

**Influence of data accuracy and non-use of quality information on reproductive health: a comparative study of Nigeria and South Africa**

**by**

**Adetooke Bukola Oyekola**

**Student Number:3707001**

**April, 2023**

Supervisor

Professor A.Sathiya Susuman

**UNIVERSITY of the  
WESTERN CAPE**

---

## CERTIFICATION

---

I certify that Adetooke Bukola Oyekola carried out this study in fulfilment of the requirement for the award of a PhD degree in Population Studies from the University of the Western Cape.

.....

**Supervisor**

Date

Professor A. Sathiya Susuman

Professor & Deputy HOD

Dept. of Statistics and Population Studies

University of the Western Cape

Cape Town, South Africa

UNIVERSITY *of the*  
WESTERN CAPE

---

## DEDICATION

---

The thesis is dedicated to God All Knowing for the wisdom, understanding and sustenance during this research. This thesis would be incomplete without the support and encouragement of my loving Husband, Prof Oluwaseun Oyekola and the patient and unconditional love of our angels, Gabriel and Michelle.

Thank you, family, for being a pillar of strength and believing in God for my successful completion.

This thesis is dedicated to you.



---

## ACKNOWLEDGEMENTS

---

I appreciate God for this privilege and the perseverance through my journey, and I do not take this for granted. I also acknowledge the assistance of every individual whom God has used in various ways to encourage me.

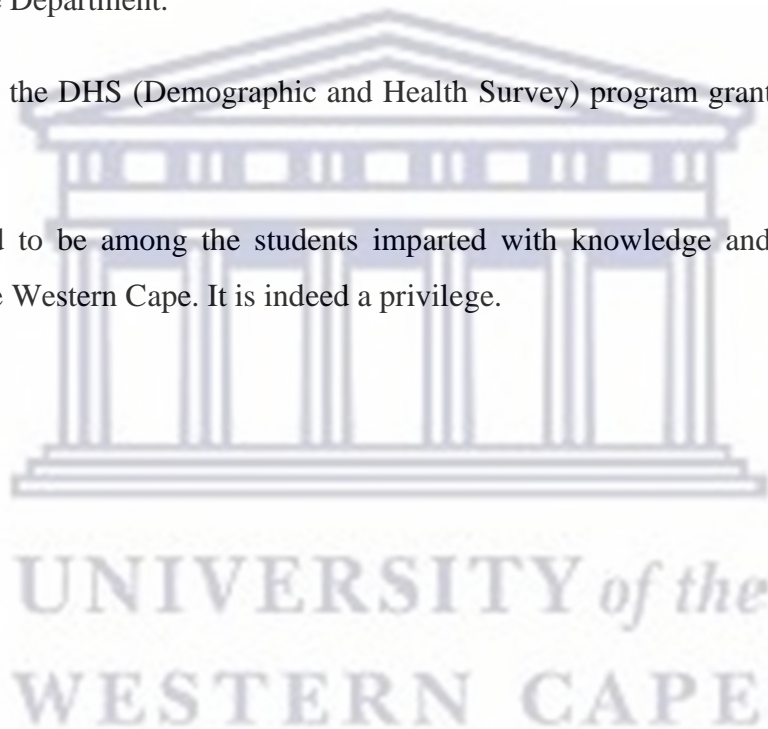
I acknowledge the support and prayers of my loving Parents, siblings, and immediate and extended family members. Thank you for being a blessing in all ramifications. In loving memory of my late Fathers, Mr Jacob Akintunde and Prof David Olaleye, for the happiness this achievement would have given them.

My immense gratitude to my Supervisor, Professor A. Sathiya Susuman (Professor & Deputy HOD, Department of Statistics and Population Studies, University of the Western Cape), for the academic supervision, Feedback, and support during the study period and all the staff and colleagues in the Department.

I also appreciate the DHS (Demographic and Health Survey) program granting me access to the survey data.

I am also proud to be among the students imparted with knowledge and groomed at the University of the Western Cape. It is indeed a privilege.

Thank you!



---

## ABSTRACT

---

In healthcare settings, information systems play a critical role in providing safe, timely, and effective healthcare services. Decision-making on medical supplies, healthcare providers, service delivery, finance, and governance all depend on access to health information. To improve overall health services and processes, these information systems manage data collection, processing, storage, retrieval, and utilisation. The effectiveness of health systems depends on effective administration and data quality.

Irrespective of the significance of health information systems, many low- and middle-income nations, such as South Africa and Nigeria, continue to encounter challenges with data accuracy and the use of high-quality information. Inaccurate data can lead to misinformed policy decisions and resource allocation, hindering efforts to improve reproductive health outcomes. Problems such as incomplete, outdated, unreported data, poor integration, and underutilisation of technology affect data quality and completeness. Data quality impacts decision-making, performance, and the ability to achieve national and international health goals. Government involvement and suitable policies are crucial for addressing these challenges and improving the effectiveness of health information systems.

The need for this study is evident due to the substantial challenges in data quality, disparities in healthcare access, cultural factors, and limited access to healthcare services. By addressing these challenges and evaluating data quality, the research provides a foundation for evidence-based policies and interventions that can enhance reproductive health outcomes in Nigeria and South Africa.

The conceptual framework highlights the relationship between factors in South Africa and Nigeria that delay or encourage postnatal care use. It emphasises the importance of policymakers in improving reproductive health outcomes and highlights the need for reliable information on reproductive health.

The study utilised the data of women of reproductive age (15- 49 years) from the Demographic and Health Survey, a quantitative method, gathering information from randomly selected households regarding eligible women within the reproductive age group of 15-49 years. The data is analysed using Univariate, Bivariate, and Multivariate methods. The univariate analysis uses statistical methods like percentages and chi-square tests to identify the background

characteristics of respondents. Bivariate analysis uses logistic regression to identify factors associated with reproductive health aspects. Multivariate analysis focuses on the distribution of observable characteristics by country and the relationship between variables like the timing of the first postnatal check for mothers. The second part examines the association of selected predictors to postnatal check timing.

Results showed discrepancies in data, peculiarity of different countries, and differences in data collection tools. There is an association between the time of postnatal check and Age, Region, Place of residence, Education, wealth index, Age at first birth, preceding birth interval and place of delivery in Nigeria. Only Place of delivery and Residence showed an association between the time of postnatal check and selected socio-demographic variables for South Africa.

Based on a thorough analysis, the recommendations include promoting health education, encouraging facility-based deliveries, prioritising education and knowledge-based outreaches, involving husbands in healthcare decision-making, promoting contraceptive use, improving infrastructure, continuously collecting and analysing data, and conducting continuous research. These measures can significantly improve the quality of maternal healthcare, postnatal care and the use of quality information for well-informed decision-making, thereby enhancing the overall well-being of mothers and children in Nigeria and South Africa.

**Keywords:** *Health Information Systems, Data Accuracy, Data quality, Reproductive Health Outcomes, Postnatal Care, Evidence-Based policies, South Africa, Nigeria.*



UNIVERSITY of the  
WESTERN CAPE

---

## TABLE OF CONTENTS

---

<b>DEDICATION.....</b>	<b>ii</b>
<b>ACKNOWLEDGEMENTS .....</b>	<b>iii</b>
<b>ABSTRACT.....</b>	<b>iv</b>
<b>LIST OF TABLES.....</b>	<b>ix</b>
<b>LIST OF FIGURES .....</b>	<b>x</b>
<b>CHAPTER 1 - INTRODUCTION.....</b>	<b>1</b>
1.1 Statement of the Problem.....	1
1.1.1 Significance of data quality and non-utilisation of information in Nigeria and South Africa .....	4
1.1.2 Reproductive health data quality in Nigeria and South Africa .....	5
1.2 Scope of research .....	5
1.3 Purpose Statement.....	7
1.4 Research Questions .....	7
1.5 Research Objectives .....	8
1.5.1 General Objectives .....	8
1.5.2 Specific Objectives .....	8
<b>CHAPTER 2 - LITERATURE REVIEW.....</b>	<b>9</b>
2.1 Introduction .....	9
2.1.1 Data accuracy and non-use of the information .....	9
2.1.2 History of data collection and reproductive health data in Nigeria and South Africa .....	10
2.1.3 Reproductive Health .....	12
2.2 Aspects of Reproductive Health Outcomes .....	14
2.2.1 Fertility.....	14
2.2.2 Family planning .....	14
2.2.3 Contraceptive prevalence .....	17
2.2.4 Unmet need for family planning .....	18
2.2.5 Access to reproductive health, antenatal and quality of care.....	19
2.2.6 Antenatal care coverage and proportion of births attended by skilled health personnel .....	20
2.2.7 Delivery (Home or Institutional) .....	22
2.2.8 Postnatal care .....	22
2.2.9 Infant, Child and Maternal Mortality.....	24
2.2.10 Maternal Mortality Ratio .....	26
2.3 Vaccination/ Child Immunisation Programme .....	28
2.4 Adolescent birth rate (Burden of Fertility on Teen Mothers) .....	28
2.5 Healthcare utilisation .....	29
2.6 Inequality in the utilisation of reproductive and maternal health services .....	31
2.7 Gender issues .....	31
2.8 Women empowerment .....	32
2.9 Health Information System (HIS) and Health Care Seeking Behaviour .....	34
2.10 Assessment of factors affecting data accuracy .....	37
2.11 Investigation of non-use of the information.....	38
2.12 Data Problem and Impact of poor-quality Data.....	38
2.13 Demographic And Health Survey .....	40
2.14 DHS data accuracy .....	42

2.15	Access to quality civil registration.....	43
2.16	Impact of data accuracy and non-use of quality information on reproductive health . .....	43
2.17	Conceptual Framework.....	45
<b>CHAPTER 3 - METHODOLOGY.....</b>		<b>47</b>
3.1	Introduction.....	47
3.2	The study area.....	47
3.3	The study population.....	47
3.4	Variable measurement .....	48
3.5	Study design.....	48
3.6	Sample design .....	49
3.7	Data collection .....	49
3.8	Data Analysis .....	50
3.9	Ethical consideration.....	51
<b>CHAPTER 4 - RESULTS .....</b>		<b>52</b>
4.1	Introduction.....	52
4.2	Socio-demographic Characteristics of respondents in South Africa and Nigeria....	52
4.3	Timing of mother postnatal care in Nigeria (NDHS 2018) and South Africa (SADHS 2016).....	58
4.4	Chi-square test of independence between Mother’s postnatal check and predictor variables .....	63
4.5	Influence of selected predictors or factors on a mother’s ability to obtain a postnatal check .....	72
<b>CHAPTER 5 - DISCUSSION .....</b>		<b>80</b>
5.1	Introduction.....	80
5.1.1	Influence of data accuracy and Non-use of quality information on postnatal check .....	81
5.2	Maternal characteristics in Nigeria and South Africa.....	82
5.3	Postnatal Care Timing Disparities in Nigeria and South Africa.....	84
5.4	Predictors of the timing of postnatal care in Nigeria and South Africa.....	85
5.5	Insights into maternal health care seeking behaviour to obtain postnatal checks in South Africa and Nigeria .....	86
<b>CHAPTER 6 - SUMMARY AND CONCLUSION.....</b>		<b>88</b>
6.1	Conclusion .....	88
6.2	Recommendation .....	89
6.3	Limitations of demographic and health surveys data in Nigeria and South Africa .	91
6.4	Improvement .....	93
6.5	Argument .....	94
6.6	Solution .....	94
6.7	Frontiers for further research .....	95
<b>REFERENCES.....</b>		<b>97</b>
<b>APPENDICES .....</b>		<b>122</b>



**Table 1: Definitions of Terms**

<b>Definitions</b>	
<b>Term</b>	<b>Definition</b>
Health Information Systems	Systems that help collect, store, process, and exchange health information of people, clinical data, administrative data, and financial data within the healthcare sector to benefit public health.
Data quality	A measure of how well data meet user's needs and expectations through its completeness, accuracy, consistency, reliability, timeliness and relevance.
Data Accuracy	Error-free data and real-world representation.
Reproductive Health Outcomes	Measure or consequences related to maternal and newborn health, child health, family planning, and sexual health. This reflects the overall well-being of individuals and their reproductive and sexual health.
Policy	Principles and guidelines established for decision-making. A framework to address specific issues, achieve objectives and manage resources efficiently.
Evidenced-based policy	Use of high-quality information to inform decisions.
Maternal health care	Ensuring and giving the necessary support to improve the health of women during pregnancy, childbirth and postnatal period.

**Table 2:** Thesis structure

<b>Thesis Structure</b>	
<b>Section</b>	<b>Description</b>
Title page	Title, name of author and Supervisor
Certification	This is the Statement of the Originality and Authorship of the thesis.
Dedication and Acknowledgements	Appreciation of Individuals who have contributed to the completion of this Study.
Abstract	Summary of Thesis
Table of contents	List of all sections and subsections in the Thesis.
List of Tables	Overview of results in Tables.
List of Figures	Visual information of results and frameworks.
Chapter 1	Introduction – Background information, Research questions and Objectives.
Chapter 2	Literature Review – Related studies review, theoretical and conceptual framework.
Chapter 3	Methodology – Explanation of the Research methods used and data.
Chapter 4	Result – Present the research findings from the data analysed.
Chapter 5	Discussion - Interpretation of findings and their implications.
Chapter 6	Conclusion - Summarised key findings in the study and recommendations.
References	List of all the sources cited in the thesis.
Appendices	Visual representation of Nigeria and South Africa on the Map.

## LIST OF TABLES

<b>Table 1:</b> Definitions of Terms .....	viii
<b>Table 2:</b> Thesis structure .....	ix
<b>Table 3:</b> The distribution of selected characteristics by Country (Nigeria) .....	54
<b>Table 4:</b> The distribution of selected characteristics by Country (South Africa).....	56
<b>Table 5:</b> Timing of first postnatal check for the mother by selected background characteristics in South Africa .....	60
<b>Table 6:</b> Timing of first postnatal check for the mother by selected background characteristics in Nigeria .....	62
<b>Table 7:</b> Chi-square test of independence between Mother’s postnatal check and predictor variables (Nigeria) .....	64

<b>Table 8:</b> Chi-square test of independence between Mother’s postnatal check and predictor variables (South Africa).....	66
<b>Table 9:</b> A multivariate logistic model for the aspect of reproductive health (Postnatal checks) in South Africa.....	74
<b>Table 10:</b> A multivariate logistic model for the aspect of reproductive health (Postnatal checks) in Nigeria .....	77

---

## LIST OF FIGURES

---

<b>Figure 1:</b> Health Metrics Network framework.....	35
<b>Figure 2:</b> Andersen’s behavioural model (1995) .....	35
<b>Figure 3:</b> Conceptual framework: A Data-Driven Framework for Informed Reproductive Healthcare Policy in Nigeria and South Africa.....	46
<b>Figure 4:</b> Percentage of women's time of postnatal check by Age (Nigeria).....	68
<b>Figure 5:</b> Percentage of women's time of postnatal check by Place of residence (Nigeria) ...	68
<b>Figure 6:</b> Percentage of women's time of postnatal check by Marital status (Nigeria) .....	69
<b>Figure 7:</b> Percentage of women's time of postnatal check by Education (Nigeria) .....	70
<b>Figure 8:</b> Percentage of women's time of postnatal check by Wealth Index (Nigeria).....	70
<b>Figure 9:</b> Percentage of women's time of postnatal check by Place of delivery (Nigeria) .....	71
<b>Figure 10:</b> Percentage of women’s time of postnatal check by place of delivery (South Africa) .....	71
<b>Figure 11:</b> Percentage of women's time of postnatal check by Place of residence (South Africa) .....	72
<b>Figure 12:</b> Map of Nigeria, extracted from the NDHS report.....	122
<b>Figure 13:</b> Map of South Africa, extracted from the SADHS report.....	123



---

## CHAPTER 1 - INTRODUCTION

---

### 1.1 Statement of the Problem

Information systems are extensively utilised in healthcare settings to offer secure, timely, effective, and efficient healthcare services (Jeddi *et al.*, 2020). Health information provides essential information for efficient decision-making about the health workforce, services, financing, governance and leadership, and all medical products (AbouZahr & Boerma, 2005). The information system signifies the management of data through collection, processing, storage, retrieval and use of the information required for a specific purpose to improve the health service and the health systems as a whole (Lippeveld, 2001). Good management is a requirement for growing the effectiveness of health services. Non-routine health information such as population census, demographic and health surveys provide data for a specific purpose over a long period (Lippeveld *et al.*, 2000), in which decisions are made based on the study. Health system success is determined by the performance involving generating and using quality data and information extracted from the health information systems (WHO, 2007). Considering the characteristics and requirements of different user groups is crucial for improving the quality of a national health information system in a developing country. The system's effectiveness depends on its features, such as functionality, reliability, usability, and manageability (Jeddi *et al.*, 2020; Handayani *et al.*, 2017).

In Nigeria, recent research by Anyebe *et al.* (2020) highlights the persistent challenges related to data accuracy and the consequences of not utilising quality information. Their study reveals that inaccurate data can lead to misinformed policy decisions and inadequate resource allocation, hampering efforts to improve reproductive health outcomes. Furthermore, Odimegwu *et al.* (2016) emphasise integrating quality information into healthcare systems to enhance service provision and improve reproductive health in Nigeria.

Likewise, Adebowale *et al.* (2017) investigated the effect of data accuracy on reproductive health in South Africa. Their results show that outdated or inadequate data can limit the efficacy of interventions and make it more difficult to identify particular needs related to reproductive health. Furthermore, recent work by Chirawurah *et al.* (2018) highlights the value of utilising quality information for targeted reproductive health interventions, leading to better outcomes for individuals and communities in South Africa. By comparing Nigeria and South Africa, this

study aims to identify similarities and differences in the effect of data accuracy and non-use of quality information on reproductive health outcomes. In addition, examining the unique contexts and challenges in these countries will provide valuable insights for policy formulation and program implementation.

Data quality impacts planning, resource financing and management of the health system (Mavimbe *et al.*, 2005). Data quality can be measured or determined by the accuracy, accessibility, completeness, consistency, relevance and timeliness of data (Teslow *et al.*, 2001). Data problems result in a burdensome, unreliable health record, which may not be useful to individuals, care providers and organisations. Adequate documentation yields accurate interpretation and, consequently, validation of data. However, computer-based records are complete and helpful in making decisions (Tang *et al.*, 1999; So *et al.*, 2010).

Consistent, reliable quality data, standard universal acceptable indicators and analysis are essential for the health information systems and to also manage it to be suitable to monitor progress towards Sustainable Development Goals and other general goals. A weak Health Information System impacts health-related Millennium Development Goals attainment (So *et al.*, 2010; Jha *et al.*, 2002; Larsson *et al.*, 2009).

The quality is still poor despite collecting large data in low- and middle-income countries. The data cannot be incorporated into other information systems and are only indirectly associated with measures critical to the SDGs and necessary universal background. Data quality and completeness are affected by many factors, such as lack of integration or poorly implemented integration, which may be untimeliness, data duplication, etc., affecting the functionality of digital health interventions and objectives. Insufficient, inaccurate or outdated data, which may impact the level of confidence in an outcome, is a major issue in Africa and influences the ability to monitor health improvement (Kruk *et al.*, 2018; Boerma *et al.*, 2018).

Data collection through technology is more efficient and accurate in a country with better quality control measures and monitoring health indicators. Still, the reporting burden reduces data quality and produces duplicate efforts (Okello *et al.*, 2018). Various designed technologies have improved the quality of data and the extent to which data is available from most African countries' health management and information systems. Nevertheless, the non-existence of quality publications through the use of these data is a significant concern. Several African countries are not making use of the vast available data supply. They have not grasped the best

use of data platforms, which is the basis for data not being analysed or examined and causing unreported outcomes despite the efforts made by national health systems policy-makers to gather and incorporate these health data into national databases (Farnham *et al.*, 2020).

The production of health records in Nigeria is still based on transcription and paper-based methods. Electronic health records are not generally implemented or used comprehensively (Cora *et al.*, 2010). Findings from a peer review assessing the impact of intervention within Africa revealed that South Africa partially implemented the electronic data platform, excluding its publication. Development and health indicators data are vital to policymakers, public health experts and supporters (Farnham *et al.*, 2020).

Unreported outcomes are influenced by various factors such as scarcity of research and analysis capacity, e.g. problem-solving skills, regular use of data platforms to manage agendas and make decisions are not being encouraged by society. There needs to be a more consistent quality of data through measures. Inaccurate data impacts reports' confidence levels, leading to incorrect conclusions and pointless policy decisions. It is, therefore, essential to equally prioritise all indicators for monitoring Population health and the progress towards achieving Sustainable Development Goals (Mitoko *et al.*, 2019) and also improve the quality of healthcare data due to its influence in making decisions in several ways. According to Kerr *et al.* (2008), performance is crucial for developing, advancing, and maintaining healthcare services. To reach national and international goals, it is essential to restructure problem reporting so that necessary and relevant indicators are coordinated internally and linked with authorities at both the national and international levels (Farnham *et al.*, 2020).

With the help of government agencies, the health information systems program has created technology that satisfies data requirements. One such tool is a publicly accessible data collecting and management tool that provides users an adjustable link to manage their health data. This platform is accessible and can also be used to perform data visualisation, validation and health data analysis at all stages of the health system. Timely access to quality data is vital to global governance and accountability (Farnham *et al.*, 2020). Government involvement in eHealth (using information and communication technologies for health) has an extensive and sustainable influence. It tends to be effective when there is a partnership with other organisations with the possibility of improvement in accessing quality health care and health information, likewise advancing the quality of health-related data (Jarosławski & Saberwal,

2014). The support from the government also brings about the effectiveness and sustainability of health information policies.

One of the challenges of using technology is that, in some instances, the government may not encourage using electronics to take records or capture data to avoid making people dealing with paper records redundant. Therefore, it is of utmost importance to have suitable policies that will make the use of technology effective and organise data in a layout in which it can be analysed. The government of Nigeria is developing policies and schemes for implementing health information technology to provide an operational National Health Management Information System that will inform decisions at all levels and, at the same time, improve healthcare (Adeleke *et al.*, 2014). The South African Government have also proposed the adoption of NHI (National Health Insurance), which will increase data sharing and accessibility and make sectors develop an interest in using electronic records (Mostert-Phipps *et al.*, 2012). Systems measuring data accuracy were accepted based on the recording or reporting standards specified by the government (Rumisha *et al.*, 2020). An efficient health information system should ascertain the types of data needed for specific purposes and also the data sources that are available and applicable for producing the required data components. Investment in human resources will also improve the quality of data (Jarosławski & Saberwal, 2014; Mbondji *et al.*, 2014). Adeleke *et al.* (2014) study recommended continuous information technology education for stakeholders and improvement of clinical documentation in health facilities to ensure data quality and its applicability.

### **1.1.1 Significance of data quality and non-utilisation of information in Nigeria and South Africa**

Nigeria has faced challenges obtaining accurate healthcare data due to infrastructure, data collection techniques, and reporting systems, and this must be revised to accurately assess postnatal care service quality and utilisation rates. Unsatisfactory utilisation of postnatal care services is due to restricted access, lack of information, cultural attitudes, and economic hurdles. Rural women often lack access to excellent healthcare services, particularly postnatal care (Vinutha *et al.*, 2022; Ahuru, 2022). However, South Africa has more vital healthcare data gathering systems, enabling accurate postnatal care service quality and use assessment. However, data errors and reporting differences between provinces may still pose problems. South Africa has higher postnatal care service utilisation rates due to its established healthcare system, higher literacy rates, and improved access to information. However, rural communities

often have inadequate access to adequate healthcare services (Manyuma et al., 2023). While there are many studies on the utilisation of maternal health services, there are limited studies on post-natal care and very few studies regarding the accuracy of information and use for improving postnatal care quality and utilisation in Nigeria and South Africa. The study highlights and encourages focus on data as a measure to enhance postnatal care service use.

### **1.1.2 Reproductive health data quality in Nigeria and South Africa**

Information regarding the utilisation of reproductive health services in Sub-Saharan Africa (Anderson, 2017) is of great significance as a result of disparities in accessing skilled birth attendance and maternal health services regions, most especially between urban and rural areas, access and use of family planning services also vary across regions and socioeconomic groups, cultural beliefs in rural areas influence the use of care during pregnancy; as a result, there are higher rates of antenatal care utilisation in the urban areas in Nigeria (Abayomi Joseph et al., 2018). On the other hand, maternal health is significantly improving in South Africa; more women are using these services, the availability of family planning services gives women the option of using various contraceptive methods, and there is a higher rate of antenatal care utilisation (Drigo et al., 2020). However, the collection and maintenance of reproductive health data can be challenging due to many reasons, such as cultural barriers, issues of privacy and confidentiality, inaccurate supply of information for acceptability or non-recall of details of events. Limited access to reproductive health services hinders the collection of data. Data collection tools and system is also a barrier, and the availability of resources, indicators and methods may also affect quality. Under-representation and over-representation of a population are also challenging (Samuel et al., 2021). Overall, the difficulty of data integration from various reproductive health data collection sources may affect accurate information, and the usefulness of such information hinders policymaking.

## **1.2 Scope of research**

A health system's primary purpose is to promote, restore and maintain health (WHO, 2000). Appropriate medical care is needed for the survival of the population. An all-encompassing and efficient health system is essential for any nation to achieve sustainable development. Still, African health systems have encountered challenges such as inadequate access to healthcare, high healthcare costs, increased disease burden, etc. The challenges can be faced and dealt with by an efficient health information system supported by qualified personnel (Ojo, 2018). A well-



functioning health information system ensures the production, exploration, distribution and use of reliable and timely information on health determinants to improve health system performance and health status (WHO, 2008). This will also inform and guide decision-making at various levels in the health system when needs and problems have been identified through health information (Islam, 2007). Community advocacy and consultations with stakeholders are required for most of the population to embrace contraceptive use fully (Adefalu *et al.*, 2018).

In line with the factors mentioned earlier, typical to developing countries, ways to strengthen and improve accuracy, timeliness and use of the information will be identified in the study. Results revealed from the investigation will help improve and strengthen the health information system (promote data use, data auditing, supervisory check and giving feedback). The study intends to determine ways to capture accurate and timely information on reproductive service health use to promote health outcomes or examine factors that determine maternal reproductive health service use. One or more social barriers should be addressed to increase the accessibility of reproductive health services. Quality of care should be improved by providing proper financing and human and infrastructural resources. Re-orientation of reproductive health services is essential towards healthcare financing schemes (Adinma & Adinma, 2011).

An adequate health record indicates sufficient care, and equally, a poor health record implies poor care. Problems with data quality make the health record linkage process difficult. The usefulness of health records is ultimately reliant on their completeness and accuracy. In Nigeria, health record production is still based on transcription and paper-based systems. Good quality healthcare data play a vital role in the planning, developing, and maintaining healthcare services (Adeleke *et al.*, 2012). A study in South Africa by Moloko & Ramukumba, 2022 revealed that inaccurate data does not reflect the situation and causes a lack of confidence in the data, resulting in inappropriate use of information. Timely reporting is also a challenge in addition to data accuracy. The period delay between data collection, analysis and dissemination to decision-makers hinders the utilisation of such information; hence, it will not be helpful for planning, organising and generating interventions.

The study assesses the quality of reproductive health data obtained from demographic and health surveys in South Africa and Nigeria. The main objectives are to identify variables impacting reproductive health services and challenges reporting reproductive health information such as postnatal care, evaluate data quality in the DHS programme, and

investigate the association between socio-demographic characteristics and postnatal check-ups for mothers. The study seeks to improve aspects of reproductive health information management, contribute to improvements in policy, and eventually improve reproductive health outcomes by providing essential insights into future developments in this field of study. By addressing these challenges and evaluating data quality, the study aims to identify gaps in postnatal care and suggest interventions. Additionally, understanding the association between socio-demographic characteristics and postnatal check-ups can help tailor reproductive health programmes to specific populations, ensuring equitable access to care for all mothers. Ultimately, this research has the potential to inform evidence-based policies that can enhance reproductive health outcomes and contribute to overall improvements in maternal and child health.

### **1.3 Purpose Statement**

The significance of this research lies in its exploration of data accuracy and the crucial role of reliable information in reproductive health. More accurate data must be collected to ensure effective decision-making and program implementation in this field. The study aims to shed light on the quality and dependability of healthcare data in South Africa and Nigeria, examining socio-demographic features, postnatal care timing, and factors affecting postnatal check-up utilisation. Also, the findings may highlight gaps in using information and making well-informed decisions based on available data by policymakers.

### **1.4 Research Questions**

1. What are the respondents' socio-demographic characteristics from South Africa and Nigeria, and how do they differ between the two countries?
2. What is the difference in postnatal care timing for mothers in Nigeria (NDHS 2018) and South Africa (SADHS 2016)?
3. Is there a correlation between a mother's postnatal check-up and predictive factors in these countries?
4. What characteristics or predictors could impact a mother's ability to receive a postnatal check in South Africa and Nigeria?

## **1.5 Research Objectives**

### **1.5.1 General Objectives**

To evaluate and compare the socio-demographics of respondents, the timeliness of postnatal care for mothers in South Africa and Nigeria, and the impact of specific predictors on a mother's capacity to receive a postnatal check.

### **1.5.2 Specific Objectives**

1. To compare the socio-demographic characteristics of respondents in South Africa and Nigeria, including factors such as age, education, marital status, income, etc.
2. To analyse the timing of postnatal care for mothers in both countries using data from NDHS 2018 for Nigeria and SADHS 2016 for South Africa.
3. To investigate the correlation between a mother's postnatal check and predictor factors in both countries, using a Chi-square test of independence.
4. To identify and evaluate the impact of various predictors or determinants, such as socio-demographic indicators, healthcare access, and cultural factors, on a mother's ability to receive a postnatal check in South Africa and Nigeria.



UNIVERSITY *of the*  
WESTERN CAPE

---

## CHAPTER 2 - LITERATURE REVIEW

---

### 2.1 Introduction

There is quite an extensive literature about sexual and reproductive health. Most research works rest on past work as a base for essential knowledge. However, for conceptual clarity and deriving some significant determinants of reproductive health and the non-use of quality information and its accuracy. Reviewing the work of scholars exploring Reproductive Health has brought about a challenge. The objective of reviewing the relevant literature is to relate the research with existing knowledge on the similarities or differences under study and to frame a series of hypotheses to be tested based on data analysis. Hence, this chapter attempts to review works on reproductive health associated with data accuracy and information use. This will strengthen the health information system for policy-making to improve health outcomes.

#### 2.1.1 Data accuracy and non-use of the information

Data quality impacts various aspects of the health system; it affects planning, funding and managing the health system (Mavimbe *et al.*, 2005). Health information system has been described in the WHO's health Systems framework as one of the six essential building blocks to strengthen the healthcare system (WHO, 2007). Effective health information system encompasses three areas of health information: health determinants, health systems performance and health status. Generating data, identifying, examining, communicating and subduing incidents that endanger public health on time, integrating information, and encouraging the accessibility and use of the information is essential to achieve a well-functioning health information system (WHO, 2007). Leadership and governance play vital roles in generating and using healthcare information; this is also a significant part of WHO's directives to monitor health systems' performance for making appropriate decisions. Statistical and health information systems are not strong enough to be effective, and the basic observed data may not be available in many countries. Where available, the quality may be poor. As a result of the lack of data in many countries, the WHO policy ensures statistical reporting to advance knowledge and comparison across countries, bearing in mind that country data may differ due to definitions, data collection methods, Population coverage and estimation methods (WHO, 2016).

Data quality is defined as accurate, reliable, valid and trusted in integrated public health informatics networks (Snee & McCormick, 2004) and also considered accurate if the report is

complete with no missing data (Makombe *et al.*, 2008). Literature has highlighted data accuracy and use as part of data quality dimensions. They need to be considered to determine the quality of the data. The problem of data quality has hindered the availability of prompt, accurate and relevant information (Karr *et al.*, 2006). Although data accuracy is one of the most used characteristics, attention to the quality of data use needs to be improved. Data accuracy is one of the measures of data quality; inaccuracy and incompleteness result in poor-quality data (Chen *et al.*, 2014). Poor data quality of available health information systems influences the use of the information (Wagenaar *et al.*, 2015), and its adverse effect has resulted in an inscribing error that leads to not getting accurate measurement and allocation of funds incorrectly (Cheng *et al.*, 2009). Accurate and valid data ensures consistency (Hahn *et al.*, 2013).

### **2.1.2 History of data collection and reproductive health data in Nigeria and South Africa**

A multifaceted combination of political, social, and technical issues has influenced how data is collected and acquired in Nigeria and South Africa. Both nations have a long and varied history, which has led to significant improvements in their data collection methods (Abubakar *et al.*, 2022; Gilson *et al.*, 2017).

Nigeria has gone through several stages of data collecting throughout its history. Data was mainly gathered for revenue and administrative purposes during the colonial era by the British, but indigenous communities have yet to fully consent to this advanced practice. To centralise data-collecting operations concentrating on economic and demographic statistics for planning national development, Nigeria formed the Central Statistical Office (CSO) in 1960 after gaining independence. Nigeria digitised census data and deployed data analysis and reporting technologies through technological advancements. Nigeria still needs to keep its statistics accurate and current, especially in rural regions. Data collection is frequently hampered by political influence, dishonesty, and inadequate financing. Nigeria has recently taken steps to improve its data collection infrastructure, including programmes like the National Identity Management Commission (NIMC) and the National Social Investment Programme (NSIP), to give citizens unique identification numbers and efficiently target social interventions using data (Onah & Olise, 2019; Onuigbo 2021). Since independence, Nigeria has made significant strides in collecting reproductive health data. Initially, the healthcare system focused on fighting infectious diseases. Still, after independence, the government established a comprehensive

healthcare infrastructure and began collecting primary health data like maternal mortality rates and birth statistics. Recognising the importance of reproductive health and family planning, the government initiated programs to collect data. The National Reproductive Health Policy and Strategy was introduced in the 2000s to tackle reproductive health issues (Cooke & Tahir, 2013; Ovikuomagbe, 2017). Data collection efforts expanded, including Demographic and Health Surveys (DHS), providing critical information on fertility rates, maternal health, and healthcare access (Bassegy et al., 2016). Despite challenges like incomplete reporting and disparities between urban and rural areas (Aliyu & Amadu, 2017), Nigeria continues to improve data collection and analysis, with a growing emphasis on integrating technology for more efficient data acquisition.

On the other hand, South Africa has made remarkable progress in modernising its data collection techniques to encourage fairness and inclusiveness rather than division and segregation (Gilson et al., 2020; Maïga et al., 2019). In this effort, it has been crucial to create Stats SA as the national statistics agency. Stats SA is dedicated to delivering trustworthy and reliable information to support policy planning and development by implementing thorough censuses, surveys, and other data collection methods (Lince-Deroche et al., 2015). The country prioritises gathering socioeconomic and demographic data to redress past inequalities, concentrating on essential sectors, including income, education, healthcare, and housing. However, South Africa still has work to ensure data privacy, close the digital gap, and fairly represent historically underrepresented populations in data collecting (Malakoane et al., 2020). South Africa's healthcare history is complex, with a history of segregation and limited data collection on reproductive health. After apartheid ended in 1994, the government prioritised universal healthcare access, including reproductive health services for all racial groups (Maphumulo & Bhengu, 2019). This led to significant progress in data collection, including national surveys like the South African Demographic and Health Survey. These surveys provided insights into maternal health, family planning, and HIV/AIDS prevalence (Moyo et al., 2022). The 2000s HIV/AIDS epidemic intensified South Africa's focus on reproductive health data, leading to extensive monitoring and treatment programs. Today, South Africa collects detailed data on HIV prevalence, prevention, and treatment outcomes (Simbayi et al., 2019; Nicol et al., 2016; Ndirangu et al., 2010).

In Nigeria and South Africa, significant efforts have been undertaken to overcome the challenges of acquiring accurate reproductive health data. These initiatives aim to improve data

quality, increase coverage of underserved groups, and use data to inform policy decisions (Naz et al., 2023; Ebenso et al., 2021; Diaz & Requejo, 2021; Biddle et al., 2020; Harries et al., 2013). Reproductive health is becoming increasingly important for development and public health (Alexander et al., 2020).

### **2.1.3 Reproductive Health**

Reproductive health is defined as a state of physical, mental, and social well-being and not simply the non-existence of illness. Reproductive health deals with the reproductive functions and processes at all stages of life, which is the central feature of the development of humans, and it is of particular concern for women during their reproductive years. Reproductive health ensures the capability of reproducing and the ability to make decisions regarding when and how often to perform it (World Health Organisation). This well-defined and all-inclusive definition of reproductive health was laid out at the International Conference on Population and Development (ICPD) in Cairo in 1994.

Poor maternal and reproductive health outcomes continue to be the main challenge in African countries, especially low-income countries, accounting for inadequate or non-utilisation of maternal and reproductive health services (Tsawe & Susuman, 2020). Sexual and reproductive health care has five components: Enhancing prenatal, perinatal, postpartum, and neonatal care; offering outstanding family planning services, including infertility services; eradication of unsafe abortions; prevention and treatment of STDs, reproductive tract infections, cervical cancer, and other gynaecological morbidities; and encourage healthy sexual behaviour (WHO, 2004).

Sexual and reproductive health is about diseases and a compilation of interrelated health and human rights issues. Sexual and reproductive health is essential to attain the three health-related goals and realise many other purposes, including eradicating severe poverty, ensuring access to educational opportunities and gender equality, and attaining environmental sustainability (Glasier *et al.*, 2006). Care for reproductive health is essential to function effectively. A woman's reproductive health is vital because it contributes to population growth. Awareness and education will help in building a society that is healthy in the aspect of reproduction. Providing essential reproductive health care services to women who are poor and socially helpless is a challenge in low-income countries. Long-term commitment and awareness

relating to access and use of services are required to achieve success in reproductive health (Yazbeck, 2004).

Reproductive health services focus primarily on women with programs such as family planning, unwanted pregnancy, safe abortion and campaigns for safe motherhood (Onyango *et al.*, 2010). The six indicators such as maternal mortality ratio, the proportion of births attended by skilled health personnel, contraceptive prevalence rate, adolescent birth rate, antenatal care coverage, and unmet need for family planning, have a direct effect on reproductive health and achieve meaningful development, these reproductive health issues need to be taken care of because there is a relationship between reproductive health and development (MDG 3, 4, 5 & 6) (Adinma & Adinma, 2011). Research carried out in Nigeria reported that real and perceived risk (side effects and complications) is encountered in the scope of reproductive health. This exists due to choices made by individuals concerning their health and family well-being; choices made may influence low contraceptive utilisation. Birth spacing is more likely to affect family planning; family planning succeeds when focusing on adequate birth spacing (Schwandt *et al.*, 2017).

A study in South Africa and Malawi report shows that reproductive decision-making or goals can be achieved when conscious action is taken, even though some factors, such as the partner's joint decision, finances, family composition, attitudes towards contraceptive use, etc., may influence the success of the goal (Evens *et al.*, 2015). Studies have shown that the socioeconomic status of women affects their participation in decisions regarding sexual and reproductive health issues (Osuafor *et al.*, 2018). There is consistency in the fact that joint decision regarding reproductive issues is associated with contraceptive use, as found in studies in Kenya and Nigeria. Spousal communication also influences the use of modern contraceptives (Osuafor *et al.*, 2018; Babalola *et al.*, 2017).

Exposure to family planning information and service influence the demand and usage of contraceptives (Wado *et al.*, 2019). In a study by Mmusi *et al.* (2019) in South Africa, findings revealed that a lack of empowerment of women, inaccessibility of reproductive health services and separation of HIV/AIDS from reproductive health are critical factors of poor reproductive health outcomes. Nigeria contributes 10% of the global estimates of maternal deaths, which are preventable and is the second largest contributor to the maternal mortality rate in the world after India (Abimbola *et al.*, 2016). Structures that improve access to contraception globally will assist women and their families to have better lives (Tyson, 2019). Reproductive health is



a broad concept that relates to a person's overall physical, mental, and social health about their reproductive system and functions during all stages of life. Reproductive health services and postnatal care are essential components of reproductive health. Postnatal care is crucial because it may prevent potential health complications and mortality after delivery for mother and Child. Enhanced support also empowers Mothers to make informed decisions about their reproductive health and care of the Child, as well as informed choices of family planning and suitable methods and then improve their healthcare needs.

