

Community-based prevention of stillbirths in Nigeria: a mixed methods study



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By

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Dedication

“To mum and everyone working across different fields and settings to improve maternal and newborn health.”

To God be the glory

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Abstract

Background

Each year, 182,000 babies are stillborn in Nigeria, ~10% of the global burden of stillbirths. Most stillbirth prevention in Nigeria has been hospital-focused, but with over 60% of childbirths in Nigeria occurring outside health facilities, community-based prevention strategies could be transformative. There is a dearth of evidence to guide policy and development of such interventions in Nigeria. This thesis aimed to review existing evidence, estimate the incidence and investigate the determinants of antepartum and intrapartum stillbirths in Imo State, and utilise women's and health workers' insights to generate evidence-based recommendations for community-based stillbirth prevention in Nigeria.

Methods

A systematic review and meta-analysis were conducted to ascertain the types, completeness of reporting, effects and acceptability of community-based interventions for stillbirth prevention implemented in sub-Saharan Africa. A convergent parallel mixed-methods study consisting of a case-control study and a descriptive qualitative study was conducted in Imo State, Nigeria. Data from 157 antepartum and 193 intrapartum stillbirths and 381 livebirths (controls) were collected from 20 secondary hospitals. Crude stillbirth rates were calculated, and independent multivariable logistic regression models were used to investigate the association of potential risk factors with each stillbirth type. Thirty in-depth interviews and three focus group discussions were conducted with women who had stillbirths and near-misses and health workers. Interview and focus group transcripts were analysed using thematic analysis, with findings organised according to the socioecological model.

Results

The interventions identified in the systematic review were: nutritional, infection prevention, improving access to skilled childbirth attendants and health knowledge/behaviour of women.

Interventions were generally acceptable; few studies explored women's perceptions, omitting key constructs like ethicality and the burden of intervention. Interventions combining community and hospital-based approaches significantly reduced the odds by 17%.

In the case-control study, 38 out of every 1,000 babies born in the study hospitals were stillborn. The rates of antepartum and intrapartum stillbirths were 16 and 19 per 1,000, respectively. The risk factors independently associated with antepartum stillbirths were nulliparity (adjusted odds ratio (aOR) 1.87; 95%CI 1.04-3.36); preterm birth (aOR 14.29; 6.31-32.38); being referred from another facility (aOR 3.75; 1.96-7.17); unbooked pregnancy (aOR 2.58; 1.37-4.85); and obstetric complications (aOR 4.04; 2.35-6.94). For intrapartum stillbirths, associated factors were preterm birth (aOR 11.28; 4.66-27.24); referral (aOR 2.50; 1.19-5.24); not using a partogram (aOR 2.92; 1.23-6.95) and obstetric complications (aOR 10.71; 5.92-19.37). The qualitative study participants highlighted that factors including woman's health knowledge, her source of health information, harmful cultural norms, socioeconomic and family context, and inadequacies within the health system exacerbate the risk of stillbirths. They suggested interventions with a dual approach using tailored interventions at the community and hospital levels.

Discussion and conclusion

The factors contributing to stillbirths in Imo State go beyond clinical care. Clinical and service-related risk factors are intertwined with complex sociocultural barriers. To design effective interventions, these nuances must be understood. The findings of the primary research conducted for this thesis align with those of the systematic review, emphasising that combined community and hospital-based interventions are essential. Additionally, interventions and policies for the prevention of stillbirths in Imo State must go beyond a one-size-fits-all approach to focusing on co-creating multifaceted strategies that are context-specific, adaptable and culturally relevant and involve all relevant stakeholders, including women.

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Statement of contribution to work

I, Uchenna Gwacham-Anisiobi, confirm that the work presented in this thesis is my own. I conceptualised the research project (together with Associate Prof Manisha Nair), secured funding, obtained the necessary ethical approvals, and engaged the local collaborator who supported hospital recruitment. I hired and trained local staff in the 20 project hospitals, sampled and recruited participants for both primary studies, cleaned the data, conducted all analyses and wrote the thesis.

I am the first author of three published articles from the systematic and meta-analysis described in Chapter Two and the case-control study described in Chapter Four. This project was supervised from its inception by Associate Prof Manisha Nair, Associate Prof Charles Opondo and Prof Jenny Kurinczuk, who provided advice on the study design, methodology, statistical analysis and interpretation of results. Dr Jenny McLeish joined the supervision team at the start of my qualitative study and provided expert advice on qualitative methods and analysis. All supervisors provided feedback on the thesis.

In addition, the following co-authors contributed to the work presented in each manuscript. They assisted with manuscript preparation and review: Yeeben Ysabelle Boo, Dr Adetola Oladimeji, and Mr Geoffrey Anyaegbu. Additionally, Yeeben Ysabelle Boo and Dr Adetola Oladimeji independently screened abstracts and full text and assessed the quality of included papers in the systematic review presented in Chapter Two. Dr Adetola Oladimeji, Ms Victoria Yesufu, and Dr Jenny McLeish served as second coders for the qualitative work and supported the qualitative data analysis presented in chapter five. The co-authors of the published and submitted publications have given their permission to include all relevant material in this thesis.

List of publications

Peer-reviewed publications arising from thesis research:

Gwacham-Anisiobi, U., Boo, Y.Y., Oladimeji, A., Kurinczuk, J.J., Roberts, N., Opondo, C. and Nair, M., 2023. Types, reporting and acceptability of community-based interventions for stillbirth prevention in sub-Saharan Africa (SSA): a systematic review. *EClinicalMedicine*, 62.

Gwacham-Anisiobi, U., Boo, Y.Y., Oladimeji, A., Kurinczuk, J.J., Roberts, N., Opondo, C. and Nair, M., 2024. Effects of community-based interventions for stillbirths in sub-Saharan Africa: a systematic review and meta-analysis. *EClinicalMedicine*, 67.

Gwacham-Anisiobi, U., Opondo, C., Cheng, T.S., Kurinczuk, J.J., Anyaegbu, G. and Nair, M., 2024. Rates and risk factors for antepartum and intrapartum stillbirths in 20 secondary hospitals in Imo State, Nigeria: A hospital-based case-control study. *PLOS Global Public Health*, 4(10), p.e0003771.

Publication arising from thesis research (in development at the time of final thesis submission):

- Qualitative paper - When culture meets care: exploring sociocultural obstacles to medical advice in pregnancy in Nigeria.

List of conference papers and presentations

1. 'Effect of Community-Based Interventions on Preventing Stillbirths in Sub-Saharan Africa (SSA): A Mixed-Method Systematic Review and Meta-analysis' at the International Maternal Newborn Health Conference, Cape Town, South Africa. (Poster presentation, 8 May, 2023)
2. 'Effect of community-based interventions on preventing stillbirths in sub-Saharan Africa (SSA): a mixed-method systematic review and meta-analysis' at the XXIV FIGO World Congress of Gynecology and Obstetrics (FIGO), Paris, France. (Oral presentation, 11 October, 2023)

3. 'Stillbirths – what can we learn from India and Nigeria?' at the OxPop Global Maternal and Perinatal Health Symposium, University of Oxford. (Oral presentation, 31 January 2024)
4. 'Numbers and Narratives: A Mixed-Methods Investigation of Community Influences on Stillbirths in Nigeria' at the Applied Health Research Day, University of Oxford (Oral presentation, 30th September, 2024).
5. 'Rates and risk factors for antepartum and intrapartum stillbirths in 20 secondary hospitals in Imo State, Nigeria: a hospital-based case-control study' at the 19th Annual Conference of the International Stillbirths Alliance, Colombo, Sri Lanka (Oral presentation, 4th November 2024)

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Abbreviations

ANC	Antenatal Care
ASB	Antepartum stillbirth
AUROC	Area under the receiver operating characteristic curve
CEmOC	Comprehensive Emergency Obstetric Care
CI	Confidence interval
CHEW	Community Health Extension Worker
CHW	Community Health Worker
EmOC	Emergency Obstetric Care
FGD	Focus Group Discussion
IDI	In-Depth Interview
ISB	Intrapartum stillbirth
LGA	Local Government Area
LMICs	Low and Middle-Income Countries
MMR	Maternal Mortality Ratio
MNH	Maternal and Newborn Health
MOH	Ministry of Health
OR	Odds Ratio
PAF	Population Attributable Fraction
PHC	Primary Health Centre
SEM	Socioecological model
SSA	Sub Saharan Africa
TBA	Traditional Birth Attendants
TIDieR	Template for Intervention Description and Replication
WHO	World Health Organization

Glossary of key terms

Term	Description
Stillbirth	A stillbirth is defined by the International Classification of Diseases 11th Revision as a baby born with no signs of life at 22 or more completed weeks of gestation ¹ . For international comparison and reporting the World Health Organization defines stillbirth as a baby who dies after 28 weeks of pregnancy, but before or during birth (also known as late stillbirth) ¹ . In this thesis, the 28-week gestation definition is adopted.
Antepartum stillbirth	This is stillbirth following antepartum fetal death (i.e. occurring before onset of labour) ¹ .
Intrapartum stillbirth	This refers to stillbirth following intrapartum fetal death (i.e. occurring during labour) ¹ .
Macerated stillbirth	Stillbirth with the presence of signs of maceration at the time of delivery.
Fresh stillbirth	Stillbirth with fresh skin appearance and no signs of maceration at the time of delivery.
Community-based intervention	In the context of this study, community-based interventions are defined as multicomponent interventions that generally combine individual, behavioural and environmental change strategies extending from households into participant's localities aiming to prevent dysfunction, promote well-being among women and enhance maternal and newborn outcomes ² .

Chapter 1 Introduction

1.1 Background

The cries of a newborn signal the joy of parents as a new life begins, marking the successful end of a pregnancy journey. Regrettably, not all pregnancies end this way. For every minute of 2021, approximately four babies were born around the world without any signs of life (stillborn), amounting to over 1.9 million stillbirths³. Sub-Saharan Africa (SSA) accounts for nearly half (45%) of all global stillbirths³, with Nigeria bearing much of the burden. In this study, SSA is defined geographically as all African countries, excluding the six countries of northern Africa. The stillbirth rate in Nigeria is 42 per 1,000 births⁴, markedly higher than the global average of 13.9 per 1,000 births³. Although there was a 19% reduction in the stillbirth rate in Nigeria between 2000 and 2019, with the overall increase in births, Nigeria witnessed a 15% increase in the absolute number of stillbirths in the same period⁵. There were 182,000 stillbirths in Nigeria in 2021⁶. Progress in stillbirth reduction in Nigeria remains slow, with an annual reduction rate of only 2.3% between 2000 and 2019⁴.

It is estimated that 45% of global stillbirths occur after the onset of labour³. In Nigeria and many other SSA countries, this proportion exceeds 50%⁴ compared with less than 10% in high-income countries⁷. These disparities suggest gaps in the quality of care provided during labour and childbirth. It is believed that most stillbirths occurring after the onset of labour are potentially preventable with access to high-quality care during labour and birth, including adequate monitoring and timely interventions to address complications³. Many stillbirths that occur before the onset of labour can be prevented through comprehensive antenatal care including early identification and management of complications³.

Although the causes of some stillbirths in SSA often remain unclear partly due to poor documentation of women's health conditions before stillbirth⁸, there are known clinical risk factors. These include antepartum haemorrhage, maternal conditions leading to placental insufficiency (e.g. diabetes, hypertensive disorders), infections (e.g. malaria, HIV, syphilis and group B streptococcus), complications during labour and childbirth (e.g., obstructed labour, uterine rupture, umbilical cord complications, etc) and genetic disorders (e.g., trisomy 13, trisomy 18)^{9–11}. Additionally, environmental factors (e.g. exposure to indoor pollution), socio-economic factors (e.g. economic status, rural residence), and behavioural factors (e.g. smoking) have been linked with an increased risk of stillbirths³.

Both the global stillbirth rate and the annual number of stillbirths have each declined by about 35% since 2000³. However, the degree of reduction has varied widely globally, with the SSA region making the least progress (24%)³. Between 2000 and 2021, 21 countries (including seven low-middle-income countries: Mongolia, India, El Salvador, Cambodia, Algeria, Uzbekistan, and Bangladesh) achieved over a 50% reduction in stillbirth rates³. Strategies implemented by these countries include strategic investments towards stillbirth prevention, national implementation of stillbirth surveillance (including the Maternal Perinatal Death Surveillance and Response System), design and implementation of national policies for stillbirth prevention, quality improvement initiatives, human resource capacity strengthening, behavioural change initiatives and several community-based interventions³. One of the main goals of both the United Nations' Global Strategy for Women's, Children's and Adolescents' Health (2016–2030) and the Every Newborn Action Plan (ENAP) is ending preventable stillbirths and reducing the global stillbirth rate to 12 or fewer stillbirths per 1,000 total births in every country by 2030¹².

Nigeria faces several inefficiencies in the health sector, which threaten the health of its population and also influence stillbirth occurrence. Nigeria has a rapidly rising population that is projected to grow from 200 million people in 2019 to 400 million by 2050¹³. The country's inadequate health financing, complex political structure, weak governance, poor accountability, inefficiency, corruption, ineffective use of available resources and lack of robust population-level health and mortality data hinder informed decision-making and implementation of effective health interventions¹⁴. There are significant disparities in access to perinatal health services within Nigeria, with women in northern Nigeria and rural areas, for instance, being at greater risk of having fewer or no antenatal coverage compared to their counterparts elsewhere^{15,16}. Barriers such as the high cost of care, predominantly financed through out-of-pocket payments, distance to health facilities, poor road access, poorly functioning referral systems and the unavailability of transport, especially in rural areas, hinder access to care, leading to late presentations and adverse pregnancy outcomes¹⁴. To address these challenges, the Nigerian government has implemented several successful projects at the national and state levels. These have helped reduce maternal and perinatal mortality, increase the uptake of skilled maternal health attendants, and encourage using facility-based maternal and child health services^{14,17}. Some initially successful historical projects were terminated. For example, the midwives service scheme, which was designed to enhance maternal health service access by posting midwives to rural areas, was terminated after an initial successful run due to inconsistent salary payments¹⁸. The Free Maternal and Child Health programme, implemented from 2009 to 2015 in 12 states, which led to improved service indicators, was also terminated because state governments defaulted on payments¹⁹.

