluleki Tsawe

Student/Research Team: M Malatji-30116724

Ethics number:

Institution Study Number Year Status

Status: S = Submission; R = Re-Submission; P = Provisional Authorisation; A = Authorisation

N	W	U	-	0	1	0	1	0	-	2	2	-	A	7	

Application Type: Single study

Commencement date: **29/08/2022**

Expiry date: 29/08/2023

Approval of the study is initially provided for a year, after which continuation of the study is dependent on receipt and review of the annual (or as otherwise stipulated) monitoring report and the concomitant issuing of a letter of continuation.

Special in process conditions of the research for approval (if applicable):

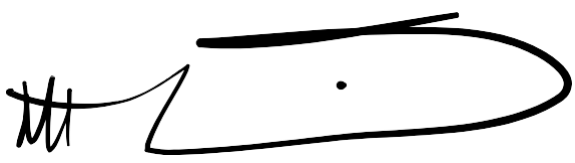
General conditions:

While this ethics approval is subject to all declarations, undertakings and agreements incorporated and signed in the application form, the following general terms and conditions will apply:

- *The study leader/supervisor (principal investigator)/researcher must report in the prescribed format to* the BaSSREC:
  - *annually (or as otherwise requested) on the monitoring of the study, whereby a letter of continuation* will be provided, and upon completion of the study; and
  - *without any delay in case of any adverse event or incident (or any matter that interrupts sound ethical* principles) during the course of the study.
- *The approval applies strictly to the proposal as stipulated in the application form. Should any* amendments to the proposal be deemed necessary during the course of the study, the study leader/researcher must apply for approval of these amendments at the BaSSREC, prior to implementation. Should there be any deviations from the study proposal without the necessary approval of such amendments, the ethics approval is immediately and automatically forfeited.
- *Annually a number of studies may be randomly selected for an external audit.*
- *The date of approval indicates the first date that the study may be started.*
- *In the interest of ethical responsibility, the NWU-SCRE and BaSSREC reserves the right to:*
  - *request access to any information or data at any time during the course or after completion of the* study;
  - *to ask further questions, seek additional information, require further modification or monitor the* conduct of your research or the informed consent process;
  - *withdraw or postpone approval if:*
    - *any unethical principles or practices of the study are revealed or suspected;*
    - *it becomes apparent that any relevant information was withheld from the BaSSREC or that* information has been false or misrepresented;
    - *submission of the annual (or otherwise stipulated) monitoring report, the required amendments, or* reporting of adverse events or incidents was not done in a timely manner and accurately; and / or
    - *new institutional rules, national legislation or international conventions deem it necessary.*
- *BaSSREC can be contacted for further information or any report templates via* BaSSREC-Admin@nwu.ac.za.

The BaSSREC would like to remain at your service as scientist and researcher, and wishes you well with your study. Please do not hesitate to contact the BaSSREC or the NWU-SCRE for any further enquiries or requests for assistance.

Yours sincerely



Prof E. Idemudia

Chairperson NWU Basic and Social Sciences Research Ethics Committee

Appendix A2: Prevalence of eight or more antenatal visits among women of reproductive age (map)