## **2.2 Aspects of Reproductive Health Outcomes**

### **2.2.1 Fertility**

Fertility determines the rate of natural population growth. Fertility preference provides insight into attitudes toward childbearing; however, fertility preferences vary according to women's socioeconomic, demographic and cultural backgrounds (Susuman *et al.*, 2014). Infertility is a global reproductive health problem (Mascarenhas *et al.*, 2012). People with infertility problems tend to search persistently for treatment, and many are threatened with primary or secondary infertility in sub-Saharan Africa. A woman's social status depends on the production of offspring in Sub-Saharan African countries, and they are sometimes stigmatised. Therefore, they tend to seek modern healthcare facilities, and traditional treatment, duration of infertility and effectiveness of therapy affect healthcare-seeking behaviour (Dierickx *et al.*, 2019). There is the possibility of a high maternal, infant and child mortality rate when fertility is high (Sedgh *et al.*, 2007). Nigeria has a fertility rate of 5.5% but a low rate of contraceptive use. Maternal age and parity level tend to impact fertility desire (Ndiaye *et al.*, 2018). When there is high fertility, or population growth is not controlled, it could negatively impact a country's economy due to pressure on resources that might even be scarce. Families with smaller family sizes are likelier to experience a higher quality of life (Novignon *et al.*, 2019).

### **2.2.2 Family planning**

Contraception improves the overall health of women, which can offer unique opportunities for women's empowerment at any phase of their lives. Continuous sensitising is essential to promote various contraceptive methods' acceptance and retention (Tyson, 2019). Contraceptives are often associated with pregnancy prevention; studies have shown that oral contraceptives and condom use preserve fertility, whereas preservation from the latter is more prolonged (Sharma *et al.*, 2013). Since unplanned pregnancies are associated with poor health

outcomes (birth and Child), unsafe abortion and maternal mortality, of which the rate is high in Sub-Saharan Africa, reducing unplanned pregnancies is a needed reproductive health goal (Speizer & Lance 2015). Contraception assists women of all ages; it allows young women to have the chance to delay pregnancy and complete their physical and mental growth and development. Contraception also helps women who may encounter pregnancy-related health risks. It limits the family size and minimises risk for women and their Children (Tyson, 2019).

Family planning services allow regular visits to a health facility. However, appropriate care and follow-up while using contraceptives are essential (Solarin & Black, 2013). The top priority of the international Family Planning 2020 initiative is to increase contraceptive use among adolescents (FP2020), an important aspect of 3 of the 13 targets of the Sustainable Development Goal for the Health of the United Nations. Contraceptive is used to delay or avoid pregnancy. Attitudes towards family planning influence fertility and contraceptive use. Fertility decline may be a consequence of increased use of contraception. Non-approval of some birth control methods, such as condoms, associated with promiscuity by men in sub-Saharan Africa is a determinant factor in regulating fertility (Bietsch, 2015). Trends have shown that positive attitude and access to contraceptive services is increasing in sub-Saharan Africa, which has influenced the decline in fertility, especially in regions with high fertility. Availability, accessibility and acceptability of health care services impact the use of prevention methods, especially for young women, which puts them at risk of diseases and pregnancy and utilisation of reproductive services is also influenced by stigmatisation (Holt *et al.*, 2012).

Meanwhile, the perception of quality of care by the care provider and women receiving the care may differ, whereby the choice of where to receive care is based on this: to achieve quality health care services, women's perception and that of the care provider needs to be reconciled (Oladapo *et al.*, 2008), so also is service satisfaction. Modern contraceptive use has been reported as a cause of infertility and other side effects, and the belief that long-term use of contraceptives, depending on the method, can cause fertility impairment, which has been the reason for the non-use of family planning methods in Kenya and some countries in Africa (Machiyama *et al.*, 2018). A research report in Nigeria shows that the risk of inadequate birth spacing is higher than the risk of using contraceptives (Schwandt *et al.*, 2017).

A government-sponsored family planning programme which prevents women from having abortions contributes to declining fertility and maternal mortality, but access has remained a challenge (Prata *et al.*, 2011). In some cases, child mortality, ideal family size and type of

marriage have been reported to encourage or discourage contraceptive use through reproductive attitudes. Intention to use contraception depends on three factors (HC3, 2014). In some cases, lack of contraceptive use does not necessarily indicate planning to get pregnant but rather the fear of its side effects and effectiveness (Evens *et al.*, 2015). In the long run, appropriate implementation of family planning tends to yield the desired result of whether to space birth or stop childbearing. A research report conducted in Ghana on contraceptive intention reveals that most people use contraceptives to space birth rather than prevent it (Bawah *et al.*, 2019).

The study on the knowledge and perceptions of women of reproductive age in Northwest Nigeria reveals that the awareness of contraceptives and Family Planning in the state increases due to the awareness campaigns reaching out to urban and educated residents. However, there is a need to reach the less educated residing in rural settlements to achieve the desired effect on contraceptive use (Adefalu *et al.*, 2018). Lack of knowledge leads to unsafe reproductive health behaviour and wrong choices, such as unwanted pregnancy, especially among adolescents (Kyilleh *et al.*, 2018). A study by Lauro, 2011 revealed a connection between abortion and contraception as a means of birth control, especially in the case of low access to modern contraceptives and refusal to use contraception. Some of the barriers to using modern contraceptives could be geographical location, lack of outreach services, insufficient knowledge, an association of the use of contraceptives with promiscuity and no support from partners (Campbell *et al.*, 2006). Engaging men in the family planning program is found to be associated with positive family planning behaviour (Speizer *et al.*, 2018). Mmusi-Phetoe *et al.* (2019) also revealed that inadequate contraception influences a high rate of unplanned pregnancy, maternal illnesses and deaths.

Many governments in developed countries have trepidations about the increasing rates of unintended pregnancy and induced abortion, even though abortion is legal in such places. However, in many countries, access to safe abortion is restricted, and unsafe abortion causes more than 30% of maternal deaths. At the same time, 3% of 19 million unsafe abortions estimated to take place every year happen in developing countries (WHO, 2004). The frequency of unsafe abortion in a country is affected by its family planning programmes' effectiveness in preventing unwanted pregnancies, abortion legislation and implementation, and the availability and quality of legal abortion services. Legal obstacles to providing safe

abortion services force women to resort to unsafe abortion when faced with an unwanted pregnancy (Berer, 2004).

In some countries, children from unwanted pregnancies are more disadvantaged than wanted ones. Children from poor large families might also be disadvantaged regarding nutrition, healthcare, and education (Glasier *et al.*, 2006). Healthcare providers are essential point of contact that helps women plan and prevent pregnancies. Contraception counselling is necessary at every health care visit during the reproductive years, including prenatal visits. It also educates patients on contraceptive options, assisting in deciding how to deal with their unique phases in life (Tyson, 2019).

### **2.2.3 Contraceptive prevalence**

Contraceptive methods include Modern (clinic and supply) and traditional (non-supply) methods. Modern methods include female and male sterilisation, intrauterine devices (IUDs), hormonal methods (oral pills, injectables, hormone-releasing implants, skin patches and vaginal rings), condoms and vaginal barrier methods (diaphragm, cervical cap and spermicidal foams, jellies, creams and sponges). In contrast, the traditional methods include rhythm, withdrawal, abstinence and lactational amenorrhoea. Surgical sterilisation is also a form of contraception if the reason for the operation is to avoid having more children. This is focused on the sexually active population, primarily women aged 15 to 49 years.

The information regarding contraceptive methods is usually obtained from women who are either presently married or in a stable relationship through population-based sample surveys, which provide comprehensive data on their contraceptive practice and show the prevalence of all methods (Both traditional and modern). Other sources of obtaining estimates on contraceptive methods include smaller-scale or dedicated surveys in which relevant questions regarding contraceptive practice are added to the survey, such as a health programme prevalence survey and records from family planning programmes. These reports are essential to efficiently monitor and manage the programmes and give timely updates and comprehensive information about changes or developments in the records and features of programme users. Other difficulties include incomplete data, double counting users due to records at different service delivery system outlets, intentionally increased service figures, and poor data quality due to human power (WHO, 2006). Previous research has shown that the increase in

contraceptive use in sub-Saharan Africa is happening subsequently and at a low speed in some sub-regions.

The range of differences in contraceptive use undoubtedly changes in sub-Saharan Africa. It shows that while there are clear native patterns, the country's point of view dynamics, such as the enabling environment, advancement of and access to family planning services, ethnic perceptions and community suitability of the modern methods, and other factors that influence contraceptive use. The use of contraceptives determines fertility. As fertility declines, evidence shows an increase in contraceptive use, possibly due to a preference for smaller families (Dasgupta *et al.*, 2022). Comparing sub-Saharan Africa to other regions with the same fertility level, more unmarried women tend to use and meet their contraceptive needs than different categories of women. Understanding the association between the use of contraceptives and fertility is essential because of the inferences of preventing unplanned pregnancies, which are significant in sub-Saharan Africa (Bearak *et al.*, 2020).

#### **2.2.4 Unmet need for family planning**

The unmet need for birth prevention services and poor maternal health outcomes are linked to poverty, making fertility high. Several factors such as redundancy, poor hygiene and congestion, insufficient accessibility to appropriate health services, gender-based violence and women's limited authority in making decisions. Research has shown that the unmet need for birth prevention is found to be higher among women who are below the age of 20 years and lowest among women are 35 years and older in South-Central Asia, including India (Darroch *et al.*, 2011), South East Asia (Wai *et al.*, 2019), South Africa (Yaya & Ghose, 2018) and other developing nations (Juarez *et al.*, 2018), this is reported among the poor urban residents. Yadav *et al.*, 2020; Sulthana *et al.*, 2015; and Huda *et al.*, 2014 studies cited shame, hesitation and nervousness as the reasons for the unmet need for family planning by most women, and most younger women have little information about the availability of services regarding family planning and lack of accessibility than older women. Non-use of contraceptive methods is due to disregard and disapproval by older women, resulting from family and husband expectations for them to give birth early and the fear of having side effects from using it.

The unmet need for family planning services can be understood from women's knowledgeable desire to space or stop childbearing and a lack of contraceptive services. This is investigative for reproductive health research and programmes (Bradley & Casterline, 2014). The unmet

need is examined through Demographic and Health Surveys by evaluating women's preferences about pregnancy, whether they want children, and how long they like to wait between births. Their current pregnancy prevention method is assessed to determine the regularity of use with Preference. Research by Sedgh *et al.*, 2007 revealed an extreme breach between women's pregnancy intention and the use of contraceptives. Wealth and economic status influence the increase in Preference for childbearing at an individual and societal level, so also at the health system level, contraceptive use is associated with finances through payment for services (Rusibamayila *et al.*, 2017). Beliefs influence choices on the scheduling of birth spacing regarding wealth, economic status and ambition in sub-Saharan Africa (Kodzi *et al.*, 2010; Rusibamayila *et al.*, 2017).

### **2.2.5 Access to reproductive health, antenatal and quality of care**

Care for women during pregnancy improves their health by preventing complications and managing them early. Antenatal care, skilled care at delivery and post-natal care are necessary to promote good health (Dairo & Owoyokun, 2010). Antenatal-care care includes screening and treatment of ailments, so also is the provision of preventive interventions such as immunisation and counselling about diet, birth, etc. (Kerber *et al.*, 2007).

Accessibility to health services is a severe problem in the developing world. A timely decision to access care may not lead to instant attention. Delays can still be experienced due to a shortage of qualified staff, etc. The quality of care in an institution or healthcare facility is essential in seeking health care. Pregnant women's decision is determined by their own experience or other people's. Some barriers, such as long waiting periods and lack of guidance by health care providers at the health facility, have indicated inadequate care (Solarin & Black, 2013). Antenatal care services during pregnancy require contact with the health care provider and facility. Four antenatal visits are not an indicator of adequate antenatal service coverage (Doskoch, 2014), but WHO recommends at least four antenatal visits during pregnancy to protect pregnant women from risks associated with pregnancy and complications (Motherhood, 1994).

Accessibility to healthcare services has reduced maternal deaths in most developed countries. Adequate and quality antenatal care also influences mortality and morbidity. Adequate antenatal care and good quality services rendered during visits improve maternal and child health outcomes. The use of health care services relating to pregnancy (antenatal care and safe

delivery) has encountered failures by the public sector due to a lack of facility-based delivery, even to people experiencing poverty. The lack of success results from not making service available physically, communicating and educating the community on the benefit of reproductive health services and meeting their needs (Yazbeck, 2004).

Even though there have been interventions in the area of accessibility to reproductive health in promoting safe motherhood, quality of care is also a determining factor of their survival, even though some socioeconomic factors, such as poverty, ignorance, etc., are found to be associated with low access to health care and poor health care services (Okonofua, 2008). Poor quality of antenatal care in Nigeria was also reported by Oladapo *et al.*, 2008. Free maternity services have increased the number of pregnant women utilising antenatal and delivery services in South Africa (Schneider & Gilson, 1999). Poor financing resulted in poor service delivery. Distance is another major factor in the underutilisation of maternal health care services.

Women tend to utilise reproductive health services more if they are satisfied with the quality of care received (Odetola & Fakorede, 2018). Antenatal care positively influences the place of delivery and postnatal care, while the place of delivery influences postnatal care (Dahiru & Oche 2015). The consistent evidence on reasons for the non-use of antenatal care in Nigeria is found to be associated with difficulties in accessing health care, such as distance to health facilities and financial constraints for treatment and consultation fees (Fagbamigbe & Idemudia, 2015; Akinyemi *et al.*, 2016). A woman who did not attend antenatal care during pregnancy misses opportunities for early detection and timely treatment of complications, immunisation and medication or supplements, birth preparedness and prevention of diseases through health messages and counselling (Kerber *et al.*, 2007). Failure to access skilled assistance during delivery may imply mismanagement of complications and compromised hygiene practices, which may put the mother and newborn at risk of infections (Akinyemi *et al.*, 2016).

#### **2.2.6 Antenatal care coverage and proportion of births attended by skilled health personnel**

The primary sources for obtaining reports on Antenatal care are routine health service data and household survey data. Vital registration data do not provide information on the number of pregnancies and births in the total Population. They may also present overestimation, poor quality and incomplete information on ANC reporting because of the potential of having

records of the same person at different facilities (WHO, 2007; Macfarlane *et al.*, 2019). However, antenatal care coverage only measures usage, not the quality of care received during the visits. Many countries depend on household survey data to obtain maternity data, which provides an estimate of all live births, the birth of a foetus after 22 weeks with the sign of breathing (WHO, 1992), but they are expensive to implement; therefore, data may be obtainable only when needed. Antenatal care coverage provides information about women who utilise antenatal care services, and as a result, they are likely to use skilled health workers at delivery. ANC visits have been suggested as a representative measure to evaluate improvement in reducing maternal mortality. Likewise, studies have shown a relationship between the utilisation of ANC by women and better maternal health outcomes (Villar *et al.*, 2002), similar to live births (Oyerinde, 2013) because Antenatal care plays a vital role in monitoring the health of the new-born and their existence.

ANC coverage is one of the four commonly helpful pointers in the required measures to determine maternal health service coverage. The other three indicators are “births attended by skilled health personnel” and “availability of basic essential obstetric care and comprehensive essential obstetric care. ANC coverage is also associated with newborn health and survival, insignificantly related to maternal mortality. Therefore, this ANC coverage can also be understood through death occurrence during and after birth but should be interpreted cautiously with maternal mortality rates (WHO, 2006). A midwife, doctor or nurse trained, educated and skilled in women and child health, such as pregnancy, childbirth, and postnatal care, is referred to as a certified health professional. They have the expertise to identify, manage and transfer women and their newborns in case of complications (WHO,2004). This category does not include traditional birth attendants, whether trained or not.

Maternal health care measures service availability, accessibility acceptability and service utilisation. Service utilisation can be measured by births attended by a skilled health worker and ANC coverage. The proportion of births whose needs are taken care of by a skilled worker is an indicator to determine how well a health system functions and its prospective to offer sufficient treatment for childbirth. Besides, it does not consider the kind and value of care given. Attendance by Skilled workers at birth may be a representative factor for examining improvement regarding the decline in maternal mortality rate (WHO, 2004).



### **2.2.7 Delivery (Home or Institutional)**

The cost of delivery care services affects the use or non-use of the service. ANC visits have a positive effect on delivery care use. Women who attended antenatal are more likely to deliver in the health care facility due to the knowledge received during ANC (Birmeta *et al.*, 2013). Most women prefer home delivery because of the presence of relatives or friends at home rather than in health facilities; more so, most of the home deliveries were attended to by TBAs. Mmusi-Phetoe *et al.*, 2019 found an association between place of residence, the attitude of health professionals, and poor service during delivery and afterwards, so women tend to deliver at home. The most common explanation for the non-use of health facilities for delivery was premature delivery or lack of time to get to a health facility, which may be attributed to a lack of birth preparedness, while some women prefer traditional birth attendants or deliver at home (Akinyemi *et al.*, 2016; Akpabio *et al.*, 2014; Ebuehi & Akintujoye, 2012; Fapohunda & Orobato, 2014).

### **2.2.8 Postnatal care**

Post-natal care is needed to monitor the mother and the newborn against the development of complications and support healthy behaviour. Post-natal care is provided to mothers and their newborns after birth till 42 days (6 weeks). Education level is the most vital factor that influences utilisation of PNC due to its association with socioeconomic status, which creates awareness of maternal health care services, and place of residence also affects it. Strengthening the systems by linking the facility and community will impact the utilisation of Maternal Health Care Services (Mohan *et al.*, 2015). Studies have also shown that women with more than one child are less likely to attend Post-natal. A study by Susuman, 2015 revealed that women with four or more children utilise post-natal care services more than those with just one child, while those who are aware of the service availability in health facilities or aware of the benefit tend to utilise PNC type of occupation also affects use PNC services (Gebrehiwot *et al.*, 2018).

Women who receive care from a skilled service provider attends ANC, reside in an urban area, have access to nearby health care facility and are delivered in a health facility have a higher chance of making use of postnatal care services (Chaka *et al.*, 2019), a study in Malawi carried out by Machira & Palamulen, 2017 revealed low utilisation of PNC in rural than an urban area, which is influenced by their economic status, education, distance to a health facility, income, having 3 to 4 children, lack of knowledge of the risks in pregnancy and no exposure to media

but delivery through caesarean section revealed higher use of postnatal care services. Findings from a study by Oluwaseyi & Latifat, 2014 showed that the mother's age at childbirth, education, economic or wealth status, ANC service, the proximity of health facility and place of delivery are associated with using PNC services.

Interventions and promotion of healthcare behaviour during post-natal care checks can prevent infant death. A study by Singh *et al.*, 2014 showed that combining the community and facility approach of training TBA and SBA to render quality service in sub-Saharan Africa after delivery will play a significant role in saving the lives of the young ones and even mothers. Postnatal care is essential in sub-Saharan Africa to avert the high maternal mortality rate, which needs more attention to provide high-quality care in facilities (Benova *et al.*, 2019). The postnatal period is critical for women as they may develop life-threatening complications, which can be treated quickly if they access postnatal care. Postnatal care also highlights implementing healthy behaviours for mother and child (Kerber *et al.*, 2007). Women who deliver at home tend to experience discrimination either through penalising them financially or denied care when they attempt to access postnatal care at health facilities, and this can only increase the health facility access gap; therefore, instead of denial, women should be encouraged to seek care regardless of the place of delivery to improve their health seeking behaviour (Sacks *et al.*, 2017).

Health-seeking behaviour is generally perceived as a habit people practice relative to their health, and so is the use of health care services, which is a completion of the progression to obtain care. Many people in low and middle-income countries need to be more capable of accessing required healthcare services for many reasons (WHO, 2010). Likely influences on health-seeking behaviour can be age, gender, level of education, employment and income, and other traditional and civil factors can also influence it. Hence, using public or private healthcare services depends on traditional beliefs and practices and significantly on the health system itself (Shaikh & Hatcher, 2005). Other determinants of seeking healthcare can be availability, affordability and quality of the healthcare services (Ash *et al.*, 2006; Dias *et al.*, 2011). The discontinuity from maternal care is high in Nigeria due to little or no formal education, poverty, and socioeconomic problems such as distance to facilities and financial constraints (Akinyemi *et al.*, 2016).

### 2.2.9 Infant, Child and Maternal Mortality

Death rates, regardless of the age at which they occur, are regarded as an essential indicator of population change. A significant number of all deaths in low-income countries are caused by infant and child mortality, making it an important public health problem. Infant mortality is a measurement used to assess the state of health and the use of its services for mothers and children and a country's socioeconomic development level. Likewise, maternal mortality is a significant measure of women's health, and it also reveals the performance of the healthcare systems. Therefore, using maternal and reproductive health services is vital for better maternal and child health outcomes. Sub-Saharan Africa accounts for 85% of maternal deaths globally (WHO, 2015).

As in most developing countries, rural mortality rates in infancy are determined by the disparities in the area in terms of socioeconomic, demographic, etc. A significant factor influencing infant death is birth interval or child spacing. This is found to be a key factor contributing to child survival. Pregnancy and the success of delivery adversely impact every individual, family, and community (WHO, 2006), which determines global and national well-being. Child mortality may impact fertility or reproductive behaviour; for instance, a family that lost a child might want to replace it. The nutritional status of children is also a measure of household poverty by which malnutrition affects their health (Black *et al.*, 2008).

Maternal mortality is a delicate indicator of the status of women, access to care, suitability and quality healthcare in developing countries (McCaw-Binns *et al.*, 2001). Maternal mortality is broadly recognised as a universal measure of a population's complete health, women's social standing, and the health system's performance. It is then suitable for policy recommendations regarding confrontations encountered by governments and assurance of health care during pregnancy and childbirth. Maternal mortality can indicate the extent of the problem of maternal death in a country as an incitement to end the crisis (WHO, 2006).

Maternal death is defined as the death of a woman while pregnant, during childbirth and at postpartum. ICD-10 (International Classification of Diseases- tenth version) defines it as “the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes” (WHO, 1994; cited by Merdad *et al.*, 2013). Most deaths occur as a result of inadequate care. The utilisation of

maternal health services is of great significance in avoiding poor pregnancy outcomes and delivery (Banke-Thomas et al., 2017). Significant factors such as inadequate healthcare facilities, non-existence of transportation to healthcare facilities, inability to pay for services and struggle to utilise modern healthcare among some populations are the causes of high maternal mortality rate (Babalola & Fatusi, 2009). High mortality is observed in many countries among people experiencing poverty who live in rural and remote places with limited access to healthcare services (Bhutta & Black, 2013).

Sub-Saharan Africa accounts for 85% of maternal deaths globally (WHO, 2015). The leading causes of maternal death are classified as direct and indirect. The direct causes of maternal death are those related to obstetric pregnancy complications, labour and delivery, and the postpartum periods. These include complications of pregnancy, delivery, or management of both (WHO, 2004). Indirect causes are pregnancy-related death in a woman with pre-existing or newly developed health problems unrelated to pregnancy. Information regarding the health of women and their children is received during maternal health services (Birmeta et al., 2013).

A study by Callaghan 2012 in the United States showed that haemorrhage remains the leading cause of pregnancy-related mortality. Statistics have shown that women die every day from a preventable cause that is related to pregnancy and childbirth. The consequences of pregnancy and childbirth are death, diseases and disability among women of reproductive age in developing countries (Abimbola et al., 2016). Appropriate focus and attention on reproductive health needs and recognising and ensuring accessibility of reproductive health reduces maternal mortality (Mmusi-Phetoe *et al.*, 2019). Additionally, Midhet et al. (1998) showed that the determinant of maternal mortality in rural Pakistan was the lack of exposure of women to modern health services, particularly where government health facilities do not have enough staff (understaffed) and are not well equipped to provide obstetric care. Likewise, Adamu *et al.* (2003), in a study in Kano, Nigeria, also showed that eclampsia, ruptured uterus, anaemia, postpartum haemorrhage, and sepsis constantly threaten pregnant women in the region. Nigeria has the fourth highest MMR in the world, and maternal death is worsened by the high rate of infant mortality and fertility and the low use of contraceptives (WHO, 2015).

An empirical study conducted by Rice (2008) to assess the factors influencing levels of maternal mortality among 92 least-developed peripheral countries, including sub-Saharan Africa, showed that maternal mortality is significant among women. While maternal mortality has been shown to decrease by less than 1% yearly across all less developed countries between

1990 and 2005, it is still the predominant cause of death among women of reproductive age (UN, 2006). A comparative investigation based on comprehensive case studies of maternal health and health systems in Bangladesh, Russia, South Africa, and Uganda showed that maternal health services are impacted by the way the entire health system of a country is run (Parkhurst *et al.*, 2005). Maternal morbidity and mortality are associated with interpregnancy interval. Pregnancy intervals less than six months apart are characterised by a 1.5-fold higher chance of maternal death and related maternal health complications than  $\geq$  1-year intervals (Conde-Agudelo and Belizan, 2000). Short birth intervals are associated with prematurity, low birth weight, and an increased risk of infant death (Conde\_Agudelo *et al.*, 2006).

Maternal death is a good indicator of the quality of a healthcare system. Studies have shown that maternal death generally reflects poor nutrition and medical care (WHO, 2007). Other risk factors associated with maternal mortality are malnutrition, poverty, lack of knowledge, and hospital accessibility (Conde-Agudelo and Belizan, 2000). Most maternal deaths can be prevented by effectively managing pregnancy-related complications and using family planning (Glasier *et al.*, 2006; Alkema *et al.*, 2016). High fertility overwhelms maternal and child health (Novignon *et al.*, 2019). Delaying pregnancy, especially among young age groups due to the risk of pregnancy and complications, will reduce maternal mortality (Adefalu *et al.*, 2018).

Most maternal and infant deaths in developing countries are found to be associated with a lack of quality services, such as service delay and attitude of healthcare workers, so also is poor access to quality health services in the case where there is availability; there is low utilisation of the service (Dzomeku, 2011). Maternal morbidity and mortality problem confirms one of the significant discrepancies between rich and developing countries (Merrick, 2007). The WHO's systematic review of maternal mortality and morbidity revealed some important regional distinctions in the input of the leading causes of death (Khan *et al.*, 2006). Maternal health interventions such as awareness and use of contraceptives, antenatal care, skilled birth attendance and postnatal care influence the decline in maternal mortality globally. Still, these interventions are hardly used in developing countries and vary among population groups (Campbell *et al.*, 2006).

#### **2.2.10 Maternal Mortality Ratio**

Maternal death is considered late if a woman dies from direct or indirect causes after 42 days. Still, less than one year after termination of pregnancy, while death associated with pregnancy

occurred during pregnancy or within 42 days of its cessation regardless of the basis of death, Live birth is the separation of the baby from its mother with a sign of existence notwithstanding of length of pregnancy (WHO,2004). Generally, maternal death measures are complex due to many factors. Hence, there is no specific information or data collection technique that is adequate for the exploration of all its aspects. Most countries focus on three primary data sources, such as vital registration, health facility-based data and population-based surveys, to estimate the maternal mortality ratio.

There is a possibility of misreporting and underreporting of maternal deaths in most developing countries due to the lack or untimeliness of notification of deaths in the vital registration system (AbouZahr,1998) with so many factors such as the omission of death reports by relatives as a result of a delay in seeking care or unwillingness to report home death in view. Thus, many maternal deaths have been misclassified, resulting in biased maternal mortality ratio estimates. In the case of health facility-based data, information may be inaccurate or incomplete records in case files. The difficulties of underreporting and bias in vital registration and health services data have shown that population-based surveys are the primary source of information for estimating the maternal mortality ratio in many developing countries today. Hence, data collection techniques have been recommended, such as reproductive age mortality surveys and direct estimation, which are both time-consuming and expensive to conduct due to the large sample size required to obtain the latest estimates.

The sisterhood method is another recommended technique that may succeed in dealing with large sample size requirements by cross-examining adult respondents about the survival of all their sisters. Still, the direct sisterhood method should be used rather than the indirect method to avoid coinciding with specified probability (Campbell *et al.*,1997). These data sources have different advantages and disadvantages, making the level of dependability on the estimates obtained vary. The variation should be considered when using or translating the maternal mortality ratio. The maternal mortality ratio measures the risk of a woman dying during pregnancy. This reveals the level of health risks associated with Pregnancy in a population. Although the measure does not show the reason for the level of risk nor how to reduce the chance of getting an accurate estimate, other methods must be included to obtain a good result (WHO, 2006).

### **2.3 Vaccination/ Child Immunisation Programme**

Adequate health interventions such as vaccination can prevent mortality. Affordability enables the utilisation of such health services. A study by Owili *et al.* in 2016 revealed that each level of maternal newborn and child health care is interrelated, i.e., antenatal care is related to delivery care, which is then associated with postnatal and then the child's immunisation program; therefore, each level of care establishes whether the next level of care will be utilised.

### **2.4 Adolescent birth rate (Burden of Fertility on Teen Mothers)**

Adolescent birth rate (ABR) is the ratio of pregnancies with live birth outcomes per 1000 women aged 10 -14 and 15 -19 years to the total population of females of the same age group, respectively, in each country per year (Orimaye *et al.*, 2021). Adolescent childbearing is a critical public health problem that must be addressed (Abma & Martinez, 2017). Most adolescent births are unplanned (Gavin *et al.*, 2017; Potter *et al.*, 2019; Kost & Zolna, 2019), but not all. This leads to various socioeconomic (education, occupation and income) and health-related (diseases) challenges for them, their families and their peer groups (Abma & Martinez, 2017; Diedrich *et al.*, 2017).

Adolescent pregnancy may harm the mother and the baby in several ways. Teenage mothers may have to suspend or stop their education, which may result in difficulty getting employment and earning income in the future (Berthelon & Kruger, 2017). There is a high risk of obstetric complications such as preeclampsia, foetal growth restriction, and preterm birth due to not being fully grown biologically. Teenage pregnancy usually happens in a community or population where there is early initiation of sex and early marriage, most especially in rural communities (Pradhan *et al.*, 2015). Household income and education influence adolescent pregnancy (Caffe *et al.*, 2017; Govender *et al.*, 2018; Coyne & D'Onofrio, 2012). Inadequate knowledge of sexual and reproductive health, restricted access to services such as efficient contraception, sexual violence, and gender inequality (Pérez *et al.*, 2021). Pregnancy may be unplanned for some and may be an implication into adulthood and improved social status for others (Parenthood, 2016).

The health concerns of adolescent childbearing range from adverse birth outcomes to the mental effects of childbearing for both the mother and the child (Diedrich *et al.*, 2017). Although not all adolescents' birth is unplanned, limited access to reproductive health services and being excluded or not counted as necessary can generate extremely high rates of unplanned

pregnancy (Sundstrom *et al.*, 2019). The current global health agenda emphasises adolescents' sexual and reproductive health. In the 2030 agenda for sustainable Development (Desa, U. N. 2016) and United Nations Global Strategy for Women's, Children's, and Adolescents' Health to reduce adolescent motherhood through worldwide access to sexual and reproductive health care services (Kuruvilla *et al.*, 2016).

Recent findings have shown that adolescent birth rates in rural areas are higher than in urban areas (Hamilton *et al.*, 2016; Sutton *et al.*, 2019). The provision of long-acting reversible contraceptives has a significant influence on reducing adolescent births (Frost *et al.*, 2016; Ranji *et al.*, 2017), except for the challenge of access to contraceptives (Kumar & Brown, 2016). Previous research indicates that suitable contraceptive access in susceptible populations may reduce adolescent births (Lindo & Packham, 2017; Andrews *et al.*, 2019). Reduction in the adolescent birth rate will likely show better economic, educational, and occupational prospects for young women. The adolescent Birth Rate differs globally but is higher in Sub-Saharan Africa and lowest in Western Europe and Central Asia (Pérez *et al.*, 2021). A significant decrease in adolescent birth rates occurred in South Asia, Europe/Central Asia, and the Middle East/North Africa (Santelli *et al.*, 2017). Prospective means for the reduction of birth rates owing to increasing economic assets comprise quality education, which enables knowledge and allows more job opportunities for women and contributes to the delay in age at first sex, community development such as urbanisation, better access to contraception, and postponement of age at marriage and childbirth (Santelli *et al.*, 2017). Another possible means of expanding access to contraceptives is by providing care through telehealth to improve wellness in rural communities and bridge the accessibility gap (Orimaye *et al.*, 2021).

## **2.5 Healthcare utilisation**

Community awareness of the benefits of reproductive healthcare services and training of health workers is required to remove barriers and increase the utilisation of reproductive health services (Kyilleh *et al.*, 2018). Beyond quality, misuse of power in the health care systems, such as clinical negligence to verbal and physical abuse, affects women's care-seeking decisions (Kruger & Schoombee, 2010).

Women tend to use ANC services when health workers respectfully treat them, and they have their privacy during delivery. Otherwise, some prefer to deliver at home (Birmeta *et al.*, 2013). Socio-cultural differences in countries influence the number of times women attend antenatal



during pregnancy. Lack of knowledge of reproductive health services leads to risky reproductive health behaviour and social and health system barriers preventing the utilisation of existing reproductive health services (Kyilleh *et al.*, 2018). Pregnant women's utilisation of healthcare facilities is influenced by proximity, cost and quality of care (Aluko-Arowolo *et al.*, 2015; Onah *et al.*, 2006). Although individuals are increasingly aware of the importance of proper medical care (Uchendu *et al.*, 2013), the cost can also determine the choice of healthcare utilisation. It is also necessary for women to know the type of services rendered in the health facilities to access them. Wealth status has also been found to impact the utilisation of healthcare facilities (Adamu, 2011; Moore *et al.*, 2011; Titaley *et al.*, 2010; Dhakal *et al.*, 2007).

Patriarchal values are also identified as a barrier to utilising reproductive health services in which decision-making is done by the male in the household (Asaolu *et al.*, 2017). Another factor contributing to women using health care services is satisfaction with the service provided. Satisfaction is determined by the relationship between expectations such as health education during pregnancy, support, and authentic experience (Aigbavboa & Thwala, 2013). Utilisation contributes indirectly to maternal mortality or morbidity, as utilisation is an efficient health intervention for preventing morbidity and mortality. The barrier to maternal health care service utilisation has been reported to be the absence of any form of illness during pregnancy, poor service quality, long waiting time to receive service in a health facility, distance to the health facility, partner's disapproval, etc.

Maternal health care service is mainly influenced by demographics, socio-economic such as age, income, education, knowledge, decision making, etc. and health-related factors as well as service-related factors. Educating women on interventions for men to participate and support during pregnancy, childbirth, and postpartum fully will improve ANC and DC services use (Birmeta *et al.*, 2013). The utilisation of maternal health care services can be associated with access, quality and affordability limitations. It may function at an individual (age, income, education, culture, etc.), household and community level (Pearson *et al.*, 2011).

The three-delay model by Thaddeus and Maine in 1994 describes factors affecting utilisation and outcomes and identifies connections between civil registration and vital statistics and the healthcare system and ways these systems can jointly strengthen one another. The study carried out in Nigeria by Dahiru & Oche in 2015; Chaka *et al.*, 2019 further corroborates findings on the influence level of education of women and their partners, place of residence, parity and

wealth index in predicting the utilisation of maternal and child health care services (ANC, institutional delivery and postnatal care).

## **2.6 Inequality in the utilisation of reproductive and maternal health services**

Inequality based on place of residence (Rural/Urban), education, and socioeconomic and regional differences influence maternal health service use (Ahmed *et al.*, 2010; Alam *et al.*, 2015). Despite the improvements in maternal healthcare services, there is still the existence of inequality in health outcomes due to differences in economic status, education, place of residence and sex among populations, especially those in rural areas. A study reported that inequality in utilisation is low, but there were disparities in measures such as the level of education of maternal health status across population groups (reference). HIV infection is found to be the dominant risk factor in South Africa for morbidity and mortality. The women infected require more service than others in which differentials in social determinants such as education, physical environment, socioeconomic status, etc., of health and quality of service are accountable. (Wabiri *et al.*, 2013). A study of maternal health inequity in South Africa requires indicators such as maternal care received apart from utilisation to have more valid information. Early ANC attendance and access to skilled birth attendance will reduce inequality in maternal healthcare services (Wabiri *et al.*, 2013). Joint decisions between couples about reproductive and child health and public access, regardless of status, enhance institutional delivery.

## **2.7 Gender issues**

Gender inequality is crucial in affecting women's status and health outcomes in South Africa. Women may lack decision-making power in sexual relationships, therefore experiencing maltreatment when negotiating condom or contraceptive use and restrictions to access services and treatments. (Andersson *et al.*, 2008). Gender equity can be improved when men embrace attitudes and behaviours that promote women's economic empowerment and transform social and cultural aspects associated with masculinity (Barker *et al.*, 2007; Promudo, 2013).

Gender relations on sexual and reproductive health are associated with patriarchy, where the male controls women, leading to poor sexual and reproductive health outcomes (Morell *et al.*, 2013). Violence against women also contributes to their ill health, particularly their sexual and reproductive health. Such violence is an abuse of human rights resulting from gender inequality. The most common types of violence, whether physical, sexual, or emotional, are

domestic violence by an intimate partner and sexual violence such as rape, sexual coercion, and child sexual abuse. Abuse by an intimate partner is common in both developed and developing countries. Incidence varies between countries and also between regions within countries. Such abuse is accepted as normal in many parts of the world. Families often regard violent acts as a private matter and as an unavoidable happening of life by the victims. In some cultures, men believe they are entitled to sex (Glasier *et al.*, 2006).

## **2.8 Women empowerment**

Empowerment is the development of people's authority to make intentional life choices when power was denied beforehand (Upadhyay & Karasek, 2012). Women's empowerment and reproductive health are major concerns in global development. The Millennium Development Goals and Sustainable Development Goals focus on gender equality and women's empowerment as strategies to reduce poverty, hunger, and disease (Sachs, 2012). Empowerment of women is the ability to participate in making a decision that reveals their domestic and economic independence. In contrast, poor empowerment has been associated with maternal and child health measures such as contraceptive use, pregnancy-related services, etc. (Corroon *et al.*, 2014). Religious compatibility of family planning and the fear of promiscuity are fundamental factors that negatively impact the perception of women of reproductive age on family planning and contraceptives (Adefalu *et al.*, 2018).

A study in Nigeria shows the association between women's empowerment and reproductive health outcomes according to place or region of residence. The finding indicates that empowering women within the context of their daily life and relationship with their partner plays a vital role in modern contraceptive use, accessing health facilities and service of skilled birth attendants at childbirth (Corroon *et al.*, 2014), which also validates several findings from studies in sub-Saharan Africa (Ahmed *et al.*, 2010). Results from the study by Odutolu *et al.*, 2003 also revealed a significant relationship between female education. It increased access to economic resources to promote women's empowerment, particularly regarding their reproductive behaviour. However, the recognition of women as equal partners in the development of the economy, bad health and socioeconomic distress can prevent their efforts to contribute to sustainable development. This process of awareness and capacity building leads to participation, power to make decisions, and taking actions such as rights to obtain good health (Duflo, 2012).

Female empowerment was identified as a predictor of positive health behaviour; education empowerment is essential, and this will influence their decision-making as regards the usage of beneficial contraceptives (Alabi *et al.*, 2019). Religious, cultural and educational differences between regions impact health outcomes in Nigeria. Despite these differences, social and economic barriers have a negative impact on health status. Economic empowerment represents a vital part of women's empowerment in such a way that it influences health behaviour; access to health care service that is not free cannot be used effectively by women who are not financially equipped or those who do not have input in the way their income is spent. It is widely agreed that economic empowerment signifies an essential aspect of women's empowerment, influencing their ability to support their health (Heckert & Fabic, 2013).

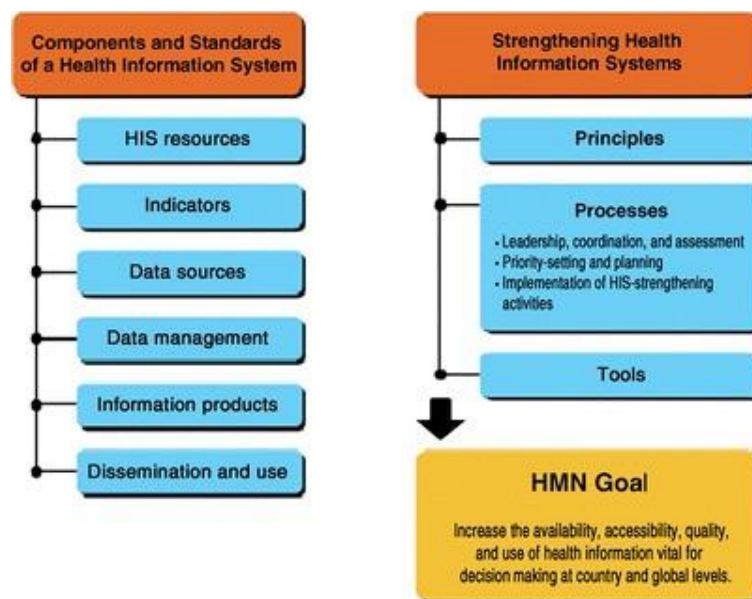
Women who are empowered are more likely to use modern contraceptives than those who are not due to their participation in deciding their reproductive health. Beyond women's level of empowerment, the ability to access reproductive health services is impacted by healthcare facility barriers (Asaolu *et al.*, 2017). Even though the empowerment of women causes a change in different areas, such as health, it can only be sufficient and produce improved outcomes when men are obligated to gender equity (access to resources, benefits and responsibilities regardless of gender), particularly in reproductive health and Child nutrition (Bapolisi *et al.*, 2020). Partner's involvement in reproductive health services by enlightening, exposing and encouraging them to participate. Hence, their family health-seeking behaviour is positively influenced (Shija *et al.*, 2011).