The availability of timely and accurate data is critical for stillbirth prevention; however, Nigeria, like many low and middle-income countries (LMICs), has inadequate civil registration of births and deaths and poor health information systems, which impedes progress. The National Household

Demographic and Health Survey (DHS) does not differentiate between the types of stillbirth²⁰, leading to an evidence gap for preventive interventions specifically tailored to each stillbirth type. While many hospital-based studies in Nigeria did not delineate stillbirth types, some did show that around 47-52% of stillbirths occur in the intrapartum period^{21,22}.

In Nigeria, stillbirths are underreported due to a weak stillbirth registration mechanism and the associated sociocultural implications of stillbirth occurrence²³. Maduekwe et al., in their paper, opined that the lack of a legal requirement to report stillbirths, the absence of linkages between hospital records and civil registry and the age-long barrier of silence surrounding stillbirths contribute to this issue²³. In Igbo and Yoruba cosmology, *ogbanje* (in Igbo) or *abiku* (in Yoruba) refer to spirits believed to inhabit some children, causing them to repeatedly die and be reborn to the same mother in a cycle of death and rebirth.^{24,25} Based on the belief that such children belong to spirits, their short existence is neither discussed nor recognised²³⁻²⁵. Such cultural interpretations of stillbirths breed social stigma, discouraging families from seeking medical explanations or registering the deaths, further contributing to underreporting.

According to the 2018 DHS survey, nearly two-thirds of childbirths (59%) in Nigeria occur outside the hospital²⁰. In contrast to global evidence, the 2013 DHS showed that women who gave birth at health facilities and had caesarean births were more likely to have stillbirths²⁶. While these findings may indicate inadequate quality of in-hospital care, further examination of hospital-based studies shows an elevated risk of stillbirths due to factors unrelated to the quality of care. These include unsupervised pregnancies (unbooked women) and delays within the community in seeking care when danger signs arise or during childbirth with unskilled attendants²⁷. In the past two decades, community-based interventions have received increased policy attention in Africa and other regions with a high burden of stillbirths^{28,29}. Lessons shared at the 53rd Safe Motherhood

and Emergency Obstetrics WHO Africa regional meeting in August 2003 in South Africa and the joint International Conference on Community Health convened in October 2006 in Ethiopia²⁸ called for more substantial community involvement in planning, implementation and monitoring interventions to improve maternal and newborn health outcomes including reducing stillbirths.

1.2 Rationale for the research presented in this thesis

There is an urgent need to reduce the burden of stillbirths in Nigeria. The stillbirth burden is disproportionately higher in northern Nigeria and aligns with inequities in access to vital maternal health services³⁰. Levels of maternal education, women's economic status, and women's empowerment, all important social determinants associated with stillbirth occurrence, are also markedly lower in the North compared with the South, and evidence suggests that targeted interventions to improve access and address these known determinants can significantly improve outcomes¹⁶.

As the Nigerian government continues to promote strategies to improve access to quality maternal and newborn health services to address poor maternal and newborn health outcomes, it is crucial to understand that access alone may not be sufficient in reducing poor outcomes. South-eastern states, such as Imo, Anambra and Abia, have lower rates of stillbirth compared with northern states. Still, while they have consistently achieved high coverage for indicators such as four or more antenatal visits, skilled antenatal care, health facility childbirth, and skilled birth attendance, this has not been associated with a commensurate decline in adverse outcomes^{20,26,31}. This highlights the need to address additional factors beyond access to care.

Despite having one of the highest rates of access to pregnancy care in Nigeria, Imo State continues to face significant challenges related to stillbirth prevention^{20,31}. The Imo State government has

invested in maternal and newborn health, including intervention projects, in the past two decades; however, there is a lack of reliable data systems to track progress made³². Two studies of stillbirths conducted in the two tertiary facilities in Imo State in 2012 reported rates of 60³³ and 180³⁴ stillbirths per 1,000 births. The paradox of the high statistics indicating access to pregnancy care and high stillbirth rates in existing studies also suggests a role of community-related risk factors and underscores the importance of exploring community-focused prevention strategies in the state.

As a trained medical doctor I worked for about six years in Imo State, and I witnessed firsthand the burden of stillbirth while serving in different capacities, including supporting the technical working group within the reproductive health unit of the Ministry of Health. My experience with the Nigeria Healthcare Quality Improvement (NHQI) Initiative further illustrated this point^{35–37}. I worked as a quality improvement coach on the NHQI project, working with quality improvement teams in participating hospitals to identify and improve on gaps in healthcare service delivery. This project was implemented in 20 health facilities in Imo State and achieved significant reductions in maternal and newborn deaths as well as intrapartum stillbirths. However, the lack of improvement seen for antepartum stillbirths suggested to me that community-related factors, beyond the scope of the hospital-focused NHQI intervention, were influential. This finding underscored the need for a broader approach to stillbirth prevention in settings with seemingly adequate access to maternal health services.

As in many parts of Nigeria, in Imo State, the influence of social issues affecting health, including disparities in healthcare access, socioeconomic inequalities and harmful cultural practices on stillbirths, are understudied^{32,38}. Such studies are needed to support health system managers in optimising available resources. The insights garnered from this study could potentially be scaled to other regions of Nigeria with lower access to pregnancy care. Also needed are crucial local data

to fill the knowledge gaps regarding stillbirth and support evidence-based policymaking and implementation for stillbirth reduction in the State. The research reported in this thesis was designed to address these information and evidence gaps.

1.3 Aims and objectives

Thesis aim

The research presented in this thesis aimed to estimate the incidence and investigate the determinants of antepartum and intrapartum stillbirths and utilise women's and health workers' insights to generate evidence-based recommendations for community-based stillbirth prevention in Nigeria.

Thesis objectives

1. To conduct a systematic review and meta-analysis of community-based interventions for the prevention of stillbirth in SSA.
2. To estimate the incidence of stillbirth, overall and by type of stillbirth, in Imo State, Nigeria.
3. To investigate the determinants of antepartum and intrapartum stillbirths.
4. To explore the perceptions of stillbirth, its risk factors and prevention among women and health workers in Imo State, Nigeria.

1.4 Structure of the thesis

[Chapter 2](#) provides a systematic review of community-based prevention of stillbirths in sub-Saharan Africa. This review aims to identify the types, reporting and effectiveness of these interventions and to assess the intervention acceptability among health workers, women, their families, and other stakeholders. This addresses the second research objective.

[Chapter 3](#) describes the methodology of the research. It provides an overview of the Nigerian health sector and contextualises maternal health services in Imo State. It describes and justifies the convergent mixed methods approach adopted for the study.

[Chapter 4](#) presents the details of the quantitative (case-control) study. It explains the rationale, justification, and settings of the case-control study and thoroughly describes the methods used and ethical considerations. The chapter also describes the derivation of the theoretical framework which guided the data analysis. Finally, the results are presented and discussed within the context of available literature to answer the second and third research objectives.

[Chapter 5](#) reports the details of the qualitative research conducted in this study. It begins by providing the rationale for method selection and comprehensively describes the descriptive qualitative methods utilised. The chapter continues by describing the epistemological and ontological considerations that underpin the research, clarifying the researcher's positionality within the research. The results are then presented and discussed in relation to the existing literature, addressing the fourth research objective.

[Chapter 6](#) draws on the results of the three studies (systematic review, case-control, and qualitative studies) to answer the research questions. These findings are then comprehensively discussed, situating them in the broader context of existing literature. The chapter continues by highlighting the policy implications of the study findings and discusses their implications. It concludes by providing a layout of stakeholder-specific recommendations and a proposition for an important stillbirth research agenda going forward.

Chapter 2 A systematic review and meta-analysis of community-based interventions implemented for the prevention of stillbirths in sub-Saharan Africa (SSA).

2.1 Introduction

This chapter has been published as two peer-reviewed articles in the Lancet eClinical Medicine journal as DPhil research outputs ([Appendix 1](#)). The paper's texts, tables and figures were produced by the DPhil researcher and published under the Creative Commons CC-BY license and have been used in this chapter.

Community-based interventions for stillbirth prevention have received increased policy attention in the past two decades for sub-Saharan Africa (SSA) and other regions with a significant burden of stillbirths^{28,29}. Bhutta and colleagues in 2009 classified global interventions for stillbirth prevention into four categories, depending upon the timing of its implementation in relation to pregnancy: interventions before pregnancy, during pregnancy, in labour, and during childbirth³⁹. These interventions involve a range of services targeting women and health workers and can be implemented in hospitals or communities. Although the regional and global policy recommendation for SSA is for women to have skilled antenatal care provision and skilled support during childbirth, preferably in a health facility, only 22.3% of women in SSA give birth in health facilities⁴⁰, and 76% have a skilled antenatal check-up⁴¹. Given the sustained burden of stillbirths in SSA and the enormous barriers to accessing good quality care, such as cost, poor care experience, distance and delays in skilled intervention during emergencies^{42–45}, it is not surprising that several community-based interventions have been implemented either as stand-alone projects or as part of health system-wide interventions in many communities in SSA^{46,47}.

However, despite decades of implementing community-based interventions for maternal and newborn health (including stillbirths), little progress has been made to date. The annual reduction rate for stillbirth in SSA was 1.4% between 2000 and 2019⁴⁸. Furthermore, transferable insights from effective interventions across communities and countries in this region are often lost due to poor reporting of interventions and inadequate assessment of intervention effectiveness and acceptability⁴⁹. Understanding the types, completeness of reporting, and acceptability of the interventions is equally important as measuring the effects of these interventions. This information would enable researchers and policymakers to improve the replicability and implementation of the tested community-based interventions and optimise benefits. An incomplete description of the intervention and lack of acceptability assessment could lead to little trust in the reported effectiveness of interventions. A pluralistic approach to intervention assessment which looks at the efficacy (to what extent does the intervention produce the intended outcomes in experimental or ideal settings), effectiveness (to what extent does the intervention produce the intended outcomes in real-world settings), theory-based (what works in which circumstances and how), and systems (how do the system and intervention adapt to one another) has been recommended for complex interventions⁵⁰. However, the usefulness of the insights drawn from such assessments hinges on the complete reporting of interventions.

There have been three previous systematic reviews of community-based maternal and newborn health interventions, two focusing globally^{39,46} and one on Africa⁴⁷. Only one of these reviews focused specifically on interventions to prevent stillbirth, but this review was conducted more than a decade ago and covered both health facility and community-based interventions worldwide³⁹. These reviews also did not systematically assess the completeness of the

intervention description and did not explore the acceptability of the interventions among women and healthcare providers.

2.1.1 Objectives of the review

Based on the preceding discussion, the objectives of this review were:

1. To describe the types of community-based interventions for preventing stillbirths in SSA and the strategies used to implement them.
2. To examine the completeness of reporting of community-based stillbirth prevention interventions in SSA.
3. To understand the acceptability of the interventions among health workers, women and their families, and communities.
4. To assess the effectiveness of community-based intervention, implemented alone or in conjunction with hospital-based intervention, on reducing the incidence of stillbirth in SSA.

2.1.2 Review Questions

The review questions were:

1. What types of community-based interventions and strategies have been implemented to prevent stillbirths in SSA?
2. How complete is the reporting of community-based stillbirth prevention interventions in sub-Saharan Africa?
3. How acceptable were these interventions to health workers, women and their families, and the communities?
4. How effective are community-based interventions for stillbirth prevention in SSA?

2.1.3 Review Outcomes

The main outcomes of the study were:

1. Types of community-based interventions implemented.
2. Completeness of intervention reporting.
3. Themes on acceptability of community-based interventions.
4. Odds of stillbirth in intervention communities compared with control communities.

2.2 Methods

2.2.1 Protocol and Review Registration

The protocol for this review was registered on the International Prospective Register of Systematic Reviews (PROSPERO) on 15th December, 2021⁵¹. The PROSPERO record has been marked as completed, and the links to the two publications resulting from the review have been included.

2.2.2 Search strategy

A systematic review was conducted following the PRISMA reporting guideline and steps outlined in the study protocol⁵¹. Eight databases (MEDLINE (OvidSP), Embase (OvidSP), Cochrane Central Register of Controlled Trials(Cochrane Library, Wiley), Global Health (OvidSP), Science Citation Index and Social Science Citation Index (Web of Science Core Collection), CINAHL(EBSCOhost) and Global Index Medicus <https://www.globalindexmedicus.net/>) and four grey literature sources (ProQuest Dissertations and Theses - Global, www.who.int/trialsearch/, www.ClinicalTrials.gov and Google (conference proceedings and implementation reports)) were searched from January 1, 2000 to July 7, 2023, for relevant quantitative and qualitative studies.

The search terms used were synonyms and specific terms from different related interventions implemented in the community in similar reviews found during the scoping search. They included

“community-based interventions”, “stillbirths”, “perinatal death”, “sub-Saharan Africa”, “pregnancy”, “birth attendants”, “home visits”, “women’s groups”, “mobile health”, “health promotion”, “nutritional interventions”, “smoking cessation”. The researcher developed the initial search strategy, which was reviewed by the DPhil supervisors and finalised by a university information librarian. The search terms and search strings were customised for each database, register and search engine. Boolean operators “OR” between synonyms and “AND” between search strings were applied to widen the search scope without losing its focus⁵². The search terms were piloted on MEDLINE, and the inclusion and exclusion criteria were applied to five percent of the papers retrieved to check the reliability for identifying relevant papers. The complete search strategy is shown in [Appendix 2](#). The researcher first conducted the search on December 16, 2021, which was reviewed by the supporting university Librarian. An updated search was conducted on July 7, 2023, before manuscript submission for publication. The updated findings are presented in this chapter.

2.2.3 Study inclusion and exclusion criteria.

Studies were included if the interventions targeted stillbirth reduction exclusively or as part of a complex intervention in SSA. There were no restrictions based on study design or language. The included studies were community-based, with or without a health facility component. Studies were excluded if they were social and economic interventions indirectly impacting stillbirths, such as micro-credit women empowerment schemes; however, studies which provided vouchers for women to ease transportation to health facilities were included. Hospital-only interventions and maternal waiting home interventions were excluded as women in waiting homes had daily access to health workers⁵³ and were not in their usual residences within the communities.

2.2.4 Study selection

The DPhil researcher and two other second reviewers undertook literature screening and study report selection independently. The researcher conducted independent title and abstract screening of all retrievals while the second assessors screened 50% each of all titles and abstracts. Next, all reports included for full-text screening were screened by the researcher, while the second assessors screened 40% of these reports (20% each) to compare with the researcher's decisions to keep or remove the reports. Disagreements at both stages were resolved by consensus and referring to the review protocol. Unresolved disagreements were further discussed with DPhil supervisors. A decision history record was maintained throughout the process.

2.2.5 Quality assessment and robustness of reporting

The researcher and second assessors independently assessed study quality using the Cochrane risk of bias tool⁵⁴, the National Heart, Lung and Blood Institute's tools⁵⁵ and the Critical Appraisal Skills Programme (CASP) checklist⁵⁶. The overall quality rating for cluster randomised controlled trials (cRCTs) and RCTs was based on the assessment rating of all five Cochrane risk of bias tool domains. For the pre-post design studies, a score of 1 was given to each of the questions on the tool where the characteristic assessed was present in the paper being evaluated. Reports scoring 70% of the available scores and above were rated as good quality, while reports that scored 50% - 69% and 0% - 49% were rated as fair and poor quality, respectively. Similar scoring and rating techniques were utilised for cross-sectional, cohort and qualitative studies.

2.2.6 Data extraction and analysis

A data extraction tool was designed using Microsoft Excel to capture information about the study design, intervention characteristics and other contextual information related to the review questions ([Appendix 3](#)). None of the authors of the included papers was contacted for additional

information, as the researcher and second assessors believed they had sufficient information to conduct the analysis. The characteristics of the studies included were described using a summary table. The main outcomes of this review, as documented in the registration protocol, were types of community-based interventions, themes related to intervention acceptability identified using a theoretical framework and intervention effect on stillbirths⁵¹. However, due to the observed variability in the completeness of reporting, completeness of intervention reporting using the TIDieR (Template for Intervention Description and replication) checklist was added as an outcome.

The researcher extracted data from 100% of the included papers and compared data with the second assessors, who independently extracted data from 50% of the included studies. Essential information extracted from identified interventions were: what the study/project sought to achieve (types of intervention)³⁹, the modality of intervention implementation (intervention delivery strategy)⁴⁶, study population characteristics and stillbirth rate in intervention and control groups. The types of interventions and delivery strategies were grouped and then described using a narrative synthesis. The TIDieR checklist⁵⁷ was used to assess the completeness of reporting for the interventions. This tool was developed by Hoffmann et al. to aid researchers, clinicians, and patients in reliably reporting, implementing, replicating, and building on complex interventions⁵⁷. Sections of the checklist that were reported fully in papers were marked as 'reported', and the missed sections were marked 'not reported' on the extraction sheet. The reporting frequency for each section/domain was calculated and described using a narrative synthesis.

Acceptability was defined as "a multi-faceted construct that reflects the extent to which people delivering or receiving a healthcare intervention consider it appropriate, based on anticipated or experienced cognitive and emotional responses to the intervention"⁵⁸. The questions underpinning the Sekhon et al. acceptability framework⁵⁸ served as a guide for data extraction for

the acceptability of interventions; both description and supporting quotes related to the seven component constructs, shown in [Panel-1](#), were extracted. If data for any framework section was unavailable in a given paper, it was noted as 'not reported' on the extraction sheet.

Panel 1: **Intervention Acceptability Framework** (Sekhon et al. ⁵⁸)

Acceptability framework

1. **Affective attitude:** refers to how an individual feels about the intervention.
2. **Burden:** The perceived amount of effort that is required to participate in the intervention.
3. **Ethicality:** The extent to which the intervention fits with an individual's value system
4. **Intervention coherence:** the extent to which the participant understands the intervention and how it works.
5. **Opportunity costs:** the extent to which benefits, profits or values must be given up to engage in the intervention.
6. **Perceived effectiveness:** The extent to which the intervention is perceived as likely to achieve its purpose.
7. **Self-efficacy:** the participant's confidence that they can perform the behaviour(s).

A framework analysis using the acceptability framework was conducted⁵⁹, which entailed five stages – familiarisation with data, identification of themes, indexing, charting and mapping/interpretation. Familiarisation with the data involved reading the secondary data in the included papers to get a holistic sense of what researchers found in the included studies. Thereafter, rather than identifying themes and building a framework, the seven component constructs of the Sekhon et al. framework⁵⁸ were used as deductive themes for the analysis. The researcher coded all the extracted qualitative data and organised them into categories and subthemes. A second coder coded and analysed 40% of the data and compared the analysis and grouping with the researcher's. The data from the included papers were then independently

indexed by carefully reading the included quotes in each paper and systematically applying them to the appropriate component construct of the acceptability framework (see Appendix 4 Table). The researcher and the second coder discussed and resolved any disparities in how data were indexed. Charting the data involved organising the indexed data into a manageable format using a matrix table showing the construct/theme, subtheme and supporting quotes. The final stage was mapping and interpretation, which involved finding patterns and making sense of the data while reflecting on the review question. This was done through reflexive conversations involving the DPhil researcher, the second coder and DPhil supervisors. A narrative synthesis was used to consolidate the findings from the qualitative analysis across the different themes.

For the effectiveness analysis, the studies were categorised into solely community-based and combined community and hospital interventions. A meta-analysis was conducted for each group using a random-effects model to estimate the pooled odds ratio (OR) of stillbirth in intervention communities compared with the control; 95% confidence intervals (95% CIs) were estimated. Subgroup analyses were performed to estimate pooled OR by intervention type and intervention delivery strategy. The meta-analyses were carried out with all studies included, and a sensitivity analysis was conducted by excluding any poor-quality studies. The I^2 statistic was used to assess heterogeneity of effects across studies. Publication bias was evaluated using a funnel plot and Egger's test. All analyses were conducted using Stata SE, v17. A narrative synthesis was used to consolidate and triangulate the findings of qualitative and quantitative analysis.

2.3 Results

2.3.1 Study selection

The searches yielded a total of 4,223 records ([Figure 2.1](#)). Following deduplication, the researcher and two reviewers independently screened the title and abstracts of 2,098 records, and 77 were

retained for full-text review. After a full-text review, 45 records were excluded based on the inclusion/exclusion criteria and seven further records were included after reference list searches. Of the 39 reports in the systematic review, all addressed research questions one and two, while seven addressed research question three. Seventeen papers which quantitatively reported the effectiveness of community-based interventions on the incidence of stillbirths were included in the meta-analysis to address research question four. Some retrieved reports assessed the effects of the intervention on the composite indicator perinatal deaths (stillbirths and early neonatal deaths, which is the death of neonates in the first seven days after birth) but were excluded from this analysis to avoid selection bias as the effect estimates for stillbirths could not be separated from the total effect on perinatal deaths.

When more than one report was retrieved for a study, the records were merged and reported as a single study. In situations where these reports described different aspects of the same study, for example, intervention description and user experience, all records were utilised, but they contributed data for separate review objectives.

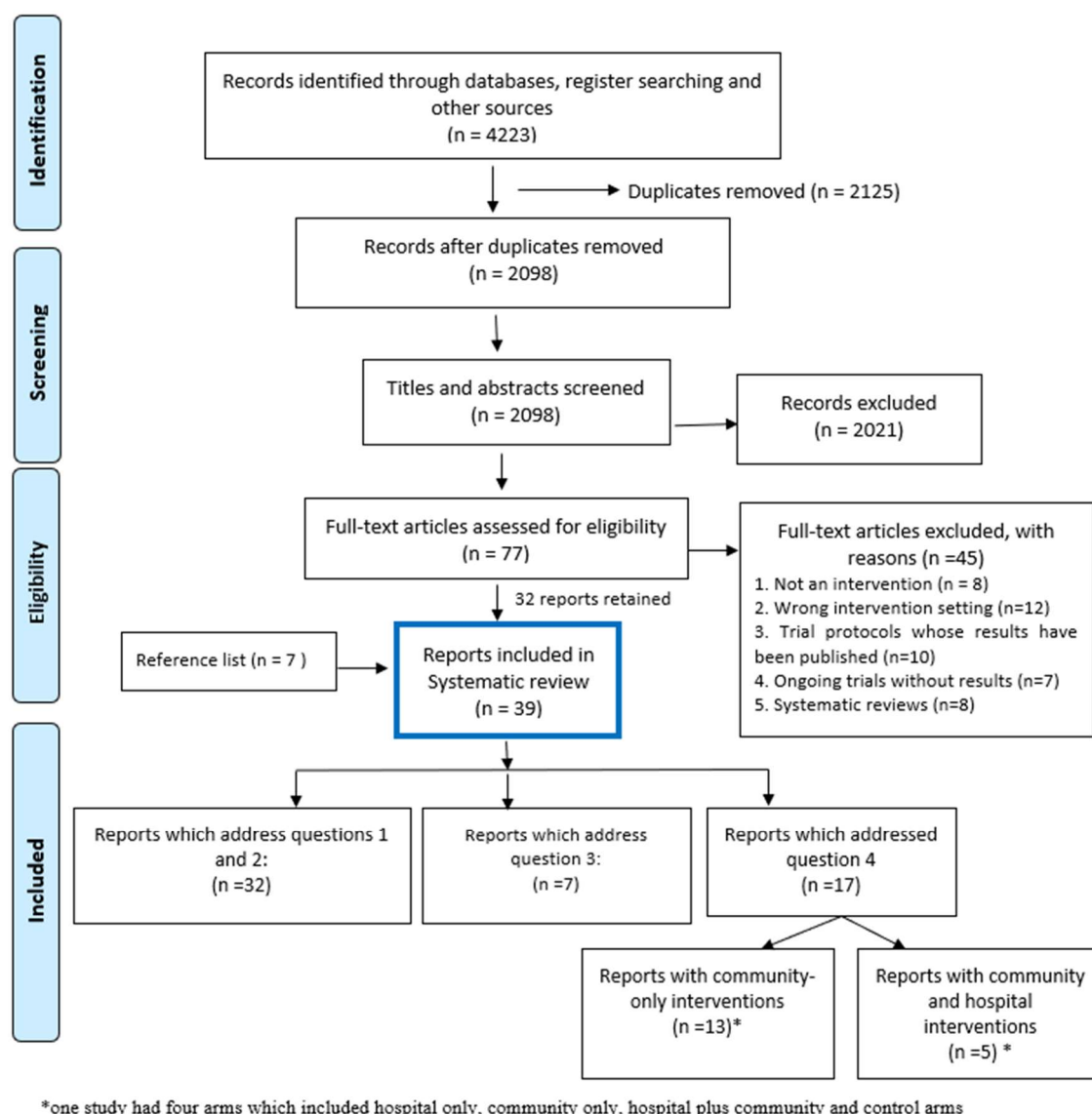


Figure 2.1: PRISMA Flow Diagram.

2.3.2 Characteristics of the included studies

Overall, 39 reports from 34 studies met the inclusion criteria for this review (Table 2.1). These studies were conducted in 18 of the 48 countries in SSA. Nigeria had the highest number of studies (five)^{60–64}, followed by Malawi^{65–68} and Burkina Faso^{69–72}, with four studies each, and the rest were from 15 other countries. Three studies were conducted in two or more countries^{70,73,74}. There was at least one study from all four regions of SSA. Fifteen studies were from West Africa conducted in Nigeria,^{60–64} Burkina Faso^{69–72}, Ghana^{75,76}, Benin⁷⁰, Guinea Bissau⁷⁷, Niger⁷⁸, and Côte d'Ivoire⁷⁹.

East Africa had fourteen studies, from Malawi,^{65–68} Tanzania,^{80–82} Kenya,^{83–85} Ethiopia,^{86,87} Mozambique⁸⁸, Uganda and Zambia⁷³. There were three studies from southern Africa (South Africa^{89–91}, and one study from Central Africa (Democratic Republic of Congo⁹²). The geographical spread and frequency of included studies are shown in [Figure 2.2](#) below.



Figure 2.2: Geographical distribution and frequency of included studies.

Most of the studies (ten) were cluster randomised controlled trials, three were randomised controlled trials, and one was a non-randomised controlled trial. Seven studies each had a pre-post and qualitative design; three were cross-sectional, two were cohort studies, and three were mixed methods studies ([Table 2.1](#)). Of the 34 studies included, 24 were conducted solely in the community, while 10 had some element of health facility implementation, including purchasing equipment, employing adjunct medical staff, and training health workers.