Women and girls' empowerment are dominant to global development goals with increased gender equality and worldwide access to sexual and reproductive health services (Karp *et al.*, 2020). According to Alimoradi *et al.* (2017), empowerment is vital in health promotion and health-related quality of life by which they have control over their health through decisions (Phuti, 2018). Stopping women's powerlessness in making decisions can reduce poor reproductive health outcomes and mortality. Lack of empowerment can also be attributed to inexplicit maternal and child health policy and poor reproductive health education; being knowledgeable ensures informed choices regarding contraceptives, health perception and behaviour (Mmusi-Phetoe *et al.*, 2019). Relevant evidence has shown that poor women experience bad reproductive health outcomes and that early and unintended childbearing leads to poverty, even in developed countries (Greene & Merrick, 2005). Adolescent pregnancy can hinder educational opportunities for both mother and child (Conde-Agudelo *et al.*, 2006).

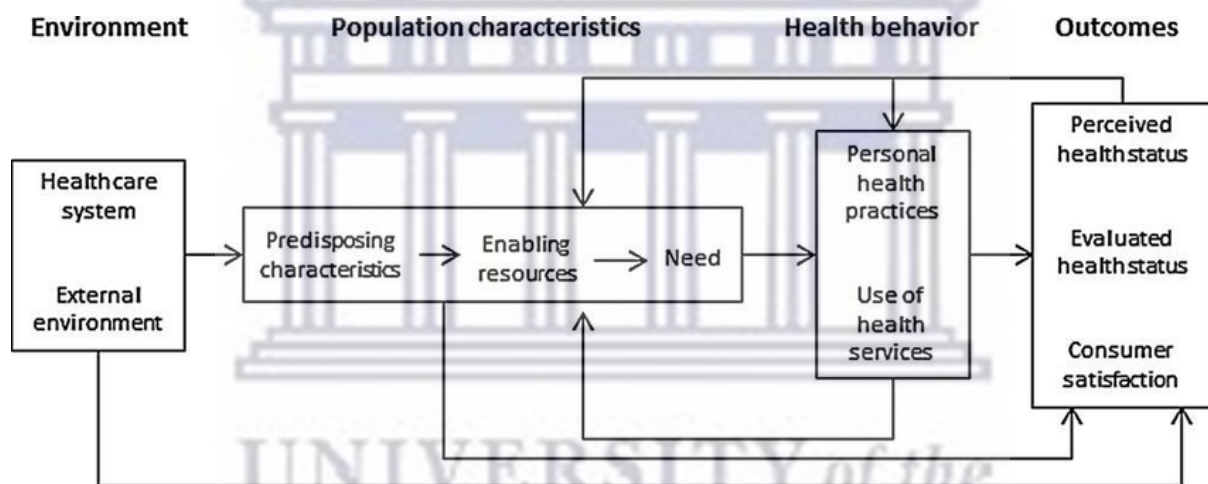
## 2.9 Health Information System (HIS) and Health Care Seeking Behaviour

Information systems can be described as the entire management of information in an organisation, including the participation of humans and the information technology used (Winter *et al.*, 2001). A strengthened HIS leads to improved health outcomes and services. It is essential to have a structured and effective HIS that can provide the information needed for the health sector to improve the health system; then, health outcomes will be improved over time. There have been persistent challenges that act as a barrier to achieving a robust Health information system, such as policies to support implementation, poor data management, non-integration of data and regularisation of data collection tools at national and provincial levels (Schonfeldt *et al.*, 2011). Health information is generally assumed to be a means of governance in making decisions and allowing supervision of resources utilised and outcomes attained (WHO, 2008). Figure 1 below is a framework extracted from the book by WHO in 2008 about the framework and standards for country health information systems. It shows the components and standards of a Health Information System and the phases for strengthening it. The features and standards of the health information system are resources, indicators, data sources, data management, information products and dissemination and use. Principles, Processes (Leadership, coordination and assessment, priority-setting and planning and implementation of health information system strengthening activities) and tools are the three implementation levels at which the HIS will be strengthened, complemented with constant assessment and development. The framework was designed to achieve the HMN goal of increasing availability, accessibility, quality and use of relevant information to make evidence-based decisions at National and global levels. Understanding the factors that impact an individual's utilisation of healthcare services is essential in healthcare. "Andersen's Behavioural Model of Health Service Utilisation", which provides a comprehensive framework for evaluating the various aspects influencing an individual's decision to seek health care services, was developed by Andersen (1995). Examining this model's concept, components, and implications for healthcare research and policy development is beneficial as it proposes using healthcare services, including post-natal care, as a function of predisposing, enabling factors and the need factor. Andersen's Behavioural Model of Health Service Utilisation is a critical framework that significantly advances our knowledge of healthcare utilisation behaviour. This model thoroughly explains how individuals decide whether to seek healthcare services by considering the need, enabling, and predisposing factors. This model's continued relevance to healthcare research and policy development highlights its importance as a fundamental concept in health services use. The

application of this model is helpful for researchers and policymakers in improving the standard and accessibility of healthcare services.



**Figure 1:** Health Metrics Network framework.



**Figure 2:** Andersen's behavioural model (Andersen, 1995)

Attention has been paid to health information systems investment to strengthen the health system in low and middle-income countries (Shakarishvili *et al.*, 2010). In South Africa, there has been much support for the establishment of a strong HIS since 1994 through legislation by enacting laws to govern health information used in the health sector and official statistics (census, vital statistics) and policies to guide on improving data quality and monitoring and evaluation of performance. Improvement also aims to provide quality, reliable and timely data

to track and improve health service delivery and acquire a national health information system (Schonfeldt *et al.*, 2011). A significant health information management challenge is a weak health information system characterised by contrasting health data sources with imprecision and ambiguity about health data quality (WHO, 2012).

Evidence has shown that modern information technology offers remarkable opportunities to reduce errors, such as medication errors and diagnostic errors, to support healthcare professionals to make available timely and up-to-date patient information to increase the effectiveness of care (reduce waiting times for patients and improve the quality of patient care) [Bates *et al.*, 2001]. Health information management plays a critical role in ensuring that the information regarding healthcare services is provided accurately and timely. Training health information management professionals can improve a weak health information system in sub-Saharan Africa (Ojo, 2018).

In a study by Martikainen *et al.*, 2020, physicians and nurses reported their inability to influence Health Information System development. Healthcare organisations need to acknowledge the importance of clinicians' contribution to developing HIS by allowing career paths for physicians and nurse informaticists.

Many literatures have described the challenges encountered in assisting health managers in using formal information from the Health Information System in their decision-making (Garrib *et al.*, 2008; Kimaro & Twaakyondo, 2005; Odhiambo-Otieno, 2005). Even though health information needs differ across levels of the health system (AbouZahr & Boerma, 2005), there needs to be a more realistic effort reflecting what information healthcare facility managers use to organise and make service delivery decisions. However, managers' performance is critical in strengthening health systems (Loewenson, 2004).

Scott & Gilson's 2017 study revealed the importance of creating an empowering environment for information managers to improve their ability to acquire knowledge to use routine health information effectively, which strengthens the information system, and informed decision is achieved, and, in turn, transforms national policies and priorities. However, the lack of health information and the use of poor-quality data in healthcare systems result in weak and poorly functioning health systems.

The quality of data from healthcare institutions will have a significant impact on how well administrative data is used for programme planning, monitoring, and supervision. Health facility data reporting and maintenance systems are generally inadequate in low- and middle-income countries (Lemma et al., 2020). Maternal and child health measures are commonly used to track the effectiveness of health initiatives at the national and local levels. Monitoring a country's progress towards sustainable development goals is hindered when it does not comply with DHS (Brault et al., 2020). The need to collect and maintain quality data has thus become even more critical. The completeness and accuracy of data in the Nigerian healthcare system is a challenge. Studies have shown that data quality, and therefore data integrity, has been less than the highest quality, hence a barrier to enhancing service delivery.

Studies have shown that one of the critical factors in improving healthcare delivery is data quality. Data is essential to health care delivery and can be used for government planning, management, and resource allocation. Over the years, healthcare facilities in low- and middle-income countries like Nigeria have struggled to maintain complete, accurate and valid patient data (Tijani *et al.*, 2021).

## **2.10 Assessment of factors affecting data accuracy**

Data accuracy is one of the components of data quality. To manage health information to improve health, data needs to be collected, stored, retrieved and the information used (WHO, 2008). Therefore, a study to explore factors that influence data accuracy, such as administration of health services, management (collection, storing, processing, analyses), adequate training of personnel, and supervision for quality assurance (medical record audit), resources (personnel, financing etc.), technology, use of information, and services in basic RHIS (routine health information system) is essential.

This study enhances good coordination of the health system, identifying the training needed for skilled and qualified personnel (Islam, 2007). This will consequently improve the quality of life to prevent, alleviate or eradicate events that threaten public health (WHO, 2010). Additionally, this will support the development of suitable programs to improve capacity and strengthen health information and its use (dissemination of the information after analysis). Consistent and reliable national health information will enable monitoring the change in coverage of critical interventions (Nicol & Bradshaw, 2010). Furthermore, this will help



produce relevant and quality information through the service delivery system for policy and decision-making to improve the population's health (WHO, 2008), such as reproductive health.

### **2.11 Investigation of non-use of the information**

To examine the relationship between human and institutional-related non-use of information and how individual actions can change institutional procedures. Factors resulting in non-use of information could be low human resources in which few health workers available are overburdened with so much responsibility, which may interfere with the period assigned to data collection, and this can affect timeliness, accuracy and completeness due to lateness in data completion, and usability of only small amount of data (WHO, 2008; Nicol *et al.*, 2013).

Timeliness of information is also a barrier to using information due to data unavailability when needed (Nicol, 2015). Without complete and timely data, it will be challenging to review fertility and fertility-related trends such as child mortality (AbouZahr *et al.*, 2015). Accessing organisational systems necessary for routine data collection, including birth and death records, is challenging. Regular health information system performance is dictated by organisational, technological, and behavioural factors (Aqil *et al.*, 2009), and organisational, environmental, and behavioural factors also impact data quality (IMF, 2003). The institutional capacity to collect, investigate and use health data at all levels must be strengthened (Nicol and Bradshaw, 2010). This study enables interventions to improve the planning, training, and all required to develop personnel skills, competence and performance to use and interpret information, which will also advance data availability, the usability of health information systems, and improve users' experience.

### **2.12 Data Problem and Impact of poor-quality Data**

A different interpretation of health system outcome can also affect health system measurement output by continent's health (Yazbeck, 2004). Therefore, national representation is required in every country due to the limitation in misreporting or no standard of capturing data about health and reproductive issues. Data is said to be inaccurate when information is not entered correctly and also not maintained. Inaccurate data can misinform decisions because quality decisions depend on data quality. Good public health decision-making relies on consistent and timely data on births, deaths, etc. (Abouzahr *et al.*, 2007). Inaccurate data may affect the quality of patient care, which can eventually result in long-term damage or death (The Markle Foundation, 2006). Poor-quality data may affect use; therefore, data management must detect

poor-quality data and correct the available case data. Data quality is usually evaluated by district and subnational officials conducting data quality assessments of health facilities. The District Monitoring and Evaluation Officer usually implement the assessment quarterly, and a nationally approved tool is used to evaluate data quality at the health facility.

Inaccurate data hinders decision-making as regards health needs; likewise, the non-use of data impedes the development of policies and reporting of health indices within the country (Ndep, 2014). Misinformation has a significant consequence on patients and healthcare policy. Health information system development is needed to regularly monitor access to quality maternal health services and outcomes (Wabiri et al., 2013). Complete data is vital for quality data, improving the chance of having valid evidence that will inform policy and decision-making (Uzochukwu *et al.*, 2020).

Insufficient, inaccurate data or irrelevant information has been a problem in the health system in measuring the population's health outcomes. Census data serve several purposes, such as informing decisions at different levels, e.g. national and municipal, and planning programs in private and public sectors in supporting an extensive range of research. Owing to the periodic nature of censuses (every ten years), its dissemination may not be available when needed. Meanwhile, accurate information will aid decision-making, development of policies, etc. (WHO, 2008). Continuous assessment of data quality (Sullivan *et al.*, 1991) and contributions from international experts are used to generate the best achievable health interview tools. Health interview surveys are a complex and somewhat underdeveloped field (Ross & Vaughan 1986), and improvements in the health section of the DHS questionnaire are made continuously.

The lack of reliable, timely and detailed information has made data rely on indirect estimation. Therefore, to justify measurements, there is a need to improve the quality and completeness of the information system in Africa. Timeliness is also essential to get data and statistics for policymakers (WHO, 2008). Improving the health status of the human population is one of the essential elements of a well-functioning health system (WHO, 2010). The health information system needs to be reinforced to assess health outcomes and enhance population health generally (WHO, 2000).

The DHS Program aims to produce high-quality data and make it available for analysis in an understandable and reliable form. The complexity of the data files results from incompleteness

or inconsistency of responses in developing countries, and many analysts find it difficult to analyse them. This is why the DHS has developed a policy to minimise errors and ensure that the data files are accurately represented. The primary data quality policies involve dealing with missing values; no response or value is labelled or excluded from analysis for accuracy, sample weights, Median calculations, rates, ratio, proportion, all women factors and wealth index (DHS program).

### **2.13 Demographic And Health Survey**

Nearly all information collected in DHS surveys is subject to reporting and evokes bias (except weight and height measures and vaccination data copied from the child health card). Certain information like the age of the respondents, birth dates of children, and age at marriage refer to historical events. This unavoidably causes biases, and although a detailed evaluation of DHS data has shown that these data are well-reported, the omission of births or deaths and the problem of cross-sectional surveys is generally within limits. Most health information is grounded on women's reports of cases concerning child diarrhoea and respiratory symptoms within two weeks.

Although misclassification biases do arise, the magnitude of the bias is constantly unknown, and correcting for the bias is delicate. As long as the biases are relatively random, the cumulative estimates of indicators will be fairly reasonable. Still, individual-position data must be interpreted more precisely, especially when making contributory interpretations. DHS surveys are also limited to health indicators, which can be measured with few questions. For instance, determining a cause of death through verbal autopsy only gives a rough idea of the significance of the particular causes of death. Still, it needs to be more specific to assess the impact of health interventions. DHS data are restricted to evaluating readiness and use of health services.

Add-ons, deductions and modifications are made in every DHS survey. Still, the number of changes made is limited to maintain its quality, limit the complication of the survey, and retain the scope of the set of questions as much as possible. Observation breakdown is appropriate at the regional level since a region is always the main component of implementing health programmes. Nationally representative surveys are expensive and require considerable skill. For most developing countries, external support is needed to cover the local costs of 3-6 months of fieldwork (50-80 staff in the field) and data processing and editing. Technical support costs

could sum up to half of the survey expenditures. DHS surveys are a vital data source on families' health in developing countries. Both at the public and international level and give essential data on health services use. DHS surveys could be used to provide more detailed data, and they could also be the primary source of data for covering the health targets of the World Summit for Children with precise aims for improvements in maternal and child health for the decade 1990-2000. An evaluation of the indicators shows that, although several targets can be covered with a well-performing public health information system and well-representative sample surveys. As such, any country striving to meet the target should conduct a DHS-type survey at the beginning and end of the decade to assess the accomplishment of its previous ten years' objectives.

An important source of information on the health of families in developing nations is the Demographic and Health Surveys (DHS) program, which conducts surveys both nationally and internationally. Such data include fertility and family planning, mortality and nutrition, and health services utilisation. Using fixed or similar survey tools allows thorough global and regional dissimilarities or similarities estimates of health status and health care (Ties Boerma & Sommerfelt, 1993). For instance, DHS data on contraceptives is limited in that there is no information about the respondents' regularity and understanding of the efficiency of use. More so, since the information is obtained from women of reproductive age who are in a union or married, many women who are not in a committed union or partnership that are sexually active and using contraceptives will be ignored. Another limitation is the information regarding the current use of contraceptive methods, which does not capture changes (use of more than one) in contraceptive methods by women for some reasons. Reasons for contraceptives should be stated/ separated (Prevention of pregnancy or diseases).

Another limitation of obtaining accurate information from the DHS is the non-availability of indicators to measure or assess the quality of care received, primarily by women. Poor quality of care is the main hindrance to improving populations' health in developing countries, particularly concerning Maternal, Neonatal and Child Health (MNCH) (Graham & Varghese 2012). Data unavailability may also result from unregulated private sectors that provide a high proportion of maternal and neonatal health services (Das & Hammer, 2014; Victora *et al.*, 2010). The collection of comprehensive quality of care information, such as provider actions and patient satisfaction, has been conducted using specially constructed surveys over small populations (Marchant *et al.*, 2014; Uzochukwu *et al.*, 2004; Van Duong *et al.*, 2004), but the

availability of quality-related measures in more extensive population surveys have been inadequate.

Routine information systems permit maternal mortality to be monitored nationally. With insignificant extra costs, where the number of deaths is large enough for obtainable estimates, annual figures are considered representative. In countries where routine systems are weak or do not exist, a population-based survey is necessary, requiring a large sample size, higher cost, and more frequency other than 5-10 years to justify accuracy in estimates obtained (WHO, 2006).

## **2.14 DHS data accuracy**

Most of the health-related measures in DHS are captured by self-reports through face-to-face interviews with respondents or by Proxy reporting. Governments and researchers use DHS data to support evidence-based policy development and plan and monitor health and development programmes (DHS, M. (2013). These reports are suitable for observing and monitoring improvement regarding the Millennium Development Goals to reduce child mortality and improve maternal health (MDG 4 & 5) (Rajaratnam *et al.*, 2010; Hogan *et al.*, 2010; Victora *et al.*, 2012). One of the strengths of the DHS data is the extensiveness of collected demographic, social, wealth and health data. This allows for in-depth data analysis, covers prevalence, and examines complex contributory relationships or associations between social characteristics and health.

The thriving of DHS data has increased information availability, which offers the source of data for policy and programme development. Research (Fabic *et al.*, 2012) has shown that DHS data modification is meeting the growing data need in some areas of health globally; as a result, gender-related publications have increased since the introduction of women's status and domestic violence modules, etc. This indicates that DHS is responsive to the data needs of countries who adopt the use, and researchers are using DHS as a base for knowledge structure. Data are being turned into information and then publicised, but the challenge is the difficulty in measuring how significantly the disseminated information by researchers is used in making decisions. Despite the comprehensive coverage, measures across countries are limited to mortality and fertility outcomes and nutrition among women and the young. Likewise, various countries collect information on children and women of reproductive age only, which only sometimes makes the DHS appropriate for comparative analysis of health among women and

men or the health of ageing populations. Another area for improvement is that the survey is conducted individually within countries where the majority of contributing countries are measured separately. This limits the simultaneous comparisons of political and economic systems. Despite the standardised collection effort and thorough recode, regular data cleaning and recoding sometimes is needed before use (Corsi *et al.*, 2012).

**Data Collection Period:** Most population-based surveys (nationally representative) are conducted at intervals of at least five years or more due to cost and planning. A shorter interval may be more realistic to affect policy than a more extended period (WHO, 2006).

### **2.15 Access to quality civil registration**

Countries with civil registration and vital statistics tend to have better health outcomes, including low maternal and child mortality. To strengthen civil registration, it is crucial to understand the factors that facilitate and limit it. Civil registration, such as birth and death, allows the government to make necessary plans for health programs and monitor their progress (Philip *et al.*, 2015). There is a link between healthcare facility delivery or delivery by a skilled health attendant and using postnatal care with birth registration by owning a birth certificate (Jackson *et al.*, 2014). Accessing civil registration, such as birth in the healthcare structure, can help understand the country's challenges and inform policies to strengthen them.

### **2.16 Impact of data accuracy and non-use of quality information on reproductive health**

In Several ways, the quality of the data and its utilisation, or lack thereof, can substantially impact reproductive health. In reproductive health, data accuracy and reliable information must be maintained. Accurate data and high-quality information are essential for making well-informed decisions for developing policies and allocating resources. Inaccuracies or lack of regard for reliable information can have significant adverse effects, possibly compromising the ability to make informed decisions about reproductive choices, health, and general well-being. As a result, it is critical to prioritise activities focused on increasing data accuracy and encouraging evidence-based practices in reproductive health (Okonofua, 2023; Mwinnyaa *et al.*, 2021).

**Maternal and Child Health:** The prevalence of inaccurate or incomplete information about pregnancies, prenatal care, and childbirth can be detrimental to providing adequate maternal

care, resulting in maternal mortality and infant morbidity. Accurately monitoring maternal and child health indicators requires reliable data (Batani & Maharaj, 2022; Bhattacharya et al., 2019; Uzochukwu et al., 2022; Knapp et al., 2018).

**Family planning:** The significance of accurate data about contraception methods, availability, and usage cannot be overstated in effective family planning programs. Any inaccuracies in the information can lead to unintended pregnancies or inadequate family planning services, adversely affecting individuals' reproductive choices and overall health. Therefore, it is imperative to ensure that family planning programs access reliable and comprehensive data to facilitate informed decision-making, which can positively impact individuals' health outcomes (Moloko & Ramukumba, 2022; Tsui et al., 2021; Olagundoye et al., 2021; Adamou et al., 2020).

**Research and Policy:** Data accuracy is of the utmost importance in reproductive health research and policy development. Data deficiency or inaccuracy can result in poorly informed policy and inefficient resource distribution, eventually restricting access to essential reproductive health services. To encourage informed decision-making and efficient policy formation in reproductive health, it is necessary to ensure the reliability and validity of data (Burton et al., 2017; Brand et al., 2021).

**Decision Making:** Reproductive health requires precise and accurate data to aid medical professionals in making informed decisions. The accuracy of medical records, test results, and patient histories is particularly critical as it can directly influence the diagnosis and treatment of conditions such as infertility, sexually transmitted infections (STIs), and other related ailments (Avan et al., 2016; Murphy et al., 2021).

**Allocation of resources:** The availability and quality of care could be impacted due to improper resource allocation for reproductive health services based on inaccurate or deficient data. The proper distribution of essential services can be compromised by underfunding or overspending in less critical sectors, resulting in substandard quality of care. Since reliable data is necessary to ensure the efficient distribution of resources for reproductive health services, the importance of the reasons above cannot be overemphasised (Sidze et al., 2015; Madaka, 2019; Farnham et al., 2020; Mboera et al., 2021).

Public Health Intervention: Accurate data is required to plan and implement public health interventions such as immunisation campaigns, sexual health clinics, and outreach programmes. The effectiveness of these interventions can be significantly compromised by inaccurate data, which can lead to missed opportunities for disease prevention. Therefore, the availability of reliable and accurate information is fundamental for the development and implementation of effective public health policies and programmes (Mogekwu et al., 2021; Harrison et al., 2020; Scobie et al., 2020; Mwinnyaa et al., 2021)

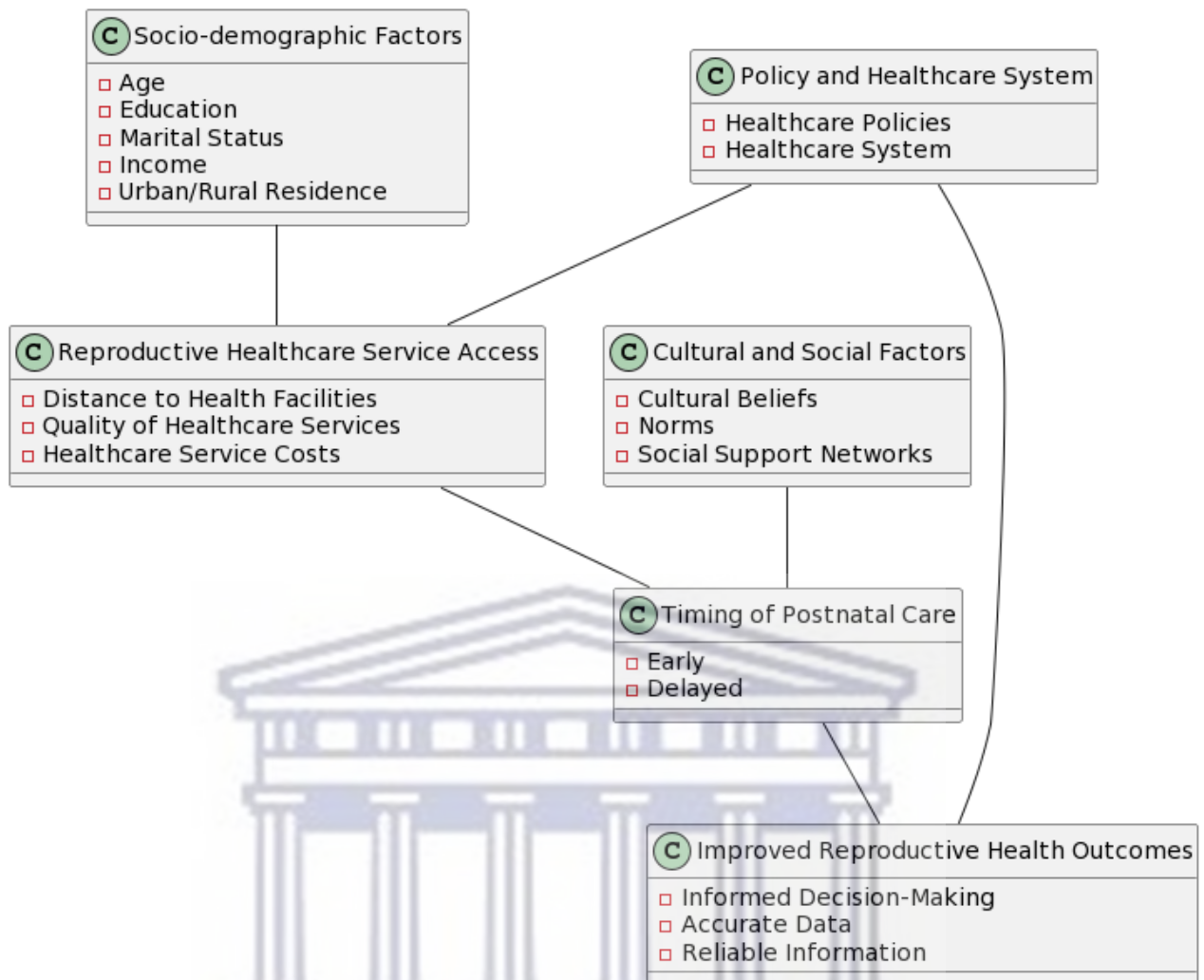
Health Equity: To uncover differences in reproductive health outcomes among different groups, especially those defined by ethnic or socioeconomic variables, precise statistics are crucial. Addressing these discrepancies and providing fair access to reproductive health treatments can only be possible with accurate information. As a result, gathering and analysing precise data is essential for advancing health equity (O'Neil et al., 2021; Ekholuenetale et al., 2021; Wagstaff et al., 2019; Veinot et al., 2019).

## **2.17 Conceptual Framework**

The various factors that influence the use of early postnatal care services may be understood using Andersen's Behavioural Model of Health Service use, which offers a practical, theoretical framework and the World Health Organisation's framework and standards for country Health Information Systems in coordinating all health data and recommends data governance structure (WHO, 2008; Andersen, 1995). This research presents a conceptual framework for understanding the relationship between factors in South Africa and Nigeria that delay or encourage postnatal care use. It emphasises the importance of policymakers in improving reproductive health outcomes and highlights the need for reliable information on reproductive health. Reliable health information systems are crucial for collecting data on women's reproductive health, identifying areas for improvement, assessing knowledge levels, and designing educational programs. Policymakers can use this information to understand women's healthcare behaviour, knowledge, perceptions, and health outcomes, leading to more informed decision-making. The framework acknowledges socio-demographic factors like age, education, marital status, income, and urban/rural residence as influences on mothers' access to postnatal care. It also considers the availability and accessibility of healthcare services, cultural beliefs, norms, and social support networks. The study focuses on the timing of postnatal care, indicating whether mothers receive it early or delayed. The research aims to



demonstrate that informed policy-making based on accurate data and reliable reproductive health information can improve women's reproductive health outcomes.



**Figure 3:** Conceptual framework: A Data-Driven Framework for Informed Reproductive Healthcare Policy in Nigeria and South Africa.

UNIVERSITY of the  
WESTERN CAPE

## **CHAPTER 3 - METHODOLOGY**

### **3.1 Introduction**

The influence of data accuracy and non-use of information on reproductive health, such as post-natal check-ups, is a quantitative method to determine, observe and analyse the data in line with the objectives. Research specifies the steps taken in collecting and analysing data to ensure generalisation. A research method is obtaining dependable solutions to problems through planned and efficient data collection, analysis and interpretation (Osuala, 2005). This section of the study presents the aim and objectives and comprehensively describes the procedures in this research study. This study uses secondary data from the 2013 and 2018 Nigerian Demographic and Health Survey and the 1998 and 2016 South African Demographic and Health Survey.

### **3.2 The study area**

The 2013 and 2018 Nigeria Demographic and Health Survey (NDHS) were undertaken in Nigeria, and the 1998 and 2016 South Africa Demography and Health Survey (SADHS) were conducted in South Africa. Nigeria became a nation in 1914 through the amalgamation of the Northern and Southern regions. Nigeria comprises 36 states and a federal capital territory grouped into six geo-political zones: North Central, North East, North West, South East, South-South and South West (Appendix A1). The country also has 774 constitutionally recognised local governments (LGAs). South Africa is situated at the southern tip of the continent of Africa and came into existence around 300-500 AD and has diverse origins; South Africa came into full democracy on 27 April 1994 and is now a republic with nine provinces: Western Cape, Eastern Cape, Northern Cape, Free state, KwaZulu-Natal, North West, Gauteng, Mpumalanga and Northern (Appendix B1).

### **3.3 The study population**

The study population comprised women of childbearing age, that is, women aged 15 to 49 years; all the women would have given birth to at least one child in the last year before the survey, and this includes women of different socio-economic status, educational attainment, occupation, income and other characteristics applicable to this study. This is mainly because the information from these various groups enriched the analysis. Nigeria's study population comprised 13420 women, while South Africa included 1414 Women.

NDHS 2013 findings show a Total Fertility Rate of 5.5 per woman; Nigerian women have one child more than the number of Children wanted. The difference between wanted pregnancy and Total Fertility Rate decreases with increasing education levels and wealth index. Educated and wealthy women transform their fertility desires into reality. TFR declined among Nigerian women from 5.3 in 2003 and 2008 to 4.8 in 2013. Southern Africa's total fertility rate is 3.0; the fertility replacement level may be reached by 2040, and annual growth rates will increase and result in 0.6 per cent. Western Africa, which includes Nigeria, has a total fertility rate of 5.6 and can only reach the fertility replacement level by 2060(Caldwell & Caldwell 2002).

### **3.4 Variable measurement**

Globally, above 500,000 women aged 15–49 die yearly from preventable pregnancy-related complications (AbouZar & Wardlaw, 2001; WHO, 2011). Women in developing countries have a 1 in 26 chance of dying from pregnancy and abortion compared to a 1 in 9400 event in Europe (Bremner *et al.*, 2010). Unmet health need for birth prevention and reproductive health services is shown to be one of the indicators of pregnancy-related death and complications. The unmet needs occur if there are no available possibilities of meeting an observed need. Therefore, the gap can be fixed if appropriate measures for women's reproductive health needs are identified to improve their possibilities of using reproductive health services. Improvement in data accuracy, data collection, and reporting help identify areas of reproductive health with unmet needs. The gap in quality information may result in unplanned pregnancy, inadequate care before and during pregnancy and insufficient postnatal care, resulting in complications, morbidity and mortality. The importance of accurate data and high-quality information cannot be overemphasised in the aspect of reproductive health, especially in the context of postnatal check-ups. To improve reproductive health services and outcomes, it is essential to have accurate and quality information to monitor and evaluate interventions or programs and identify challenges. A measure of the timeliness of post-natal checks is critical, including the percentage of mothers who received check-ups within a recommended time frame, usually 24 hours (WHO, 2014; Amouzou *et al.*, 2017).

### **3.5 Study design**

The study employed a quantitative method approach using the cross-sectional survey of the Demographic and Health Surveys of Nigeria and South Africa. The DHS data sets are publicly available through request on the website (<https://dhsprogram.com>).

### **3.6 Sample design**

The sample for the SADHS 1998 was designed to be a nationally representative probability sample of approximately 12,000 completed interviews with women between the ages of 15 and 49. The sampling frame used for the SADHS 2016 is the Statistics South Africa Master Sample Frame (MSF), created using Census 2011 enumeration areas (EAs). Administratively, South Africa is divided into nine provinces. The sample for the SADHS 2016 was designed to provide estimates of key indicators for the country as a whole, for urban and non-urban areas separately, and each of the nine provinces in South Africa.

The sample for the 2013 NDHS was nationally representative and covered the entire population residing in non-institutional dwelling units in the country. The survey was used as a sampling frame for the list of enumeration areas (EAs) prepared for the 2006 Population Census of the Federal Republic of Nigeria, provided by the National Population Commission. The sample was designed to provide population and health indicator estimates at the national, zonal, and state levels. The sample design allowed for specific indicators to be calculated for each of the six zones, 36 states, and the Federal Capital Territory, Abuja. A fixed sample take of 45 households was selected per cluster. All women aged 15-49 who were either permanent residents of the households in the 2013 NDHS sample or visitors present in the households on the night before the survey were eligible to be interviewed (NPC, 2013). The sampling frame used for the 2018 NDHS is the Population and Housing Census of the Federal Republic of Nigeria (NPHC) conducted in 2006 by the National Population Commission (NPC). Administratively, Nigeria is divided into states. Each state is subdivided into local government areas (LGAs), and each LGA is divided into localities. In addition to these administrative units, during the 2006 Population Census, each locality was subdivided into convenient areas called census enumeration areas (EAs). The primary sampling unit (PSU), a cluster for the 2018 NDHS, is defined based on EAs from the 2006 EA census frame (NPC, 2019).

### **3.7 Data collection**

This study utilised the data of women of reproductive age (15- 49 years) from the Demographic and Health Survey, a quantitative method, gathering information from randomly selected households regarding eligible women within the reproductive age group of 15-49 years to explore the influence of data accuracy and non-use of quality information on reproductive health outcomes. Those who were either a member of the household or just present in the home

the night before the survey from the DHS (Demographic and Health Survey) for both South Africa and Nigeria (1998, 2016 and 2013, 2018, respectively), more recent surveys are relevant for policy-making. The DHS is a nationally representative population-based survey with large sample sizes. Information on several areas of population and health, such as maternal and child health, contraceptive use, and women empowerment, is collected by using a multistage and stratified sampling design and also provides data for a wide range of monitoring and impact evaluation indicators in the areas of population, health, and nutrition. All DHS surveys are guided by the same standard sampling procedures, design of questionnaires, mode of data collection, cleaning, coding or creating sets of instructions and analysis to allow cross-country comparison.

The DHS data has improved the need for more data on health status and has contributed immensely to providing data in developing countries due to the unattainability or scarcity of other data sources. Therefore, DHS surveys are used extensively in many health studies by national and international organisations and researchers.

### **3.8 Data Analysis**

Information regarding postnatal checks is retrieved from birth, and the mother checks to get the timing (hours and days) of that check from the DHS 2016 and 2018 for South Africa and Nigeria, respectively. This information recoded into 'Mothers check for two days' and is further dichotomised and measured as 'Within two days' (Mother had a postnatal check within two days of delivering a baby) and 'Not in 2 days' (Mother did not have a postnatal check within two days of delivering a baby).

The analysis focused on South Africa and Nigeria in line with the objectives of this study. The quantitative data is analysed at Univariate, Bivariate and Multivariate levels using IBM® SPSS® software version 28. The Univariate analysis uses simple statistics to examine some selected characteristics of Women in South Africa and Nigeria, where frequency distribution tables, percentages and bar charts highlight the respondents' variability according to their characteristics. The chi-square test of independence was used to assess the association between 'Mothers check within two days' and the predictor variables. Further examination was carried out using the odds ratio after the chi-square test.

A logistic regression model is a multivariate analysis used to correlate the relationship and examine the influence of other independent predictors based on their relevance to the obtainability of postnatal checks of mothers within two days of delivery in South Africa and Nigeria. The dependent variable, the Postnatal check, was categorised into a dichotomy variable of having a postnatal check within two days and not having a postnatal check within two days. The regression model examined the odds of selected predictors to test for this. All the analyses were implemented using the Complex Sample Analysis procedure, which was considered vital to adjust for sample weight. An analysis plan was prepared using strata, clusters and sample weights. This plan file was used to estimate more accurately while performing Complex Sample Analysis. These two countries were chosen due to the high mortality rates due to the non-utilisation of reproductive health services (Idris et al., 2013; Yaya et al., 2018; Bolarinwa & Boikhutso, 2021; Chol et al., 2019). The level of measurement of the data for analysis, how many samples and the purpose of the analysis are considered to determine the appropriate test. The data used for the analysis are nominal. The chi-square test of independence and regression analysis are used to test the relationship between variables. The significance level of a P-value less than 0.05 was chosen for hypothesis testing due to the sample size. The null hypothesis is “There is no influence of data or use of information timely postnatal checks to inform policy”.

### **3.9 Ethical consideration**

Ethics in research is about the responsibility to respect the rights of others, which is typically associated with morality. Ethical issues and principles in research have been considered in the Demographic and Health Survey data; respondents gave informed consent to participate in the study before the interview, and DHS complies with the requirement of protecting correspondents' privacy. No further permission is required since the data is secondary data and it is publicly available. Website: <https://dhsprogram.com/data>.

---

## CHAPTER 4 - RESULTS

---

### 4.1 Introduction

This chapter focuses on the analysis of data to explain the demographic and socio-economic characteristics of the respondents to determine the influence of quality information on reproductive health in South Africa and Nigeria. The factors include maternal age, age at marriage, education, etc. The data is subjected to Univariate, Bivariate and Multivariate analysis. The Univariate analysis describes the background characteristics of the respondents by using statistical methods such as percentage, and the chi-square test of independence identifies the relationship between the variables selected. The Multivariate describes the factors independently associated with selected aspects of reproductive health using logistic regression analysis. The first part of the analysis focuses on the distribution of selected observable characteristics of the respondents (women aged 15-49) by Country. At the same time, another section describes the relationship between the selected multiple variables: the timing of the first postnatal check for the mother. The second part of the analysis examines the association of predictors chosen to the timing of postnatal checks of mothers.

The study focuses on the time the mothers have their postnatal checks because it helps prevent childbirth complications that may affect the mother and the child. There is little attention on the mother's postnatal care compared to the child's. Post-natal service is an effective strategy to stop the increase in physical and mental relapse among post-natal mothers (Tumbure *et al.*, 2018). Despite several programs put in place to improve maternal and child health, the maternal mortality rate at 576/100,000 and neonatal mortality rate at 37/1000 live births (NDHS, 2013), MMR of 512/100,000 and NMR of 39/1000 live births which remained stagnant (NDHS, 2018). SADHS 2016 reported an MMR of 536 deaths per 100,000 live births, with 35 per 1000 live births and 150 per 100,000 in SADHS 1998, with a 45 per 1000 live births infant mortality rate. The maternal mortality ratio is one of the indicators to assess progress towards SDG 3 which is to ensure healthy lives and promote well-being for all ages. Non-utilisation of postnatal care influences poor maternal and child health.

### 4.2 Socio-demographic Characteristics of respondents in South Africa and Nigeria

Tables 3 and 4 show women's maternal characteristics in Nigeria and South Africa, respectively. This comprises their demographic and socioeconomic profiles. A large proportion

of mothers are between the ages of 20 to 29 years in both countries [South Africa: 1998 (26%) & 2016 (29%), Nigeria: 2013(28%) & 2018 (28%)], which remains consistent in each year of the survey and women aged between 15 and 29 years have the highest proportion of first births in both countries [(South Africa: 94% & 95% in 1998 & 2016 respectively), (Nigeria: 71% & 75% in 2013 & 2018 respectively)]. Most of the respondents reside in rural areas in Nigeria.