Table 2.1: Summary characteristics of all included studies

Study ID	Name of study	First author and year	Key intervention(s)	Control	Country	Study design	Place of intervention	Quality rating
01	Thesis	Mohammed 2016 ⁸⁶	Early access to Iodized salt distribution	Later access to Iodized salt	Ethiopia	cRCT	Community only	Some concerns
02	Maikhanda	Colbourn 2013 ⁹³	Participatory women's groups to improve care practices and health-seeking behaviours using quality improvement methods	Usual care	Malawi	cRCT	Community and hospitals	Low risk
02b	Maikhanda	Colbourn 2013 ⁶⁵	Participatory women's groups to improve care practices and health-seeking behaviours using quality improvement methods	Usual care	Malawi	cRCT	Community and hospitals	Low risk
03	Maimwana	Lewycka 2013 ⁹⁴	Women's groups, peer health counselling, home visits	Usual care	Malawi	cRCT	Community and hospitals	Some concerns
03b	Thesis/ Maimwana	Lewycka 2011 ⁶⁶	Women's groups	Usual care	Malawi	cRCT	Community only	Some concerns
04	Wired mothers	Lund 2014 ⁸⁰	Automated and directed health messaging. Call voucher system for women to reach health workers.	Usual care	Tanzania	cRCT	Community only	Some concerns
05	Global Network First Breath trial	Pasha 2013 ⁷⁴	Community mobilisation to establish and maintain emergency transport through loan schemes. TBA training and referral linkages	Usual care	India Pakistan Kenya*, Zambia*Gua temala & Argentina	cRCT	Community and hospitals	Some concerns

Study ID	Name of study	First author and year	Key intervention(s)	Control	Country	Study design	Place of intervention	Quality rating
06	First breathe trial	Matendo 2011 ⁹²	Emergency newborn care training for TBAs, nurses and midwives.	Usual care	DRC	cRCT	Community only	Some concerns
07	Community-scheduled Malaria screening and treatment	Scott 2019 ⁷⁰	Malaria screening and treatment, home visits.	Usual care	Gambia, Burkina Faso and Benin	cRCT	Community only	Low risk
08	N/A	Leight 2018 ⁶²	Provision of birth kits, and health education using Community resource persons.	Usual care	Nigeria	cRCT	Community only	High risk
09	N/A	Ilboudo 2022	Home visits, health worker training, iron and folic acid supplementation, Intermittent Preventive malaria therapy, nutrition counselling	Usual care	Burkina Faso	cRCT	Community and hospitals	Low risk
10	N/A	Kone 2023	Home visits, nutritional counselling, micronutrient supplementation.	Usual care	Côte d'Ivoire	cRCT	Community only	Some concerns
11		De Kok 2022	Provision of prenatal fortified balanced energy-protein supplement, iron and folic acid supplementation	Usual care	Burkina Faso	RCT	Community only	Low risk
12	N/A	Alexander 2018 ⁶⁴	Provision of clean cook ethanol stoves, home visits and health education.	Usual care	Nigeria	RCT	Community only	Low risk

Study ID	Name of study	First author and year	Key intervention(s)	Control	Country	Study design	Place of intervention	Quality rating
13	Bandim Health Project	Kaestel 2005 ⁷⁷	Micronutrient supplementation and home visits.	Usual care	Guinea-Bissau	RCT	Community only	Low risk
14	TBA Manica programme	Gloyd 2001 ⁸⁸	Periodic TBA re/training and provision of essential supplies.	One-off national TBA training	Mozambique	nrCT	Community only	Moderate risk
15	Taiwan Medical Mission and the TBA project	Chen 2011 ⁶⁸	Periodic TBA re/training and provision of essential supplies.	One-off training for TBAs	Malawi	Pre-post	Community only	Fair
16	Maternal and newborn health in Ethiopia Partnership	Sibley 2014 ⁸⁷	Training TBAs and other community health workers, health sensitisation and community health quality improvement.	N/A	Ethiopia	Pre-post	Community only	Good
17	skilled care initiative	Hounton 2009 ⁶⁹	Community mobilisation for health advocacy behavioural change communication and capacity strengthening.	N/A	Burkina Faso	Pre-post	Community and hospitals	poor
18	N/A	Sloan 2018 ⁶³	Community mobilisation, TBA training, referral linkages, and supply of essential medications.	N/A	Nigeria	Pre-post	Community and hospitals	Good
19	Boresha	Shikuku 2020 ⁸³	Community midwifery, training and deployment of health workers to hard-to-reach areas.	N/A	Kenya	Pre-post	Community only	Poor

Study ID	Name of study	First author and year	Key intervention(s)	Control	Country	Study design	Place of intervention	Quality rating
20	N/A	Seim 2014 ⁷⁸	Evacuation of women in obstructed labour from their home to a midwife, health centre, or hospital.	N/A	Niger	Pre-post	Community only	Fair
21	Text4Life	Okonofua 2023	Text-based access to health providers, emergency transport, health education, health workers, and volunteer emergency readiness training.	N/A	Nigeria	Pre-post	Community and hospitals	Good
22	Saving mothers giving life	Serbanescu 2019 ⁷³	Health sensitisation, community outreach clinics and distribution of childbirth kits.	N/A	Uganda and Zambia	Pre-post (mixed)	Community and hospitals	Poor
22b	Saving mothers giving life	Conlon 2019 ⁹⁵	Health sensitisation, community outreach clinics and distribution of childbirth kits.	N/A	Uganda and Zambia	Pre-post (mixed)	Community and hospitals	Poor
22c	Saving mothers giving life	Palaia 2019 ⁹⁶	Health sensitisation, community outreach clinics and distribution of childbirth kits.	N/A	Uganda and Zambia	Qualitative (Mixed)	Community and hospitals	Fair
23	N/A	Azaare 2022	National health policy for free maternal healthcare	Women accessing care before the policy	Ghana	Qualitative (mixed)	Community only	Good
24	N/A	Kamau 2020 study ⁸⁵	Iron and folic acid supplementation and home visits	N/A	Kenya	Qualitative	Community only	Good
25	Mom connect	Skinner 2018 ⁹⁰	Text-based interventions with health promotion messages.	N/A	South Africa	Qualitative	Community only	Good
26	RapidSMS Rwanda	Musabyimana 2018 ⁹⁷	Text-based interventions with health promotion messages.	N/A	Rwanda.	Qualitative		Good

Study ID	Name of study	First author and year	Key intervention(s)	Control	Country	Study design	Place of intervention	Quality rating
			Community health workers also use the system to trigger systems for response from the nearest health centre or an ambulance in emergencies.				Community only	
26b	RapidSMS Rwanda	mwendwa 2015 ⁹⁸	Text-based interventions with health promotion messages. Community health workers also use the system to trigger systems for response from the nearest health centre or an ambulance in emergencies.	N/A	Rwanda.	Qualitative	Community only	Good
27	Innovating for maternal and child health in Africa (IMCHA)	Joseph 2021 ⁸¹	Participatory women's groups, community mobilisation and health education	N/A	Tanzania	Qualitative	Community only	Good
28	Sustainable Emergency Referral care	Patel et al. No date ⁷⁶	Low-cost emergency transport, health/emergency education, health worker training	N/A	Ghana	Qualitative (mixed)	Community and hospitals	Good
29	N/A	Fatti 2016 ⁸⁹	Home visits, health education, counselling for anti-retroviral therapy initiation and adherence.	N/A	South Africa	Cohort	Community only	Fair
30	Mobile WACH NEO	Headstrom 2022	Personalised text-based health education and action-oriented SMS	N/A	Kenya	Cohort	Community only	Good
31	N/A	Okafor 2015 ⁶⁰	TBA training and supervision	N/A	Nigeria	Cross-sectional	Community only	Fair

Study ID	Name of study	First author and year	Key intervention(s)	Control	Country	Study design	Place of intervention	Quality rating
32	National health promotion policy	Mostert 2021 ⁹¹	National health promotion policy (cigarette control), home visits and health education.	N/A	South Africa	Cross-sectional	Community only	Good
33	RBF4MNH	Makuluni 2021 ⁶⁷	Result-based financing for stillbirth reduction.	N/A	Malawi	Cross-sectional	Community and hospitals	Poor
34	M-Mama	Bryan et al. 2017 ⁸²	Community mobilisation, emergency transport and health worker training.	N/A	Tanzania	Not reported	Community only	N/A
		* Africa-based studies; cRCT – cluster randomised controlled trial; nrCT – non-randomised controlled trial; RCT – randomised controlled trial; N/A – not applicable; TBA: Traditional birth attendant; a, b, c – depicting additional articles from the same project.						

2.3.3 Community-based interventions implemented for stillbirth prevention

All types of interventions targeting stillbirths implemented in a community setting in SSA were included. The interventions in the included studies were grouped by the overall aim of the intervention, and the studies were categorised into four main groups ([Table 2.2](#)):

1. Micronutrient supplementation to improve the nutritional status of pregnant women.
Nutritional interventions in this review assessed the impact of micronutrient supplementation such as iodine, iron and folic acid supplementation on perinatal health outcomes, including stillbirths^{71,72,77,79,85,86,97}.
2. Screening, prevention and treatment of infections. Two studies in this category targeted malaria and HIV infections^{70,89}, which are endemic in SSA and have been linked to stillbirth occurrence.
3. Improving women's health knowledge and health behaviours. This was the most common group of interventions with 22 studies^{61–64,69,71,72,74,77–79,81,82,84,87,90,91,93–95,97}. The researchers aimed to reduce stillbirths by influencing health behaviours through pregnancy health education, such as recognising danger signs in pregnancy.
4. Increasing access to skilled childbirth attendants through training of community health workers and traditional birth attendants and reducing delays women face in accessing skilled care. Eighteen studies were in this group^{60,61,63,68,74–76,80,82,83,87,88,90,92,93,95,97}.

Based on how the researchers achieved their research aims, the studies were categorised into nine intervention delivery strategies ([Table 2.2](#)).

Most of the included studies implemented more than one type of intervention, using two or more intervention strategies. Interventions to improve health knowledge and behaviours were the most common, while interventions targeting infection prevention were the least common. Community mobilisation activities, including advocacy, health sensitisation, transport and emergency loan

schemes, were the most common strategy deployed, while community midwifery and transport vouchers were the least deployed.

Table 2.2: Summary of included studies by type of intervention and delivery strategy

Characteristics of interventions in included studies		No. of studies*
TYPE OF INTERVENTION		
1	Nutritional	7
2	Prevention and management of infections (including HIV or malaria)	2
3	Knowledge and behavioural (educating for ANC4, pollution, danger signs recognition)	22
4	Increasing access to skilled birth attendants	18
INTERVENTION DELIVERY STRATEGY		
1	mHealth	6
2	Women's groups/peer counselling	6
3	Community midwifery	1
4	Home visits (including education, health screening and infection treatment)	12
5	Mass media	5
6	Traditional birth attendant training	7
7	Volunteer and community health worker training	12
8	Community mobilisation (including advocacy, health sensitization, transport and emergency loan schemes).	14
9	Transport vouchers/transfers	1
*Some studies have more than one type of intervention and may use one or more intervention delivery strategy ANC4 – attending four or more antenatal visits in pregnancy mHealth interventions in this review included text-based educational programmes and appointment reminders.		

2.3.4 Completeness of intervention reporting

All 34 studies addressed the questions in the TIDieR checklist⁵⁷ ([Table 2.3](#)) to varying degrees. The detailed scoring for each paper included is shown in [Appendix 4](#). Most interventions reported why they were carrying out the intervention, what the intervention was, who provided it, and how and where it was delivered. About 74% of the included studies (n=25) described the intervention intensity or dose. The least reported areas of the checklist were information about intervention fidelity (only five studies reported), modification (in 11 studies) and tailoring of interventions (9 studies).

Table 2.3: TIDieR checklist assessment of included studies

Template for intervention description and replication (TIDieR) checklist for included studies		
Criteria	Reported	Not reported
Why Describe any rationale, theory or goal of the elements essential to the intervention.	34	0
What Materials – describe physical or informational materials used in the intervention. Procedure: describe each of the procedures, activities and/or processes used in the intervention, including enabling or supporting activities	34	0
Who provided For each category of intervention provider, describe their expertise, background and any specific training given.	33	1
How Describe the modes of intervention delivery (e.g., face-to-face or by some other mechanism such as the internet or telephone). Was it delivered individually or in a group?	33	1
Where Describe the types of locations where the intervention occurred, including any necessary infrastructure or relevant features.	32	2
When and how much Describe the number of times the intervention was delivered and over what period of time, including the number of sessions, their schedule, and their duration, intensity or dose.	25	9
Tailoring	9	25

If the intervention was planned to be personalised titrated or adapted, then describe what, why, when and how		
Modification If the intervention was modified during the study, describe the changes (what, why, when, and how).	11	23
How well? Planned: If intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity, describe them. Actual: if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned.	5	29

2.3.5 Acceptability of community-based interventions among health workers, women, and communities

Eight studies included qualitative data, and seven of them addressed question three. Six studies were assessed as having good quality, and one was assessed as fair quality ([Table 2.4](#)). Azaare et al.'s⁷⁵ study was not included in the analysis because the researchers were focused on understanding the health workers' perceptions regarding the rise in stillbirths during the intervention. Six studies were single-country studies, while one was conducted in two countries. The included studies utilised in-depth interviews, focus group discussions, or both as data collection methods. The study sample sizes ranged from 19 to 93 participants. Most studies included health workers and women and their families^{76,81,85,97}, while one study each had participants from funding bodies/ministries of health⁹⁶, women alone⁹⁰ and health workers⁹⁸.

Table 2.4: Characteristics of studies included in the qualitative analysis

First author and year	Country (ies)	Study design (s)	Number of participants	Health system actor of focus			Quality rating
				Women/families	Health workers	Funders and Ministries of health	
Palaia 2019 ⁹⁶	Uganda and Zambia	Qualitative	46 IDIs	No	No	Yes	Fair
Joseph 2021 ⁸¹	Tanzania	Qualitative	86 IDIs	Yes	Yes	No	Good
Kamau 2020 ⁸⁵	Kenya	Qualitative	19 IDIs	Yes	Yes	No	Good
Skinner 2018 ⁹⁰	South Africa	Qualitative	32 IDIs, 7 FGDs	Yes		No	Good
Musabyimana 2018 ⁹⁷	Rwanda.	Qualitative	93 (28 IDI, 10 FGD)	Yes	Yes	No	Good
Mwendwa 2015 ⁹⁸	Rwanda.	Qualitative	14 FGDs (5-8 participants each)	No	Yes	No	Good
Patel et al (No date) ⁷⁶	Ghana	Mixed	16 FGDs and 59 IDIs)	Yes	Yes	No	Good
IDIs – In-depth interviews, FGDs – Focus group discussion							

Though none of the included studies explicitly reported their findings as per the constructs of the acceptability framework ([Panel 1](#)), the themes generated from the analysis were mapped with these constructs. A summary of the constructs addressed by each of the included papers is shown in [Table 2.5](#). The table immediately highlights the ‘ethicity’ or ethical implications of the intervention and the ‘opportunity cost’ of implementing or participating in the interventions. These were the least explored concepts in the included studies, particularly for women. All constructs of the framework were more likely to be explored if health workers, funders or staff from the Ministry of Health were the participants in the study.

Table 2.5: Constructs of the theoretical framework of acceptability explored in included papers by stakeholder types

	Palaia 2019			Joseph 2021			Kamau 2020			Skinner 2018			Musabyimana 2018			Mwendwa 2015			Patel et al. (No date)		
	Women	Health worker	Funders + MoH	Women	Health worker	Funders + MoH	Women	Health worker	Funders + MoH	Women	Health worker	Funders + MoH	Women	Health worker	Funders + MoH	Women	Health worker	Funders + MoH	Women	Health worker	Funders + MoH
Affective attitude			✓	✓	✓		✓	✓		✓			✓	✓			✓		✓	✓	
Burden /barrier			✓		✓			✓		✓				✓			✓			✓	
Ethicality			✓		✓			✓						✓							
Intervention coherence			✓		✓			✓		✓			✓	✓			✓			✓	
Opportunity cost			✓		✓									✓			✓				
Perceived effect			✓	✓	✓			✓		✓				✓			✓		✓	✓	
Self-efficacy			✓					✓		✓				✓			✓				
Legend – ✓ – construct explored; brown squares – group not included in participants; grey squares – group included																					

2.3.5.1 AFFECTIVE ATTITUDE

Women and their families were happy when they felt they benefited directly from the intervention, especially when the intervention appeared to have contributed to a good outcome.

“We think that the child was saved by the nurses because of the timeliness of our arrival. We were happy when we got into the hands of the nurses.” (Woman, Ghana, Patel et al. no date)

Although women were generally happy to participate in various mobile/text-based interventions, some reported getting confused or worried by some of the messages received at home.

“It is clear to me, although I got confused when I received the message about what to do when the baby is not moving at all...I asked the nurse because that got me really scared, but she managed to make me understand.” (Woman, South Africa, Skinner 2018)

Health workers were happy participating in community interventions as they benefit women and create capacity-building avenues for the health workers.

“I personally felt good because now I had something that I would be taking to them and teaching them about IFAS [Iron and folic acid supplementation] in detail. I felt that this was going to help many women.” (Female Community Health volunteer, Kenya, Kamau 2020)

However, some health workers highlighted their displeasure at the increased workload due to the intervention and some unpleasant encounters with women and their families.

“It complicates and increases our work. One has to stop everything she is doing and concentrate when sending reports. When you have a baby and family responsibilities, it is difficult, and then it creates conflict with family responsibilities.” (Community Health volunteer, Rwanda Mwendwa, 2015)

“Give us the money that you have been given instead of tormenting us with your questions.” (Community health worker recounting an experience with a woman, Tanzania, Joseph, 2021)

Funders/staff from ministries of health: Externally funded projects may seem to have high or challenging goals for the people working at the Ministry of Health. There were also concerns about power dynamics in multi-partner consortium interventions affecting how these stakeholders feel about the intervention.

"It was a very ambitious goal that in the first year [we would have a] 50% reduction in MMR [maternal mortality ratio]. We looked at people [SMGL partners] and said, "Are you going to make this? This goal is very high." (host government, Palaia 2019)

"And by big P [Partner] and small p [partner], it had to do with who had the biggest investments and therefore gets the biggest seat at the table. So that was a little bit concerning for us because those big P partners seemed to have had more of the say in the partnership." (small partner in consortium, Palaia 2019)

2.3.5.2 BURDEN AND BARRIERS

None of the included reports explored the burden or barriers faced by women who are the recipients of the intervention, but these were explored for health workers and other stakeholders.

Health workers implementing community interventions, in some cases, had to overcome geographical and sociocultural barriers to discharge their duties.

"Rains were a hindrance to our efforts in sensitising the community on the use of ANC services. We used to hold public meetings in open spaces, but when it rained, we had to postpone them." (Community health worker, Tanzania, Joseph 2021).

"You know, for me as a man, visiting peoples' homes week after week might raise some questions somewhere." (Male CHV, Kenya, Kamau, 2020)

Health workers were also faced with the challenges of insufficient training and the lack of necessary equipment or tools to carry out interventions. In some cases, community health volunteers were not remunerated.

"CHWs take measurements of the child, but the indicators confuse them. They mix them up (...). There is a need to have a look at how to train them better or maybe there is a need to recruit more qualified personnel. There is a need for improvement." (District Health official, Rwanda Musabyimana, 2018)

"Equipment is not yet available, and we need the right equipment to take measures for pregnant women and children. For example, we need instruments to measure the height and weight of pregnant women because those measures were not taken at the health facility. We also need thermometers to measure temperature." (Community Health worker, Rwanda Musabyimana, 2018)

"My partner always wanted to know the amount of money I was paid. No matter how often I told him that we were not paid, he never understood. You know, when you spend such a long time walking all over the village and come back home very tired with nothing in your

pocket, very few partners will understand why you keep committed to the intervention.” (Community health volunteer, Tanzania, Joseph 2021)

Local stakeholders and funders felt the implementation burden was eased by drawing on consortium partners’ unique strengths and experiences; however, they reported that strong leadership was required for consortia to function optimally.

“I think the partnership was aiming to achieve first of all, having a pool of varied resources. So, we have a lot more than if we had one or two people involved, both financial as well as the technical support and understanding. And also, just bringing the varied experiences from the different partners, from the very beginning.” (Field representative Uganda or Zambia, Palaia 2019)

“I think that effective leadership made a difference— there was always a sense of team. And that doesn’t happen without effort. There was remarkably little ego, which is really hard to do with these separate agencies with their own separate missions coming together for one mission as a team, so a lot of that was just really strong leadership and management.” (Global Partner, Palaia 2019)

2.3.5.3 ETHICALITY

The construct of ethicality examines the extent to which interventions fit with an individual’s value system. None of the included papers explored the ethicality of interventions for women, but it was explored for health workers and other stakeholders.

For health workers, interventions that involved trained community volunteers delivering some health services in the community led to internal conflicts about task delegation.

“I would say the health professionals are much better; we cannot solely give the responsibility to the CHVs. We have to do this professionally, bearing in mind the woman is pregnant, there can be other problems.” (Nurse in charge of ANC services, Kenya, Kamau, 2020)

A community health volunteer reported hiding information about the intervention from her spouse to enable her to continue engaging with the programme. Health workers who reported a lack of support from their spouses attributed it to the little or no remuneration received from project participation.

“At times, I failed to tell my husband where I was going. This is because he was not supportive of the interventions we were implementing. I knew the risk of telling him where I was going daily since I knew his reaction.” (Community health volunteer, Tanzania, Joseph 2021).

Although intervention funders desire higher levels of host government engagement at all stages of an intervention, high-profile officials were often unavailable at the initial stages of community intervention design. As such, interventions may be designed without the desired level of leadership input.

“They [the MOH] weren’t even represented on the Leadership Council in the early days. And I think that was a serious mistake and something that I hope has been corrected and will continue to be corrected. The problem is that you don’t have high officials in a host government who are willing to sit through long conference calls or travel to Washington for meetings talking about leadership and governance.” (US Government representative, Palaia 2019)

There were concerns about rightful access and use of project data, as health workers felt that having access to the data could inform better service provision.

“We don’t have access to the information in RapidSMS. The data manager and the CHW [community health workers] supervisor are the only ones with access to this information. For example, we would like to be able to check whether all the women who delivered at our health centre were registered in RapidSMS because we have their name in our registers.”-Provider from a District not supported by UNICEF (Community health volunteer, Rwanda, Musabyimana, 2018)

2.3.5.4 INTERVENTION COHERENCE

Women and their families showed an understanding of what each intervention programme offered and, in some cases, provided suggestions on how they could be improved.

“Sometimes you get it in the morning, but usually you get it around 9:00 or 10:00...Yes, but sometimes it delays, and you receive it late...And sometimes when there is a delay, they often send a message apologising.” (Woman, South Africa, Skinner 2018)

“I wonder whether pregnant women should provide their phone number since they are the beneficiaries. Then, both she and the CHW [community health worker] would receive the RapidSMS messages. This system would help remind parents that we are very busy and sometimes forget our responsibilities to our children.” (Father in urban area, Rwanda, Musabyimana 2018)

Health workers showed a good understanding of the service delivery gaps targeted by the community interventions and how the intervention works. They also proffered insights on how to maximise the benefits afforded by the interventions.

“We worked closely with health workers and in the facilities, and this made our work persuasive. For instance, whenever we referred pregnant women to the facility for more information, health workers would attend to them very well. Similarly, whenever we invited them to attend our community sensitisation meetings, they would come and help us in clarifying some of the health issues.” (Community health volunteer, Tanzania, Joseph 2021).

“The system needs to point out mistakes; otherwise, we send the same wrong mistake many times.” (Community Health volunteer, Rwanda Mwendwa, 2015)

Partners who fund community intervention projects try to engender local ownership by ensuring local stakeholders are involved at every stage and understand the intervention and how it works.

“Partners have not done activities in the district without consulting the DHO [District Health Office], the Chief Administrative Officer, and with the Chief Administrative Office, the District Executive Committee. And monthly there have been project coordination meetings, and that makes us own whatever we do that we are implementing in these areas.” (Subnational Government Representative Uganda, Palaia 2019).

However, a lack of clarity on partner roles can hinder progress in multi-stakeholder collaboration projects.

“The partners were kind of cobbled together pretty quickly, it seemed, without a lot of thought of what they would do, how they would contribute in distinctive ways. And that's something that took a long time to resolve, and I'm not sure it even really was resolved.” (Global Partner, Palaia 2019)

2.3.5.5 OPPORTUNITY COSTS

Women and their families reported having to sometimes endure some discomfort to benefit from the intervention with the hopes of achieving the desired good outcomes for the mother and baby. In an intervention involving the use of a make-shift motorbike ambulance, which was considered uncomfortable compared to the traditional ambulance, a family member had this to say:

“There are issues like discomfort, safety and others when you are being transported, but as a sick person, you do not have those issues in mind when there is an emergency. Anything that can hurriedly get you to the place on time is what you will be looking for. All vehicles have the tendency of falling when transporting people so it will not be fair relating safety issues to the Motorking alone.” (Male family member, Ghana, Patel et al no date)

Although this discomfort was reported in one study, it was not clear if the speaker had other alternatives. No other study included data suggesting that the burden of intervention or opportunity cost was explored for women and their families.

Health workers sometimes had to sacrifice time, money and logistics planning to make the interventions work.

“Often I arrived home late because I had to walk a long distance from my home to the meeting venue. I would get back home late after meetings, and I often found my little children asleep.” (Community health worker, Tanzania, Joseph 2021).

“In addition, the phones given to CHWs are old. Now they are buying phones using their own money. Providing them with new phones would provide them with a type of motivation.” (Community supervisor, Rwanda, Musabyimana, 2018)

“Most of the time, ambulances are not available. We then have to use traditional transport to take the mother to the nearest health centre. Mothers at times deliver on the way to the health centre before an ambulance comes.” (Community Health volunteer, Rwanda Mwendwa, 2015)

Funders and staff of ministries of health: when funding organizations had rigid timelines and complex bureaucratic processes, host governments reported having to forgo their desired level of groundwork to ensure that the funder timelines were met.

“I think some of the groundwork that would ordinarily happen when trying to put together a partnership of this size; it just didn't because speed seemed really important. There's this real desire to get something off the ground quickly, and so there wasn't the planning and the groundwork that you would usually see with something like this until it was catching up and learning more information, figuring out how to plug in.” (Host government representative, Palaia 2019).

“I think in any partnership, a funding cycle has different sorts of decision makers and timelines, and I would not say we were fast. There were several delays in our funding, but it was often [because], you know, we didn't have congressional approval or things like that. So, it's hard to control, but it's the reality of how funding gets allocated.” (Global partner – Palaia, 2019))

2.3.5.6 PERCEIVED EFFECTIVENESS

Women and their families generally believed that the interventions were helpful and shared personal stories of positive differences made by the interventions.

“They (MomConnect messages) are so helpful because even after you give birth, they also tell you how to take care of the baby; in case you notice something wrong with the baby, go to the clinic.” (Woman, South Africa, Skinner 2018)

“If not for the Motorking [motorbike ambulance], women, especially pregnant women and children, would have been suffering a lot.... It is able to go to the interior [of communities] to carry cases like the one I told you about with the woman who was in labour and nearly died if not for the sake of the Motorking ambulance.” (Community sub-chief, Ghana, Patel et al. N.D)

Health workers and community volunteers believed that the interventions contributed to the reduction in mortality and improved demand for antenatal care and that recipients were, in turn, cascading the benefits of the intervention to other women in their social circles.

“I can see we dropped maternal mortality; we reached Millennium Development Goals about reducing maternal mortality, and the impact is very positive for me. Maybe statistically you can’t report that is related to RapidSMS only because there were so many interventions in the area.” (Central level participant, Rwanda, Musabyimana 2018)

“Antenatal care attendance improved because CHVs [community health volunteers] were really mobilizing mothers to come to the clinic. For the deliveries we had, I would say we did not have many serious cases due to low Hb [haemoglobin]. Also, IFAS [Iron and Folic Acid supplementation] adherence improved.” (Nurse in charge of ANC services, Kenya, Kamau, 2020)

“We have visited them during this program of IFAS [Iron and folic acid supplementation] and they have been taking them, and now they are teaching the other women about the importance of taking IFAS and other services as well.” (Community health volunteer, Kenya, Kamau, 2020)

Funders and staff of ministries of health: Funders consider a project to be effective if they secure host government buy-in and commitment to scale the intervention. In addition, the ability to work with multiple agencies and achieve useful outcome data was reported as a measure of project effectiveness.

“The district and local leadership were very excited about it. And then when it started to show pretty incredible successes, the government really got behind it, embraced it and wanted to roll it up and package it as one of their everyday works.” (Host government representative, Uganda or Zambia, Palaia 2019).

“It’s kind of a hallmark of SMGL [saving mothers giving life] that we don’t just produce fluff, we actually provide health outcome data, which is extremely rare in USAID-led projects. I’m very proud of the M&E [monitoring and evaluation] we have done and our ability to work across agency silos capturing outcomes in a really sterling, top-notch way.” (US Government representative, Palaia 2019)

2.3.5.7 SELF-EFFICACY

Women felt empowered to make the right decisions for their health and their babies due to the support they received from the interventions.

“When I registered with MomConnect, they informed me that ‘I must pack my ID, my clothes, sanitary towels and the child’s clothes’, things like that... It was simple to raise a child with MomConnect because I took every advice I got from MomConnect.” (Woman, South Africa, Skinner 2018)

Health workers felt more capable of doing their jobs, and some desired more training to maximise the use of available information.

“There are many benefits because I learned that IFAS increases the blood levels in a woman, and it makes her and the baby to be healthy. It helps the mothers to avoid so many problems, which they face when giving birth. We learned the sources of iron and how to cook like spinach and not to overcook which we pass to the mothers and teach the same, thus creating awareness to the community.” (Community Health volunteer, Kenya, Kamau 2020)

“What needs to be improved is the use of the data we are collecting. Health facility staff and everyone who has access to RapidSMS should be trained on data analysis so that they can benefit from the system and know what type of information is provided by the system.” (Community supervisor, Rwanda, Musabyimana, 2018)

Local stakeholders reported that the integration of the intervention infrastructures and resources with the government mechanisms increased their chances of sustaining the gains of donor-funded interventions.