(65% & 62% in 2013 and 2018, respectively) while a majority in South Africa live in urban areas (2016: 64%), except for a slight difference in percentage between urban and rural residents in the 1998 survey (Urban: 50%, rural: 51%). South African respondents are more educated (High School; 56% in 1998 & 79% in 2016) than those in Nigeria (No education; 49% in 2013 & 46% in 2018), likewise their husbands/partners, respectively [(South Africa: 46% in 1998, 70% in 2016, Nigeria: 40% in 2013, 37% in 2018)]. Early marriage is common in both countries [(ages 15-29); South Africa:89% & 86% in 1998 & 2016 respectively, Nigeria: 71% & 75% in 2013 & 2018 respectively]. The majority (25% in 2013 & 24% in 2018)of the mothers in Nigeria have more than five children, while the majority of these categories of women (27% in 1998) have one child & (34% in 2016) have two children in South Africa. The highest proportions of the women are from the North West region in Nigeria (2013; 37%, 2018; 37%), while the majority (22% in 1998 & 28% in 2016) are from Kwazulu-natal & Gauteng in South Africa, respectively. The distribution also shows that most of the women are poor in both countries (South Africa: 46% (2016), Nigeria: 47% (2013), 45% (2018).

The distribution also shows that most respondents in both countries wanted their pregnancies when they conceived. Most women in Nigeria do not intend to use contraceptives, while most South African women use modern contraceptives. A large percentage of women in Nigeria are either married or living with a partner. Still, in the case of women in South Africa, a 1998 survey shows that most women are either married or living with a partner, as opposed to the 2016 survey, which indicates that most women are never in a union. Most women in Nigeria deliver at home, while those in South Africa have their babies in public sectors (hospitals, clinics, etc.). Birth interval is duly practised in both countries (Minimum of 2 years birth spacing). Most of the women in South Africa are not employed, while the majority of the women are employed in Nigeria.



**Table 3:** The distribution of selected characteristics by Country (Nigeria)

<b>Background characteristic</b>	<b>Nigeria 2013 N (%)</b>	<b>Nigeria 2018 N (%)</b>
<b>Maternal age</b>		
15-19	1597(5.0)	1461(4.3)
20-24	6237 (19.6)	6684(19.5)
25-29	8893(27.9)	9591(28.1)
30-34	6974(21.9)	7792(22.8)
35-39	4926(15.5)	5441(15.9)
40-44	2317(7.3)	2337(6.8)
45-49	885(2.8)	887(2.6)
<b>Region</b>		
North Central	4340(13.6)	4619(13.5)
North East	5578(17.5)	6213(18.2)
North West	11775(37.0)	12558(36.7)
South East	2840(8.9)	3428(10.0)
South South	2935(9.2)	2968(8.7)
South West	4360(13.7)	4407(12.9)
<b>Place of residence</b>		
Urban	11126(35.0)	13170(38.5)
Rural	20702(65.0)	21023(61.5)
<b>Level of education</b>		
No education	15657(49.2)	15858(46.4)
Primary	6127(19.3)	5103(14.9)
Secondary	8211(25.8)	10413(30.4)
Higher	1834(5.8)	2818(8.2)
<b>Religion</b>		
Christian	11647(36.8)	12,304(36.0)
Islam	19689(62.2)	21706(63.5)
Other	29(0.9)	182(0.5)
<b>Children born</b>		
1	3670(11.5)	3758(11.0)
2	5494(17.3)	6347(18.6)
3	5297(16.6)	5781(16.9)
4	4503(14.1)	4738(13.9)
5+	12864(40.4)	13568(39.7)
<b>Wealth Index</b>		
Poor	14851(46.6)	15354(44.9)
Middle	6001(18.9)	7043(20.6)
Rich	10976(34.5)	11795(34.5)
<b>Age at first birth(Years)</b>		
Less than 15	2546(8.0)	2185(6.4)
15-29	28471(89.4)	30837(90.2)
30+	811(2.6)	1170(3.4)
<b>Number of living Children</b>		
0	338(1.1)	352(1.0)
1-2	10961(34.4)	11942(34.9)
3-4	10899(34.2)	11343(33.2)
5+	9630(30.3)	10555(30.9)

<b>Wanted</b>	<b>Current</b>	
<b>pregnancy</b>		
Then	3795(88.3)	3830(84.8)
later	368(8.6)	565(12.5)
Not at all	135(3.1)	123(2.7)
<b>Contraceptives use and intentions</b>		
None- intends to use later	7411(23.3)	12142(35.5)
Modern	3056(9.6)	4156(12.2)
Traditional	1773(5.6)	1523(4.5)
Does not intend to use	19588(61.5)	16372(47.9)
<b>Wanted last Child</b>		
Then	28494(90.0)	29913(87.5)
Later	2502(7.9)	3195(9.3)
No more	669(2.1)	1085(3.2)
<b>Marital status</b>		
Never in union	500(1.6)	584(1.7)
Married or living with partner	30491(95.7)	32606(95.3)
Widowed	339(1.1)	366(1.1)
Divorced, not living together or separated	498(1.6)	637(1.9)
<b>Cohabitation duration (years)</b>		
Never married	500(1.6)	584(1.7)
0-4	5357(16.8)	6010(17.6)
5-9	8879(27.9)	10489(30.7)
10-14	7309(23.0)	7263(21.2)
15+	9783(30.7)	9847(28.7)
<b>Place of delivery</b>		
Home	20078(63.7)	20175(59.0)
Public	7179(22.8)	9012(26.4)
Private	4208(13.4)	4450(13.0)
Other	38(0.1)	556(1.6)
<b>Child's Birth Order</b>		
1	6202(19.5)	6625(19.4)
2	5482(17.2)	6256(18.3)
3	4827(15.2)	5249(15.4)
4	4137(13.0)	4329(12.7)
5	3329(10.5)	3544(10.4)
Higher than 5	7851(24.6)	8190(23.9)
<b>Preceding birth interval ( months)</b>		
First birth	6285(19.7)	6694(19.6)
Less than 24	5935(18.6)	6850(20.0)
24-36	10556(33.2)	11209(32.8)
37+	9052(28.4)	9440(27.6)
<b>Husband/Partner education</b>		
No education	12334(39.6)	11999(36.8)
Primary	5884(18.9)	4530(13.9)
secondary	9035(29.0)	10839(33.2)

Higher	3667(12.1)	4732(14.5)
Don't Know	135(0.4)	506(1.6)
<b>Respondent currently working</b>		
No	9823(31.0)	11082(32.4)
Yes	21865(69.0)	23111(67.6)
<b>Age at cohabitation (years)</b>		
Less than 15	8573(27.4)	7403(22.0)
15-29	22265(71.1)	25221(75)
30+	491(1.5)	954(2.9)

Source: NDHS 2013, 2018

**Table 4:** The distribution of selected characteristics by Country (South Africa)

Background characteristic	South Africa 1998 N(%)	South Africa 2016 N(%)
<b>Maternal age</b>		
15-19	310(6.2)	187(5.2)
20-24	1227(24.6)	844(23.6)
25-29	1286(25.8)	1025(28.7)
30-34	1001(20.1)	760(21.3)
35-39	743(14.9)	488(13.7)
40-44	332(6.6)	222(6.2)
45-49	93(1.9)	45(1.3)
<b>Region</b>		
Western Cape	401(8.0)	313(8.8)
Eastern Cape	741(14.9)	398(11.1)
Northern Cape	102(2.0)	69(1.9)
Free State	257(5.1)	164(4.6)
Kwazulu Natal	1094(21.9)	654(18.3)
North West	340(6.8)	282(7.9)
Gauteng	954(19.1)	1013(28.4)
Mpumalanga	379(7.6)	332(9.3)
Northern Province	724(14.5)	347(9.7)
<b>Place of residence</b>		
Urban	2470(49.5)	2281(63.9)
Rural	2522(50.5)	1291(36.1)
<b>Level of education</b>		
No education	453(9.1)	50(1.4)
Primary	1404(28.1)	320(9.0)
Secondary	2800(56.1)	2805(78.5)
Higher	336(6.7)	397(11.1)
<b>Religion</b>	NA	NA
Christian		
Islam		
Other		
<b>Children born</b>		
1	1356(27.2)	1035(29.0)
2	1326(26.6)	1219(34.1)
3	820(16.4)	746(20.9)
4	577(11.6)	334(9.4)

5+	914(18.3)	237(6.6)
<b>Wealth Index</b>	<b>NA</b>	
Poor		1652(46.2)
Middle		788(22.1)
Rich		1133(31.7)
<b>Age at first birth (Years)</b>		
Less than 15	142(2.8)	51(1.4)
15-29	4707(94.4)	3384(94.7)
30+	143(2.8)	138(3.9)
<b>Number of living Children</b>		
0	71(1.4)	40(1.1)
1-2	2787(55.8)	2336(65.4)
3-4	1413(28.3)	1002(28.1)
5+	722(14.5)	194(5.4)
<b>Wanted pregnancy</b>	<b>Current</b>	
Then	75(42.6)	59(45.4)
later	68(38.8)	46(35.6)
Not at all	33(18.6)	25(19.1)
<b>Contraceptives use and intentions</b>		
None- intends to use later	1235(24.7)	631(17.7)
Modern	3099(62.1)	2375(66.5)
Traditional	62(1.2)	15(0.4)
Does not intend to use	596(11.9)	552(15.5)
<b>Wanted last Child</b>		
Then	2137(43.1)	1552(43.5)
Later	1845(37.2)	1200(33.6)
No more	973(19.6)	819(22.9)
<b>Marital status</b>		
Never in union	1802(36.1)	1816(50.8)
Married or living with partner	2828(56.6)	1619(45.3)
Widowed	87(1.7)	35(1.0)
Divorced, not living together or separated	276(5.5)	103(2.9)
<b>Cohabitation duration (years)</b>		
Never married	1802(36.1)	1816(50.8)
0-4	859(17.2)	584(16.4)
5-9	963(19.3)	585(16.4)
10-14	597(12.0)	272(7.6)
15+	771(15.5)	314(8.9)
<b>Place of delivery</b>		
Home	713(14.6)	131(3.7)
Public	3740(76.5)	3123(87.4)
Private	424(8.7)	304(8.5)
Other	11(0.2)	14(0.4)
<b>Child's Birth Order</b>		
1	1652(33.1)	1272(35.6)
2	1248(25.0)	1150(32.2)

3	760(15.2)	666(18.6)
4	517(10.4)	277(7.8)
5	330(6.6)	102(2.9)
Higher than 5	486(9.7)	104(2.9)
<b>Preceding birth interval ( months)</b>		
First birth	1662(33.3)	1281(35.9)
Less than 24	456(9.1)	247(6.9)
24-36	725(14.5)	373(10.5)
37+	2148(43.0)	1671(46.8)
<b>Husband/Partner education</b>		
No education	410(13.2)	59(3.7)
Primary	970(31.2)	175(11.1)
secondary	1429(46.0)	1112(70.2)
Higher	240(7.7)	236(14.9)
Don't Know	55(1.8)	3(0.2)
<b>Respondent currently working</b>		
No	3612(72.6)	2460(68.9)
Yes	1361(27.4)	1112(31.1)
<b>Age at cohabitation (years)</b>		
Less than 15	139(4.4)	62(3.5)
15-29	2839(88.9)	1512(86.1)
30+	212(6.6)	181(10.3)

Source: ZADHS 1998,2016

#### 4.3 Timing of mother postnatal care in Nigeria (NDHS 2018) and South Africa (SADHS 2016)

Table 5 below is a Cross tabulation summarising the relationship between selected categorical variables and the timing of mothers' (aged 15-49) postnatal care. This is the per cent distribution of the mother's first postnatal check for the most recent live birth by timing after delivery and the percentage of women with a live birth during the two years preceding the survey that received a postnatal check in the first two days after delivery according to background characteristics (Nigeria DHS 2018, South Africa DHS 2016).

Most maternal deaths occur within 24 hours after delivery globally. Therefore, it is essential, according to the WHO guidelines, that women who deliver in a health facility get postnatal health care within the time of delivery, at least 24 hours after birth (WHO, 2014), and referral should be given within 12 hours for postnatal checks, to those who deliver outside health facilities immediately after delivery (NDHS, 2018). The safe motherhood recommendation is that a postnatal check should be done within 2 days after delivery (SADHS, 2016).

Table 5 shows that the proportion of women who had a postnatal check during the first 2 days after childbirth is higher among the richest, followed by richer, and the poorest had the lowest proportion. This indicates that the proportion of women who received a postnatal check within 2 days is influenced by increasing wealth, possibly due to financial constraints in accessing postnatal care services. In South Africa, 82% of mothers had a postnatal check within the first 2 days after delivery. Most mothers had their first postnatal check within 4 hours (72%), while 8% had a check between 4 and 8 hours. 9% of the mothers did not have a postnatal health check, and 6% were unsure whether they had a postnatal check. The percentage of women who received a postnatal check within 2 days is associated with increasing wealth (Percentage increase from 78% among those with the lowest wealth index to 87% among women with the highest wealth index). Women who had their first birth at age 35-49 years receive a postnatal check during the first 2 days after birth (83%), while those aged 20-34 have a postnatal check within 4 hours after delivery (73%). Urban women are more likely to receive a postnatal check (84%) than those living in rural areas (79%) within 2 days after delivery. For the regions, Western Cape and Free State have the highest percentage (90%) of women who received this check within 2 days of delivery, while Kwazulu-natal shows the lowest percentage of 77%. Women with the highest level of education (88%) were more likely to receive postnatal checks than those with primary education (71%) within 2 days of giving birth. However, only a few women attained the highest level of education.

In comparison, most women have secondary education (1128). Most women who used other types of healthcare services (traditional, etc.) have the highest percentage (86%) of receiving a postnatal check within 2 days of delivery. Still, there are only a few women in that category. Most (1250) women in South Africa use a public health facility. Women delivered in a private health facility are slightly more likely to receive a postnatal check (84%) than those delivered in a public facility (83%) within 2 days. Those who delivered at home are less likely to receive a postnatal check (29%). Birth order pattern shows a slight difference in the percentage of those who receive a postnatal check within 2 days. 83% of the women with birth orders 2-3 received a timely postnatal check within 2 days than those with birth orders 1, 4-5 and 6 or more, with percentages of 81%, 82% and 82%, respectively. Women (12%) with 6 or more birth orders had no postnatal check.

**Table 5:** Timing of first postnatal check for the mother by selected background characteristics in South Africa

Background characteristic	Time of postnatal check after delivery							Total	Percentage of women with a postnatal check during the first 2 days after birth	Number of women
	<4hrs	4-23 hours	1-2 days	3-6 days	7-41 days	Don't know	No postnatal check			
<b>Wealth</b>										
Poorest	62.4	13.0	2.5	1.2	0.6	4.7	15.5	100.0	78.0	323
Poorer	70.5	6.4	2.7	2.7	0.3	8.2	9.1	100.0	79.4	330
Middle	75.2	6.3	2.0	2.3	2.3	5.9	5.9	100.0	83.8	302
Richer	77.0	6.3	1.5	2.6	0.4	6.3	5.9	100.0	84.4	270
Richest	75.7	7.9	3.2	4.2	0.5	3.2	5.3	100.0	86.8	189
<b>Age at first birth</b>										
<20	70.2	9.0	3.4	2.2	1.1	6.4	7.7	100.0	82.6	626
20-34	72.6	7.2	1.5	2.8	0.6	5.4	9.7	100.0	81.4	776
35-49	61.5	15.4	0.0	0.0	0.0	15.4	7.7	100.0	83.3	12
<b>Place of residence</b>										
Urban	74.5	7.0	2.5	2.5	0.6	5.5	7.5	100.0	84.0	885
Rural	66.1	10.0	2.3	2.6	1.5	6.6	10.9	100.0	78.5	530
<b>Region</b>										
Western Cape	83.1	5.1	1.7	0.0	0.8	5.9	3.4	100.0	89.9	119
Eastern Cape	70.7	12.0	1.8	0.0	1.2	3.0	11.4	100.0	84.9	166
Northern Cape	67.9	10.7	3.6	3.6	0.0	3.6	10.7	100.0	81.5	27
Free State	81.4	5.1	3.4	5.1	0.0	1.7	3.4	100.0	90.0	60
Kwazulu Natal	67.8	6.3	2.6	2.2	2.2	8.9	10.0	100.0	76.6	269
North west	73.6	7.5	2.8	4.7	0.9	7.5	2.8	100.0	84.8	105
Gauteng	73.2	5.2	1.8	2.8	0.3	5.7	11.1	100.0	79.9	389
Mpumalanga	63.4	10.7	4.6	3.1	0.8	7.6	9.9	100.0	77.9	131
Limpopo	67.8	15.8	2.1	3.4	0.0	4.1	6.8	100.0	85.6	146
<b>Level of education</b>										
No education	60.0	5.0	15.0	0.0	0.0	5.0	15.0	100.0	84.2	19
Primary	56.8	9.9	4.5	0.9	0.0	9.9	18.0	100.0	70.9	110
Secondary	72.2	8.2	1.8	2.5	1.1	5.9	8.4	100.0	82.2	1128
Higher	77.7	5.7	3.8	4.5	0.0	4.5	3.8	100.0	87.8	156
<b>Place of delivery</b>										
Home	41.7	14.6	6.3	0.0	2.1	6.3	29.2	100.0	61.2	49
Public	72.2	8.2	2.2	2.8	0.6	5.4	8.6	100.0	82.6	1250
Private	74.5	5.5	2.7	0.9	3.6	10.9	1.8	100.0	83.5	109
Other	71.4	0.0	14.3	0.0	0.0	14.3	0.0	100.0	85.7	7
<b>Birth Order</b>										
1	71.7	8.1	1.2	3.9	1.2	4.3	9.6	100.0	81.1	492

2-3	73.3	6.9	2.3	2.2	0.7	6.4	8.2	100.0	82.6	734
4-5	63.9	12.3	5.2	0.6	0.6	9.0	8.4	100.0	81.8	154
6+	63.6	12.1	6.1	0.0	0.0	6.1	12.1	100.0	81.8	33
<b>Total</b>	<b>71.5</b>	<b>8.1</b>	<b>2.4</b>	<b>2.5</b>	<b>0.8</b>	<b>5.9</b>	<b>8.8</b>	<b>100.0</b>	<b>81.9</b>	<b>1414</b>

*Source: SADHS 2016*

Table 6 shows the timing of postnatal checks of mothers in Nigeria. 40% of mothers who gave birth in the two years preceding the survey reported having a postnatal check within 2 days after delivery, 35% reported a check within 4 hours after delivery, 4% reported a check between 4 and 23hours, while 58% had no postnatal check and 1% are not sure they had a check.

The higher the birth order, the less likely the woman will receive a postnatal check within 2 days after delivery; women with birth order 1 have the highest percentage (50%), and women with 6 or more birth orders have 28%. Women who delivered in a public health facility have the highest percentage (78%) of having a postnatal check within 2 days, and then 76% of women that delivered in a private facility and those who delivered at home have the lowest percentage (14%). A higher level of education most likely has an impact on having a postnatal check within 2 days (77%), followed by a Secondary level of education (59%). Therefore, better education is linked with a better understanding of the importance of postnatal checks. Significantly, 75% of women in the southwest region have a check, while 67% in the southeast region have a postnatal check within 2 days after delivery. Urban residents (59%) are more likely to have a postnatal check than rural residents (29%) within 2 days. An increase in age at first birth contributes to the likelihood of having a postnatal check within 2 days. The higher the wealth status, the more the possibility of having a postnatal check within 2 days after delivery.

UNIVERSITY of the  
WESTERN CAPE



**Table 6:** Timing of first postnatal check for the mother by selected background characteristics in Nigeria

Background characteristic	<u>Time of postnatal check after delivery</u>							Total	Percentage of women with a postnatal check during the first 2 days after birth	Number of women
	<4hrs	4-23 hours	1-2 days	3-6 days	7-41 days	Don't know	No postnatal check			
<b>Wealth</b>										
Poorest	14.9	1.2	1.5	0.7	0.7	0.1	80.8	100.0	17.7	2849
Poorer	20.1	2.3	1.4	0.3	0.8	0.2	74.9	100.0	23.7	3063
Middle	34.4	3.7	2.1	0.7	1.1	0.3	57.7	100.0	40.2	2783
Richer	51.0	5.4	2.3	0.6	0.6	0.8	39.3	100.0	58.8	2525
Richest	62.8	6.4	2.6	0.9	0.2	2.5	24.6	100.0	71.8	2199
<b>Age at first birth</b>										
<20	25.3	2.6	1.7	0.6	0.9	0.4	68.5	100.0	29.5	7642
20-34	47.2	4.9	2.3	0.6	0.6	1.0	43.3	100.0	54.5	5717
35-49	52.4	9.5	3.2	0.0	0.0	0.0	34.9	100.0	65.1	63
<b>Place of residence</b>										
Urban	51.5	5.3	2.3	0.7	0.7	1.3	38.1	100.0	59.2	5163
Rural	24.3	2.5	1.7	0.6	0.8	0.3	69.9	100.0	28.5	8257
<b>Region</b>										
North Central	36.7	4.1	1.9	0.5	0.2	0.2	56.2	100.0	42.8	1857
North East	28.0	2.6	2.0	0.7	0.7	0.0	65.9	100.0	32.6	2431
North West	17.2	1.7	1.6	0.7	1.4	0.0	77.5	100.0	20.4	4793
South East	53.6	11.0	2.7	0.4	0.1	1.4	30.7	100.0	67.4	1385
South South	39.5	7.3	3.0	0.4	0.6	2.2	47.0	100.0	49.9	1223
South West	72.4	1.4	1.5	0.7	0.2	2.4	21.4	100.0	75.3	1730
<b>Level of education</b>										
No education	15.9	1.6	1.3	0.5	0.8	0.1	79.7	100.0	18.8	5973
Primary	37.3	3.5	2.2	0.8	1.1	0.5	54.6	100.0	43.0	1937
Secondary	51.2	5.2	2.7	0.6	0.5	1.2	38.6	100.0	59.1	4376
Higher	66.4	8.5	1.9	0.9	0.4	2.0	20.0	100.0	76.7	1133
<b>Place of delivery</b>										
Home	11.0	1.4	1.7	0.9	1.1	0.2	83.7	100.0	14.1	7691
Public	69.1	6.3	2.3	0.2	0.3	1.0	20.8	100.0	77.7	3678
Private	66.0	7.9	2.1	0.2	0.2	1.9	21.8	100.0	75.9	1820
Other	34.8	0.9	2.2	1.3	0.9	0.9	59.1	100.0	37.8	230
<b>Birth Order</b>										
1	43.3	4.3	2.5	0.7	1.0	0.9	47.2	100.0	50.1	2552
2-3	38.7	3.8	1.8	0.8	0.5	1.1	53.2	100.0	44.3	4552
4-5	33.3	3.9	2.0	0.5	0.8	0.4	59.2	100.0	39.2	3087
6+	24.0	2.6	1.5	0.3	0.7	0.2	70.7	100.0	28.1	3229

<b>Total</b>	<b>34.8</b>	<b>3.6</b>	<b>1.9</b>	<b>0.6</b>	<b>0.7</b>	<b>0.7</b>	<b>57.6</b>	<b>100.0</b>	<b>40.3</b>	<b>13420</b>
--------------	-------------	------------	------------	------------	------------	------------	-------------	--------------	-------------	--------------

*Source: NDHS 2018*

#### **4.4 Chi-square test of independence between Mother’s postnatal check and predictor variables**

The Chi-square test of independence was implemented to determine the association between the timing of the mother’s postnatal check and selected variables. In comparison, the results from the analysis using NDHS 2018 (Nigeria) indicated that the timing of Postnatal checks of mothers is statistically significantly associated with each selected variable. While the results from the analysis of SADHS 2016 (South Africa) mostly revealed a non-significance of all variables except for Place of residence and Place of delivery.

In Table 7, the analysis result for Nigeria shows very strong evidence of an association between Age and timing of mothers' postnatal check ( $\chi^2=88.61$ ; P-value= $<0.001$ ), so also is the marital status of the mother ( $\chi^2=96.42$ ; P-value= $<0.001$ ). This indicates a high chance of the timing of the postnatal check on the mothers' age and marital status. The statistically significant value (P-value =0.000) of the place of residence, education, wealth index, age at first birth, preceding birth interval, place of delivery, contraceptives method and husband /partner’s education variables show strong or sufficient evidence of a relationship with Mothers’ timing of postnatal check. Likewise, the region variable also showed good evidence of association. Figures 4, 5, 6, 7, 8 and 9 show the time mothers received their postnatal check in Nigeria (2018) according to their background characteristics. The figures clearly reflect the visual understanding of the relationship between the selected characteristics and the time of postnatal check.

Results from the analysis of SADHS 2016 in Table 8 revealed no association or relationship between Age (P=0.250 $>0.05$ ), region(P=0.052 $>0.05$ ), education (P=0.056 $>0.05$ ), wealth index (P=0.320 $>0.05$ ), Age at first birth (P=0.888 $>0.05$ ), Preceding birth interval (P=0.736 $>0.05$ ) and contraceptive method (P=0.938 $>0.05$ ) and timing of mother’s postnatal check. The timing of the mother’s postnatal check is found to be associated with place of residence (P=0.030 $<0.05$ ) and place of delivery (P=0.033 $<0.05$ ). Figures 10 and 11 show the time mothers received their postnatal check in South Africa (2016) according to the significant background characteristics (Place of delivery and Residence). The figures clearly show the visual understanding of the relationship between these characteristics and the time of postnatal check.

**Table 7:** Chi-square test of independence between Mother's postnatal check and predictor variables (Nigeria)

Variables	Postnatal check (NDHS 2018)	
	Not in 2 days N (%)	Within 2 days N (%)
<b>Age</b>		
15-19	711(8.9)	299(5.5)
20-24	1889(23.6)	1124(20.8)
25-29	2163(27.0)	1618(29.9)
30-34	1618(20.2)	1221(22.6)
35-39	1062(13.3)	815(15.1)
40-44	434(5.4)	265(4.9)
45-49	130(1.6)	69(1.3)
$\chi^2=88.61$ ; Pvalue= $<0.001$		
<b>Region</b>		
North Central	1062(13.3)	794(14.7)
North East	1639(20.5)	792(14.6)
North West	3814(47.6)	979(18.1)
South East	452(5.6)	933(17.2)
South South	613(7.7)	610(11.3)
South West	427(5.3)	1302(24.1)
$\chi^2=2180.71$ ; Pvalue=0.001		
<b>Place of residence</b>		
Urban	2104(26.3)	3058(56.5)
Rural	5904(73.7)	2353(43.5)
$\chi^2=1236.72$ ; Pvalue=0.000		
<b>Education</b>		
No education	4849(60.6)	1124(20.8)
Primary	1105(13.8)	831(15.4)
Secondary	1789(22.3)	2589(47.8)
Higher	264(3.3)	869(16.1)
$\chi^2=2397.36$ ; Pvalue=0.000		
<b>Wealth Index</b>		
Poorest	2346(29.3)	503(9.3)
Poorer	2337(29.2)	726(13.4)
Middle	1665(20.8)	1118(20.7)
Richer	1041(13.0)	1484(27.4)
Richest	619(7.7)	1580(29.2)
$\chi^2=2205.75$ ; Pvalue=0.000		
<b>Age at first birth</b>		
<20	5384(67.2)	2258(41.7)
20-34	2603(32.5)	3114(57.5)
35-49	22(0.3)	41(0.8)
$\chi^2=852.82$ ; Pvalue=0.000		
<b>Preceding birth interval</b>		
First birth	1277(16.0)	1293(23.9)
Less than 24	1221(15.2)	809(14.9)

24-36	2828(35.3)	1619(29.9)
37+	2683(33.5)	1691(31.2)

$\chi^2=138.89$ ; Pvalue=0.000

**Place of delivery**

Home	6607(82.5)	1084(20.0)
Public	820(10.2)	2858(52.8)
Private	438(5.5)	1382(25.5)
Other	143(1.8)	87(1.6)

$\chi^2=5246.95$ ; Pvalue=0.000

**Contraceptive method**

Not using	7275(90.9)	3992(73.8)
Pill	55(0.7)	90(1.7)
IUD	13(0.2)	24(0.4)
Injections	167(2.1)	218(4.0)
Male condom	72(0.9)	195(3.6)
Female sterilisation	0.5(0)	8(0.1)
Periodic abstinence	33(0.4)	114(2.1)
Withdrawal	91(1.1)	266(4.9)
Other traditional	48(0.6)	42(0.8)
Implants/Norplant	132(1.7)	208(3.8)
Lactational amenorrhea	111(1.4)	245(4.5)
Emergency contraception	6(0.1)	3(0.1)
Other modern method	1(0)	4(0.1)
Standard days method	1(0)	3(0)

$\chi^2=759.97$ ; Pvalue=0.000

**Marital status**

Never in union	142(1.8)	159(2.9)
Married	7542(94.2)	4880(90.2)
Living with partner	164(2.1)	235(4.3)
Widowed	49(0.6)	41(0.8)
Divorced	71(0.9)	39(0.7)
No longer living together/separated	41(0.5)	57(1.1)

$\chi^2=96.42$ ; Pvalue=<0.001

**Husband/partner education**

No education	3795(49.2)	747(14.6)
Primary	1017(13.2)	676(13.2)
Secondary	2072(26.9)	2331(45.6)
Higher	669(8.7)	1319(25.8)
Don't know	153(2.0)	41(0.8)

$\chi^2=1938.59$ ;Pvalue=0.000

Source: NDHS2018. Test of significance = 0.05

**Table 8:** Chi-square test of independence between Mother's postnatal check and predictor variables (South Africa)

Variables	Postnatal check(SADHS 2016)	
	Not in 2 days N (%)	Within 2 days N (%)
<b>Age</b>		
15-19	27(10.4)	119(10.3)
20-24	67(26.4)	297(25.6)
25-29	90(35.2)	334(28.8)
30-34	47(18.5)	208(17.9)
35-39	17(6.8)	139(12.0)
40-44	6(2.5)	59(5.1)
45-49	1(0.3)	5(0.4)
$\chi^2 = 11.25$ ; Pvalue=0.250		
<b>Region</b>		
Western Cape	12(4.8)	106(9.2)
Eastern Cape	25(9.8)	141(12.2)
Northern Cape	5(2.0)	22(1.9)
Free State	6(2.5)	54(4.7)
Kwazulu Natal	63(24.8)	206(17.8)
North West	16(6.4)	89(7.7)
Gauteng	78(30.4)	311(26.9)
Mpumalanga	29(11.2)	102(8.8)
Limpopo	21(8.1)	125(10.8)
$\chi^2 = 17.67$ ; Pvalue=0.052		
<b>Place of residence</b>		
Urban	142(55.4)	742(64.1)
Rural	114(44.6)	415(35.9)
$\chi^2 = 6.82$ ; Pvalue=0.030		
<b>Education</b>		
No education	3(1.3)	16(1.4)
Primary	32(12.5)	78(6.8)
Secondary	201(78.7)	927(80)
Higher	19(7.5)	137(11.8)
$\chi^2 = 12.33$ ; Pvalue=0.056		
<b>Wealth Index</b>		
Poorest	71(27.6)	252(21.7)
Poorer	68(26.7)	262(22.6)
Middle	49(19.2)	253(1.7)
Richer	42(16.5)	228(19.7)
Richest	26(9.9)	164(14.2)
$\chi^2 = 9.30$ ; Pvalue=0.320		
<b>Age at first birth</b>		
<20	109(42.5)	517(44.6)
20-34	144(56.5)	632(54.5)
35-49	2(1.0)	10(0.9)
$\chi^2 = 0.36$ ; Pvalue=0.888		

**Preceding birth interval**

First birth	94(36.8)	401(34.7)
Less than 24	23(9.2)	87(7.5)
24-36	27(10.4)	104(9.0)
37+	112(43.6)	566(48.8)

$\chi^2=2.65$ ; Pvalue=0.736

**Place of delivery**

Home	19(7.3)	30(2.5)
Public	218(85.2)	1032(89.1)
Private	18(7.2)	91(7.8)
Other	1(0.3)	6(0.5)

$\chi^2=14.42$ ; Pvalue=0.033

**Contraceptive method**

Not using	86(4.0)	344(29.7)
Pill	16(6.3)	70(6.0)
IUD	1(0.3)	12(1.0)
Injections	82(32.1)	387(33.4)
Male condom	20(7.7)	92(7.9)
Female sterilisation	7(2.8)	49(4.3)
Periodic abstinence	0(0)	5(0.4)
Withdrawal	0.2(0.1)	2(0.1)
Implants/Norplant	6(2.2)	32(2.8)
Female condom	0(0)	6(0.3)
Injections 2 month	38(14.8)	158(13.6)

$\chi^2=6.54$ ; Pvalue=0.938

**Marital status**

Never in union	152(60)	636(55)
Married	58(22.7)	289(25)
Living with partner	41(15.8)	199(17.1)
Widowed	0(0)	10(0.9)
Divorced	0.1(0.1)	9(0.8)
No longer living together/separated	5(1.8)	16(1.3)

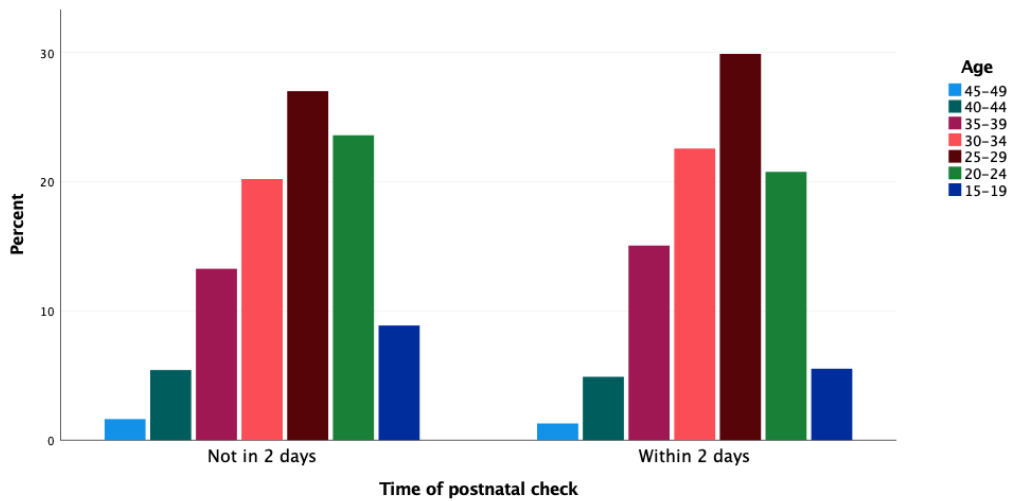
$\chi^2=5.65$ ; Pvalue=0.452

**Husband/partner education**

No education	2(2.1)	12(2.6)
Primary	14(14.3)	51(10.7)
Secondary	76(80)	326(2.8)
Higher	4(3.7)	86(18.2)

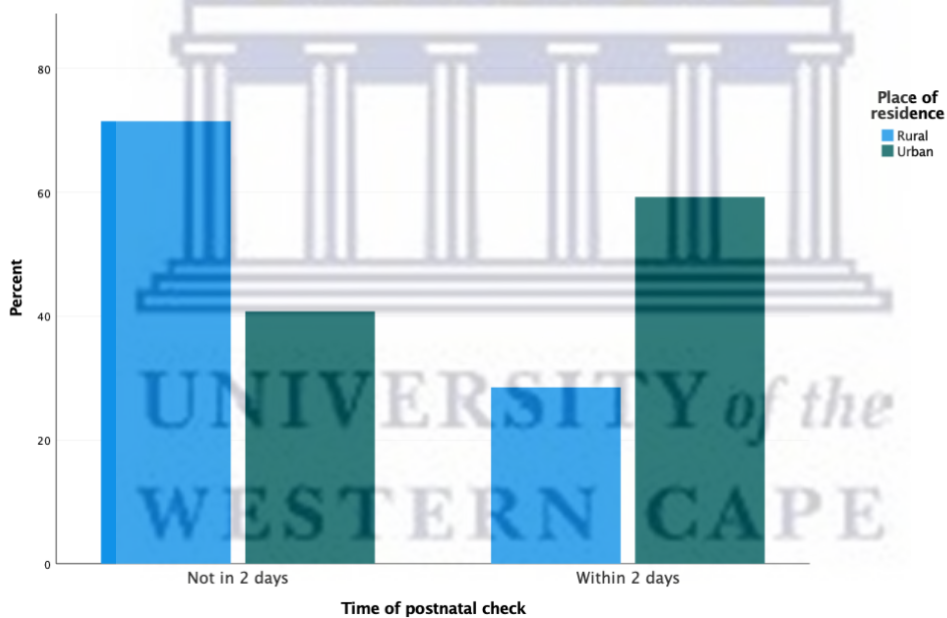
$\chi^2=11.79$ ; Pvalue=0.302

Source: SADHS2016. Test of significance = 0.05

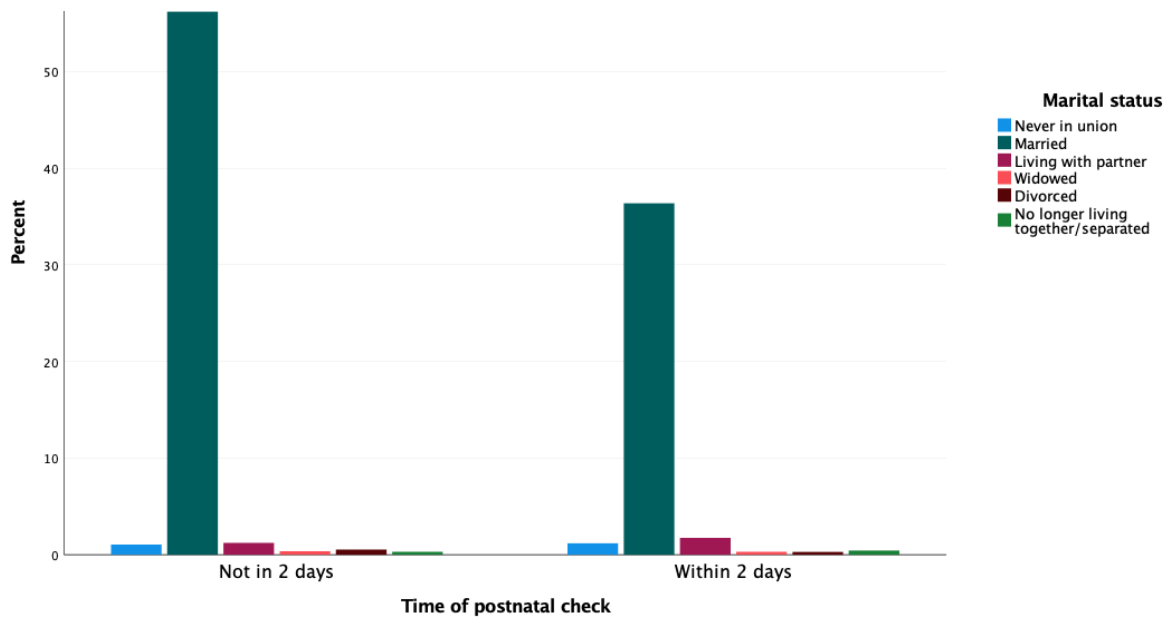


**Figure 4:** Percentage of women's time of postnatal check by Age (Nigeria)

The majority of the women are aged 25-29, and they have the highest percentage of having a postnatal check within 2 days (Figure 4). Most rural women do not have a postnatal check within 2 days, while the majority of urban women do have a check within 2 days (Figure 5).