“A lot of infrastructure improvements have been done ... and equipment—those can probably stay longer maybe five years or more. A lot of capacity has been built of the

health workers, and a number of them have been taken on by the districts of the government of Uganda. They have been put on the government payroll, so I believe with that knowledge that has been passed on to them, that is something that can stay on in the long term.” (Uganda Government representative, Palaia 2019)

2.3.6 Effectiveness of community-based interventions

The 17 reports included in this analysis were from studies conducted in 15 countries in SSA ([Table 2.6](#)). Three studies each were from Malawi^{65–67}, and Burkina Faso^{70–72}, and the rest were from 13 other countries. Two studies were conducted in two or more countries^{70,73}. There was at least one study from all four regions of SSA. Seven studies were from West Africa conducted in Nigeria^{63,64}, Burkina Faso^{70–72}, Ghana⁷⁵, and Côte d’Ivoire⁷⁹. East Africa had seven studies, from Malawi^{65–67}, Tanzania⁸⁰, Ethiopia⁸⁶, Mozambique⁸⁸, Uganda and Zambia⁷³. There was one study each from central (Democratic Republic of Congo⁹²) and southern Africa (South Africa⁸⁹).

Table 2.6: Summary characteristics of studies which reported the effect of the intervention on stillbirths

	Title	First author and year	Country	Study design	Place of intervention
1	A Cluster Randomized Trial to Evaluate the Effect of Iodized Salt Exposure on Birth Outcome and Infant Development in Ethiopia	Mohammed 2016 ⁸⁶	Ethiopia	cRCT	Community only
2	Effects of quality improvement in health facilities and community mobilization through women's groups on maternal, neonatal and perinatal mortality in three districts of Malawi: MaiKhanda, a cluster randomized controlled effectiveness trial.	Colbourn 2013 ⁹³	Malawi	cRCT	Community and hospitals
3	Reducing maternal and neonatal deaths in rural Malawi: evaluating the impact of a community-based women's group intervention	Lewycka 2011 ⁶⁶	Malawi	cRCT	Community only

	Title	First author and year	Country	Study design	Place of intervention
4	Mobile Phone Intervention Reduces Perinatal Mortality in Zanzibar: Secondary Outcomes of a Cluster Randomized Controlled Trial	Lund 2014 ⁸⁰	Tanzania	cRCT	Community only
5	Reduced perinatal mortality following enhanced training of birth attendants in the Democratic Republic of Congo: a time-dependent effect.	Matendo 2011 ⁹²	DRC	cRCT	Community only
6	Community-based malaria screening and treatment for pregnant women receiving standard intermittent preventive treatment with sulfadoxine-pyrimethamine: A multicenter (The Gambia, Burkina Faso, and Benin) cluster-randomized controlled trial	Scott 2019 ⁷⁰	Gambia, Burkina Faso and Benin	cRCT	Community only
7	Effect of personalized home-based support for pregnant women on pregnancy outcomes: a cluster randomized trial	Ilboudo 2022 ⁷¹	Burkina Faso	cRCT	Community and hospitals
8	Improving coverage of antenatal iron and folic acid supplementation and malaria prophylaxis through targeted information and home deliveries in Côte d'Ivoire: a cluster randomised controlled trial	Kone 2023 ⁷⁹	Côte d'Ivoire	cRCT	Community only
9	Pregnancy outcomes and ethanol cook stove intervention: A randomized-controlled trial in Ibadan, Nigeria	Alexander 2018 ⁶⁴	Nigeria	RCT	Community only
10	Prenatal fortified balanced energy-protein supplementation and birth outcomes in rural Burkina Faso: A randomized controlled efficacy trial	De Kok 2022 ⁷²	Burkina Faso	RCT	Community only
11	Impact of traditional birth attendant training in Mozambique: a controlled study.	Gloyd 2001 ⁸⁸	Mozambique	Non randomised CT	Community only
12	Impact of the Saving Mothers, Giving Life approach on decreasing maternal and perinatal deaths in Uganda and Zambia.	Serbanescu 2019 ⁷³	Uganda and Zambia	Pre-post	Community and hospitals

	Title	First author and year	Country	Study design	Place of intervention
13	Advancing Survival in Nigeria: A Pre-post Evaluation of an Integrated Maternal and Neonatal Health Program.	Sloan 2018 ⁶³	Nigeria	Pre-post	Community and hospitals
14	The effect of the community midwifery model on maternal and newborn health service utilization and outcomes in Busia County of Kenya: a quasi-experimental study	Shikuku 2020 ⁸³	Kenya	Pre-post	Community only
15	Evaluating the impact of maternal health care policy on stillbirth and perinatal mortality in Ghana; a mixed method approach using two rounds of Ghana demographic and health survey data sets and qualitative design technique	Azaare 2022 ⁷⁵	Ghana	Pre-post (mixed)	Community only
16	Effectiveness of community-based support for pregnant women living with HIV: A cohort study in South Africa	Fatti 2016 ⁸⁹	South Africa	Cohort	Community only
17	Impact of a maternal and newborn health results-based financing intervention (RBF4MNH) on stillbirth: a cross-sectional comparison in four districts in Malawi	Makuluni 2021 ⁶⁷	Malawi	Cross-sectional	Community and hospitals

Eight of the included studies were cluster Randomised Controlled Trials (cRCT)^{65,66,70,71,79,80,86,92}.

Four had pre-post design^{63,73,75,83}, two were RCT^{64,72}, while one each was non-randomised controlled trial (non-RCT)⁸⁸, cohort⁸⁹ and cross-sectional⁶⁷ studies respectively (Table 1). Of the 17 studies, twelve were conducted solely in the community, and four were conducted both in the communities and health facilities, while one study had four arms comprising community only, community and health facility, health facility only and control⁶⁵. The interventions in the health facilities included one or more of the following: training health workers, purchasing equipment and employing adjunct medical staff.

2.3.6.1 Effect of community-only interventions on stillbirths

Thirteen community-only studies assessed the effect of the interventions on stillbirths. Of these, seven were RCTs, and one was non-RCT, cohort and pre-post studies ([Table 2.7](#)). Five studies were rated as good quality, seven as fair quality, and one as poor quality.

Table 2.7: Characteristics of the studies included in the meta-analysis.

	First author and year	Study design	Key intervention(s)	Control	Type of intervention	Intervention strategy	Quality rating
1	Mohammed 2016	cRCT	Early access to iodized salt distribution	Later access to iodized salt	Nutritional	Community mobilisation	Fair
2	Colbourn 2013	cRCT	Participatory women's groups to improve care practices and health-seeking behaviours using quality improvement methods	Usual care	Knowledge and behavioural Increasing access to skilled childbirth	Women's groups/ peer counselling Volunteer and community Health worker training Community mobilisation	Good
3	Lewycka 2011	cRCT	Women's groups, peer health counselling, home visits	Usual care	Knowledge and behavioural	Women's groups/peer counselling	Fair
4	Lund 2014	cRCT	Automated and directed health messaging. Call voucher system for women to reach health workers.	Usual care	Knowledge and behavioural Increasing access to skilled birth	mHealth	Fair
5	Matendo 2011	cRCT	Emergency newborn care training for TBAs, nurses and midwives.	Usual care	Increasing access to skilled childbirth	Traditional birth attendant training(TBA) Community mobilisation	Fair
6	Scott 2019	cRCT	Malaria screening and treatment, home visits.	Usual care	Prevention and management of infections	Home visits, Volunteer and community Health worker training	Good

	First author and year	Study design	Key intervention(s)	Control	Type of intervention	Intervention strategy	Quality rating
7	Kone 2023	cRCT	Home visits, nutritional counselling, micronutrient supplementation.	Usual care	Nutritional, Knowledge and behavioural	Home visits, Volunteer and community Health worker training	Fair
8	De Kok 2022	RCT	Provision of prenatal fortified balanced energy-protein supplement, iron and folic acid supplementation	Usual care	Nutritional, Knowledge and behavioural	Home visits, Volunteer and community Health worker training	Good
9	Alexander 2018	RCT	Provision of clean cook ethanol stoves, home visits and health education.	Usual care	Knowledge and behavioural	Home visits	Good
10	Gloyd 2001	Non randomised CT	Periodic TBA re/training and provision of essential supplies.	One-off national TBA training	Increasing access to skilled childbirth	Traditional birth attendant training	Fair
11	Fatti 2016	Cohort	Home visits, health education, counselling for anti-retroviral therapy initiation and adherence.	N/A	Prevention and management of infections	Home visits	Fair
12	Shikuku 2020	Pre-post	Community midwifery, training and deployment of health workers to hard-to-reach areas.	N/A	Increasing access to skilled childbirth	Community midwifery, Volunteer and community health worker training, Community mobilisation.	Poor
13	Azaare 2022 ⁷⁵	Pre-post (mixed)	National health policy for free maternal healthcare	Women accessing care before policy	Increasing access to skilled childbirth	Community mobilisation	Good

The meta-analysis, including all thirteen studies of community-based intervention alone, showed that the intervention communities had only marginally reduced odds of stillbirth compared with the control communities (OR 0.96; 95% CI 0.78-1.17, $n = 63,884$), which was not statistically significant ([Figure 2.3](#)). Statistical heterogeneity across studies was moderate ($I^2=57\%$, $p < 0.01$). A sensitivity analysis excluding the study with a high risk of bias⁸³ did not materially change the results (OR 0.97; 95% CI 0.79-1.19, $n = 60,615$).

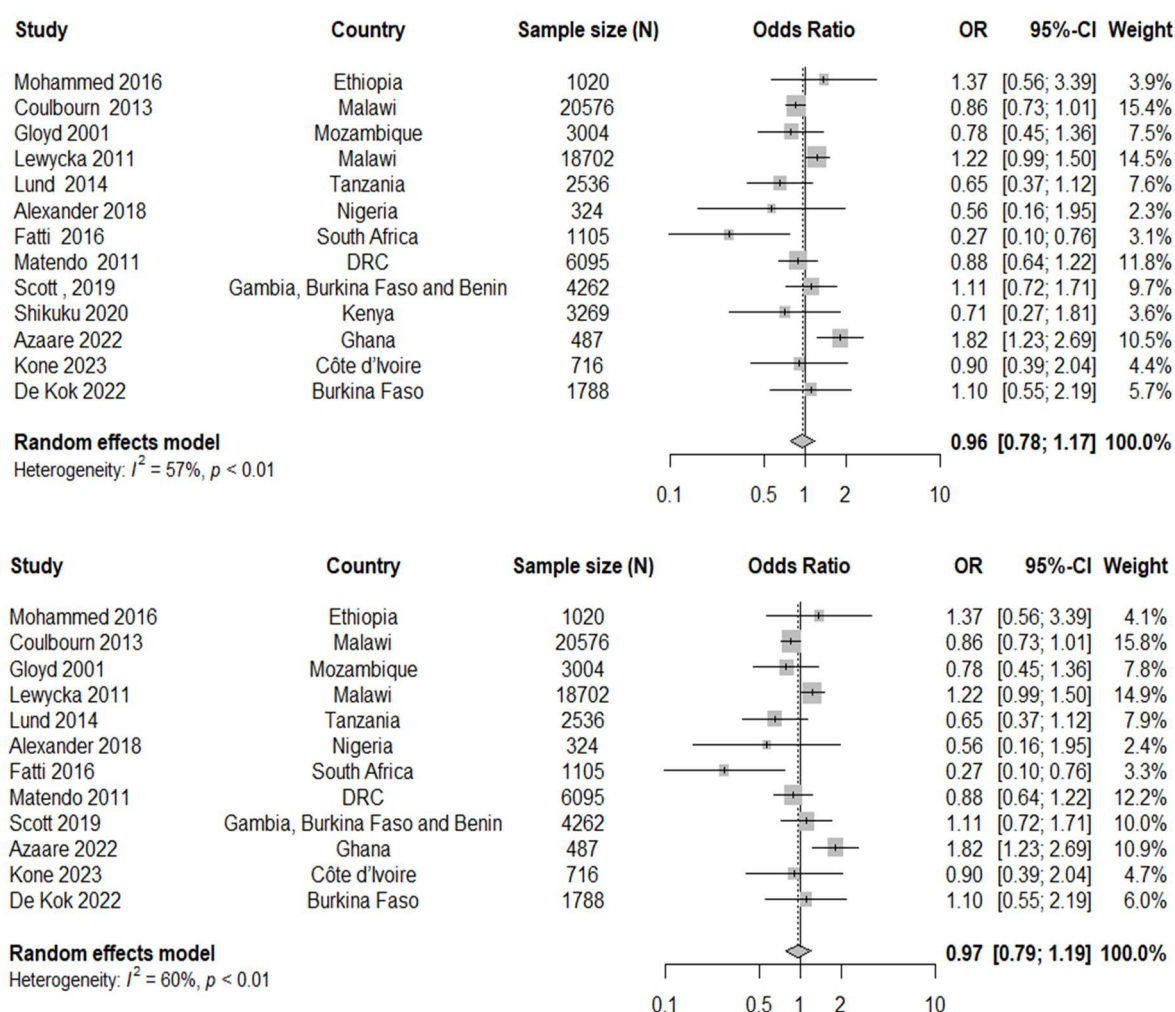


Figure 2.3: Forest plot of odds of stillbirths in intervention communities compared with control communities in (a) all studies (b) without high risk of bias study

The funnel plot ([Figure 2.4](#)) and Egger's test ($p=0.08$) showed very weak evidence of publication bias.