**Figure 5:** Percentage of women's time of postnatal check by Place of residence (Nigeria)

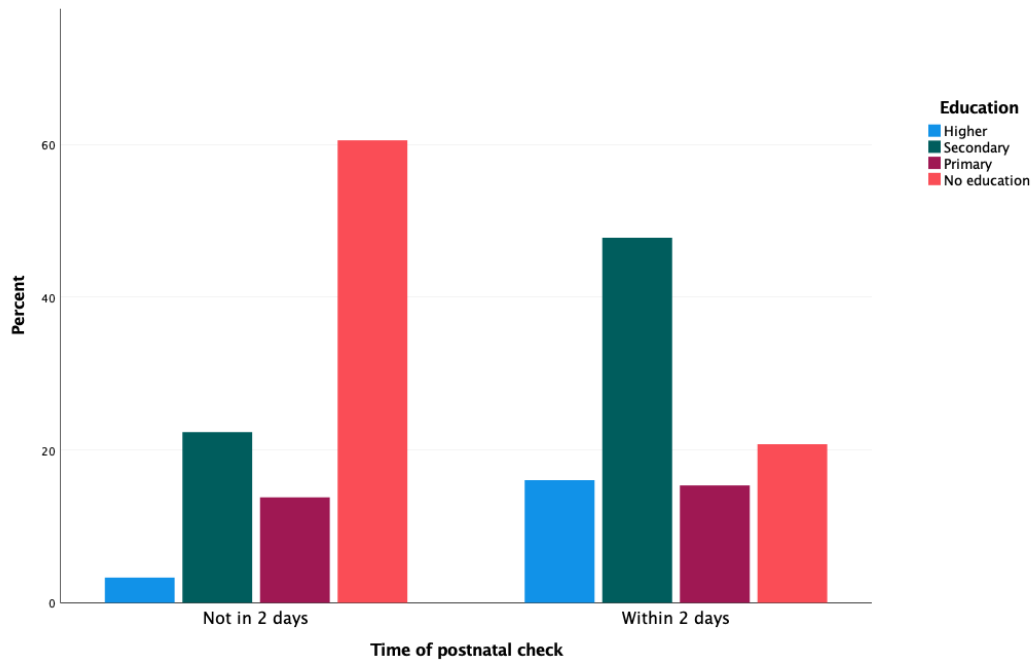


**Figure 6:** Percentage of women's time of postnatal check by Marital status (Nigeria)

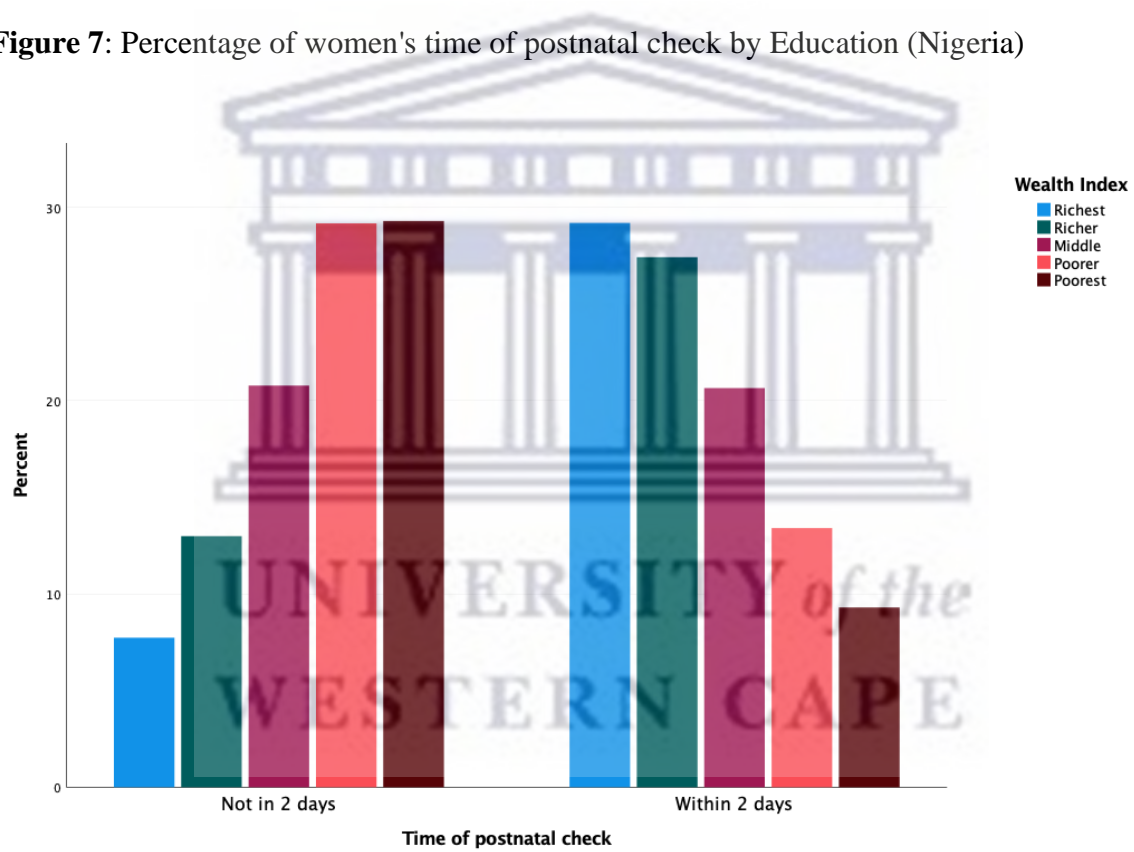
Most participants in the survey are married women, and they have the highest percentage of those who received postnatal checks within 2 days (Figure 6). Most women who have a postnatal check within 2 days have secondary education, which indicates that education imparts knowledge, increases awareness and allows a timely positive attitude towards postnatal care checks (Figure 7). Wealth influences postnatal care services use and timely checks without constraints on paying for services (Figure 8). Women who deliver in a health facility receive timely postnatal checks compared to those who deliver their babies at home (Figure 9). Most women in South Africa access healthcare facilities for delivery and receive timely postnatal checks; this indicates accessibility to public healthcare services (Figure 10). Most women in South Africa are urban residents who received a postnatal check within 2 days (Figure 11).

UNIVERSITY of the  
WESTERN CAPE

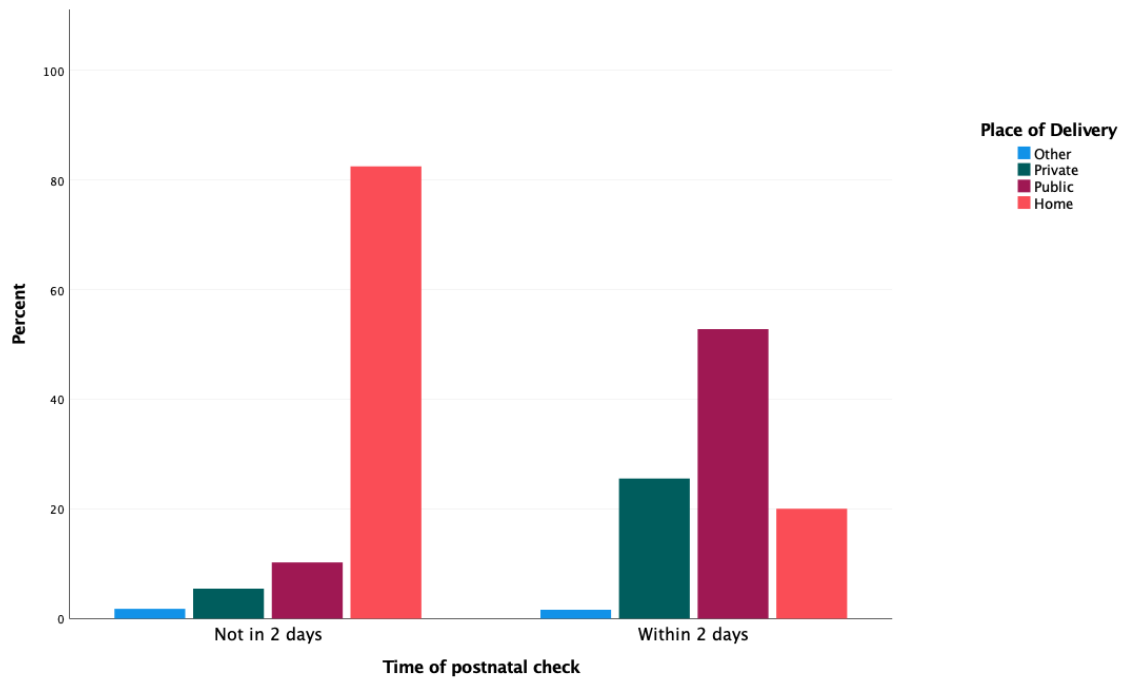




**Figure 7:** Percentage of women's time of postnatal check by Education (Nigeria)



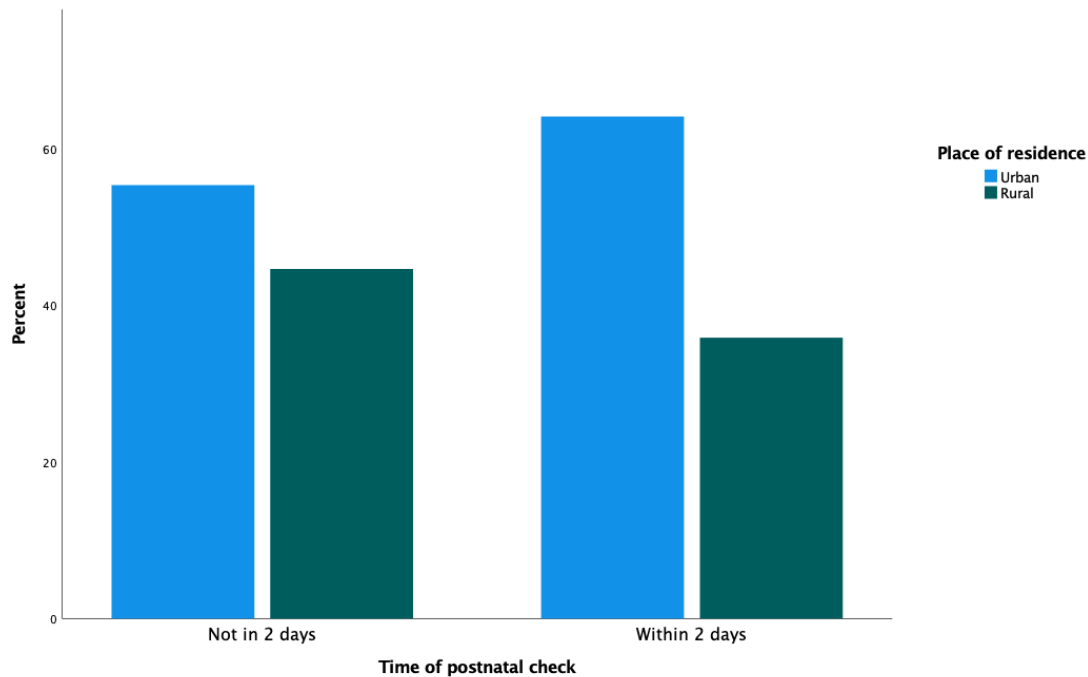
**Figure 8:** Percentage of women's time of postnatal check by Wealth Index (Nigeria)



**Figure 9:** Percentage of women's time of postnatal check by Place of delivery (Nigeria)



**Figure 10:** Percentage of women's time of postnatal check by place of delivery (South Africa)



**Figure 11:** Percentage of women's time of postnatal check by Place of residence (South Africa)

#### 4.5 Influence of selected predictors or factors on a mother's ability to obtain a postnatal check

Logistic regression assesses how well a set of predictor variables predicts or explains categorical dependent variables. It indicates the adequacy of a set of predictor variables by evaluating the fundamental importance of each predictor variable or the interaction among the predictor variables. This checks the association between the predictor variables and the time of Postnatal care.

Model 1 examined the place of delivery differentials on a postnatal check as one of the aspects of reproductive health. In contrast, Model 2 assessed the impact when other demographic and socioeconomic factors were included. Model 1 shows a significant difference in the prevalence of postnatal checks among women who deliver in the public sector; the postnatal check is more likely for those who deliver in the public health sector than those who deliver at home in South Africa. However, in Nigeria, the significant difference is more prevalent in public, private and other health places of delivery than those who deliver at home. Still, the likelihood is higher for a public health facility, followed by a private health facility.

In model 2, where other demographic and socioeconomic variables are controlled, the obtainability of postnatal checks within 2 days is insignificant with the place of delivery. Therefore, the effect of place of delivery is also not significant after controlling for other demographic and socioeconomic variables for South Africa. This suggests that place of delivery differences in obtaining a postnatal check within 2 days are due to the other demographic and socioeconomic variables. Other determinants of the timing of postnatal check (within 2 days after delivery), as revealed in model 2, are wealth and contraceptive use.

After controlling for other factors, model 2 results for Nigeria revealed that women having a postnatal check within 2 days after delivery is still significant for public and private health facilities and not for the 'Others' category. This is suggestive that other demographic and socioeconomic variables do not influence the place of delivery to obtain a postnatal check within 2 days. The most critical determinants of the timing of postnatal check (within 2 days after delivery), as revealed in model 2, are Age, Region, place of residence, women's education level, contraceptive use and husband/partner education level.

The result in Table 9 indicates no significant evidence of an association between the ages of women and the time they had a postnatal check after delivery. The odds ratio < 1 (0.217, 0.178, 0.159, 0.715 and 0.276) shown in the Ages (20-24, 25-29, 30-34, 40-44 and 45-49), respectively, indicate that women in these age categories are less likely to have a postnatal check within 2 days than those within the age 15-19 years. However, the age category 35-39 indicates a higher likelihood of having a postnatal check within 2 days than those aged 15-19 years, but there is no 95% confidence that the evidence is significant.

Although the region of residence was not a significant independent predictor of the mother's postnatal check, the result shows more likelihood of having a postnatal check within 2 days after delivery for Eastern Cape (OR= 6.029), Northern Cape (OR= 1.1106), Free State (OR= 1.544), KwaZulu-Natal (OR= 1.117), North West (OR= 1.917) and Limpopo (OR= 2.240) is less likely than women who are in Gauteng (OR= 0.401) and Mpumalanga (OR=0.571). Women in urban areas (OR= 2.833) are more likely to have the check within 2 days. The result of the education level of women is suggestive of an increase in the likelihood as their level of education advances (OR; Pry= 0.557, Sec:1.729 & Higher: 1.781). Those with an average (middle) wealth index are more likely to have postnatal checks within 2 days than people experiencing poverty, which is significantly accurate. Women who had their first birth between 20-34 years are more likely (OR= 1.102) to have a postnatal check, as do those with preceding

birth intervals between 24-36 months (OR=3.422). As regards contraceptive use, those who use pills (OR=3.388), injections (OR= 4.615) and male condoms are more likely to have a postnatal check within 2 days than those who are not using any form of contraceptive, and this is significantly accurate.

**Table 9:** A multivariate logistic model for the aspect of reproductive health (Postnatal checks) in South Africa

Variables	Model 1		Model 2	
	OR (95%CI)	SE	OR (95%CI)	SE
<b>Intercept</b>	1.842(0.911,3.723)	0.358	37.971(0.170,8490)	2.748
<b>Age</b>				
15-19(RC)			1.000	
20-24			0.217(0.039,1.218)	0.876
25-29			0.178(0.027,1.187)	0.965
30-34			0.159(0.025,1.003)	0.935
35-39			1.214(0.134, 10.979)	1.118
40-44			0.715(0.055,9.285)	1.302
45-49			0.276(0.014, 5.263)	1.497
<b>Region</b>				
Western Cape (RC)			1.000	
Eastern Cape			6.029(0.728,49.947)	1.074
Northern Cape			1.106(0.157,7.769)	0.990
Free State			1.544(0.236,10.116)	0.955
Kwazulu Natal			1.117(0.248,5.035)	0.765
North West			1.917(0.464,7.918)	0.720
Gauteng			0.401(0.108,1.485)	0.655
Mpumalanga			0.571(0.136,2.045)	0.730
Limpopo			2.240(0.346,14.514)	0.949
<b>Place of residence</b>				
Rural(RC)			1.000	
Urban			2.833(0.861,9.318)	0.605
<b>Education</b>				
No education (RC)			1.000	
Primary			0.557(0.038,8.226)	1.367
Secondary			1.729(0.135,22.144)	1.295
Higher			1.781(0.120,26.349)	1.368
<b>Wealth</b>				
Poorest (RC)			1.000	
Poorer			1.601(0.521,4.923)	0.570
Middle			6.410(1.218,33.735)*	0.843
Richer			0.587(0.155,2.226)	0.677
Richest			1.847(0.138,24.747)	1.318
<b>Age at first birth</b>				
<20 (RC)			1.000	
20-34			1.102(0.516,2.352)	0.385
35-49			0.064(0.002,1.850)	1.705

<b>Preceding birth interval</b>				
First birth (RC)			1.000	
<24months			0.417(0.081,2.142)	0.831
24-36months			3.422(0.748,15.660)	0.772
37months+			0.869(0.225,3.356)	0.686
<b>Contraceptive Use</b>				
Not using (RC)			1.000	
Pill			3.388(1.118,10.269)*	0.563
Injections			4.615(1.882,11.312)*	0.455
			*	
Male condoms			27.900(3.085,252.361)	1.118
			)**	
Female sterilization			2.819(0.580,13.705)	0.803
Implants/norplants/IUD			3.852(0.684,21.686)	0.878
Injections 2 months			4.053(1.190,13.805)*	0.622
<b>Husband/partner's education</b>				
No education (RC)			1.000	
Primary			0.099(0.002,5.312)	2.021
Secondary			0.120(0.003,5.289)	1.922
Higher			1.021(0.021,49.610)	1.972
<b>Husband/partner's occupation</b>				
Professional/technical/managerial (RC)			1.000	
Agricultural(Self-employed)			0.799(0.084,7.644)	1.147
Services			0.614(0.069,5.468)	1.110
Skilled manual			0.314(0.093,1.055)	0.616
Unskilled manual			0.433(0.100,1.886)	0.747
Don't know			0.334(0.072,1.559)	0.782
<b>Women's occupation</b>				
Not working (RC)			1.000	
Professional/technical/managerial			1.058(0.141,7.957)	1.025
Clerical			0.312(0.092,1.058)	0.621
Agricultural(unsilled, self-employed)			0.425(0.028,6.422)	1.380
Services/ Household & domestic			1.718(0.431,6.848)	0.702
Skilled manual			0.353(0.019,6.464)	1.476
Unskilled manual			0.636(0.139,2.908)	0.772
Don't know			0.542(0.073,4.037)	1.020
<b>Place of delivery</b>				
Home (RC)	1.000		1.000	
Public	2.572(1.224,5.407)	0.378	1.022(0.208,5.026)	0.809
	*			
Private	2.680(0.975,7.361)	0.514	1.246(0.134,11.618)	1.134
Population size	1414		477	

<i>Strata</i>	26	26
<i>Primary Sampling unit</i>	548	289
<i>McFadden R<sup>2</sup></i>	0.007	0.283

*Source: SADHS2016, Statistical significance: \*\*0.01 \*0.05. RC: Reference Category.*

*Model 1: Predicts the relationship between place of delivery and Postnatal checks within 2 days.*

*Model 2: Assess the relationship when other demographic and socioeconomic factors are included.*

The result shows (Table 10) that all age groups are more likely to have a postnatal check within 2 days after delivery than those aged 15-19 years, but there is a 95% confidence that the evidence is accurate for only the age group 40-44 years (OR=1.731), women in the Northeast (OR=1.298), South East (OR= 1.047), South-South (OR= 1.026) and Southwest (OR= 1.866) are more likely to obtain postnatal checks than those in the North central part of Nigeria, and those in Northwest (OR= 0.799) are less likely to get checked within 2 days. Urban resident women are more likely (OR= 1.250) to get a postnatal check within 2 days than their rural counterparts, which is significantly accurate. The level of women's education is suggestive of more likelihood as they advance in education (OR= Pry: 1.208, Sec: 1.331 & Higher:1.206). Those who are poorer are less likely (OR= 0.872), while other categories of the wealth index are more likely (OR= Middle:1.017, Richer: 1.148, Richest: 1.112) to obtain postnatal checks within 2 days than the poorest women. The likelihood of having a postnatal check within 2 days increases as women's age at first birth increases (20-34, 35-49 with OR 1.026 & 1.184, respectively). Those who use forms of contraceptives such as female sterilisation, Periodic abstinence (OR=3.436), lactation amenorrhoea (OR= 2.352) and standard day method (OR= 0.307) are more likely to have a postnatal check within 2 days than those who are not using any form of contraceptive, and this is significantly accurate. Place of delivery indicates that those who deliver in public (OR= 21.228) and private sectors (OR= 19.236) of health are more likely to have postnatal checks within 2 days than those who deliver at Home.

**Table 10:** A multivariate logistic model for the aspect of reproductive health (Postnatal checks) in Nigeria

Variables	Model 1		Model 2	
	OR (95%CI)	SE	OR (95%CI)	SE
<b>Intercept</b>	0.164(0.149,0.181)**	0.049	0.068(0.035,0.135)**	0.345
<b>Age</b>				
15-19(RC)			1.000	
20-24			1.154(0.844,1.577)	0.159
25-29			1.327(0.956,1.843)	0.167
30-34			1.159 (0.797,1.685)	0.191
35-39			1.271(0.860,1.878)	0.199
40-44			1.731(1.155,2.594)**	0.206
45-49			1.231(0.666,2.276)	0.313
<b>Region</b>				
North Central (RC)			1.000	
North East			1.298(1.030,1.635)*	0.118
North West			0.799(0.638,1.000)*	0.115
South East			1.047 (0.812,1.349)	0.129
South South			1.026(0.788,1.336)	0.135
South West			1.866 (1.427,2.440)**	0.137
<b>Place of residence</b>				
Rural (RC)			1.000	
Urban			1.250(1.053,1.484)**	0.087
<b>Education</b>				
No education (RC)			1.000	
Primary			1.208(0.982,1.485)	0.105
Secondary			1.331(1.077,1.645)**	0.108
Higher			1.206(0.851,1.708)	0.178
<b>Wealth</b>				
Poorest (RC)			1.000	
Poorer			0.872(0.703,1.081)	0.110
Middle			1.017(0.815,1.271)	0.113
Richer			1.148(0.862,1.529)	0.146
Richest			1.112(0.800,1.547)	0.168
<b>Age at first birth</b>				
<20 (RC)			1.000	
20-34			1.026(0.873,1.205)	0.082
35-49			1.184(0.467,3.002)	0.474
<b>Preceding birth interval</b>				
First birth (RC)			1.000	
<24months			0.883(0.683,1.142)	0.131
24-36months			1.091(0.857,1.390)	0.123
37months+			0.913(0.714,1.167)	0.125



**Contraceptive Use**

Not using (RC)	1.000	
Pill	1.255(0.582,2.705)	0.391
IUD	1.085(0.241,4.882)	0.767
Injections	1.138(0.788, 1.643)	0.187
Male condoms	1.088(0.687,1.721)	0.234
Female sterilization	7.709(1.471,40.391)*	0.844
Periodic abstinence	3.436 (1.698,6.952)**	0.359
Withdrawal	1.662(1.010,2.733)	0.254
Other traditional	0.988(0.484,1.976)	0.358
Implants/nor-plants	1.120(0.760,1.651)	0.198
Lactational amenorrhea	2.352 (1.543,3.586)**	0.215
Emergency contraception	0.485(0.166,1.419)	0.547
Other Modern method	1.983(0.257,15.324)	1.042
Standard days method (SDM)	0.307(0.138,0.682)**	0.407

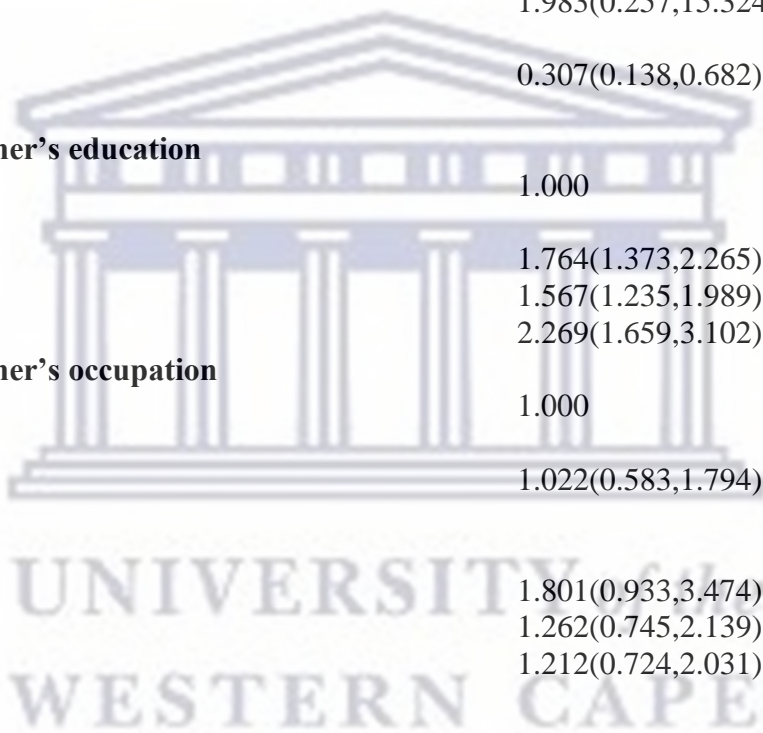
**Husband/partner's education**

No education (RC)	1.000	
Primary	1.764(1.373,2.265)**	0.127
Secondary	1.567(1.235,1.989)**	0.122
Higher	2.269(1.659,3.102)**	0.159

**Husband/partner's occupation**

Did not work (RC)	1.000	
Professional/technical/managerial	1.022(0.583,1.794)	0.287
Clerical	1.801(0.933,3.474)	0.335
Sales	1.262(0.745,2.139)	0.269
Agricultural (Self-employed)	1.212(0.724,2.031)	0.263
Services	1.249(0.709,2.199)	0.288
Skilled manual	0.836(0.461,1.516)	0.303
Unskilled manual	1.119(0.653,1.917)	0.274
Others, don't know	0.569(0.204,1.583)	0.522

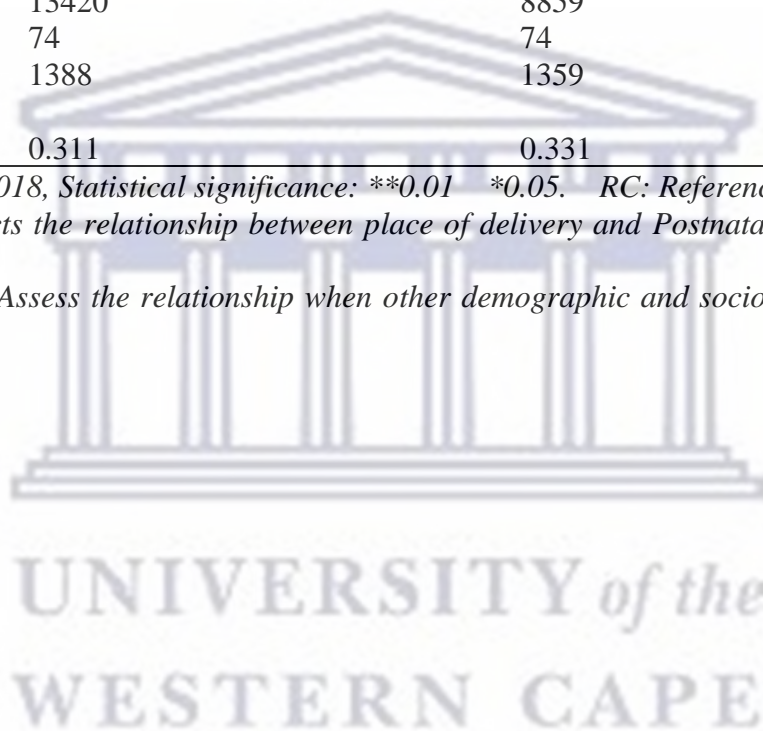
**Women's occupation**



Professional/technical/managerial (RC)			1.000	
Clerical			0.883(0.404,1.931)	0.399
Sales			1.225(0.897,1.672)	0.159
Services			1.318(0.896,1.939)	0.197
Skilled manual			1.328(0.876,2.014)	0.212
Unskilled manual			1.297(0.359,4.687)	0.655
Agricultural (Self-employed)			0.888(0.624,1.264)	0.180
Others, don't know			0.786(0.202,3.055)	0.692
<b>Place of delivery</b>				
Home (RC)	1.000		1.000	
Public	21.228(18.570,24.266)**	0.068	12.147(10.302,14.322)**	0.084
Private	19.236(15.660,23.630)**	0.105	8.092(6.000,10.914)**	0.152
Other	3.727(2.411, 5.762)**	0.222	1.432(0.845,2.427)	0.269
Population size	13420		8859	
Strata	74		74	
Primary	1388		1359	
Sampling unit				
McFadden R <sup>2</sup>	0.311		0.331	

Source: NDHS2018, Statistical significance: \*\*0.01 \*0.05. RC: Reference Category  
 Model 1: Predicts the relationship between place of delivery and Postnatal checks within 2 days.

Model 2: Assess the relationship when other demographic and socioeconomic factors are included.



---

## CHAPTER 5 - DISCUSSION

---

### 5.1 Introduction

The chi-square test of independence shows a positive relationship between age and postnatal care within 2 days. This indicates that, as women increase in age, the likelihood of a better health service experience in postnatal care and that women have more pregnancy experience using postnatal care services as they age. This is similar to reports from other studies (Adhikari, 2016; Neupane & Doku, 2013; Pal & Mehndiratta, 2016). Place of delivery was significantly associated with having a postnatal check within 2 days. This implies that Women who deliver in a health facility receive medical care from skilled attendants and receive postnatal care, which supports the study by Khanal *et al.*, 2014; Titaley *et al.*, 2009. Mothers tend to receive immediate postnatal checks as their age increases.

Nigeria has noted age as a characteristic that influences maternal healthcare utilisation behaviour, which could result from the exposure of older women to information regarding postnatal care from previous births, thus, their knowledge about the benefit and need for a postnatal check after delivery. (Titaley *et al.*, 2009; Mugo *et al.*, 2015; Appiah *et al.*, 2021). Urban residents are also more likely to have postnatal checks due to more access to better civic facilities, advanced health facilities, and health promotion programs than rural areas, corroborating the study by Gupta *et al.*, 2015; Mekonnen & Mekonnen, 2002.

Education is found to influence postnatal checks, which may be because educated women are more likely to be well-informed and knowledgeable about the health risk of Childbirth. Therefore they tend to access health care services. This is supported by the study by Mosiur *et al.*, 2022; Limenih *et al.*, 2016; Berhe *et al.*, 2019 and many studies have highlighted the likelihood of education to empower women to have access to health promotion messages, process it, understand the importance and then obtain the services for good health (Chakraborty *et al.*, 2003).

Educated women may have a higher socioeconomic status which allows them to have independence in their households and thereby have the ability to make independent decisions on their health utilisation. Southwest, Northwest and Northeast residents are more likely to get postnatal checks early compared to other regions of Nigeria. This could be attributable to regional differences such as improvement & better access, nearness of health facilities and

availability of social amenities in these regions, which then increase the chance of Postnatal care services (Ononokpono *et al.*, 2014; Sakeah *et al.*, 2018).

Husband/partner education influences postnatal checks, similar findings in the study by Timerga & Hailemeskel, 2018; Babalola & Fatusi, 2009; Chakraborty *et al.*, 2002. Educated husband/partner most likely supports their wives to utilise health care delivery services. This corroborates previous research findings by Aremu *et al.*, 2011; Dahiru & Oche, 2015.

Women who seek contraception are more likely to get postnatal checks within 2 days, and contraceptive use is found to be associated with the utilisation of post-natal care service. This study highlighted female sterilisation, periodic abstinence, lactational amenorrhoea and standard days method as contraceptive methods associated with a postnatal check. Studies have shown a high acceptance of family planning during postpartum (Borda *et al.*, 2010; Teka *et al.*, 2018). Contraceptive services are included in maternal healthcare.

The use of maternal and child healthcare services possibly contributes to the enhancement of the survival of infants and children, encouraging mothers to get and use contraceptive methods (Do & Hotchkiss, 2013).

Results from analysis using a test of independence and odds ratio from South African data revealed differences in the association of Socio-demographic characteristics to a postnatal check. Only the place of delivery is significant for both tests of analysis. There is an association between public places of delivery and postnatal checks. This could be due to easy access to public health facilities. The association between post-natal care and place of delivery could be linked to the exposure of women to health education regarding post-natal care services during delivery. Therefore, health facility-based delivery by women influences the utilisation of post-natal care services, corroborating the findings by Haliu, 2014 & Chungu *et al.*, 2018.

### **5.1.1 Influence of data accuracy and Non-use of quality information on postnatal check**

Results from the analysis have shown discrepancies in data peculiarities of different countries and differences in data collection tools. For instance, there are some variables, such as Religion, that are not included in the SADHS that are in the NDHS. Data are used for policy-making and prospective planning. The use of organisational data for effective planning, monitoring and supervision of healthcare programs will be determined by the quality of data from health

facilities. Nevertheless, most developing countries have weak systems for sustaining and coverage of health facility data and eventually have data that needs to be completed, accurate, and timely (Arts *et al.*, 2002; Kihuba *et al.*, 2014; Many & Nielsen, 2016). Therefore, it is imperative for countries to assess the quality of their data often to use such data with the assurance of planning and monitoring health services.

Maternal and child health indicators are generally used to monitor the success of health programmes at national and subnational levels. For instance, the data on aspects of reproductive health is essential to monitor maternal health services' function and guide policies. The outcome of poor data quality is the damage it incurs because accurate and sufficient data will be utilised for planning. Evidence has shown that integrated healthcare information systems improve data quality and highlight the need to make crucial decisions (Lin & Chan, 2000). Studies have shown that implementing interventions at family and community levels will improve antenatal and postnatal care, and health education will also improve home-delivered newborn care practices and health-seeking behaviour in case of any illness (Singh *et al.*, 2017). World Health Organisation has recommended that mother and their baby be visited at home by a trained health worker as soon as possible (within the first week after birth) to determine life-threatening signs and symptoms and avoid maternal and child mortality as well as other related issues regarding new-born care (WHO, 2010).

## **5.2 Maternal characteristics in Nigeria and South Africa**

According to this study, many mothers are 20-29 years old. This persistence attests to the stability of this demographic trend. An interesting observation is that a significant number of respondents in South Africa live in urban areas, which is consistent with the global trend of urbanisation and the migration of people from rural to urban areas, a widespread occurrence in many countries. The South African urban distribution is probably due to the economic opportunities available in urban areas (Asogwa *et al.*, 2022; Montgomery *et al.*, 2013). The distribution of women varies by location. South African Women are more residents in Kwazulu-natal and Gauteng, while a significant proportion of Nigerian women reside in the North-western region. This may also be associated with differences in healthcare accessibility and socioeconomic factors.

South African women exhibit a greater level of educational achievement compared to Nigerian women. Educational infrastructure, availability of educational resources and socioeconomic status are possible factors responsible for these differences. Studies have also indicated a relationship between women's decisions regarding reproductive health and family planning and their education level (Kebede et al., 2022; Bongaarts, 2020). In both countries, early marriage is still a common practice among women aged 15-29 years. This observation aligns with studies highlighting how early marriage is still a common practice in some regions and its potential adverse effect on maternal and child health (Tamirat et al., 2021; Yaya et al., 2019). This suggests more attention to this age group to address maternal health.

Mothers in Nigeria tend to have more children, while South African women have smaller families. Socioeconomic status, access to family planning and cultural norms may impact this variation (Gahungu et al., 2021; Ezeh et al., 2020). It is important to acknowledge the impact that family size has on mother's and children's well-being. Additionally, there are notable differences in the two countries' contraceptive usage. In contrast to South African women, Nigerian women are less likely to use modern forms of contraception. The variance could be availability and access, which can be traced to cultural, socioeconomic, and religious factors and may have significant implications on family planning programmes (Boadu, 2022; Negash, 2022; Ahinkorah et al., 2021; Bahamondes & Peloggia, 2019).

The prevalence of poverty among women in both countries emphasises how urgent it is to address economic inequalities and their impact on maternal and child health. The study highlights the significant relationship between poverty and poor outcomes for maternal health (Samuel et al., 2021; Pons-Duran et al., 2019). Therefore, addressing poverty should be prioritised to improve maternal health. The marital status of women in these countries varies. More women are not in a union in South Africa, which may be related to changing family structures and social standards (Ahinkorah et al., 2022; Gebremichael & Fenta, 2021). Nigerian women prefer home birth, while South African women utilise public healthcare facilities. The quality of healthcare services, accessibility and cultural considerations may influence the decision (Adde et al., 2020; Fantaye et al., 2019). Women's employment status may imply their decision-making ability, with most Nigerian women employed and South African women less employed (Tessema et al., 2021; Okedo-Alex et al., 2019). Birth spacing with a minimum of two years is prioritised in both countries, following the international maternal and child health recommendations (Ajayi & Somefun, 2020).

### 5.3 Postnatal Care Timing Disparities in Nigeria and South Africa

As maternal death rates are highest in the first 24 hours following childbirth, planning postnatal care is crucial. Within 24 hours of delivery, postnatal care is advised for women who give birth in a medical institution by the World Health Organisation (WHO). According to WHO (2022) and NDHS (2018), women who give birth outside of a medical institution should also be referred for postnatal assessments within 12 hours after the delivery.

Wealth inequalities have a significant impact on when postnatal care is needed. The study found that women from higher-income households are more likely than women from lower-income households to receive timely postnatal care within two days of giving birth. This outcome aligns with current research that shows the financial constraints many women encounter when seeking postnatal care services (Balde et al., 2021; Olajubu et al., 2019). These results highlight the critical need to eradicate financial obstacles to ensure that all women receive timely postnatal care. The frequency of postnatal check-ups varies significantly between women living in urban and rural areas. Women who live in cities are more likely than those who live in rural areas to receive postnatal check-ups within the first two days after giving birth. This gap has been previously highlighted (Asumah et al., 2023; Dickson et al., 2023), highlighting the urgent need for targeted initiatives to enhance access to postnatal care in rural areas.

According to research data, highly educated women are more likely to obtain prompt postnatal care. This is consistent with the broad study findings that education and healthcare utilisation are positively correlated (Tessema et al., 2020; Babalola & Fatusi, 2009). Increasing female education is one way to enhance access to postnatal care. The likelihood that women in private and public health facilities will seek postnatal care within 48 hours after giving birth indicates that the type of facility may influence postnatal care accessibility, possibly due to varying infrastructure and service quality standards. Therefore, to ensure that all women have equal access to postnatal care, public facilities must adhere to the same standards as their private counterparts (Doctor et al., 2019). Regional Disparities in healthcare access like this are common and may be due to variations in healthcare infrastructure and service availability (Sidze et al., 2022; Atake, 2021).

#### **5.4 Predictors of the timing of postnatal care in Nigeria and South Africa**

Studies conducted by Tessema et al., 2020 found that the timing of postnatal checks is significantly influenced by factors such as age and marital status. This observation aligns with other research conducted by Takai et al., 2015 and Titaley et al. (2009), which further underscores the impact of maternal age and marital status on postnatal care-seeking behaviour.

According to research conducted by Dada (2019) and Zhao et al., 2023, the timing of postnatal care-seeking behaviour in Nigeria is heavily influenced by factors such as place of residence, education, and wealth index. Specifically, mothers residing in urban areas with higher education and income levels tend to seek prompt postnatal care more frequently. These socioeconomic factors have consistently demonstrated a strong correlation with the timing of postnatal check-ups.

Existing research suggests that the place of delivery and the region are crucial factors influencing the timing of postnatal checks in Nigeria (Alabi et al., 2022; Ononokpono et al., 2020). In line with this, mothers who give birth in healthcare facilities are more likely to receive prompt postnatal care, highlighting the benefits of facility-based delivery efforts (Camara et al., 2021).

The timing of postnatal check-ups in South Africa revealed an influence by both the place of delivery and the place of residence (Akokuwebe & Idemudia, 2023). This suggests that her living situation significantly impacts a woman's access to postnatal care in South Africa. The research emphasises the importance of improving healthcare services in rural areas and ensuring that all healthcare facilities offer sufficient postpartum care to women.

Findings from South Africa and Nigeria have revealed that seeking postnatal care can be a complex process influenced by various sociodemographic factors. These results are consistent with earlier studies on maternal healthcare usage, highlighting the significance of customised interventions that account for the unique contextual circumstances of each country. It is imperative to tackle socioeconomic inequalities, encourage hospital-based deliveries, and enhance healthcare availability in marginalised regions to guarantee that all women can access prompt postnatal care, resulting in improved maternal and child health outcomes.



## **5.5 Insights into maternal health care seeking behaviour to obtain postnatal checks in South Africa and Nigeria**

Several research works have examined maternal healthcare and attempted to identify the variables influencing the use of postnatal care. By utilising logistic regression models consistent with other research and highlighting the complexity of maternal healthcare utilisation, this study contributes to the body of knowledge already in existence. The place of birth is a significant factor that influences the use of postnatal care. The outcomes of Model 1 support past research showing that women who give birth in public health facilities have a higher likelihood of receiving prompt postnatal care. The healthcare systems at these institutions are designed to support and offer postnatal care.

However, in Model 2, the place of delivery becomes less important in South Africa. This finding is consistent with the investigations conducted by scholars who have examined the complex aspects of maternal healthcare utilisation. This implies that while the place of delivery is crucial, other elements like socioeconomic status as well as individual characteristics are relevant. This is consistent with research that highlights the necessity for all-encompassing strategies for providing maternal healthcare that addresses all aspects of health in addition to the place of delivery.

The study reveals valuable new insight into how age impacts the use of postnatal care. It indicates that, in comparison to their older counterparts, women between the ages of 15 and 19 are more likely to receive timely postnatal check-ups; this finding calls for more research. The absence of a 95% confidence interval in the 35-39 age range, on the other hand, indicates that factors associated with age in postnatal care are complex and need further investigation. To further understand the problem, there is a need to investigate the social, cultural, and economic factors that impact the healthcare-seeking behaviours of different age groups.

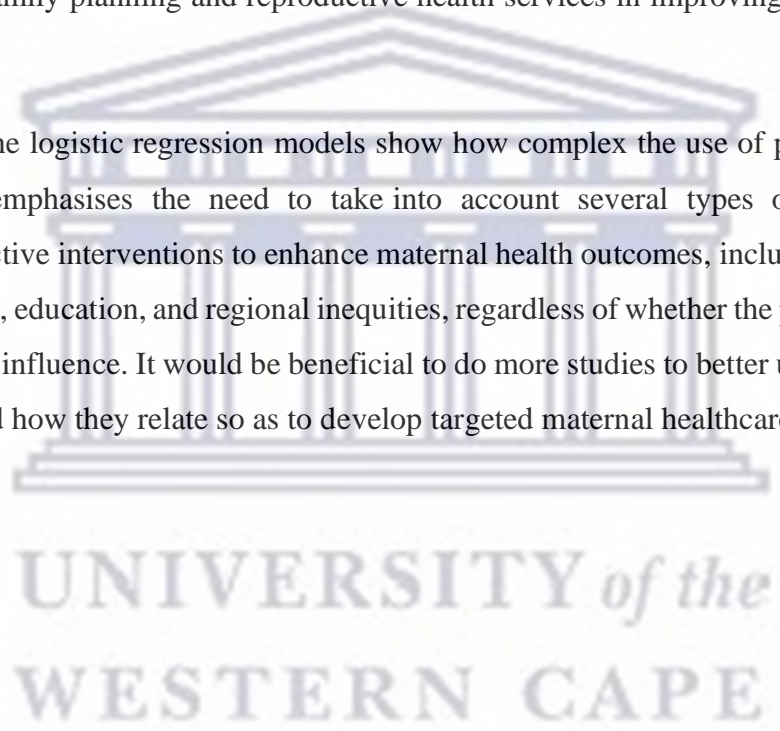
Model 2's finding that significant variations in the use of postnatal care highlight how crucial it is to understand the regional setting. Regional differences in the availability and quality of maternal healthcare have been the subject of much investigation. The findings imply that initiatives to enhance postnatal care have to be targeted to specific geographic areas, taking into consideration socioeconomic factors and the overall performance of the healthcare system in that area.

Furthermore, the finding that women residing in urban areas had a higher probability of receiving timely postnatal care aligns with the urbanisation patterns observed in most developing nations. Greater access to healthcare services is often the result of urban regions' better healthcare infrastructure and resources. This is consistent with studies that highlight the significance of addressing healthcare inequalities between rural and urban areas for mothers.

There has been much research done on how wealth and education impact the use of postnatal care. Higher-educated people and those with a middle wealth index are more likely to seek timely postnatal checks. Wealth and education are frequently seen as important factors that influence the behaviour of individuals who seek medical attention since they provide the resources and knowledge required for seeking healthcare services.

The outcomes also emphasise the need for family planning for maternal healthcare. Women who use contraceptives are more likely to receive postnatal care quickly highlighting the importance of family planning and reproductive health services in improving maternal health outcomes.

In conclusion, the logistic regression models show how complex the use of postnatal care is. This research emphasises the need to take into account several types of factors when developing effective interventions to enhance maternal health outcomes, including age, family planning, wealth, education, and regional inequities, regardless of whether the place of delivery remains a major influence. It would be beneficial to do more studies to better understand all of these factors and how they relate so as to develop targeted maternal healthcare policy.



---

## CHAPTER 6 - SUMMARY AND CONCLUSION

---

### 6.1 Conclusion

The comparison of South Africa and Nigeria in this study revealed a contrast in postnatal checks' associated factors, which could be attributed to dissimilarities in their study population. Some of the background characteristics and time of postnatal check revealed a relationship in Nigeria, unlike South Africa results that only show an association between the time of postnatal check and Place of delivery. This clearly indicates that there are challenges in obtaining quality data on reproductive health indicators, as revealed by several studies.

Socioeconomic empowerment is liable to improve access to better healthcare and subsequently end in better health outcomes. Social determinant of health differs according to environmental and social background, and so is the influences of various socioeconomic determinants of dissimilarity to the utilisation of maternal healthcare services in a separate geographical and cultural setting. A woman's reproductive health is essential as it contributes to population growth. Knowledge and education will help in building up a reproductively healthy people.

Despite the limitations and challenges, the data quality must be improved. This also suggests that a similar approach across nations is employed to enhance the quality of data needed for advanced reproductive health services and interventions needed to reach people, most especially women of reproductive age and those who may give support to them, such as partners, relative etc. by enlightening them on the importance of utilising reproductive health services and availability of these services. This will encourage women to seek health care services. When services rendered are documented and kept, the information will be useful for making decisions and allocating resources that will help develop reproductive health care. Work is needed to ensure that tools for data collection and clarity in the definition of questions to capture data, regular audits and continuous review of the quality of data to effectively improve accuracy and completeness for advancing health information systems.

Strengthening the health system should be beyond skilled birth attendance and quality health care but the availability of data and the use of accurate data. Hence, quality and timely information will improve reproductive health outcomes. Accurate information is essential for health care development and evaluating the progress of certain health objectives.

A survey run by developing countries needs to be conducted properly to obtain accurate, quality, timely and useful data or information for policy and planning, implementation and monitoring of health interventions aimed at increasing life expectancy and health improvements, even though it is a complex process. Vital registration systems in African countries are almost non-existent or lacking, so researchers rely on surveys, census data and indirect demographic research to model health-related patterns and analyse the population's health needs.

## **6.2 Recommendation**

Data is an asset that is very valuable and sometimes expensive to collect. Usually irreplaceable when lost. To obtain accurate data and useable data for reproductive health planning and improvement. Therefore, data quality should be enhanced through training data capturers or fieldworkers, and quality control measures should be implemented. Likewise, harmonising different sources for completeness and improved understanding of indicators used in capturing data, strengthening and expanding analytic capacity by storing reports or information obtained and making it available. Relevant information should be extracted or reproduced from the original data without replacing or damaging it.

More investment in health services assessment such as antenatal, delivery and postnatal, including specific interventions for mothers during service delivery and synchronising the report with population-based household surveys, will improve data quality and its useability.

One of the major expenses of household surveys is the cost of getting the interviewer to a household. This expense can be reduced by taking advantage of respondents coming to the interviewer, such as going to a health facility for required services. Health facilities are also likely to record incidences like births and deaths that occur at the facility and the causes as part of a routine health management information system.

However, the major problem with such data from the health facility is selection bias. It is still being determined whether the women who received one service or the other are representative of all mothers, for instance, those who give birth in a facility. To expand coverage, there is a need to find out the possibility of deploying health extension workers or the equivalent working in communities to collect adequate data regarding reproductive health, such as births, deaths and care received. Such an approach will enhance the quality of the registration system.

An evaluation approach for facility data should be proposed and implemented. When capturing reproductive health information, women visiting a health facility could be asked about their age, children ever born, children still alive and questions about their socioeconomic status. This vital information about children born and still alive could then be modelled onto the socio-economic structure of the whole population, such as the procedure available from a population census. A comprehensive review of programs to monitor and evaluate reproductive health indicators is essential. Data quality improvement efforts should be incorporated into strategies to advance health care. In turn, the data can be used to improve care, decision making and allocation of resources in public health programs. The intervention ought to start locally with health facilities and health information systems. This improvement will further the data accuracy of most reproductive health indicators. Assessment and extensive use of electronic reproductive health data are essential to achieve high-quality data, increase users' confidence, and improve performance in public health (WHO, 2010; Chan *et al.*, 2010). The intervention should start with health facilities and health information systems to produce relevant and quality information through the service delivery system for policy and decision-making to improve reproductive health.

Based on the factors and associations results of the analysis, a few recommendations for improving maternal healthcare utilisation and postnatal care in Nigeria and South Africa are as a result of this made:

**Promoting Health Education and Awareness by Implementing** health education programs to inform women, especially younger mothers, about the benefits and importance of postnatal care. These programs can be designed to target women during pregnancy and delivery to ensure they understand the necessity of postnatal check-ups.

**Encouraging Health Facility-Based Deliveries** with efforts to give women easy access to deliver their babies in health facilities with skilled attendants. This may include initiatives to improve access to public health facilities and promote the advantages of delivering in a health facility to increase the likelihood of receiving immediate postnatal checks.

With the notable influence of education on maternal healthcare utilisation, policies and programs should prioritise improving women's access to education. This can empower women with knowledge about the health risks associated with childbirth and the importance of accessing healthcare services.

Encourage husbands/partners to be involved in healthcare decision-making and support their wives in utilising healthcare services. This can also be achieved through targeted interventions and programs to educate and engage partners in maternal and child healthcare.

Contraceptive use can also be promoted by recognising the relationship between contraceptive use and postnatal care utilisation. Implementing family planning programs that emphasise the availability of postnatal care services and the importance of postpartum contraception is essential. Integrating family planning and contraceptive services into maternal and child health programs may encourage women to seek postnatal care.

Regional differences may be tackled by improving infrastructure, access, and availability of social amenities, especially in the regions with lower postnatal care utilisation. This could include investments in healthcare infrastructure and facilities in these regions. Community-based health promotion programs such as outreaches, especially in rural communities, will increase awareness and knowledge about postnatal care services.

Continuous collection and analysis of data to understand better the specific factors influencing maternal healthcare utilisation in different regions of Nigeria and South Africa and reducing the time lag will enable policymakers to direct interventions to the particular needs of each region. This will enhance data-driven decision-making.

Continuous Research and Evaluation is essential in assessing the effectiveness of various interventions and programs to improve maternal healthcare utilisation. Over time, this will be valuable in educating and adapting strategies.

By implementing the recommendations mentioned above, Nigeria and South Africa can significantly improve maternal healthcare utilisation and postnatal care experience for women. This will ultimately contribute to the overall well-being of mothers and children.

### **6.3 Limitations of demographic and health surveys data in Nigeria and South Africa**

Demographic and Health Surveys (DHS) are considered a valuable resource for researchers, policymakers, and organisations aiming to enhance public health and healthcare access (Kana et al., 2022). Nevertheless, these surveys may have their limitations (Ties & Sommerfelt, 1993). In Nigeria, these limitations may include sampling bias, data quality issues, limited

geographic coverage, temporal constraints, lack of detailed information, cultural and linguistic diversity, dependency on self-reporting, conflict and security concerns, data lag, and limited scope. Sampling bias is a significant concern in DHS surveys, which typically use a two-stage stratified cluster sampling method. Obtaining a representative sample in a large and diverse country like Nigeria can be challenging, leading to biased results that do not accurately reflect the entire country (Ozodiegwu et al., 2021).

Moreover, the quality of data collected in DHS surveys can vary. Respondents may provide inaccurate or incomplete information due to recall bias, social desirability bias, or other factors impacting the data's reliability. Additionally, DHS surveys may only partially capture data from some states or remote areas of Nigeria, limiting the generalizability of the findings to the entire country. The surveys are typically conducted every 5-10 years, so the data may not capture rapid changes in demographics, health, or healthcare access between survey cycles. Furthermore, while DHS surveys provide essential information on critical indicators like fertility, maternal and child health, and family planning, they may lack detailed data on certain health conditions, healthcare utilisation, or specific social determinants of health. Cultural and linguistic diversity in Nigeria presents challenges in survey administration and data collection, and the surveys may not adequately capture distinctions or variations in practices and beliefs across different ethnic and cultural groups (Benova et al., 2019). DHS data relies heavily on self-reported information from respondents, which can be influenced by social, cultural, and individual factors and may only sometimes provide a complete and accurate representation (Mak et al., 2023). Finally, there is often a significant time lag between data collection and the release of DHS survey results, making it challenging for policymakers to address emerging issues promptly.

Demographic and Health Surveys (DHS) constitute an essential data source for comprehending various aspects of a country's population, health, and development (Kana et al., 2022). However, the limitations inherent in such surveys can be particularly pertinent in South Africa. DHS data collection is not conducted annually but typically every few years (Brault et al., 2020). Given the rapidly changing demographic and health indicators in South Africa, the infrequency of DHS data collection can pose a challenge in obtaining up-to-date information for policy and program planning, and sampling methods can introduce bias (Woldeamanuel, 2019), especially in a diverse and unequal country like South Africa. Urban and wealthier areas are often oversampled, while rural and poorer regions may be underrepresented. This can lead

to data that only accurately represents part of the population. DHS data are often aggregated at the national or provincial level, which can conceal regional disparities. Significant health and demographic indicators variations exist in South Africa between provinces, so the national-level data may not adequately capture these differences.

DHS relies on self-reported data, which can introduce errors due to social desirability or recall bias (Tessema et al., 2020). People may not always provide accurate information on sensitive topics like sexual behaviour, substance use, etc. DHS surveys cover sensitive topics like HIV/AIDS, sexual behaviour, and domestic violence. Respondents may underreport or provide inaccurate information due to stigma, fear, or social norms (Ndugga et al., 2020). This can lead to an underestimation of specific issues. More detailed research may also be necessary for in-depth analysis or understanding of complex issues and also include certain indicators to improve estimates (Damian et al., 2019). It can take significant time to process and release DHS data. This time lag between data collection and availability can hinder the ability to respond quickly to emerging health and demographic trends. DHS surveys primarily provide quantitative data, but qualitative insights can be crucial for a deeper understanding of the context and underlying issues. Complementing DHS data with qualitative research can be essential. South Africa's social, economic, and political context has evolved significantly in recent years (Gazeley et al., 2023). DHS data might only sometimes capture these rapid changes effectively. Despite these limitations, DHS data remain valuable for policymakers, researchers, and organisations working in South Africa. Despite these limitations (Bliznashka et al., 2021).

Despite these limitations, DHS data remains valid for researchers, policymakers, and organisations working to improve public health and healthcare access (Lyons-Amos & Stones, 2017). It is important to continuously improve reporting Demographic and Health Surveys for accuracy and reliability (Awopegba et al., 2020; Croft, 1991; Croft et al., 2020).

#### **6.4 Improvement**

Multiple visits to the same sample of households at regular intervals are mentioned as improving survey information and using local languages to avoid misinterpretation. The organisation of censuses and the nature of the data collected have not changed much during the past 40 years. There has been a modification of the user data, which brought about new methods of studying population dynamics by Ansley J Coale and William Brass (Moultrie *et al.*, 2013).



Improvement and elaboration of established techniques and processes were implemented in the last five decades to search for the most cost-effective means of obtaining data of reasonable quality. To get data on births, deaths and migration directly from a census is unusual; therefore, estimation is required to measure the three processes to evaluate, adjust and transform data based on theoretical relationships. This estimation brought about the indirect method of extracting information from existing material, which is relatively cheap, and attention has been drawn to improvements in estimates. Even though the specification of the indirect estimates can lead to difficulties in comparing ideas about the population dynamics of the Third World to those conventionally held in Europe and other developed regions, the results are more accurate and consistent. Moreso, a straightforward process of question and answer still gathers the overwhelming majority of demographic data in less developed countries. Births and deaths are relatively unambiguous events and pose no severe definitional problems (Hill, 1990; Akinyemi *et al.*, 2022).

## **6.5 Argument**

Some have argued that the best way forward was to improve the data quality at the point of capture by elaborating measurement procedures in the field. Others saw outstanding merit in keeping the content and style of surveys relatively simple and thus cheaper and devoted their energy to developing methods of adjustment and indirect estimation (Abouzar *et al.*, 2007; Vetrò *et al.*, 2016; Batini & Scannapieco, 2016).

## **6.6 Solution**

Irrespective of the limitations, findings have shown increased use of DHS data, which has increased vital health information accessibility. Therefore, the DHS project should remain responsive to the need for data adjustment and sustain data quality and comparison. Countries and those that subscribe to DHS data should find a technique and use opportunities DHS provides to strengthen statistical capacity and improve health information systems. Demographic and Health Surveys and Multiple Indicator Cluster Surveys are the principal existing techniques to track population-based trends in Maternal, Newborn, and Child Health (MNCH) intervention coverage (WHO, 2015). Routine health information primarily includes those in contact with the health system and cannot capture those who are not, especially in most low and middle-income countries. Therefore, the reports produced by routine health information systems are not adequate to help with decision-making.

Moreover, household surveys allow for analysis of coverage by variables or indicators such as wealth, etc.,. The study by Bryce *et al.*, 2013 revealed that services received by mothers and children could be enriched by combining information from the sources of care obtained through household surveys with facility evaluation of the coverage and quality of the interventions provided. However, High-quality household survey programs will remain the primary source of data on MNCH intervention coverage for the justification and regulation or assessment of data from other sources, even as routine health information systems improve. As periodic health information systems improve, particularly in middle-income countries, there may be prospects to standardise them with data collected from representative samples of the population to increase their effectiveness in coverage measurement. Likewise, new evidence about coverage measurement must be adapted in the surveys to provide the best and most important information needed by public health decision-makers.

## **6.7 Frontiers for further research**

The study offers a thorough overview of South African and Nigerian mothers' characteristics. The socioeconomic and demographic determinants influencing mother and child health outcomes in these countries are better understood by analysing these findings in light of previous research, which also identifies areas in need of focused interventions and policy improvements. Furthermore, it reveals the complex relationship between several factors influencing women's timing of postnatal care. It emphasises how important it is to establish policies and initiatives that deal with wealth disparity, the gap between rich and poor, educational variations, and geographical differences to ensure timely and suitable access to postnatal care. The results of this study contribute to the advancing research aimed at enhancing maternal healthcare services and provide significant insights into the complex nature of postnatal care-seeking behaviours. These insights are relevant to policymakers and healthcare professionals in South Africa and Nigeria and the development of effective healthcare policies and interventions.

Further investigation is necessary to identify the complex factors causing these differences to develop a targeted strategy for improving maternal healthcare, explore further the underlying causes of the correlations between each factor, and evaluate the effectiveness of specific interventions aimed at improving the use of postnatal care in the regions as well as in South Africa and Nigeria.



UNIVERSITY *of the*  
WESTERN CAPE

---

## REFERENCES

---

- Abayomi Joseph, A., Timothy, A., Adeola, O., Abimbola, O., Ganiyu, A., & Maduakolam, O. (2018). Factors that influence the use of routine health information in family planning services in Lagos, Nigeria. A prospective review of the use of family planning data. *Res Rev Health Care Open Acc J*, 2(5), 10-32474. <https://doi.org/10.32474/rrhoaj.2018.02.000150>
- Abimbola, J. M., Makanjuola, A. T., Ganiyu, S. A., Babatunde, U. M. M., Adekunle, D. K., & Olatayo, A. A. (2016). Pattern of utilization of ante-natal and delivery services in a semi-urban community of North-Central Nigeria. *African Health Sciences*, 16(4), 962-971.
- Abma, J. C., & Martinez, G. M. (2017). Sexual activity and contraceptive use among teenagers in the United States, 2011-2015. *National health statistics reports*, (104), 1-23.
- AbouZahr, C. (1998). Maternal mortality overview. *Global Burden of Disease and Injury Series*, 3, 111-164.
- AbouZahr, C., & Boerma, T. (2005). Health information systems: the foundations of public health. *Bulletin of the World Health Organization*, 83, 578-583.
- AbouZahr, C., & Wardlaw, T. (2001). Maternal mortality at the end of a decade: signs of progress? *Bulletin of the World Health Organization*, 79, 561-573.
- AbouZahr, C., Cleland, J., Coullare, F., Macfarlane, S.B., Notzon, F.C., Setel, P., Szreter, S. (2007). The way forward. *Lancet*. 370, 1791-1799.
- AbouZahr, C., De Savigny, D., Mikkelsen, L., Setel, P. W., Lozano, R., Nichols, E., Notzon, F., & Lopez, A. D. (2015). Civil registration and vital statistics: progress in the data revolution for counting and accountability. *The Lancet*, 386(10001), 1373-1385.
- Abubakar, I., Dalglish, S. L., Angell, B., Sanuade, O., Abimbola, S., Adamu, A. L., Adetifa, I.M., Colbourn, T., Ogunlesi, A.O., Onwujekwe, O., Owoaje, E.T., & Zanna, F. H. (2022). The Lancet Nigeria Commission: investing in health and the future of the nation. *The Lancet*, 399(10330), 1155-1200.
- Adamou, B., Barden-O'Fallon, J., Williams, K., & Selim, A. (2020). Routine family planning data in the low-and middle-income country context: a synthesis of findings from 17 small research grants. *Global Health: Science and Practice*, 8(4), 799-812.
- Adamu, H. S. (2011). Utilization of maternal health care services in Nigeria: an analysis of regional differences in the patterns and determinants of maternal health care use. *University of Liverpool*, 3-5.
- Adamu, Y. M., Salihu, H. M., Sathiakumar, N., & Alexander, G. R. (2003). Maternal mortality in Northern Nigeria: a population-based study. *European Journal of Obstetrics & Gynecology and Reproductive Biology*, 109(2), 153-159.
- Adde, K. S., Dickson, K. S., & Amu, H. (2020). Prevalence and determinants of the place of delivery among reproductive age women in sub-Saharan Africa. *Plos one*, 15(12), e0244875.
- Adebowale, A. S., Fagbamigbe, A. F., & Bamgboye, E. A. (2017). Data quality assessment in maternal and child health registry in Nigeria: an experience from two states. *BMC Res Notes*, 10(1):442.
- Adefalu, A. A., Ladipo, O. A., Akinyemi, O. O., Popoola, O. A., Latunji, O. O., & Iyanda, O. F. (2018). Awareness and opinions regarding contraception by women of reproductive age in North-West Nigeria. *The Pan African Medical Journal*, 30.
- Adeleke, I. T., Adekanye, A. O., Onawola, K. A., Okuku, A. G., Adefemi, S. A., Erinle, S. A., Shehu, A.A., Yahaya, O.E., Adebisi, A.A., James, J.A. and AbdulGhaney, O.O., Ogundiran, L.M., Jibril, A.D., Atakere, M.E., Achinbee, M., Abodunrin, O.A., & Hassan, M. W. (2012). Data quality assessment in healthcare: a 365-day chart review of inpatients' health records

- at a Nigerian tertiary hospital. *Journal of the American Medical Informatics Association*, 19(6), 1039-1042.
- Adeleke, I. T., Erinle, S. A., Ndana, A. M., Anamah, T. C., Ogundele, O. A., & Aliyu, D. (2014). Health information technology in Nigeria: Stakeholders' perspectives of nationwide implementations and meaningful use of the emerging technology in the most populous black nation. *American Journal of Health Research*, 3(1-1), 17-24.
- Adhikari, R. (2016). Effect of Women's autonomy on maternal health service utilization in Nepal: a cross sectional study. *BMC women's health*, 16(1), 1-7.
- Adinma, J. I. B., & Adinma, E. D. (2011). Impact of reproductive health on socio-economic development: a case study of Nigeria. *African journal of reproductive health*, 15(1).
- Ahinkorah, B. O., Budu, E., Aboagye, R. G., Agbaglo, E., Arthur-Holmes, F., Adu, C., Acher, A.G., Aderoju, Y.B., & Seidu, A. A. (2021). Factors associated with modern contraceptive use among women with no fertility intention in sub-Saharan Africa: evidence from cross-sectional surveys of 29 countries. *Contraception and reproductive medicine*, 6(1), 1-13.
- Ahinkorah, B. O., Budu, E., Seidu, A. A., Bolarinwa, O. A., Agbaglo, E., Adu, C., Author-Holmes, F., Samad, N... & Yaya, S. (2022). Girl child marriage and its association with maternal healthcare services utilization in sub-Saharan Africa. *BMC Health Services Research*, 22(1), 777.
- Ahmed, S., Creanga, A. A., Gillespie, D. G., & Tsui, A. O. (2010). Economic status, education and empowerment: implications for maternal health service utilization in developing countries. *PloS one*, 5(6), e11190.
- Ahuru, R. R. (2022). Maternal care utilization in primary healthcare centers in Nigerian communities. *Community Health Equity Research & Policy*, 42(3), 325-336. <https://doi.org/10.1177/0272684X20983956>
- Aigbavboa, C., & Thwala, W. (2013, December). A theoretical framework of users' satisfaction/dissatisfaction theories and models. In *2nd International Conference on Arts, Behavioral Sciences and Economics Issues (ICABSEI'2013) Dec* (pp. 17-18).
- Ajayi, A. I., & Somefun, O. D. (2020). Patterns and determinants of short and long birth intervals among women in selected sub-Saharan African countries. *Medicine*, 99(19).
- Akinyemi, J. O., & Adedini, S. A. (2022). Indirect Estimation Techniques and Statistical Modeling in African Demographic Research. In *The Routledge Handbook of African Demography* (pp. 64-77). Routledge.
- Akinyemi, J. O., Afolabi, R. F., & Awolude, O. A. (2016). Patterns and determinants of dropout from maternity care continuum in Nigeria. *BMC pregnancy and childbirth*, 16(1), 1-11.
- Akokuwebe, M. E., & Idemudia, E. S. (2023). Factors associated with choice of home birth as place of delivery among women of reproductive age in South Africa. *African Journal of Reproductive Health*, 27(1), 22-40.
- Akpabio, I. I., Edet, O. B., Etifit, R. E., & Robinson-Bassey, G. C. (2014). Women's preference for traditional birth attendants and modern health care practitioners in Akpabuyo community of Cross River State, Nigeria. *Health care for women international*, 35(1), 100-109.
- Alabi, O., Odimegwu, C. O., De-Wet, N., & Akinyemi, J. O. (2019). Does female autonomy affect contraceptive use among women in northern Nigeria? *African journal of reproductive health*, 23(2), 92-100.
- Alabi, T. A., Atinge, S., Ejim, C., & Adejoh, S. O. (2022). Does where mothers live matter? Regional variations in factors influencing place of child delivery in Nigeria. *Journal of Biosocial Science*, 54(2), 163-183.
- Alam, N., Hajizadeh, M., Dumont, A., & Fournier, P. (2015). Inequalities in maternal health care utilization in sub-Saharan African countries: a multiyear and multi-country analysis. *PloS one*, 10(4), e0120922.

- Alexander, L. L., LaRosa, J. H., Bader, H., & Garfield, S. (2020). *New dimensions in women's health*. Jones & Bartlett Learning.
- Alimoradi, Z., Kariman, N., Simbar, M., & Ahmadi, F. (2017). Empowerment of adolescent girls for sexual and reproductive health care: A qualitative study. *African Journal of Reproductive Health*, 21(4), 80-92.
- Aliyu, A. A., & Amadu, L. (2017). Urbanization, cities, and health: the challenges to Nigeria—a review. *Annals of African medicine*, 16(4), 149.
- Alkema, L., Chou, D., Hogan, D., Zhang, S., Moller, A. B., Gemmill, A., Fat, D.M., Boerma, T., Temmerman, M., Mathers, C., & Say, L. (2016). Global, regional, and national levels and trends in maternal mortality between 1990 and 2015, with scenario-based projections to 2030: a systematic analysis by the UN Maternal Mortality Estimation Inter-Agency Group. *The Lancet*, 387(10017), 462-474.
- Aluko-Arowolo, S. O. & Ayobami, O. O. (2015). Residence Location and Ante-Natal Healthcare Utilisation in Selected Public and Private Orthodox Hospitals in Ijebu, South-Western Nigeria. *Procedia-Social and Behavioral Sciences*, 185, 307-313.
- Amouzou, A., Mehra, V., Carvajal–Aguirre, L., Khan, S. M., Sitrin, D., & Vaz, L. M. (2017). Measuring postnatal care contacts for mothers and newborns: An analysis of data from the MICS and DHS surveys. *Journal of global health*, 7(2).
- Andersen, R. M. (1995). Revisiting the behavioral model and access to medical care: does it matter?. *Journal of health and social behavior*, 1-10.
- Anderson, T. (2017). Providing family planning services to women in Africa. *Bulletin of the World Health Organization*, 95(9), 614+. <https://doi.org/10.2471/blt.17.020917>
- Andersson, N., Cockcroft, A., & Shea, B. (2008). Gender-based violence and HIV: relevance for HIV prevention in hyperendemic countries of southern Africa. *Aids*, 22, S73-S86.
- Andrews, B., Ross, C., & Yoost, J. L. (2019). Availability of Long acting Reversible contraceptives for adolescents in urban vs rural West Virginia Counties. *Marshall Journal of Medicine*, 5(3), 20.
- Anyebe, E. E., Okechukwu, A. A., & Nwanze, J. C. (2020). Barriers to access and utilization of quality reproductive health information by rural women in Nigeria: A qualitative study. *PLoS ONE*, 15(9):e0238313.
- Appiah, F., Salihu, T., Fenteng, J. O. D., Darteh, A. O., Djan, E. T., Takyi, M., Ayerakwah, P.A., & Ameyaw, E. K. (2021). Factors influencing early postnatal care utilisation among women: Evidence from the 2014 Ghana Demographic and Health Survey. *PloS one*, 16(4), e0249480.
- Aqil, A., Lippeveld, T., & Hozumi, D. (2009). PRISM framework: a paradigm shift for designing, strengthening and evaluating routine health information systems, *Health Policy and Planning*, 24, 217-228.
- Aremu, O., Lawoko, S., & Dalal, K. (2011). Neighborhood socioeconomic disadvantage, individual wealth status and patterns of delivery care utilization in Nigeria: a multilevel discrete choice analysis. *International journal of women's health*, 3, 167.
- Arts, D. G., De Keizer, N. F., & Scheffer, G. J. (2002). Defining and improving data quality in medical registries: a literature review, case study, and generic framework. *Journal of the American Medical Informatics Association*, 9(6), 600-611.
- Asaolu, I. O., Okafor, C. T., Ehiri, J. C., Dreifuss, H. M., & Ehiri, J. E. (2017). Association between measures of Women's empowerment and use of modern contraceptives: an analysis of Nigeria's demographic and health surveys. *Frontiers in public health*, 4, 293.
- Asch, S. M., Kerr, E. A., Keeseey, J., Adams, J. L., Setodji, C. M., Malik, S., & McGlynn, E. A. (2006). Who is at greatest risk for receiving poor-quality health care? *New England Journal of Medicine*, 354(11), 1147-1156.

- Asogwa, F. O., Amuka, J. I., Igwe, A. A., & Nkalu, C. N. (2022). Dynamics of population, urban agglomeration, and economic growths in Sub-Saharan Africa: Evidence from panel data. *Journal of Public Affairs*, 22(2), e2447.
- Asumah, M. N., Abubakari, A., Abdulai, A. M., Nukpezah, R. N., Adomako-Boateng, F., Faridu, A. W., Kubio, C., Padhi, B.K., & Kabir, R. (2023). Sociodemographic and Maternal Determinants of Postnatal Care Utilization: A Cross-Sectional Study. *SAGE Open Nursing*, 9, 23779608231206759.
- Atake, E. H. (2021). Socio-economic inequality in maternal health care utilization in Sub-Saharan Africa: Evidence from Togo. *The International Journal of Health Planning and Management*, 36(2), 288-301.  
Available at <http://dhsprogram.com/pubs/pdf/FR359/FR359.pdf>.
- Avan, B. I., Berhanu, D., Umar, N., Wickremasinghe, D., & Schellenberg, J. (2016). District decision-making for health in low-income settings: a feasibility study of a data-informed platform for health in India, Nigeria and Ethiopia. *Health policy and planning*, 31(suppl\_2), ii3-ii11.
- Awopegba, O. E., Kalu, A., Ahinkorah, B. O., Seidu, A. A., & Ajayi, A. I. (2020). Prenatal care coverage and correlates of HIV testing in sub-Saharan Africa: Insight from demographic and health surveys of 16 countries. *PloS one*, 15(11), e0242001.
- Babalola, S., & Fatusi, A. (2009). Determinants of use of maternal health services in Nigeria - looking beyond individual and household factors. *BMC Pregnancy and Childbirth*, 9, 43.
- Babalola, S., & Fatusi, A. (2009). Determinants of use of maternal health services in Nigeria - looking beyond individual and household factors. *BMC pregnancy and childbirth*, 9, 1-13.
- Babalola, S., Oyenubi, O., Speizer, I. S., Cobb, L., Akiode, A., & Odeku, M. (2017). Factors affecting the achievement of fertility intentions in urban Nigeria: analysis of longitudinal data. *BMC public health*, 17(1), 942.
- Bahamondes, L., & Poggia, A. (2019). Modern contraceptives in sub-Saharan African countries. *The Lancet Global Health*, 7(7), e819-e820.
- Balde, M. D., Diallo, A., Soumah, A. M., Barry, F., Touré, A. O., & Camara, S. (2021). Barriers to utilization of postnatal care: a qualitative study in Guinea. *Open Journal of Obstetrics and Gynecology*, 11(04), 391.
- 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.
- Bapolisi, W. A., Ferrari, G., Blampain, C., Makelele, J., Kono-Tange, L., Bisimwa, G., & Merten, S. (2020). Impact of a complex gender-transformative intervention on maternal and child health outcomes in the eastern Democratic Republic of Congo: protocol of a longitudinal parallel mixed-methods study. *BMC public health*, 20(1), 1-11.
- Barker, G., Ricardo, C., Nascimento, M., & World Health Organization. (2007). *Engaging men and boys in changing gender-based inequity in health: Evidence from programme interventions*. World Health Organization.
- Bassey, P. E., Ndep, A. O., & Esu, E. B. (2016). Determinants and Differentials of Maternal Reproductive Health Outcomes in Nigeria: A Review of National Demographic Health Survey Data from 1999 to 2013. *Health*, 40(50), 60.
- Batani, J., & Maharaj, M. S. (2022). Towards data-driven models for diverging emerging technologies for maternal, neonatal and child health services in Sub-Saharan Africa: a systematic review. *Global Health Journal*.
- Bates, D. W., Cohen, M., Leape, L. L., Overhage, J. M., Shabot, M. M., & Sheridan, T. (2001). Reducing the frequency of errors in medicine using information technology. *Journal of the American Medical Informatics Association*, 8(4), 299-308.

- Batini, C., & Scannapieco, M. (2016). Data and information quality. *Cham, Switzerland: Springer International Publishing.*
- Bawah, A. A., Asuming, P., Achana, S. F., Kanmiki, E. W., Awoonor-Williams, J. K., & Phillips, J. F. (2019). Contraceptive use intentions and unmet need for family planning among reproductive-aged women in the Upper East Region of Ghana. *Reproductive health, 16*(1), 26.
- Bearak, J., Popinchalk, A., Ganatra, B., Moller, A. B., Tunçalp, Ö., Beavin, C., Kwok, L., & Alkema, L. (2020). Unintended pregnancy and abortion by income, region, and the legal status of abortion: estimates from a comprehensive model for 1990–2019. *The Lancet Global Health, 8*(9), e1152-e1161.
- Benova, L., Owolabi, O., Radovich, E., Wong, K. L., Macleod, D., Langlois, E. V., & Campbell, O. M. (2019). Provision of postpartum care to women giving birth in health facilities in sub-Saharan Africa: A cross-sectional study using Demographic and Health Survey data from 33 countries. *PLoS medicine, 16*(10), e1002943.
- Benova, L., Owolabi, O., Radovich, E., Wong, K. L., Macleod, D., Langlois, E. V., & Campbell, O. M. (2019). Provision of postpartum care to women giving birth in health facilities in sub-Saharan Africa: a cross-sectional study using demographic and health survey data from 33 countries. *PLoS medicine, 16*(10), e1002943.
- Benova, L., Owolabi, O., Radovich, E., Wong, K. L., Macleod, D., Langlois, E. V., & Campbell, O. M. (2019). Provision of postpartum care to women giving birth in health facilities in sub-Saharan Africa: a cross-sectional study using demographic and health survey data from 33 countries. *PLoS medicine, 16*(10), e1002943.
- Berer, M. (2004). National laws and unsafe abortion: the parameters of change. *Reproductive Health Matters, 12*(24 Suppl), 1-8.
- Berhe, A., Bayray, A., Berhe, Y., Teklu, A., Desta, A., Araya, T., Zielinski, R., & Roosevelt, L. (2019). Determinants of postnatal care utilization in Tigray, Northern Ethiopia: A community based cross-sectional study. *PLoS One, 14*(8), e0221161.
- Berthelon, M., & Kruger, D. I. (2017). Does adolescent motherhood affect education and labor market outcomes of mothers? A study on young adult women in Chile during 1990–2013. *International journal of public health, 62*(2), 293-303.
- Bhattacharya, A. A., Umar, N., Audu, A., Felix, H., Allen, E., Schellenberg, J. R., & Marchant, T. (2019). Quality of routine facility data for monitoring priority maternal and newborn indicators in DHIS2: a case study from Gombe state, Nigeria. *PloS one, 14*(1), e0211265.
- Bhutta, Z. A., & Black, R. E. (2013). Global maternal, newborn, and child health—so near and yet so far. *New England Journal of Medicine, 369*(23), 2226-2235.
- Biddle, L., Wahedi, K., & Bozorgmehr, K. (2020). Health system resilience: a literature review of empirical research. *Health policy and planning, 35*(8), 1084-1109.
- Bietsch, K. E. (2015). Men's attitudes towards contraception in sub-Saharan Africa. *African journal of reproductive health, 19*(3), 41-54.
- Birmeta, K., Dibaba, Y., & Woldeyohannes, D. (2013). Determinants of maternal health care utilization in Holeta town, central Ethiopia. *BMC health services research, 13*(1), 256.
- Black, R. E., Allen, L. H., Bhutta, Z. A., Caulfield, L. E., De Onis, M., Ezzati, M., Mathers, C., Rivera, J., & Maternal and Child Undernutrition Study Group. (2008). Maternal and child undernutrition: global and regional exposures and health consequences. *The Lancet, 371*(9608), 243-260.
- Bliznashka, L., Udo, I. E., Sudfeld, C. R., Fawzi, W. W., & Yousafzai, A. K. (2021). Associations between women's empowerment and child development, growth, and nurturing care practices in sub-Saharan Africa: A cross-sectional analysis of demographic and health survey data. *PLoS medicine, 18*(9), e1003781.



- Boadu, I. (2022). Coverage and determinants of modern contraceptive use in sub-Saharan Africa: further analysis of demographic and health surveys. *Reproductive Health, 19*(1), 1-11.
- Boerma, T., Ronsmans, C., Melesse, D. Y., Barros, A. J., Barros, F. C., Juan, L., Moler, A.B., Say, L., Hosseinpoor, A.R., Yi, M., Neto D.D.L.R & Temmerman, M. (2018). Global epidemiology of use of and disparities in caesarean sections. *The Lancet, 392*(10155), 1341-1348.
- Bolarinwa, O. A., & Boikhutso, T. (2021). Mapping evidence on predictors of adverse sexual and reproductive health outcomes among young women in South Africa: A scoping review. *African Journal of Primary Health Care & Family Medicine, 13*(1).
- Bongaarts, J. (2020). Trends in fertility and fertility preferences in sub-Saharan Africa: the roles of education and family planning programs. *Genus, 76*(1), 1-15.
- Borda, M. R., Winfrey, W., & McKaig, C. (2010). Return to sexual activity and modern family planning use in the extended postpartum period: an analysis of findings from seventeen countries. *African journal of reproductive health, 14*(4).
- Bradley, S. E., & Casterline, J. B. (2014). Understanding unmet need: history, theory, and measurement. *Studies in family planning, 45*(2), 123-150.
- Brand, H., Brand, A., Clemens, T., & Miteniece, E. (2021). Study on the use of real-world data (RWD) for research, clinical care, regulatory decision-making, health technology assessment, and policy-making.
- Brault, M. A., Mwinga, K., Kipp, A. M., Kennedy, S. B., Maimbolwa, M., Moyo, P., Ngure, K., Haley, C.A., & Vermund, S. H. (2020). Measuring child survival for the Millennium Development Goals in Africa: what have we learned and what more is needed to evaluate the Sustainable Development Goals?. *Global health action, 13*(1), 1732668.
- Bremner, J., Frost, A., Haub, C., Mather, M., Ringheim, K., & Zuehlke, E. (2010). World population highlights: Key findings from PRB's 2010 world population data sheet. *Population Bulletin, 65*(2), 1-12.
- Bryce, J., Arnold, F., Blanc, A., Hancioglu, A., Newby, H., Requejo, J., Wardlaw, T., & CHERG Working Group on Improving Coverage Measurement. (2013). Measuring coverage in MNCH: new findings, new strategies, and recommendations for action. *PLoS medicine, 10*(5), e1001423.
- Burton, P. R., Banner, N., Elliot, M. J., Knoppers, B. M., & Banks, J. (2017). Policies and strategies to facilitate secondary use of research data in the health sciences. *International Journal of Epidemiology, 46*(6), 1729-1733.
- Caffe, S., Plesons, M., Camacho, A. V., Brumana, L., Abdool, S. N., Huaynoqa, S., Mayall, K., Menard-Freeman, L., de Francisco Serpa, L.A., Gomez Ponce de Leon, R., & Chandra-Mouli, V. (2017). Looking back and moving forward: can we accelerate progress on adolescent pregnancy in the Americas? *Reproductive Health, 14*(1), 1-8.
- Caldwell, J. C. (1979). Education as a factor in mortality decline an examination of Nigerian data. *Population studies, 39*, 395-413.
- Caldwell, J. C., & Caldwell, P. (2002, October). The fertility transition in sub-Saharan Africa. In *Conference on Fertility and the Current South African Issues of Poverty, HIV/AIDS and Youth, Pretoria, South Africa*.
- Callaghan, W. M. (2012, February). Overview of maternal mortality in the United States. In *Seminars in perinatology* (Vol. 36, No. 1, pp. 2-6). WB Saunders.
- Camara, B. S., Delamou, A., Grovogui, F. M., de Kok, B. C., Benova, L., El Ayadi, A. M., ... & Delvaux, T. (2021). Interventions to increase facility births and provision of postpartum care in sub-Saharan Africa: a scoping review. *Reproductive Health, 18*(1), 1-22.
- Campbell, M., Sahin-Hodoglugil, N. N., & Potts, M. (2006). Barriers to fertility regulation: a review of the literature. *Studies in family planning, 37*(2), 87-98.