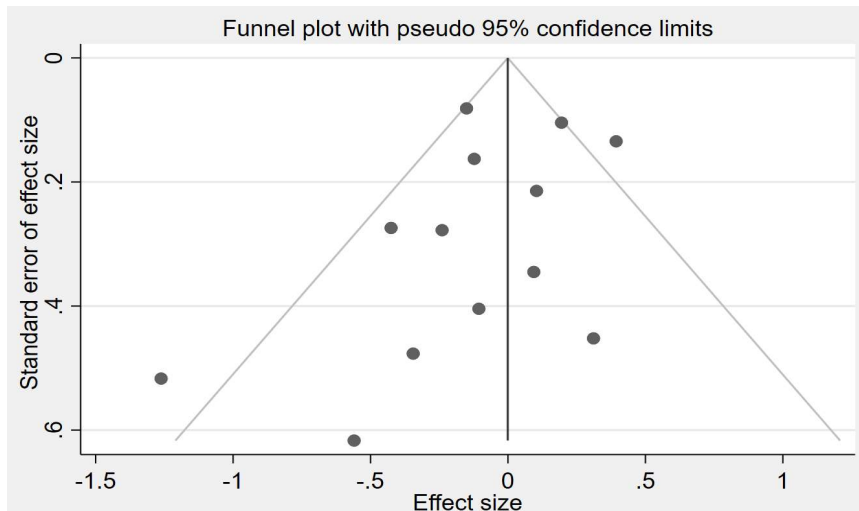


Figure 2.4: Publication bias evaluated by funnel plot

Subgroup analysis

The included studies implemented one or more types of intervention using two or more intervention strategies. For example, the Colbourn study⁹³ implemented two types of intervention (knowledge/ behavioural intervention and increasing access to skilled childbirth) using three delivery strategies (women's groups, volunteer/community health worker training and community mobilisation). To calculate the pooled effect by intervention types, the effect of studies with more than one type of intervention was included in the pooled subgroup analysis for each type (Figure 2.5). The meta-analysis showed that compared with the control group, there was no evidence of difference in odds of stillbirth for infection prevention and treatment (OR 0.60; 95% CI 0.15-2.35 n= 5,367), health knowledge and behaviour (OR 0.90; 95% CI 0.72 -1.12, n= 53,278), skilled attendance at childbirth (OR 1.06; 95% CI 0.75-1.49, n= 17,117), and nutritional interventions (OR 1.09; 95% CI 0.69 – 1.73, n= 3,524). The heterogeneity in the subgroups varied from 0% (P= 0.79) to 84% (P= 0.01).

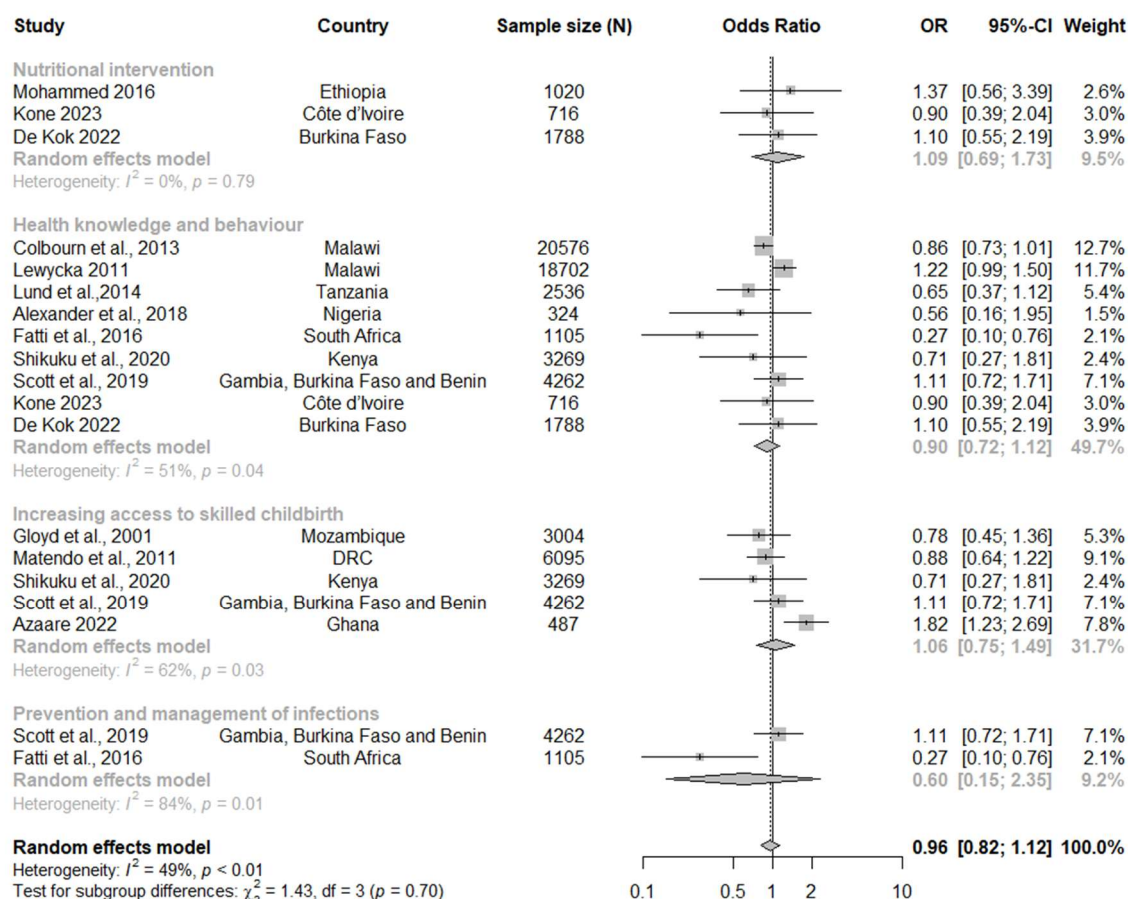


Figure 2.5: Forest plot of odds of stillbirths in intervention communities compared with control communities by intervention types

Subgroup analysis based on the intervention delivery strategy followed the same pattern as the previous analysis (Figure 2.6). The meta-analysis showed that in all but two intervention delivery strategies (women's groups and community mobilisation), the intervention communities also had non-significant lower odds of stillbirth, while there was no evidence of an effect of women's group and community mobilisation interventions. The heterogeneity in the subgroups varied from 0% ($P = 0.72$) to 85% ($P < 0.01$).

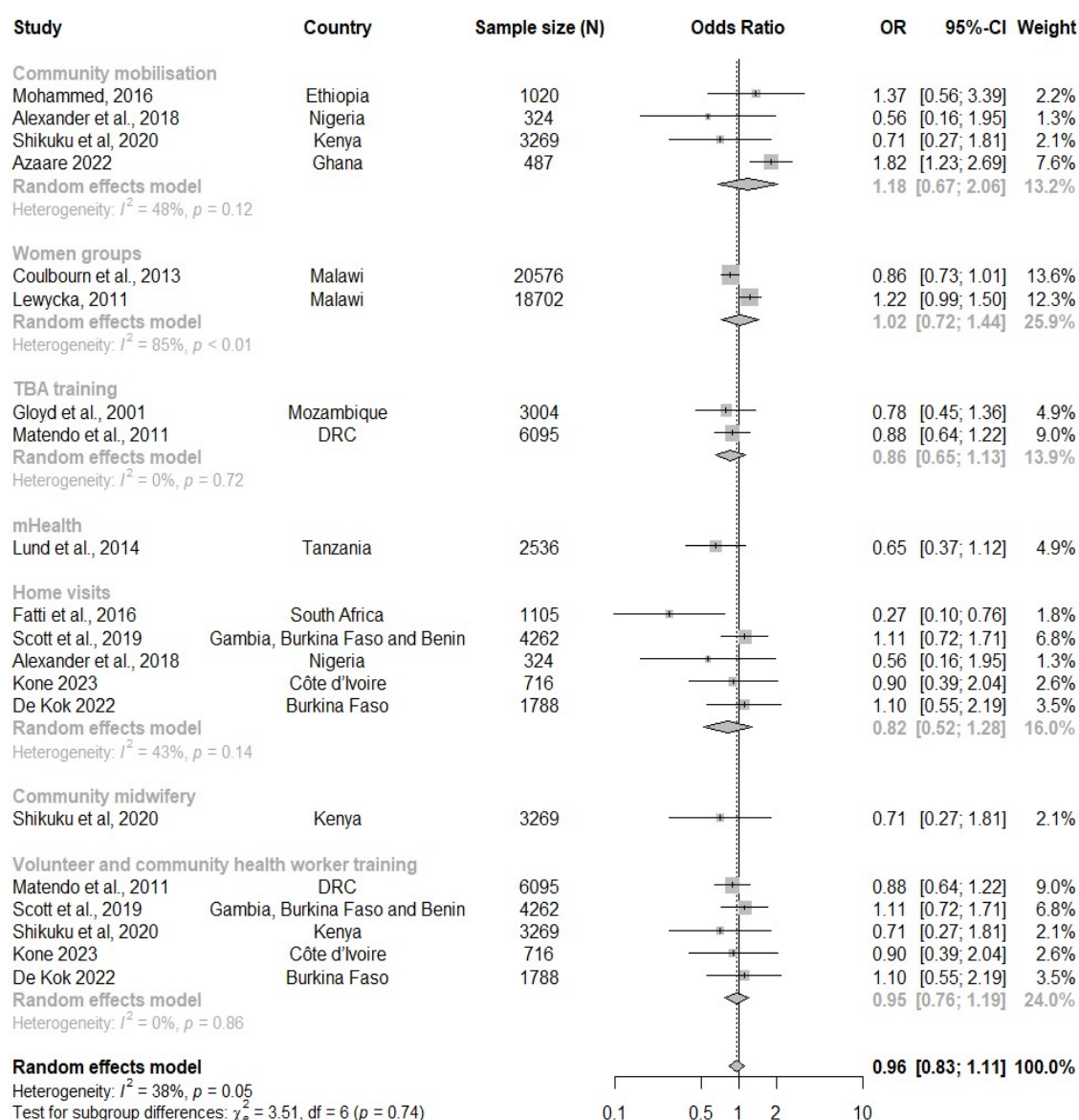


Figure 2.6: Forest plot of odds of stillbirths in intervention communities compared with control communities by intervention delivery strategies

2.3.6.2 Effect of community and hospital interventions on stillbirths

The effect of studies that had both community and health facility interventions for stillbirth prevention was explored further. Five such studies were identified and included in this analysis. Two studies each had a fair and good quality rating, while one had a poor rating (Table 2.8). The Colbourn study⁹³ had four arms, one of which was a community and health facility intervention; the effect estimate from this arm was included in this analysis. The pooled estimate from these

studies showed no evidence of a difference in the odds of stillbirth (OR 0.97; 95% CI 0.48 - 1.95, n= 247,640) ([Figure 2.7](#)). A sensitivity analysis excluding the Makuluni study⁶⁷, which had a high risk of bias, showed evidence of reduced odds of stillbirths in the intervention group compared with the control group (OR 0.83; 95% CI 0.79 - 0.87, n= 244,868).

Table 2.8: Characteristics of studies with community and health facility interventions included in the meta-analysis.

	Authors and year	Country	Study design	Type of intervention	Intervention strategy	Quality rating
1	Serbanescu 2019	Uganda and Zambia	Pre-post	• Knowledge and behavioural • Increasing access to skilled childbirth	• Women's groups/peer counselling • Volunteer and community Health worker training • Community mobilisation	Fair
2	Sloan 2018	Nigeria	Pre-post	• Knowledge and behavioural, • Increasing access to skilled childbirth	• Women's groups/peer counselling, • Volunteer and community health worker training, • Community mobilisation	Fair
3	Colbourn 2013	Malawi	cRCT	• Knowledge and behavioural, • Increasing access to skilled childbirth	• Women's groups/peer counselling • Volunteer and community Health worker training • Community mobilisation	Good
4	Makuluni 2021	Malawi	Cross-sectional	• Increasing access to skilled childbirth	• Transportation vouchers • Health worker training	Poor
5	Ilboudo 2022	Burkina Faso	cRCT	• Nutritional	• Home visits, • Volunteer and community Health worker training	Good

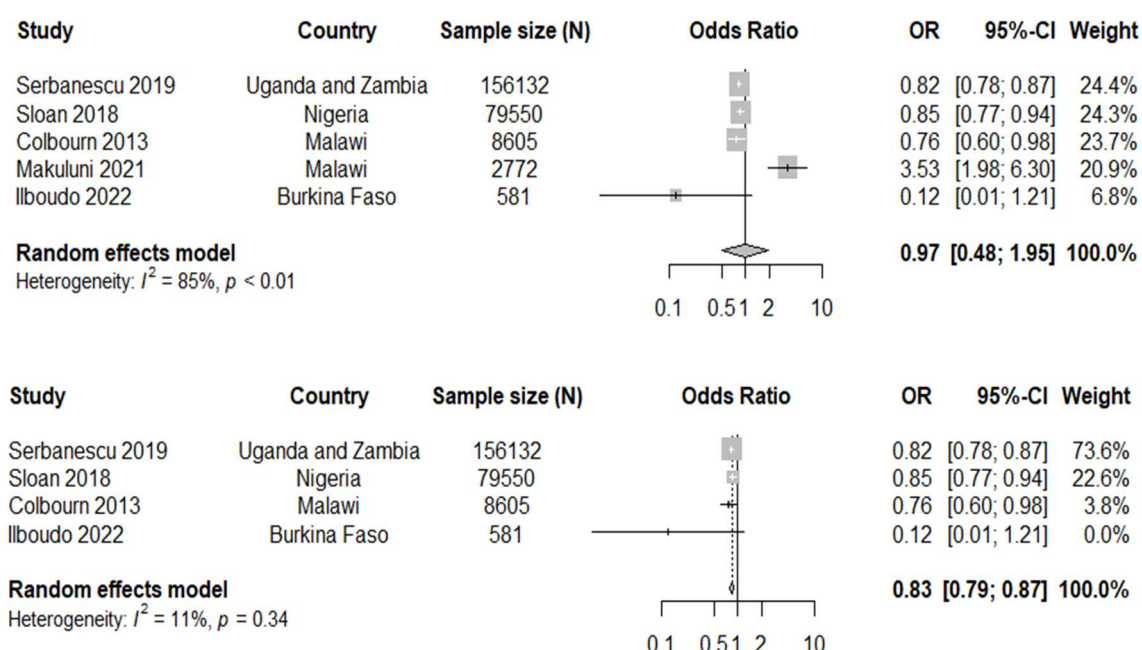


Figure 2.7: Forest plot of odds of stillbirths in the intervention arm compared with control hospitals and communities in (a) all studies (b) without high risk of bias study

2.4 Discussion

2.4.1 Overview of the findings

This systematic review and meta-analysis of community-based interventions for stillbirth prevention assessed the types, completeness of reporting, acceptability and effect of interventions in SSA. A total of 39 reports from 34 studies conducted in 18 countries in SSA were included in this review. All four regions of SSA – west, east, central and southern Africa were represented in the review. The quality of included studies ranged from poor and fair to good, with the majority receiving a fair rating. Four types of interventions were identified: nutritional, infection prevention and treatment, improving access to skilled childbirth attendants and improving women's health knowledge and behaviours. These interventions were delivered using

nine strategies, including mHealth, women's groups, community midwifery, home visits, mass media sensitisation, traditional birth attendants and community volunteer training, community mobilisation and transport vouchers. The least reported areas of the included interventions were intervention tailoring, modification and intervention fidelity. Community-based interventions were generally acceptable to women, health workers and local ministries of health. However, important constructs of acceptability, such as ethicality, opportunity cost and burden of intervention were poorly explored for women in this region. There was no evidence supporting the use of community-based interventions to reduce stillbirth rates; however, combined community and hospital-based interventions were found to significantly reduce the odds of stillbirth in intervention communities by 17%. A range of intervention types and delivery strategies were evaluated, and there was no clear indication that any particular type of intervention or delivery strategy was more effective than any other.