- Campbell, O. M., Graham, W. J., & Lancet Maternal Survival Series steering group. (2006). Strategies for reducing maternal mortality: getting on with what works. *The Lancet*, 368(9543), 1284-1299.
- Campbell, O., Filippi, V., Koblinsky, M., Marshall, T., Mortimer, J., Pittrof, R., & Ronsmans, C. (1997). Lessons learnt; a decade of measuring the impact of safe motherhood programmes.
- Chaka, E. E., Abdurahman, A. A., Nedjat, S., & Majdzadeh, R. (2019). Utilization and determinants of postnatal Care Services in Ethiopia: a systematic review and meta-analysis. *Ethiopian journal of health sciences*, 29(1).
- Chakraborty, N., Islam, M. A., Chowdhury, R. I., & Bari, W. (2002). Utilisation of postnatal care in Bangladesh: evidence from a longitudinal study. *Health & social care in the community*, 10(6), 492-502.
- Chakraborty, N., Islam, M. A., Chowdhury, R. I., Bari, W., & Akhter, H. H. (2003). Determinants of the use of maternal health services in rural Bangladesh. *Health promotion international*, 18(4), 327-337.
- Chan, M., Kazatchkine, M., Lob-Levyt, J., Obaid, T., Schweizer, J., Sidibe, M., Veneman, A., & Yamada, T. (2010). Meeting the demand for results and accountability: a call for action on health data from eight global health agencies. *PLoS Medicine*, 7(1), e1000223.
- Chen, H., Hailey, D., Wang, N., & Yu, P. (2014). A review of data quality assessment methods for public health information systems. *International journal of environmental research and public health*, 11(5), 5170-5207.
- Cheng, P., Gilchrist, A., Robinson, K. M., & Paul, L. (2009). The risk and consequences of clinical miscoding due to inadequate medical documentation: a case study of the impact on health services funding. *Health Information Management Journal*, 38(1), 35-46.
- Chirawurah, D., Kyei, N. N., & Awoonor-Williams, J. K. (2018). How Ghana's health service can strengthen its ability to generate and use reliable and usable data: a call for action. *Int J Health Policy Manage*, 7(11):1030-1034.
- Chol, C., Negin, J., Agho, K. E., & Cumming, R. G. (2019). Women's autonomy and utilisation of maternal healthcare services in 31 Sub-Saharan African countries: results from the demographic and health surveys, 2010–2016. *BMJ open*, 9(3), e023128.
- Chungu, C., Makasa, M., Chola, M., & Jacobs, C. N. (2018). Place of delivery associated with postnatal care utilization among childbearing women in Zambia. *Frontiers in public health*, 6, 94.
- Conde-Agudelo, A., & Belizán, J. M. (2000). Maternal morbidity and mortality associated with interpregnancy interval: cross sectional study. *Bmj*, 321(7271), 1255-1259.
- Conde-Agudelo, A., Rosas-Bermúdez, A., & Kafury-Goeta, A. C. (2006). Birth spacing and risk of adverse perinatal outcomes: a meta-analysis. *Jama*, 295(15), 1809-1823.
- Cooke, J. G., & Tahir, F. (2013). Maternal health in Nigeria. *Center for Strategic & International Studies*.
- Cora Garcia, A., David, G. C., & Chand, D. (2010). Understanding the work of medical transcriptionists in the production of medical records. *Health Informatics Journal*, 16(2), 87-100.
- Corroon, M., Speizer, I. S., Fotso, J. C., Akiode, A., Saad, A., Calhoun, L., & Irani, L. (2014). The role of gender empowerment on reproductive health outcomes in urban Nigeria. *Maternal and child health journal*, 18(1), 307-315.
- Corsi, D. J., Neuman, M., Finlay, J. E., & Subramanian, S. V. (2012). Demographic and health surveys: a profile. *International journal of epidemiology*, 41(6), 1602-1613.
- Coyne, C. A., & D'Onofrio, B. M. (2012). Some (but not much) progress toward understanding teenage childbearing: A review of research from the past decade. *Advances in child development and behavior*, 42, 113-152.

- Croft, T. (1991). DHS data editing and imputation. *Columbia, Maryland: IRD/ORC Macro, 13371356*.
- Croft, T. N., Aileen, M. J., & Courtney, K. A. (2020). Guide to DHS Statistics: DHS-7 (Version 2). ICF.
- Dada, A. A. (2019). *Factors affecting maternal health seeking behaviour in a Yoruba community of Nigeria: an analysis of socio-cultural beliefs and practices* (Doctoral dissertation).
- Dahiru, T., & Oche, O. M. (2015). Determinants of antenatal care, institutional delivery and postnatal care services utilization in Nigeria. *Pan African medical journal, 22*(1).
- Dairo, M. D., & Owoyokun, K. E. (2010). Factors affecting the utilization of antenatal care services in Ibadan, Nigeria. *Benin Journal of Postgraduate Medicine, 12*(1).
- Damian, D. J., Njau, B., Lisasi, E., Msuya, S. E., & Boule, A. (2019). Trends in maternal and neonatal mortality in South Africa: a systematic review. *Systematic reviews, 8*(1), 1-13.
- Darroch, J. E., Sedgh, G., & Ball, H. (2011). Contraceptive technologies: responding to women's needs. *New York: Guttmacher Institute, 201*(1), 1-51.
- Das, J., & Hammer, J. (2014). Quality of primary care in low-income countries: facts and economics. *Annual Review of Economics, 6*(1), 525-553.
- Dasgupta, A., Wheldon, M., Kantorová, V., & Ueffing, P. (2022). Contraceptive use and fertility transitions: The distinctive experience of sub-Saharan Africa. *Demographic Research, 46*, COV1-COV1.
- Department of Health/South Africa and Macro International. 2002. South Africa Demographic and Health Survey 1998. Pretoria, South Africa: Department of Health/South Africa. Available at <http://dhsprogram.com/pubs/pdf/FR131/FR131.pdf>.
- Desa, U. N. (2016). Transforming our world: The 2030 agenda for sustainable development. <https://sustainabledevelopment.un.org/content/documents/21252030%20Agenda%20for%20Sustainable%20Development%20web.pdf>
- Dhakar, S., Chapman, G. N., Simkhada, P. P., Van Teijlingen, E. R., Stephens, J., & Raja, A. E. (2007). Utilisation of postnatal care among rural women in Nepal. *BMC pregnancy and childbirth, 7*(1), 19.
- DHS, M. (2013). Demographic and health surveys. *Calverton: Measure DHS*. [http://www.measuredhs.com/Who-We-Are/upload/MEASURE\\_DHS\\_Brochure.pdf](http://www.measuredhs.com/Who-We-Are/upload/MEASURE_DHS_Brochure.pdf)
- Dias, S., Gama, A., Cortes, M., & de Sousa, B. (2011). Healthcare-seeking patterns among immigrants in Portugal. *Health & social care in the community, 19*(5), 514-521.
- Diaz, T., & Requejo, J. (2021). Improving analysis and use of routine reproductive, maternal, newborn, and child health facility data in low-and middle-income countries: a universal priority. *BMC health services research, 21*(1), 1-3.
- Dickson, K. S., Ayebeng, C., Adu-Gyamfi, A. B., & Okyere, J. (2023). Postnatal care service utilisation for babies within the first two months after childbirth: an analysis of rural-urban differences in eleven Sub-Saharan African countries. *BMC Pregnancy and Childbirth, 23*(1), 1-10.
- Diedrich, J. T., Klein, D. A., & Peipert, J. F. (2017). Long-acting reversible contraception in adolescents: a systematic review and meta-analysis. *American journal of obstetrics and gynecology, 216*(4), 364-e1.
- Dierickx, S., Balen, J., Longman, C., Rahbari, L., Clarke, E., Jarju, B., & Coene, G. (2019). 'We are always desperate and will try anything to conceive': The convoluted and dynamic process of health seeking among women with infertility in the West Coast Region of The Gambia. *PloS one, 14*(1), e0211634.
- Do, M., & Hotchkiss, D. (2013). Relationships between antenatal and postnatal care and postpartum modern contraceptive use: evidence from population surveys in Kenya and Zambia. *BMC health services research, 13*(1), 1-14.

- Doctor, H. V., Radovich, E., & Benova, L. (2019). Time trends in facility-based and private-sector childbirth care: analysis of Demographic and Health Surveys from 25 sub-Saharan African countries from 2000 to 2016. *Journal of global health, 9*(2).
- Doskoch, P. (2014). Women Who Have Four Antenatal Visits Rarely Receive All Recommended Services. *International Perspectives on Sexual and Reproductive Health, 40*(2), 102.
- Drigo, L., Luvhengo, M., Lebeso, R. T., & Makhado, L. (2020). Attitudes of pregnant women towards antenatal care services provided in primary health care facilities of Mbombela Municipality, Mpumalanga Province, South Africa. *The Open Public Health Journal, 13*(1). <https://doi.org/10.2174/1874944502013010569>
- Duflo, E. (2012). Women empowerment and economic development. *Journal of Economic literature, 50*(4), 1051-79.
- Dzomeku, M. V. (2011). Maternal satisfaction with care during labour: a case study of the Mampong-Ashanti district hospital maternity unit in Ghana. *International Journal of Nursing and Midwifery, 3*(3), 30-34.
- Ebenso, B., Okusanya, B., Okunade, K., Akeju, D., Ajepe, A., Akaba, G. O., Yalma, R.M., Dirisu, O., Tukur, J., Abdullahi, M.K., Okuzu, O., & Allsop, M. J. (2021). What are the contextual enablers and impacts of using digital technology to extend maternal and child health services to rural areas? Findings of a qualitative study from Nigeria. *Frontiers in Global Women's Health, 2*, 670494.
- Ebuehi, O. M., & Akintujoye, I. A. (2012). Perception and utilization of traditional birth attendants by pregnant women attending primary health care clinics in a rural Local Government Area in Ogun State, Nigeria. *International journal of women's health, 4*, 25.
- Ekholuenetale, M., Nzopotam, 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, 349-360*.
- Evens, E., Tolley, E., Headley, J., McCarragher, D. R., Hartmann, M., Mtimkulu, V. T., Manenzhe, K.N., Hamela, G., Zulu, F., & Fem-PrEP, S. B. C. (2015). Identifying factors that influence pregnancy intentions: evidence from South Africa and Malawi. *Culture, health & sexuality, 17*(3), 374-389.
- Exavery, A., Kanté, A. M., Njozi, M., Tani, K., Doctor, H. V., Hingora, A., & Phillips, J. F. (2014). Access to institutional delivery care and reasons for home delivery in three districts of Tanzania. *International journal for equity in health, 13*(1), 1-11.
- Ezeh, A., Kissling, F., & Singer, P. (2020). Why sub-Saharan Africa might exceed its projected population size by 2100. *The Lancet, 396*(10258), 1131-1133.
- Fabic, M. S., Choi, Y., & Bird, S. (2012). A systematic review of Demographic and Health Surveys: data availability and utilization for research. *Bulletin of the World Health Organization, 90*, 604-612.
- Fagbamigbe, A. F., & Idemudia, E. S. (2015). Barriers to antenatal care use in Nigeria: evidences from non-users and implications for maternal health programming. *BMC pregnancy and childbirth, 15*(1), 1-10.
- Family Planning 2020, Family Planning 2020: accelerating progress, strategy for 2016–2020, 2015 [Available from: <http://www.familyplanning2020.org/microsite/strategy>].
- Fantaye, A. W., Gunawardena, N., & Yaya, S. (2019). Preferences for formal and traditional sources of childbirth and postnatal care among women in rural Africa: A systematic review. *PLoS One, 14*(9), e0222110.
- Fapohunda, B., & Orobato, N. (2014). Factors influencing the selection of delivery with no one present in Northern Nigeria: implications for policy and programs. *International journal of women's health, 6*, 171.

- Farnham, A., Utzinger, J., Kulinkina, A. V., & Winkler, M. S. (2020). Using district health information to monitor sustainable development. *Bulletin of the World Health Organization*, 98(1), 69.
- Farnham, A., Utzinger, J., Kulinkina, A. V., & Winkler, M. S. (2020). Using district health information to monitor sustainable development. *Bulletin of the World Health Organization*, 98(1), 69.
- Frost, J. J., Frohwirth, L. F., & Zolna, M. R. (2016). Contraceptive needs and services, 2014 update.
- Gahungu, J., Vahdaninia, M., & Regmi, P. R. (2021). The unmet needs for modern family planning methods among postpartum women in Sub-Saharan Africa: a systematic review of the literature. *Reproductive Health*, 18, 1-15.
- Garrib, A., Stoops, N., McKenzie, A., Dlamini, L., Govender, T., Rohde, D., & Herbst, K. (2008). An evaluation of the district health information system in rural South Africa. *South African Medical Journal*, 98(7), 549-552.
- Gavin, L., Frederiksen, B., Robbins, C., Pazol, K., & Moskosky, S. (2017). New clinical performance measures for contraceptive care: their importance to healthcare quality. *Contraception*, 96(3), 149-157.
- Gazeley, U., Reniers, G., Romero-Prieto, J. E., Calvert, C., Jasseh, M., Herbst, K., Khagayi, S., Obor, D., Kwaro, D., Dube, A., Dheresa, M., & Filippi, V. (2023). Pregnancy-related mortality up to 1 year postpartum in sub-Saharan Africa: an analysis of verbal autopsy data from six countries. *BJOG: An International Journal of Obstetrics & Gynaecology*.
- Gebrehiwot, G., Medhanyie, A. A., Gidey, G., & Abrha, K. (2018). Postnatal care utilization among urban women in northern Ethiopia: cross-sectional survey. *BMC women's health*, 18(1), 78.
- Gebremichael, S. G., & Fenta, S. M. (2021). Determinants of institutional delivery in Sub-Saharan Africa: findings from Demographic and Health Survey (2013–2017) from nine countries. *Tropical Medicine and Health*, 49(1), 1-8.
- Gilson, L., Barasa, E., Nxumalo, N., Cleary, S., Goudge, J., Molyneux, S., Tsofa, B., & Lehmann, U. (2017). Everyday resilience in district health systems: emerging insights from the front lines in Kenya and South Africa. *BMJ global health*, 2(2), e000224.
- Gilson, L., Ellokori, S., Lehmann, U., & Brady, L. (2020). Organizational change and everyday health system resilience: lessons from Cape Town, South Africa. *Social science & medicine*, 266, 113407.
- Glazier, A., Gülmezoglu, A. M., Schmid, G. P., Moreno, C. G., & Van Look, P. F. (2006). Sexual and reproductive health: a matter of life and death. *The Lancet*, 368(9547), 1595-1607.
- Govender, D., Naidoo, S., & Taylor, M. (2018). Scoping review of risk factors of and interventions for adolescent repeat pregnancies: A public health perspective. *African Journal of Primary Health Care and Family Medicine*, 10(1), 1-10.
- Govender, D., Naidoo, S., & Taylor, M. (2018). Scoping review of risk factors of and interventions for adolescent repeat pregnancies: A public health perspective. *African Journal of Primary Health Care and Family Medicine*, 10(1), 1-10.
- Graham, W. J., & Varghese, B. (2012). Quality, quality, quality: gaps in the continuum of care. *The Lancet*, 379(9811), e5-e6.
- Greene, M. E., & Merrick, T. (2005). Poverty Reduction: Does Reproductive Health Matter?
- Gupta, R. K., Kumar, A., & Pandey, A. (2015). Maternal Health Care in Rural and Urbanized Villages of Delhi-A Comparative Study. *Indian Journal of Community Health*, 27(1), 46-51.

- Hahn, D., Wanjala, P., & Marx, M. (2013). Where is information quality lost at clinical level? A mixed-method study on information systems and data quality in three urban Kenyan ANC clinics. *Global health action*, 6(1), 21424.
- Hailu, Y. (2014). Factors affecting utilization of postnatal care service in Amhara region, Jabitena district, Ethiopia. *Science Journal of Public Health*, 2(3), 169-76.
- Hamilton, B. E., Rossen, L. M., & Branum, A. M. (2016). *Teen birth rates for urban and rural areas in the United States, 2007-2015*. US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics.
- Handayani, P. W., Hidayanto, A. N., Pinem, A. A., Hapsari, I. C., Sandhyaduhita, P. I., & Budi, I. (2017). Acceptance model of a hospital information system. *International journal of medical informatics*, 99, 11-28. <https://doi.org/10.1016/j.ijmedinf.2016.12.004>
- Harries, A. D., Zachariah, R., & Maher, D. (2013). The power of data: Using routinely collected data to improve public health programmes and patient outcomes in low-and middle-income countries. *Tropical medicine & international health*, 18(9), 1154-1156.
- Harrison, K., Rahimi, N., & Danovaro-Holliday, M. C. (2020). Factors limiting data quality in the expanded programme on immunization in low and middle-income countries: A scoping review. *Vaccine*, 38(30), 4652-4663.
- Health Communication Capacity Collaborative [HC3]. (2014). Engaging families for healthy pregnancies—A focused desk review of knowledge, attitudes and behaviors related to pregnancies in three high-risk situations: Advanced maternal age; high parity; and rapid repeat pregnancies after abortion or miscarriage.
- Heckert, J., & Fabric, M. S. (2013). Improving data concerning women's empowerment in sub-Saharan Africa. *Studies in Family Planning*, 44(3), 319-344.
- Hill, K. (1990). "Demographic estimation from deficient or defective data" in Fetter Bruce (ed). *Demography from scanty evidence: central Africa in the colonial era*, 133-142.
- Hogan, M. C., Foreman, K. J., Naghavi, M., Ahn, S. Y., Wang, M., Makela, S. M., Lopez, A.D., Lozano, R., & Murray, C. J. (2010). Maternal mortality for 181 countries, 1980–2008: a systematic analysis of progress towards Millennium Development Goal 5. *The lancet*, 375(9726), 1609-1623.
- Holt, K., Lince, N., Hargey, A., Struthers, H., Nkala, B., McIntyre, J., Glenda, J., Coceka M., & Blanchard, K. (2012). Assessment of service availability and health care workers' opinions about young women's sexual and reproductive health in Soweto, South Africa. *African journal of reproductive health*, 16(2), 283-294.
- Huda, F. A., Chowdhuri, S., Sarker, B. K., Islam, N., & Ahmed, A. (2014). Prevalence of unintended pregnancy and needs for family planning among married adolescent girls living in urban slums of Dhaka, Bangladesh.
- Idris, S. H., Sambo, M. N., & Ibrahim, M. S. (2013). Barriers to utilisation of maternal health services in a semi-urban community in northern Nigeria: The clients' perspective. *Nigerian Medical Journal: Journal of the Nigeria Medical Association*, 54(1), 27.
- Islam, M., ed. (2007). *Health Systems Assessment Approach: A How-To Manual*. Submitted to the U.S. Agency for International Development in collaboration with Health Systems 20/20, Partners for Health Reformplus, Quality Assurance Project, and Rational Pharmaceutical Management Plus. Arlington, VA: Management Sciences for Health.
- Jackson, M., Duff, P., Kusumanigrum, S., & Stark, L. (2014). Thriving beyond survival: understanding utilization of perinatal health services as predictors of birth registration: a cross-sectional study. *BMC international health and human rights*, 14(1), 306.

- Jarosławski, S., & Saberwal, G. (2014). In eHealth in India today, the nature of work, the challenges and the finances: an interview-based study. *BMC medical informatics and decision making*, *14*(1), 1-12.
- Jeddi, F. R., Nabovati, E., Bigham, R., & Farrahi, R. (2020). Usability evaluation of a comprehensive national health information system: A heuristic evaluation. *Informatics in Medicine Unlocked*, *19*, 100332. <https://doi.org/10.1016/j.imu.2020.100332>.
- Jeddi, F. R., Nabovati, E., Bigham, R., & Khajouei, R. (2020). Usability evaluation of a Comprehensive national health information system: relationship of quality components to users' characteristics. *International journal of medical informatics*, *133*, 104026. <https://doi.org/10.1016/j.ijmedinf.2019.104026>
- Jha, P., Mills, A., Hanson, K., Kumaranayake, L., Conteh, L., Kurowski, C., Nguyen, S.N., Cruz, V.O., Ranson, K., Vaz, L.M., Yu, S., & Sachs, J. D. (2002). Improving the health of the global poor. *Science*, *295*(5562), 2036-2039.
- Juarez, F., Gayet, C., & Mejia-Pailles, G. (2018). Factors associated with unmet need for contraception in Mexico: evidence from the National Survey of Demographic Dynamics 2014. *BMC public health*, *18*(1), 1-8.
- Kana, M. A., Khanijahani, A., Raji, I. A., Adamu, A., & Linkov, F. (2022). Data Use in Public Health. In *Healthcare Information Management Systems: Cases, Strategies, and Solutions* (pp. 181-199). Cham: Springer International Publishing.
- Karp, C., Wood, S. N., Galadanci, H., Kibira, S. P. S., Makumbi, F., Omoluabi, E., Shiferaw, S., Seme, A., Tsui, A., & Moreau, C. (2020). 'I am the master key that opens and locks': Presentation and application of a conceptual framework for women's and girls' empowerment in reproductive health. *Social Science & Medicine*, *258*, 113086.
- Karr, A. F., Sanil, A. P., & Banks, D. L. (2006). Data quality: A statistical perspective. *Statistical Methodology*, *3*(2), 137-173.
- Kebede, E., Striessnig, E., & Goujon, A. (2022). The relative importance of women's education on fertility desires in sub-Saharan Africa: A multilevel analysis. *Population Studies*, *76*(1), 137-156.
- Kerber, K. J., de Graft-Johnson, J. E., Bhutta, Z. A., Okong, P., Starrs, A., & Lawn, J. E. (2007). Continuum of care for maternal, newborn, and child health: from slogan to service delivery. *The Lancet*, *370*(9595), 1358-1369.
- Kerr, K. A., Norris, T., & Stockdale, R. (2008). The strategic management of data quality in healthcare. *Health Informatics Journal*, *14*(4), 259-266.
- Khan, K. S., Wojdyla, D., Say, L., Gülmezoglu, A. M., & Van Look, P. F. (2006). WHO analysis of causes of maternal death: a systematic review. *The lancet*, *367*(9516), 1066-1074.
- Khanal, V., Adhikari, M., Karkee, R., & Gavidia, T. (2014). Factors associated with the utilisation of postnatal care services among the mothers of Nepal: analysis of Nepal demographic and health survey 2011. *BMC women's health*, *14*(1), 1-13.
- Kihuba, E., Gathara, D., Mwinga, S., Mulaku, M., Kosgei, R., Mogo, W., Nyamai, R., & English, M. (2014). Assessing the ability of health information systems in hospitals to support evidence-informed decisions in Kenya. *Global health action*, *7*(1), 24859.
- Kimaro, H. C., & Twaakyondo, H. M. (2005). Analysing the hindrance to the use of information and technology for improving efficiency of health care delivery system in Tanzania. *Tanzania Journal of Health Research*, *7*(3), 189-197.

- Knapp, C., Mumm, R., Skaal, L., & Wittwer-Backofen, U. (2018). Assessing Urban Health Data: A Case Study of Maternal and Child Health Data in Cape Town, South Africa. *Global Health Collaboration: Challenges and Lessons*, 75-89.
- Kodzi, I. A., Johnson, D. R., & Casterline, J. B. (2010). Examining the predictive value of fertility preferences among Ghanaian women. *Demographic research*, 22, 965.
- Kost, K., & Zolna, M. (2019). Challenging unintended pregnancy as an indicator of reproductive autonomy: A response. *Contraception*, 100(1), 5-9.
- Kruger, L. M., & Schoombee, C. (2010). The other side of caring: abuse in a South African maternity ward. *Journal of reproductive and infant psychology*, 28(1), 84-101.
- Kruk, M. E., Gage, A. D., Arsenault, C., Jordan, K., Leslie, H. H., Roder-DeWan, S., Adeyi, O., Barker, P., Daelmans, B., Doubova, S.V. & Pate, M. (2018). High-quality health systems in the Sustainable Development Goals era: time for a revolution. *The Lancet global health*, 6(11), e1196-e1252. [https://doi.org/10.1016/S2214-109X\(18\)30386-3](https://doi.org/10.1016/S2214-109X(18)30386-3).
- Kumar, N., & Brown, J. D. (2016). Access barriers to long-acting reversible contraceptives for adolescents. *Journal of Adolescent Health*, 59(3), 248-253.
- Kuruvilla, S., Bustreo, F., Kuo, T., Mishra, C. K., Taylor, K., Fogstad, H., Gupta, G.R., Gilmore, K., Temmerman, M., Thomas, J. and Rasanathan, K., & Costello, A. (2016). The Global strategy for women's, children's and adolescents' health (2016–2030): a roadmap based on evidence and country experience. *Bulletin of the World Health Organization*, 94(5), 398.
- Kyilleh, J. M., Tabong, P. T. N., & Konlaan, B. B. (2018). Adolescents' reproductive health knowledge, choices and factors affecting reproductive health choices: a qualitative study in the west Gonja District in northern region, Ghana. *BMC international health and human rights*, 18(1), 1-12.
- Larsson, E. C., Atkins, S., Chopra, M., & Ekström, A. M. (2009). What about health system strengthening and the internal brain drain?. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 103(5), 533-534.
- Lauro, D. (2011). Abortion and contraceptive use in sub-Saharan Africa: how women plan their families. *African Journal of Reproductive Health*, 15(1).
- Lemma, S., Janson, A., Persson, L. Å., Wickremasinghe, D., & Källestål, C. (2020). Improving quality and use of routine health information system data in low-and middle-income countries: a scoping review. *PloS one*, 15(10), e0239683.
- Limenih, M. A., Endale, Z. M., & Dachew, B. A. (2016). Postnatal care service utilization and associated factors among women who gave birth in the last 12 months prior to the study in Debre Markos town, northwestern Ethiopia: a community-based cross-sectional study. *International journal of reproductive medicine*, 2016.
- Lin, B., & Chan, H. G. (2000). Managing data quality in the health care industry: Some critical issues. *Journal of International Information Management*, 9(1), 4.
- Lince-Deroche, N., Hargey, A., Holt, K., & Shochet, T. (2015). Accessing sexual and reproductive health information and services: A mixed methods study of young women's needs and experiences in Soweto, South Africa. *African journal of reproductive health*, 19(1), 73-81.
- Lindo, J. M., & Packham, A. (2017). How much can expanding access to long-acting reversible contraceptives reduce teen birth rates? *American Economic Journal: Economic Policy*, 9(3), 348-76.
- Lippeveld, T. (2001). Routine health information systems: the glue of a unified health system issues and innovation in routine health information in developing countries workshop. *Carolina Population Center*.
- Lippeveld, T., Sauerborn, R., Bodart, C., & World Health Organization. (2000). *Design and implementation of health information systems*. World Health Organization.



- Loewenson, R. (2004). Global challenges to equity in safety and health at work: struggles for fair work in southern Africa. *Perspectives on Global Development and Technology*, 3(1), 153-170.
- Lyons-Amos, M., & Stones, T. (2017). Trends in Demographic and Health Survey data quality: an analysis of age heaping over time in 34 countries in Sub Saharan Africa between 1987 and 2015. *BMC Research Notes*, 10(1), 1-7.
- Macfarlane, S. B., AbouZahr, C., & Frank, J. (2019). Indicators for Monitoring Health Targets. In *The Palgrave Handbook of Global Health Data Methods for Policy and Practice* (pp. 25-43). Palgrave Macmillan, London.
- Machira, K., & Palamulen, M. (2017). Rural–urban differences in the use of postnatal care services in Malawi. *Journal of Egyptian Public Health Association*, 92(1), 1-10.
- Machiyama, K., Huda, F. A., Ahmmed, F., Odwe, G., Obare, F., Mumah, J. N., Wamukoya, M., Casterline, J.B., & Cleland, J. (2018). Women’s attitudes and beliefs towards specific contraceptive methods in Bangladesh and Kenya. *Reproductive health*, 15(1), 75.
- Madaka, N. C. (2019). Public health policy in resource allocation: the role of ubuntu ethics in redressing resource disparity between public and private healthcare in South Africa.
- Maïga, A., Jiwani, S. S., Mutua, M. K., Porth, T. A., Taylor, C. M., Asiki, G., Melesse, D.Y., Day, C., Strong, K.L., Faye, C.M., Viswanathan, K., & Boerma, T. (2019). Generating statistics from health facility data: the state of routine health information systems in eastern and southern Africa. *BMJ Global Health*, 4(5), e001849.
- Mak, J., Odihi, D., Wonodi, C., Ali, D., de Broucker, G., Sriudomporn, S., & Patenaude, B. (2023). Multivariate assessment of vaccine equity in Nigeria: A VERSE tool case study using demographic and health survey 2018. *Vaccine: X*, 14, 100281.
- Makombe, S. D., Hochgesang, M., Jahn, A., Tweya, H., Hedt, B., Chuka, S., Yu, J.K.L., Aberle-Grasse, J., Pasulani, O., Bailey, C. and Kamoto, K., & Harries, A. D. (2008). Assessing the quality of data aggregated by antiretroviral treatment clinics in Malawi. *Bulletin of the World Health Organization*, 86(4), 310-314.
- Malakoane, B., Heunis, J. C., Chikobvu, P., Kigozi, N. G., & Kruger, W. H. (2020). Public health system challenges in the Free State, South Africa: A situation appraisal to inform health system strengthening. *BMC Health Services Research*, 20, 1-14.
- Manya, A., & Nielsen, P. (2016). Reporting practices and data quality in health information systems in developing countries: an exploratory case study in Kenya. *Journal of Health Informatics in Developing Countries*, 10(1).
- Manyuma, D., Tshitangano, T. G., & Mudau, A. G. (2023, August). A Mixed Methods Protocol for Developing Strategies to Improve Access to Health Care Services for Refugees and Asylum Seekers in Gauteng Province, South Africa. In *Healthcare* (Vol. 11, No. 17, p. 2387). MDPI. <https://doi.org/10.3390/healthcare11172387>
- Maphumulo, W. T., & Bhengu, B. R. (2019). Challenges of quality improvement in the healthcare of South Africa post-apartheid: A critical review. *Curationis*, 42(1), 1-9.
- Marchant, T., Schellenberg, J., Peterson, S., Manzi, F., Waiswa, P., Hanson, C., Temu, S., Darious, K., Sedekia, Y., Akuze, J., & Rowe, A. K. (2014). The use of continuous surveys to generate and continuously report high quality timely maternal and newborn health data at the district level in Tanzania and Uganda. *Implementation science*, 9(1), 1-11.
- Martikainen, S., Kaipio, J., & Lääveri, T. (2020). End-user participation in health information systems (HIS) development: Physicians' and nurses' experiences. *International journal of medical informatics*, 137, 104117.
- Mascarenhas, M. N., Flaxman, S. R., Boerma, T., Vanderpoel, S., & Stevens, G. A. (2012). National, regional, and global trends in infertility prevalence since 1990: a systematic analysis of 277 health surveys. *PLoS medicine*, 9(12).

- Mavimbe, J. C., Braa, J., & Bjune, G. (2005). Assessing immunization data quality from routine reports in Mozambique. *BMC public health*, 5(1), 1-8.
- Mboera, L. E., Rumisha, S. F., Mbata, D., Mremi, I. R., Lyimo, E. P., & Joachim, C. (2021). Data utilisation and factors influencing the performance of the health management information system in Tanzania. *BMC Health Services Research*, 21, 1-8.
- Mbondji, P. E., Kebede, D., Soumbey-Alley, E. W., Zielinski, C., Kouvidila, W., & Lusamba-Dikassa, P. S. (2014). Health information systems in Africa: descriptive analysis of data sources, information products and health statistics. *Journal of the Royal Society of Medicine*, 107(1\_suppl), 34-45.
- McCaw-Binns, A., Standard-Goldson, A., Ashley, D., Walker, G., & MacGillivray, I. (2001). Access to care and maternal mortality in Jamaican hospitals: 1993–1995. *International journal of epidemiology*, 30(4), 796-801.
- Mekonnen, Y., & Mekonnen, A. (2002). *Utilization of maternal health care services in Ethiopia*. Ethiopian Health and Nutrition Research Institute.
- Merdad, L., Hill, K. & Graham, W. (2013). Improving the Measurement of Maternal Mortality: The Sisterhood Method Revisited. *PLoS ONE* 8(4): e59834.
- Merrick, T. (2007). UN Millennium Project: Public Choices, Private Decisions: Sexual and Reproductive Health and the Millennium Development Goals. *Studies in Family Planning*, 38(1), 67-69.
- Midhet, F., Becker, S., & Berendes, H. W. (1998). Contextual determinants of maternal mortality in rural Pakistan. *Social Science & Medicine*, 46(12), 1587-1598.
- Mitoko, A., Domnick, A., Okango, F., Abuje, L., Obango, P., & Oule, L. (2019). Integrating Family Planning Data in Kenya's DHIS 2.
- Mmusi-Phetoe, R., Thupayagale-Tshweneagae, G., & Akpor, O. A. (2019). Reproductive health outcomes: Insights from experts and verbal autopsies. *Curationis*, 42(1), 1-7.
- Mogekwu, F. I., Oteri, J. A., Nsubuga, P., Ezebilo, O., Maxwell, N., Wiwa, O., Braka, F., & Shuaib, F. (2021). Using data to improve outcomes of supplemental immunisation activities: 2017/2018 Nigeria measles vaccination campaign. *Vaccine*, 39, C38-C45.
- Mohan, D., Gupta, S., LeFevre, A., Bazant, E., Killewo, J., & Baqui, A. H. (2015). Determinants of postnatal care use at health facilities in rural Tanzania: multilevel analysis of a household survey. *BMC pregnancy and childbirth*, 15(1), 282.
- Moloko, S. M., & Ramukumba, M. M. (2022). Healthcare providers' views of factors influencing family planning data quality in Tshwane District, South Africa. *African Journal of Primary Health Care & Family Medicine*, 14(1), 1-10.
- Moloko, S. M., & Ramukumba, M. M. (2022). Healthcare providers' views of factors influencing family planning data quality in Tshwane District, South Africa. *African Journal of Primary Health Care & Family Medicine*, 14(1), 1-10.
- Montgomery, M. R., Stren, R., Cohen, B., & Reed, H. E. (2013). *Cities transformed: demographic change and its implications in the developing world*. Routledge.
- Moore, B. M., Alex-Hart, B. A., & George, I. O. (2011). Utilization of health care services by pregnant mothers during delivery: a community based study in Nigeria. *East African journal of public health*, 8(1), 48-50.
- Morrell, R., Jewkes, R., Lindegger, G., & Hamlall, V. (2013). Hegemonic masculinity: reviewing the gendered analysis of men's power in South Africa. *South African Review of Sociology*, 44(1), 3-21.
- Mosieur Rahman, M., Haque, S. E., & Sarwar Zahan, M. (2011). Factors affecting the utilisation of postpartum care among young mothers in Bangladesh. *Health & social care in the community*, 19(2), 138-147.

- Mostert-Phipps, N., Pottas, D., & Korpela, M. (2012). Improving continuity of care through the use of electronic records: a South African perspective. *South African Family Practice*, 54(4), 326-331.
- Motherhood, S. (1994). *Mother-Baby Package: Implementing safe motherhood in countries: Geneva, Switzerland: WHO* (Vol. 11). FHE/MSM/94.
- Moultrie, T. A., Dorrington, R. E., Hill, A. G., Hill, K., Timæus, I. M., & Zaba, B. (2013). *Tools for demographic estimation*. International Union for the Scientific Study of Population.
- Moyo, F., Mazanderani, A. H., Sherman, G. G., & Kufa, T. (2022). Population-level risk factors for vertical transmission of HIV in the national prevention of mother-to-child transmission programme in South Africa: An ecological analysis. *South African Medical Journal*, 112(3), 219-226. <https://doi.org/10.7196/samj.2022.v112i3.16041>.
- Mugo, N. S., Dibley, M. J., & Agho, K. E. (2015). Prevalence and risk factors for non-use of antenatal care visits: analysis of the 2010 South Sudan household survey. *BMC pregnancy and childbirth*, 15(1), 1-13.
- Murphy, J. P., Kgowedi, S., Naidoo, N., Girdwood, S., Jamieson, L., Soeteman, D., Resch, S., & Meyer-Rath, G. (2021). Role of data from cost and other economic analyses in healthcare decision-making for HIV, TB and sexual/reproductive health programmes in South Africa. *Health Policy and Planning*, 36(10), 1545-1551.
- Mwinnyaa, G., Hazel, E., Maïga, A., & Amouzou, A. (2021). Estimating population-based coverage of reproductive, maternal, newborn, and child health (RMNCH) interventions from health management information systems: a comprehensive review. *BMC health services research*, 21, 1-14.
- National Population Commission - NPC and ICF. 2019. Nigeria Demographic and Health Survey 2018 - Final Report. Abuja, Nigeria: NPC and ICF.
- National Population Commission - NPC/Nigeria and ICF International. 2014. Nigeria Demographic and Health Survey 2013. Abuja, Nigeria: NPC/Nigeria and ICF International. Available at <http://dhsprogram.com/pubs/pdf/FR293/FR293.pdf>.
- National Population Commission. (2013). *Nigeria demographic and health survey 2013*. National Population Commission, ICF International.
- Naz, O., Ibrahim, M., Mohiuddin, A. F., Khan, A. A., & Samad, Z. (2023). Public health data quality and evidence use in developing countries: a call to action. *Front. Public Health* 11:1194499. <https://doi.org/10.3389/fpubh.2023.1194499>.
- Ndep, A.O (2014). Informed community participation is essential to reducing maternal mortality in Nigeria. *International Journal of Health and Psychology Research*. Vol.2, Issue 1, pp.26-33.
- Ndiaye, K., Portillo, E., Ouedraogo, D., Mobley, A., & Babalola, S. (2018). High-Risk Advanced Maternal Age and High Parity Pregnancy: Tackling a Neglected Need Through Formative Research and Action. *Global Health: Science and Practice*, 6(2), 372-383.
- Ndirangu, J., Newell, M. L., Tanser, F., Herbst, A. J., & Bland, R. (2010). Decline in early life mortality in a high HIV prevalence rural area of South Africa: evidence of HIV prevention or treatment impact?. *AIDS (London, England)*, 24(4), 593. <https://doi.org/10.1097/qad.0b013e328335cff5>
- NDoH, S. S., & SAMRC, I. (2019). South Africa Demographic and Health Survey 2016. Pretoria, South Africa, and Rockville, Maryland, USA: National Department of Health (NDoH). *Statistics South Africa (Stats SA), South African Medical Research Council (SAMRC), ICF*. Available at <http://dhsprogram.com/pubs/pdf/FR337/FR337>
- Ndugga, P., Namiyonga, N. K., & Sebuwufu, D. (2020). Determinants of early postnatal care attendance: analysis of the 2016 Uganda demographic and health survey. *BMC pregnancy and childbirth*, 20(1), 1-14.

- Negash, W. D., Eshetu, H. B., & Asmamaw, D. B. (2022). Predictors of modern contraceptive use among reproductive age women in high fertility countries in sub-Saharan Africa: evidence from demographic and health surveys. *BMC Women's Health*, 22(1), 1-10.
- Neupane, S., & Doku, D. (2013). Utilization of postnatal care among Nepalese women. *Maternal and child health journal*, 17(10), 1922-1930.
- Nicol, E. (2015). Evaluating the Process and Output indicators for Maternal, Newborn and Child survival in South Africa: A comparative study of PMTCT information systems in KwaZulu-Natal and the Western Cape. PhD Thesis. Stellenbosch University.
- Nicol, E. & Bradshaw, D. (2010). Maternal, Newborn and Child Survival: data challenges. Reflections on the Millennium Development Goals. *South African health review*, 73-78.
- Nicol, E., Bradshaw, D., Philips, T. & Dudley, L. (2013). Human Factors Affecting the Quality of Routinely Collected Data in South Africa. *Studies in health technology and informatics*, 192, 788-792.
- Nicol, E., Dudley, L., & Bradshaw, D. (2016). Assessing the quality of routine data for the prevention of mother-to-child transmission of HIV: an analytical observational study in two health districts with high HIV prevalence in South Africa. *International journal of medical informatics*, 95, 60-70. <https://doi.org/10.1016/j.ijmedinf.2016.09.006>.
- Nigeria Population Commission. (2019). *Nigeria demographic and health survey 2018*. NPC, ICF.
- Novignon, J., Djossou, N. G., & Enemark, U. (2019). Childhood mortality, intra-household bargaining power and fertility preferences among women in Ghana. *Reproductive health*, 16(1), 139.
- O'Neil, S., Taylor, S., & Sivasankaran, A. (2021). Data equity to advance health and health equity in low-and middle-income countries: a scoping review. *Digital Health*, 7, 20552076211061922.
- Odetola, T. D., & Fakorede, E. O. (2018). Assessment of perinatal care satisfaction amongst mothers attending postnatal care in Ibadan, Nigeria. *Annals of global health*, 84(1), 36.
- Odhiambo-Otieno, G. W. (2005). Evaluation criteria for district health management information systems: lessons from the Ministry of Health, Kenya. *International Journal of Medical Informatics*, 74(1), 31-38.
- Odimegwu, C., Somefun, O. D., & Chukwudi, E. (2016). Reproductive health and data quality: the Nigeria 2008 demographic and health survey experience. *African Population Studies*, 30(2):2425-2440.
- Odutolu, O., Adedimeji, A., Odutolu, O., Baruwa, O., & Olatidoye, F. (2003). Economic empowerment and reproductive behaviour of young women in Osun state, Nigeria. *African Journal of Reproductive Health*, 92-100.
- Ojo, A. I. (2018). Repositioning health information management practice in Nigeria: Suggestions for Africa. *Health Information Management Journal*, 47(3), 140-144.
- 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.
- Okello, G., Gerrets, R., Zakayo, S., Molyneux, S., & Jones, C. (2018). "Every day they keep adding new tools but they don't take any away": Producing indicators for intermittent preventive treatment for malaria in pregnancy (IPTp) from routine data in Kenya. *PLoS one*, 13(1), e0189699.
- Okonofua, F. (2023). Information and communication technologies: A novel but underused approach in sexual and reproductive health and rights in Africa. *African Journal of Reproductive Health*, 27(1), 9-12.
- Okonofua, F. E. (2008). Maternal mortality prevention in Africa-need to focus on access and quality of care. *African journal of reproductive health*, 12(3), 9-12.

- Oladapo, O. T., Iyaniwura, C. A., & Sule-Odu, A. O. (2008). Quality of antenatal services at the primary care level in southwest Nigeria. *African Journal of Reproductive Health*, 12(3).
- Olagundoye, O., van Boven, K., Daramola, O., Njoku, K., & Omosun, A. (2021). Improving the accuracy of ICD-10 coding of morbidity/mortality data through the introduction of an electronic diagnostic terminology tool at the general hospitals in Lagos, Nigeria. *BMJ Open Quality*, 10(1), e000938.
- Olajubu, A. O., Olowokere, A. E., Ogundipe, M. J., & Olajubu, T. O. (2019). Predictors of Postnatal Care Services Utilization Among Women in Nigeria: A Facility-Based Study. *Journal of Nursing Scholarship*, 51(4), 408-416.
- Oluwaseyi, S. D., & Latifat, I. (2014). *Determinants of postnatal care non-utilization among women in Nigeria* (Doctoral dissertation, University of the Witwatersrand, Faculty of Humanities, School of Social Sciences).
- Onah, H. E., Ikeako, L. C., & Iloabachie, G. C. (2006). Factors associated with the use of maternity services in Enugu, southeastern Nigeria. *Social science & medicine*, 63(7), 1870-1878.
- Onah, R. C., & Olise, C. N. (2019). National social investment programme (NSIP) and sustainable poverty reduction in Nigeria: Challenges and prospects. *Journal of Humanities and Social Science*, 24(10), 20-31.
- Ononokpono, D. N., Gayawan, E., & Adedini, S. A. (2020). Regional variations in the use of postnatal care in Nigeria: a spatial analysis. *Women & Health*, 60(4), 440-455.
- Ononokpono, D. N., Odimegwu, C. O., Imasiku, E. N., & Adedini, S. A. (2014). Does it really matter where women live? A multilevel analysis of the determinants of postnatal care in Nigeria. *Maternal and child health journal*, 18(4), 950-959.
- Onuigbo, F. N. (2021). Biometric Information Management in Nigeria. *ESUT JOURNAL OF SOCIAL SCIENCES*, 6(2).
- Onyango, M. A., Owoko, S., & Oguttu, M. (2010). Factors that influence male involvement in sexual and reproductive health in western Kenya: a qualitative study. *African journal of reproductive health*, 14(4).
- Orimaye, S. O., Hale, N., Leinaar, E., Smith, M. G., & Khoury, A. (2021). Adolescent birth rates and rural–urban differences by levels of deprivation and health professional shortage areas in the United States, 2017–2018. *American Journal of Public Health*, 111(1), 136-144.
- Osuafor, G. N., Maputle, S. M., & Ayiga, N. (2018). Factors related to married or cohabiting women's decision to use modern contraceptive methods in Mahikeng, South Africa. *African journal of primary health care & family medicine*, 10(1), 1-7.
- Osuala, E. C. (2005). Introduction to research methodology: The millennium edition. *Enugu, Nigeria, Cheston Agency Ltd.*
- Ovikuomagbe, O. (2017). Determinants of maternal healthcare utilization in Nigeria. *African Research Review*, 11(2), 283-294.
- Owili, P. O., Muga, M. A., Chou, Y. J., Hsu, Y. H. E., Huang, N., & Chien, L. Y. (2016). Associations in the continuum of care for maternal, newborn and child health: a population-based study of 12 sub-Saharan Africa countries. *BMC public health*, 16(1), 1-15.
- Oyerinde, K. (2013). Can antenatal care result in significant maternal mortality reduction in developing countries. *J Community Med Health Educ*, 3(2), 2-3.
- Ozodiegwu, I. D., Ambrose, M., Battle, K. E., Bever, C., Diallo, O., Galatas, B., Runge, M., & Gerardin, J. (2021). Beyond national indicators: adapting the Demographic and Health Surveys' sampling strategies and questions to better inform subnational malaria intervention policy. *Malaria journal*, 20, 1-7.
- Pal, R., & Mehndiratta, A. (2016). Assessment of utilization of postnatal care services in tertiary care center of Delhi. *IOSR J Dental and Medical Sciences*, 15(6), 72-75.

- Parenthood, G. P. (2016). Stolen lives. A multi-country study on the health effects of forced motherhood on girls 9-14 years old. 2016. [https://www.plannedparenthoodaction.org/uploads/filer\\_public/db/6d/db6d56cb-e854-44bb-9ab7-15bb7fc147c5/ppfa-stolen-lives-english.pdf](https://www.plannedparenthoodaction.org/uploads/filer_public/db/6d/db6d56cb-e854-44bb-9ab7-15bb7fc147c5/ppfa-stolen-lives-english.pdf)
- Parkhurst, J. O., Penn-Kekana, L., Blaauw, D., Balabanova, D., Danishevski, K., Rahman, S. A., Onama, V., & Ssengooba, F. (2005). Health systems factors influencing maternal health services: a four-country comparison. *Health policy*, 73(2), 127-138.
- Pearson, L., Gandhi, M., Admasu, K., & Keyes, E. B. (2011). User fees and maternity services in Ethiopia. *International journal of gynecology & obstetrics*, 115(3), 310-315.
- Pérez, W., Ekholm Selling, K., Zelaya Blandón, E., Peña, R., Contreras, M., Persson, L. Å., Sysoev, O., & Källestål, C. (2021). Trends and factors related to adolescent pregnancies: an incidence trend and conditional inference trees analysis of northern Nicaragua demographic surveillance data. *BMC pregnancy and childbirth*, 21(1), 1-14.
- Phillips, D. E., AbouZahr, C., Lopez, A. D., Mikkelsen, L., De Savigny, D., Lozano, R., Wilmoth J., & Setel, P. W. (2015). Are well functioning civil registration and vital statistics systems associated with better health outcomes? *The Lancet*, 386(10001), 1386-1394.
- Phuti, K. (2018). *Influence of feminist cultural practices on married adolescent girls sexuality in the context of HIV and AIDS* (Doctoral dissertation, University of South Africa).
- Pons-Duran, C., Lucas, A., Narayan, A., Dabalen, A., & Menéndez, C. (2019). Inequalities in sub-Saharan African women's and girls' health opportunities and outcomes: evidence from the Demographic and Health Surveys. *Journal of global health*, 9(1).
- Potter, J. E., Stevenson, A. J., Coleman-Minahan, K., Hopkins, K., White, K., Baum, S. E., & Grossman, D. (2019). Challenging unintended pregnancy as an indicator of reproductive autonomy. *Contraception*, 100(1), 1-4.
- Pradhan, R., Wynter, K., & Fisher, J. (2015). Factors associated with pregnancy among adolescents in low-income and lower middle-income countries: a systematic review. *J Epidemiol Community Health*, 69(9), 918-924.
- Prata, N., Passano, P., Rowen, T., Bell, S., Walsh, J., & Potts, M. (2011). Where there are (few) skilled birth attendants. *Journal of health, population, and nutrition*, 29(2), 81.
- Promundo, C. (2013). *REDMAS. Program P: A Manual for Engaging Men in Fatherhood, Caregiving, Maternal and Child Health. Rio de Janeiro, Brazil and Washington, DC USA: Promundo.*
- Rajaratnam, J. K., Marcus, J. R., Flaxman, A. D., Wang, H., Levin-Rector, A., Dwyer, L., Costa, M., Lopez, A.D., & Murray, C. J. (2010). Neonatal, postneonatal, childhood, and under-5 mortality for 187 countries, 1970–2010: a systematic analysis of progress towards Millennium Development Goal 4. *The Lancet*, 375(9730), 1988-2008.
- Ranji, U., Salganicoff, A., Sobel, L., Rosenzweig, C., & Gomez, I. (2017). Financing family planning services for low-income women: The role of public programs. The Henry J. Kaiser Family Foundation.
- Rice, J. (2008). Material consumption and social well-being within the periphery of the world economy: an ecological analysis of maternal mortality. *Social Science Research*, 37(4), 1292-1309.
- Ross, D. A., & Vaughan, J. P. (1986). Health interview surveys in developing countries: a methodological review. *Studies in family planning*, 17(2), 78-94.
- Rumisha, S. F., Lyimo, E. P., Mremi, I. R., Tungu, P. K., Mwingira, V. S., Mbata, D., Malekia, S.E., Joachim, C., & Mboera, L. E. (2020). Data quality of the routine health management information system at the primary healthcare facility and district levels in Tanzania. *BMC medical informatics and decision making*, 20(1), 1-22.

- Rusibamayila, A., Phillips, J., Kalollela, A., Jackson, E., & Baynes, C. (2017). Factors influencing pregnancy intentions and contraceptive use: an exploration of the ‘unmet need for family planning in Tanzania. *Culture, health & sexuality*, 19(1), 1-16.)
- Sachs, J. D. (2012). From millennium development goals to sustainable development goals. *The Lancet*, 379(9832), 2206-2211.
- Sacks, E., Masvawure, T. B., Atuyambe, L. M., Neema, S., Macwan’gi, M., Simbaya, J., & Kruk, M. (2017). Postnatal care experiences and barriers to care utilization for home-and facility-delivered newborns in Uganda and Zambia. *Maternal and child health journal*, 21(3), 599-606.
- Sakeah, E., Aborigo, R., Sakeah, J. K., Dalaba, M., Kanyomse, E., Azongo, D., Anaseba, D., Oladokun, S., & Oduro, A. R. (2018). The role of community-based health services in influencing postnatal care visits in the Builsa and the West Mamprusi districts in rural Ghana. *BMC pregnancy and childbirth*, 18(1), 1-9.
- Samuel, O., Zewotir, T., & North, D. (2021). Decomposing the urban–rural inequalities in the utilisation of maternal health care services: evidence from 27 selected countries in Sub-Saharan Africa. *Reproductive Health*, 18(1), 1-12. <https://doi.org/10.1186/s12978-021-01268-8>
- Samuel, O., Zewotir, T., & North, D. (2021). Decomposing the urban–rural inequalities in the utilisation of maternal health care services: evidence from 27 selected countries in Sub-Saharan Africa. *Reproductive Health*, 18(1), 1-12.
- Santelli, J. S., Song, X., Garbers, S., Sharma, V., & Viner, R. M. (2017). Global trends in adolescent fertility, 1990–2012, in relation to national wealth, income inequalities, and educational expenditures. *Journal of adolescent health*, 60(2), 161-168.
- Schneider, H., & Gilson, L. (1999). The impact of free maternal health care in South Africa.
- Schonfeldt, A., Masilela, T., Barron, P., & English, R. (2011). Health information systems in South Africa. *South African health review*, 2011(1), 81-89.
- Schwandt, H. M., Skinner, J., Hebert, L. E., Cobb, L., Saad, A., & Odeku, M. (2017). Inadequate birth spacing is perceived as riskier than all family planning methods, except sterilization and abortion, in a qualitative study among urban Nigerians. *BMC women's health*, 17(1), 80.
- Scobie, H. M., Edelstein, M., Nicol, E., Morice, A., Rahimi, N., MacDonald, N. E., Danovaro-Holliday, M.C., & Jawad, J. (2020). Improving the quality and use of immunization and surveillance data: Summary report of the Working Group of the Strategic Advisory Group of Experts on Immunization. *Vaccine*, 38(46), 7183-7197.
- Scott, V., & Gilson, L. (2017). Exploring how different modes of governance act across health system levels to influence primary healthcare facility managers’ use of information in decision-making: experience from Cape Town, South Africa. *International Journal for Equity in Health*, 16(1), 1-15.
- Sedgh, G., Hussain, R., Bankole, A., & Singh, S. (2007). Women with an unmet need for contraception in developing countries and their reasons for not using a method. *Occasional report*, 37, 5-40.
- Shaikh, B. T., & Hatcher, J. (2005). Health seeking behaviour and health service utilization in Pakistan: challenging the policy makers. *Journal of public health*, 27(1), 49-54.
- Shakarishvili, G., Atun, R., Berman, P., Hsiao, W., Burgess, C., & Lansang, M. A. (2010). Converging health systems frameworks: towards a concepts-to-actions roadmap for health systems strengthening in low and middle income countries. *Global Health Governance*, 3(2).
- Sharma, R., Biedenharn, K. R., Fedor, J. M., & Agarwal, A. (2013). Lifestyle factors and reproductive health: taking control of your fertility. *Reproductive Biology and Endocrinology*, 11(1), 66.

- Shija, A. E., Msovela, J., & Mboera, L. E. (2011). Maternal health in fifty years of Tanzania independence: challenges and opportunities of reducing maternal mortality. *Tanzania Journal of Health Research*, 13(5).
- Sidze, E. M., Beekink, E., & Maina, B. W. (2015). Challenges associated with tracking resources allocation for reproductive health in sub-Saharan African countries: the UNFPA/NIDI resource flows project experience. *Reproductive Health*, 12(1), 1-5.
- Sidze, E. M., Wekesah, F. M., Kisia, L., & Abajobir, A. (2022). Inequalities in access and utilization of maternal, newborn and child health services in sub-Saharan Africa: A special focus on urban settings. *Maternal and Child Health Journal*, 1-30.
- Simbayi, L. C. Z. K., Zuma, K., Zungu, N., Moyo, S., Marinda, E., Jooste, S., Mabaso, M., Ramlagan, S., North, A., Van Zyl, J., Mohlabane, N., & Naidoo, I. (2019). South African national HIV prevalence, incidence, behaviour and communication survey, 2017: towards achieving the UNAIDS 90-90-90 targets.
- Singh, K., Brodish, P., & Haney, E. (2014). Postnatal care by provider type and neonatal death in sub-Saharan Africa: a multilevel analysis. *BMC public health*, 14(1), 1-7.
- Singh, K., Brodish, P., Chowdhury, M. E., Biswas, T. K., Kim, E. T., Godwin, C., & Moran, A. (2017). Postnatal care for newborns in Bangladesh: The importance of health-related factors and location. *Journal of global health*, 7(2).
- Snee, N. L., & McCormick, K. A. (2004). The case for integrating public health informatics networks. *IEEE Engineering in Medicine and Biology Magazine*, 23(1), 81-88.
- So, L., Beck, C. A., Brien, S., Kennedy, J., Feasby, T. E., Ghali, W. A., & Quan, H. (2010). Chart documentation quality and its relationship to the validity of administrative data discharge records. *Health informatics journal*, 16(2), 101-113.
- 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.
- Speizer, I. S., & Lance, P. (2015). Fertility desires, family planning use and pregnancy experience: longitudinal examination of urban areas in three African countries. *BMC pregnancy and childbirth*, 15(1), 294.
- Speizer, I. S., Corroon, M., Calhoun, L. M., Gueye, A., & Guilkey, D. K. (2018). Association of men's exposure to family planning programming and reported discussion with partner and family planning use: The case of urban Senegal. *PloS one*, 13(9), e0204049.
- Sullivan, J. M., Bicego, G. T., & Rutstein, S. O. (1991). An assessment of DHS-I data quality DHS Methodological Reports No 1. *Columbia: Institute for Resource Development/Macro Systems, Inc*, 113-143.
- Sulthana, B., Shewade, H. D., Sunderamurthy, B., Manoharan, K., & Subramanian, M. (2015). Unmet need for contraception among married women in an urban area of Puducherry, India. *The Indian journal of medical research*, 141(1), 115.
- Sundstrom, B., DeMaria, A. L., Ferrara, M., Meier, S., & Billings, D. (2019). "The closer, the better:" the role of telehealth in increasing contraceptive access among women in rural South Carolina. *Maternal and Child Health Journal*, 23(9), 1196-1205.
- Susuman, A. S. (2015). Health care services and maternal education in South Africa. *Scandinavian journal of public health*, 43(7), 673-676.
- Susuman, A. S., Bado, A., & Lailulo, Y. A. (2014). Promoting family planning use after childbirth and desire to limit childbearing in Ethiopia. *Reproductive health*, 11(1), 53.
- Sutton, A., Lichter, D. T., & Sessler, S. (2019). Rural-urban disparities in pregnancy intentions, births, and abortions among US adolescent and young women, 1995-2017. *American Journal of Public Health*, 109(12), 1762-1769.
- Takai, I. U., Dlakwa, H. D., Bukar, M., Audu, B. M., & Kwayabura, A. S. (2015). Factors responsible for under-utilization of postnatal care services in Maiduguri, north-eastern Nigeria. *Sahel Medical Journal*, 18(3), 109.



- Tamirat, K. S., Sisay, M. M., Tesema, G. A., & Tessema, Z. T. (2021). Determinants of adverse birth outcome in Sub-Saharan Africa: analysis of recent demographic and health surveys. *BMC Public Health*, *21*(1), 1-10.
- Tang, P. C., LaRosa, M. P., & Gorden, S. M. (1999). Use of computer-based records, completeness of documentation, and appropriateness of documented clinical decisions. *Journal of the American Medical Informatics Association*, *6*(3), 245-251.
- Teka, T. T., Feyissa, T. R., Melka, A. S., & Bobo, F. T. (2018). Role of antenatal and postnatal care in contraceptive use during postpartum period in western Ethiopia: a cross sectional study. *BMC research notes*, *11*(1), 1-6.
- Teslow, M. S., Wilde, D. J., & Abdelhak, M. (2001). Data collection standards. *Health Information Management of a Strategic Resource. 2nd edn. Philadelphia: WB Saunders Company.*
- 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*, 1-12.
- Tessema, Z. T., Yazachew, L., Tesema, G. A., & Teshale, A. B. (2020). Determinants of postnatal care utilization in sub-Saharan Africa: a meta and multilevel analysis of data from 36 sub-Saharan countries. *Italian journal of pediatrics*, *46*(1), 1-11.
- Tessema, Z. T., Yazachew, L., Tesema, G. A., & Teshale, A. B. (2020). Determinants of postnatal care utilization in sub-Saharan Africa: a meta and multilevel analysis of data from 36 sub-Saharan countries. *Italian journal of pediatrics*, *46*(1), 1-11.
- Thaddeus, S., & Maine, D. (1994). Too far to walk: maternal mortality in context. *Social science & medicine*, *38*(8), 1091-1110.
- The Markle Foundation. (2006). "Background Issues on data quality". Connecting for health common framework.
- Ties Boerma, J., & Sommerfelt, A. E. (1993). Demographic and health surveys (DHS: contributions and limitations. *World health statistics quarterly 1993*; *46* (4): 222-226.
- Ties Boerma, J., & Sommerfelt, A. E. (1993). Demographic and health surveys (DHS: contributions and limitations. *World health statistics quarterly 1993*; *46* (4): 222-226.
- Tijani, B., Jaiyeola, T., Oladejo, B., & Kassam, Z. (2021). Improving data integrity in public health: a case study of an outbreak management system in Nigeria. *Global Health: Science and Practice*, *9*(Supplement 2), S226-S233.
- Timerga, G., & Hailemeskel, S. (2018). Trend analysis on maternal health care services utilization in Amhara Region Referral Hospitals, Ethiopia. *Int J Nutr Food Sci*, *7*(3), 81.
- Titaley, C. R., Dibley, M. J., & Roberts, C. L. (2009). Factors associated with non-utilisation of postnatal care services in Indonesia. *Journal of Epidemiology & Community Health*, *63*(10), 827-831.
- Titaley, C. R., Dibley, M. J., & Roberts, C. L. (2009). Factors associated with non-utilisation of postnatal care services in Indonesia. *Journal of Epidemiology & Community Health*, *63*(10), 827-831.
- Titaley, C. R., Hunter, C. L., Heywood, P., & Dibley, M. J. (2010). Why don't some women attend antenatal and postnatal care services? a qualitative study of community members' perspectives in Garut, Sukabumi and Ciamis districts of West Java Province, Indonesia. *BMC pregnancy and childbirth*, *10*(1), 61.
- Tsawe, M., & Susuman, A. S. (2020). Factors associated with the upsurge in the use of delivery care services in Sierra Leone. *Public Health*, *180*, 74-81.
- Tsui, A. O., Cardona, C., Srivatsan, V., OlaOlorun, F., Omoluabi, E., Akilimali, P., Gichangi, P., Thiongo, M., PMA Agile Team, Radloff, S., & Anglewicz, P. (2021). Is client reporting

- on contraceptive use always accurate? Measuring consistency and change with a multicountry study. *Studies in family planning*, 52(3), 361-382.
- Tumbure, A., Argaw, D., Fantahun, E., Negusu, M., Yitbarek, T., Tadesse, L., & Desalegn, T. (2018). Assessment of postnatal care service utilization and associated factors in Asella town, Arsi zone, Oromiya regional state, Ethiopia. *Global Journal of Reproductive Medicine*, 6(1), 13-20.
- Tyson, N. A. (2019). Reproductive health: options, strategies, and empowerment of women. *Obstetrics and Gynecology Clinics*, 46(3), 409-430.
- Uchendu, O. C., Ilesanmi, O. S. & Olumide, A. E. (2013). Factors Influencing The Choice Of Health Care Providing Facility Among Workers In A Local Government Secretariat In South Western Nigeria. *Annals of Ibadan Postgraduate Medicine*, 11(2), 87-95.
- United Nations. Statistical Division. (2006). *The world's women 2005: Progress in statistics*. UN.
- Upadhyay, U. D., & Karasek, D. (2012). Women's empowerment and ideal family size: an examination of DHS empowerment measures in Sub-Saharan Africa. *International perspectives on sexual and reproductive health*, 78-89.
- Uzochukwu, B. S. C., Onwujekwe, O. E., & Akpala, C. O. (2004). Community satisfaction with the quality of maternal and child health services in southeast Nigeria. *East African medical journal*, 81(6), 293-299.
- Uzochukwu, B., Mirzoev, T., Okeke, C., Hicks, J., Etiaba, E., Obi, U., Ensor, T., Uzochukwu, A., & Onwujekwe, O. (2020). ‘‘Did an Intervention Programme Aimed at Strengthening the Maternal and Child Health Services in Nigeria Improve the Completeness of Routine Health Data Within the Health Management Information System?’’ *International Journal of Health Policy and Management*.
- Uzochukwu, B., Mirzoev, T., Okeke, C., Hicks, J., Etiaba, E., Obi, U., Ensor, T., Uzochukwu, A., & Onwujekwe, O. (2022). Did an Intervention Programme Aimed at Strengthening the Maternal and Child Health Services in Nigeria Improve the Completeness of Routine Health Data Within the Health Management Information System?. *International journal of health policy and management*, 11(7), 937.
- Van Duong, D., Binns, C. W., Lee, A. H., & Hipgrave, D. B. (2004). Measuring client-perceived quality of maternity services in rural Vietnam. *International journal for quality in health care*, 16(6), 447-452.
- Veinot, T. C., Ancker, J. S., & Bakken, S. (2019). Health informatics and health equity: improving our reach and impact. *Journal of the American Medical Informatics Association*, 26(8-9), 689-695.
- Vetrò, A., Canova, L., Torchiano, M., Minotas, C. O., Iemma, R., & Morando, F. (2016). Open data quality measurement framework: Definition and application to Open Government Data. *Government Information Quarterly*, 33(2), 325-337.
- Victora, C. G., Barros, A. J., Axelson, H., Bhutta, Z. A., Chopra, M., França, G. V., Kerber, K., Kirkwood, B.R., Newby, H., Ronsmans, C., & Boerma, J. T. (2012). How changes in coverage affect equity in maternal and child health interventions in 35 Countdown to 2015 countries: an analysis of national surveys. *The Lancet*, 380(9848), 1149-1156.
- Victora, C. G., Matijasevich, A., Silveira, M. F., Santos, I. S., Barros, A. J. D., & Barros, F. C. (2010). Socio-economic and ethnic group inequities in antenatal care quality in the public and private sector in Brazil. *Health policy and planning*, 25(4), 253-261.6
- Villar, J., Carroli, G., Khan-Neelofur, D., Piaggio, G., & Gülmezoglu, M. (2002). Patterns of routine antenatal care for low-risk pregnancy. *Cochrane Database of Systematic Reviews*, (2).

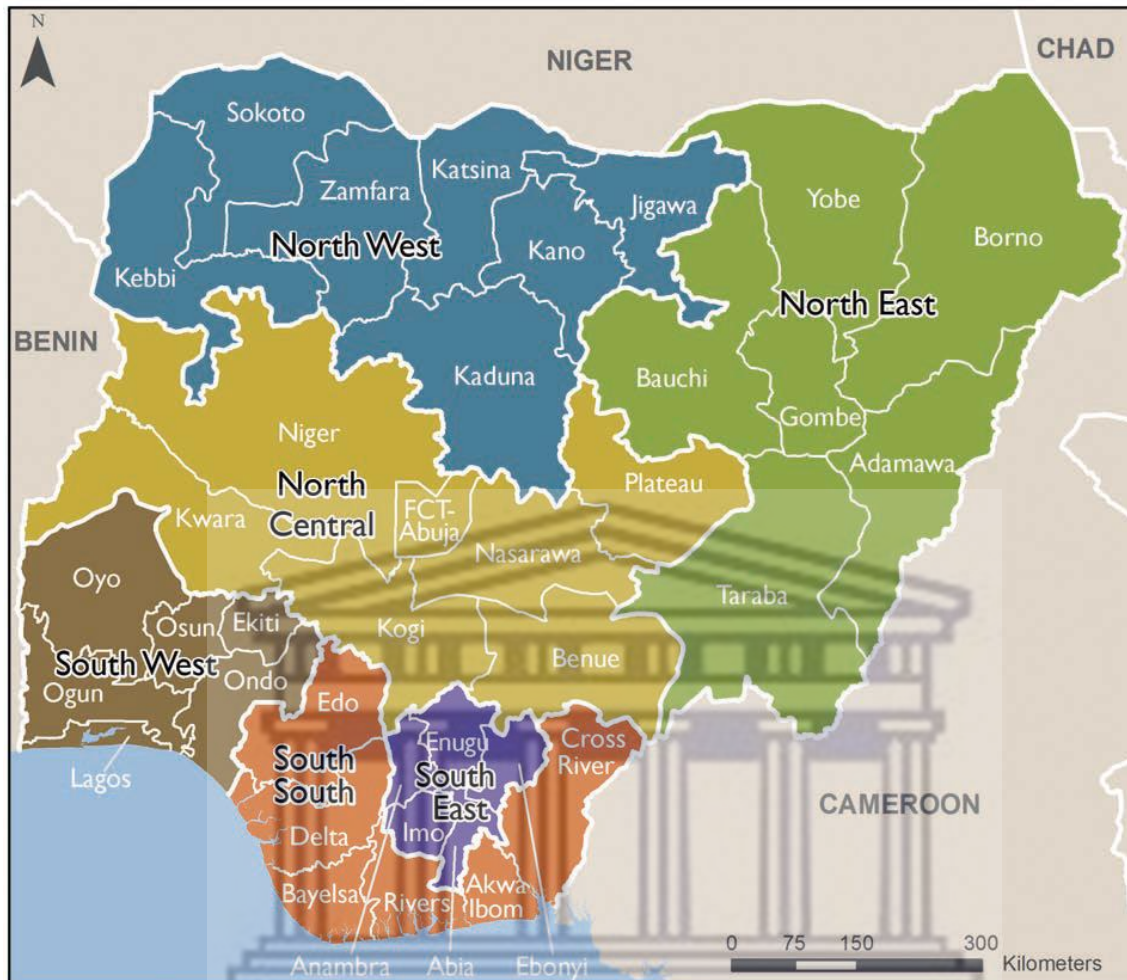
- Vinutha, U. M., Kulloli, S., & Hegde, P. R. (2022). Postnatal Care of Mothers: Knowledge, Nutritional Status and Utilization of Postnatal Care Services. *J Edu Psyc Res*, 4 (1), 312, 319, 2690-0726. <https://doi.org/10.33140/jepr.04.01.06>
- Wabiri, N., Chersich, M., Zuma, K., Blaauw, D., Goudge, J., & Dwane, N. (2013). Equity in maternal health in South Africa: analysis of health service access and health status in a national household survey. *PLoS One*, 8(9), e73864.
- Wado, Y. D., Gurmu, E., Tilahun, T., & Bangha, M. (2019). Contextual influences on the choice of long-acting reversible and permanent contraception in Ethiopia: A multilevel analysis. *PloS one*, 14(1).
- Wagenaar, B. H., Gimbel, S., Hoek, R., Pfeiffer, J., Michel, C., Manuel, J. L., Cuembelo, F., Quembo, T., Afonso, P., Porthé, V., Gloyd, S., & Sherr, K. (2015). Effects of a health information system data quality intervention on concordance in Mozambique: time-series analyses from 2009–2012. *Population Health Metrics*, 13(1), 1-5.
- Wagstaff, A., Eozenou, P. H. V., Neelsen, S., & Smits, M. F. (2019). The 2019 update of the health equity and financial protection indicators database: an overview. *World Bank Policy Research Working Paper*, (8879).
- Wai, M. M., Bjertness, E., Stigum, H., Htay, T. T., Liabsuetrakul, T., Moe Myint, A. N., & Sundby, J. (2019). Unmet need for family planning among urban and rural married women in Yangon region, Myanmar—a cross-sectional study. *International journal of environmental research and public health*, 16(19), 3742.
- WHO (2010). Key Components of a well-functioning health information system. World Health Organization, Geneva, Switzerland.
- Winter, A. F., Ammenwerth, E., Bott, O. J., Brigl, B., Buchauer, A., Gräber, S., Grant, A., Häber, A., Hasselbring, W., Haux, R. and Heinrich, A. (2001). Strategic information management plans: the basis for systematic information management in hospitals. *International Journal of Medical Informatics*, 64(2-3), 99-109.
- Woldeamanuel, B. T. (2019). Socioeconomic, demographic, and environmental determinants of under-5 mortality in Ethiopia: evidence from Ethiopian demographic and health survey, 2016. *Child Development Research*, 2019.
- World Health Organisation (2008). Framework and standards for country health information system. Health Metrics Network. Second Edition. World Health Organization, Geneva, Switzerland.
- World Health Organization (WHO) (2012) Management of patient information: trends and challenges in member states. Global Observatory for eHealth series. Geneva: World Health Organization. World Health Organization (WHO) (2012) Management of patient information: trends and challenges in member states. Global Observatory for eHealth series. Geneva: World Health Organization.
- World Health Organization. (1992). ICD-10. International Statistical Classification of Diseases and Related Health Problems: Tenth Revision 1992, Volume 1= CIM-10. Classification statistique internationale des maladies et des problèmes de santé connexes: Dixième Révision 1992, Volume 1.
- World Health Organization. (1997). *Monitoring reproductive health: selecting a short list of national and global indicators* (No. WHO/RHT/HRP/97.26). World Health Organization.
- World Health Organization. (2000). The world health report 2000: health systems: improving performance. World Health Organization.
- World Health Organization. (2004). *Beyond the numbers: reviewing maternal deaths and complications to make pregnancy safer*. World Health Organization.
- World Health Organization. (2004). Global and regional estimates of the incidence of unsafe abortion and associated mortality. *Unsafe Abortion, 4th edn*. Geneva: World Health Organization.

- World Health Organization. (2004). *International Statistical Classification of Diseases and related health problems: Alphabetical index* (Vol. 3). World Health Organization.
- World Health Organization. (2004). *Making pregnancy safer: the critical role of the skilled attendant: a joint statement by WHO, ICM and FIGO*. World health organization.
- World Health Organization. (2004). Reproductive health strategy to accelerate progress towards the attainment of international development goals and targets (No. WHO/RHR/04.8). World Health Organization.
- World Health Organization. (2006). *Reproductive health indicators: guidelines for their generation, interpretation and analysis for global monitoring*. World Health Organization.
- World Health Organization. (2007). Maternal mortality in 2005: estimates developed by WHO, UNICEF, UNFPA, and the World Bank.
- World Health Organization. (2007). Task shifting to tackle health worker shortages. *Geneva: WHO*. <http://www.who.int/hiv/toronto2006/takingstocktrr.pdf>
- World Health Organization. (2010). *Monitoring the building blocks of health systems: a handbook of indicators and their measurement strategies*. World Health Organization.
- World Health Organization. (2010). *The world health report: health systems financing: the path to universal coverage: executive summary* (No. WHO/IER/WHR/10.1). World Health Organization.
- World Health Organization. (2011). *WHO guidelines on preventing early pregnancy and poor reproductive health outcomes among adolescents in developing countries*. World Health Organization.
- World Health Organization. (2014). *WHO recommendations on postnatal care of the mother and newborn*. World Health Organization.
- World Health Organization. (2015). Accountability for women's and children's health: 2015 progress report.
- World Health Organization. (2015). *Trends in maternal mortality: 1990-2015: estimates from WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division*. World Health Organization.
- World Health Organization. (2016). *World health statistics 2016: monitoring health for the SDGs sustainable development goals*. World Health Organization.
- World Health Organization. (2022). *WHO recommendations on maternal and newborn care for a positive postnatal experience*. World Health Organization.
- World Health Organization. Department of Making Pregnancy Safer, & World Health Organization. (2010). *Counselling for maternal and newborn health care: A handbook for building skills*. World Health Organization.
- Yadav, K., Agarwal, M., Shukla, M., Singh, J. V., & Singh, V. K. (2020). Unmet need for family planning services among young married women (15–24 years) living in urban slums of India. *BMC women's health*, 20(1), 1-17.
- Yaya, S., & Ghose, B. (2018). Prevalence of unmet need for contraception and its association with unwanted pregnancy among married women in Angola. *PloS one*, 13(12), e0209801.
- Yaya, S., Bishwajit, G., Uthman, O. A., & Amouzou, A. (2018). Why some women fail to give birth at health facilities: a comparative study between Ethiopia and Nigeria. *PloS one*, 13(5), e0196896.
- Yaya, S., Odusina, E. K., & Bishwajit, G. (2019). Prevalence of child marriage and its impact on fertility outcomes in 34 sub-Saharan African countries. *BMC international health and human rights*, 19(1), 1-11.
- Yazbeck, A. S. (2004). Real and perceived threats to reproductive health: A way forward. *Reproductive Health Matters*, 12(24), 25-34.
- Zhao, S., Zhang, Y., Xiao, A. Y., He, Q., & Tang, K. (2023). Key factors associated with quality of postnatal care: a pooled analysis of 23 countries. *EClinicalMedicine*, 62.

## APPENDICES

### Appendix A

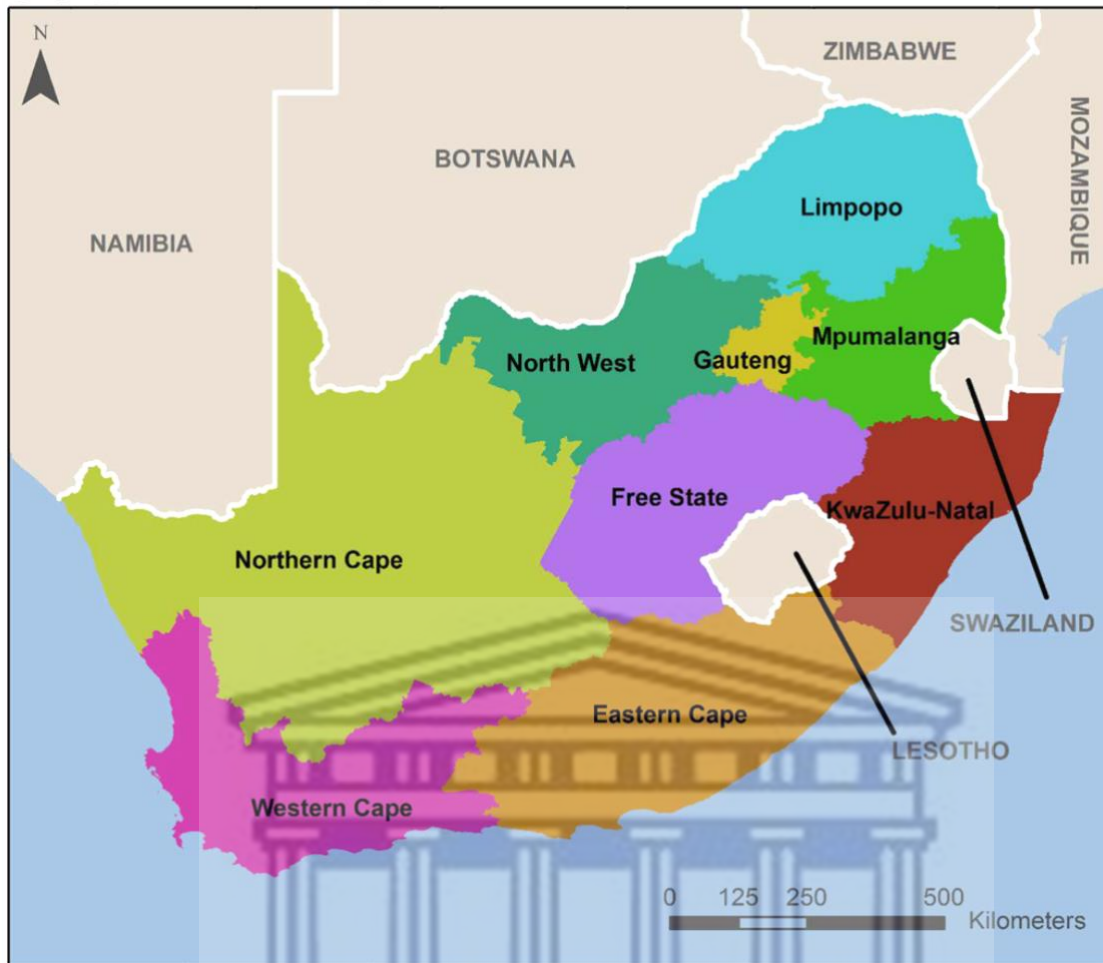
# NIGERIA



**Figure 12:** Map of Nigeria, extracted from the NDHS report.

UNIVERSITY of the  
WESTERN CAPE

## SOUTH AFRICA



**Figure 13:** Map of South Africa, extracted from the SADHS report.

UNIVERSITY of the  
WESTERN CAPE



UNIVERSITY *of the*  
WESTERN CAPE