2.4.2 Completeness of intervention reporting

While there are unique contextual differences in LMICs, there is room for successful interventions to be adapted from one context to another. With many public health interventions being incompletely described in the published literature⁹⁹, this potential benefit has not been fully exploited. Since many interventions targeting stillbirths are often complex interventions (described as interventions which have several interacting components¹⁰⁰), researchers need to describe each component in replicable detail for future researchers and those implementing the interventions to attain a similar level of intervention efficacy. Similar to previous reviews, this review showed that details about intervention intensity, dosing, tailoring and modification are also incompletely reported^{99,101,102}. Although it may appear counter-intuitive for researchers to report some intervention components such as intensity, dosing or tailoring for some study designs (e.g. cross-sectional studies), it is beneficial for future researchers and implementers to know, for instance, the frequency, variations or tailoring of training visits over time or across geographical

zones within the study. Skivington and colleagues⁵⁰ described a comprehensive framework for developing and evaluating complex interventions as having core elements including understanding context, engaging stakeholders, developing programme theory and four phases – feasibility studies, intervention development, implementation and evaluation. They argue that researchers studying complex interventions need to address and report a broader range of questions, including unintended impacts of research, how it interacts with the health system and how their findings can support future researchers or policymakers in making decisions. Incomplete reporting of interventions also poses additional challenges for researchers synthesising available evidence in a meta-analysis as some characteristics may remain uncertain, hampering effective moderator analysis¹⁰³. There is evidence that community-based interventions can complement interventions at health facilities to accelerate progress for stillbirth reduction in SSA. Scaling up interventions with proven benefits and instituting policies based on generated evidence will require robust intervention documentation and assessments.

2.4.3 Types of community-based interventions

Evidence synthesis from studies across the world suggests there are different levels of effectiveness of different interventions implemented for stillbirth prevention at the various stages of pregnancy^{39,104–106}. Commonly recommended interventions before and during pregnancy include peri-conceptional folic acid supplementation, malaria screening and treatment, and syphilis screening and treatment. As the pregnancy advances, other recommended interventions include the detection and management of diabetes and hypertensive disorders of pregnancy, detection of fetal growth restriction and post-term pregnancy. During childbirth, interventions recommended are skilled childbirth attendance and basic and comprehensive emergency obstetric care. Only interventions outside of the clinical setting were examined in this review, and the interventions were grouped into types based on what they sought to accomplish³⁹ and the intervention strategies deployed⁴⁶. This review showed that various types of community-based

interventions for preventing stillbirths have been tested in countries located in all four sub-regions of SSA, potentially due to increasing policy attention for maternity care and collaboration for stillbirth prevention (and broader maternal and newborn health approaches) in this region^{28,29}.

In SSA, 22% of childbirths occur in health facilities⁴⁰, and 64% of women have skilled childbirth attendance¹⁰⁷. Increasing access to skilled attendance at childbirth is one of the evidence-based recommendations for reducing stillbirths in SSA³⁹. This review shows that several strategies have been tried to improve skilled attendance at childbirth in the region with varying degrees of success. Strategies tried include providing emergency transport, health worker training, training traditional birth attendants (TBA), free maternal health services, and community midwifery. Of these strategies, TBA training remains one of the most controversial, with inconclusive findings about its effectiveness as some studies have found them to be beneficial in improving maternal and newborn outcomes, including reducing stillbirths^{108,109}, and others found them unhelpful⁸⁸. While there is a preference for skilled attendance at childbirth, the worsening shortages in human resources for health in SSA require innovative strategies to make up for the shortfall¹¹⁰. Some researchers argue that TBAs could potentially serve to reduce the gaps in primary maternal care provision if they are adequately trained, supervised and integrated into the health system. In Timor Leste, TBAs have been incorporated into the national healthcare system through the Family Health Promoter programme since 2007 and have since been scaled up and assessed to have contributed to the reduction of poor maternal and newborn health outcomes in the country¹¹¹. Maternal infection with several viral and bacterial pathogens is thought to account for 20- 50% of stillbirths in LMIC settings^{39,112}. Malaria and syphilis infection have been associated with a two-fold increase in the risk of stillbirths¹¹³, while uncontrolled HIV has been associated with over 1.5-fold risk¹¹⁴. This risk of stillbirth can be reduced at the community level through disease control and prevention efforts (e.g. use of insecticide-treated nets) or massive screening campaigns coupled with treatment strategies, which were identified in this review. Several non-clinical

interventions that aim to alter maternal nutrition and behaviours, leading to improved maternal health status and reduction of fetal exposure to insult have been attempted with various degrees of success¹¹⁵. Similar to previous reviews, researchers in the included studies adopted strategies such as improving the quality of antenatal education, women's groups, home visits and community mobilisation. Despite the concerns for the inequitable access to mobile health (mHealth) interventions due to inadequate mobile phone penetration in SSA (46% in 2020¹¹⁶), mHealth interventions for health education, appointment reminders and referral coordination are rapidly increasing in SSA⁴⁹, although many of them lack robust evaluations to identify their impact on health outcomes.⁴⁹ A notable intervention included in this review is the rapid SMS intervention in Rwanda, which was piloted as a mechanism to support community health workers in delivering community maternal and newborn health interventions. This intervention has now been scaled nationally and is utilised for several health service delivery programmes in Rwanda¹¹⁷.

2.4.4 Acceptability of interventions

This review uncovered essential issues concerning how the acceptability of interventions has been studied in SSA. Recommendations for community-based interventions advocate for co-creation, co-implementation and co-evaluation with host communities, as acceptability by the potential recipients is crucial for intervention success and sustainability¹¹⁸. Although intervention acceptability alone may not substantially influence the intervention outcomes, different studies have linked the acceptability of interventions with increased adoption or engagement with intervention, compliance or adherence, user satisfaction and experience, effectiveness or impact and sustainability beyond the implementation phase^{119–121}. The review findings highlight that various aspects of the interventions could be related to acceptability, including affective attitude, intervention burden and barriers, ethicality, intervention coherence, opportunity costs, perceived effectiveness and self-efficacy attained from interventions targeting women and their families. Health workers, women and their families expressed that they were happy to take part in

community interventions due to the perceived direct benefits from participation. However, similar to another study, health workers highlighted challenges such as increased workload, conflicts with family responsibilities, and the need for better support and remuneration¹²².

Ethical implications of intervention were also examined, particularly from the perspective of health workers and other stakeholders, but not for women and their families, which could be a significant problem in improving the acceptability of community-based interventions. Task delegation and conflicts regarding the involvement of community volunteers were highlighted. A task-shifting policy is increasingly being adopted to address the widespread human resource gaps in many SSA countries. However, its implementation is not without challenges, including inadequate training, inadequate supportive supervision, lack of clarity on roles, ethical concerns for health outcome implications and legal protection for additional tasks ceded¹²³. It was interesting to find that despite having no remuneration, some community volunteers continued to support interventions, aligning with previous findings that volunteers are mostly driven by the intrinsic desire to serve and gain satisfaction and status within the community rather than monetary gain^{119,124}. Women and health workers demonstrated a good understanding of their roles in intervention activities. However, as reported in previous studies, navigating bureaucracies in a multi-partner consortium of funders and the local ministries of health can be complicated, inadvertently influencing the outcome of the intervention. Funders and staff from ministries of health had concerns about the ambitious targets set by externally funded interventions, emphasising the importance of strong local leadership and engagement with potential recipient communities to ensure the success of interventions.

A lot of attention was paid to intervention acceptability in the included studies, which focused on health workers implementing these interventions rather than women, probably because of the protracted critical workforce shortages in the region¹¹⁰. Interventions in the region need to be

driven by local ministries of health to improve sustainability. The Rapid SMS programme in Rwanda, included in this review, is a government-led mHealth intervention which started in 2010 and, from various assessments, has been found to significantly contribute to improved outcomes such as decreased maternal and infant mortality and increased demand for high-quality maternal and newborn health services¹¹⁷. An important finding of this review was that none of the qualitative evaluations addressed the ethical implications and burden of the interventions from the perspectives of the women and their families. This brings the participation of women under scrutiny as one may wonder if they participate in these interventions by choice or out of despondency or dependency. There is a need to increase the engagement of women in co-creation, co-implementation and co-evaluation of the stillbirth prevention interventions trials.

Recently, Kim et al.¹²⁵ reported a minimum set of key outcomes (core outcome set) agreed on by stakeholders that should be reported consistently in all efficacy and effectiveness trials/studies for stillbirth prevention. The outcome set were developed with relevant stakeholders, including parents. While this appears to be a useful development for stillbirth prevention, Dube et al.¹²⁶ argue that the involvement of parents and families from high-burden LMICs for the outcome set development appears 'tokenistic' and, therefore, may not reflect the needs of parents or communities in these settings. The perspectives and experiences of women and their families can inform contextually appropriate strategies that address the unique challenges and cultural considerations of these settings, leading to improved outcomes for both women and babies.

2.4.5 Effect of interventions

Seventeen of the included studies quantitatively assessed the effect of interventions on preventing stillbirths. Three previous reviews have evaluated the effect of community-based interventions on maternal and newborn health, with only one focusing solely on stillbirths^{39,46,47}. Two of the previous community intervention reviews assessed intervention effect on stillbirth and

concluded that some interventions showed promising results (community financing schemes, maternal waiting homes)³⁹, while some demonstrated significant reductions in stillbirth (training for newborn resuscitation, perinatal death audits, community mobilisation, health education)^{39,46}.

The effectiveness of community interventions depends on several factors, including community readiness to adopt interventions, acceptability of interventions by women, robustness of implementation, strength of local administrative systems, local health system support, available infrastructure, quality of the relationship between implementers and stakeholders, as well as sociocultural norms in the society which could preclude participation in the intervention⁸¹. In assessing the pooled effect of these interventions, studies with different levels of implementation variability and methodological flaws are often pooled together. This remains a much-debated practice in research, especially with the inclusion of observational studies¹²⁷. Another common challenge in the meta-analysis of the effects of different types of intervention is the poor reporting in published literature and the uncertainty about study characteristics omitted by some authors, which limit effective moderator analysis¹⁰³. The pooled effect of community-based intervention from this review was a 4% reduction in the odds of stillbirth. However, only five papers had good methodological quality, while the other eight had moderate to serious methodological flaws. Some of the studies in the review suggest that the lack of effect on stillbirth may be due to factors such as the implementation effect (increased reporting of stillbirth due to intervention project)⁹², other ongoing national or regional projects in the control region or other factors which researchers are unable to explain^{79,128}. In a much larger Cochrane review of community-based interventions, there was a strong evidence of a 19% reduction in stillbirth in intervention communities⁴⁶; however, some of the included papers had some health facility components included in the interventions. Aligning with the Cochrane study, a meta-analysis of the joint community and health-facility interventions included in this review found 17% lower odds of

stillbirth in the intervention group, whereas there was no evidence of effect for community-based intervention alone.

In SSA, several risk factors, which could be addressed by altering the nutrition and behaviour of women, have been associated with an increased risk of stillbirths, including anaemia in pregnancy, malaria, gestational diabetes, hypertensive disorders of pregnancy, and external trauma^{129–131}. Knowledge and behavioural interventions included in this meta-analysis led to a non-significant 13% reduction in stillbirth, while nutritional interventions had no impact. These findings appear not to be unique to the study reported here as similar results have been reported elsewhere¹¹⁵. In a systematic review of global nutritional and behavioural interventions targeting stillbirths, no clear benefit of these interventions was found in reducing stillbirth, although many of the interventions led to increased demand for antenatal care services¹¹⁵. Again, this lack of effect may be due to the short implementation and follow-up period of such intervention programmes, underpowered studies, methodical flaws or the inadequate integration of such programmes into the healthcare system¹³². Another possible reason for a marginal improvement in stillbirths for community-based interventions could be the high proportion of stillbirths that occur during labour – an estimated 40% of all stillbirths globally and 50% of all stillbirths in SSA⁵, compared with antepartum stillbirths.

Intervention strategies aimed at improving access to skilled birth attendance, including the provision of emergency transport, health worker training, traditional birth attendant (TBA) training, free maternal health services, and community midwifery, showed a non-significant 14% reduction in the odds of stillbirth. Interventions targeting the prevention of maternal infections associated with stillbirths (e.g. malaria, HIV, syphilis) were identified in this review. While this meta-analysis found no evidence of an effect of the infection prevention studies, another meta-analysis showed syphilis and malaria treatment in pregnancy are beneficial in reducing stillbirth

and decreasing the odds of stillbirths by 80% and 20%, respectively¹³³. This difference in findings may be due to the smaller number of studies (n=2) and participants included in this review, which focused on SSA alone. In contrast, the review by Ishaque *et al.*¹³³ had a larger sample size and included 25 studies from different parts of the world¹³³. Similarly, interventions delivered via mHealth, volunteer and community worker training, community midwifery and home visits led to non-significant reductions in the odds of stillbirth in the intervention communities, possibly due to the number of participants and the number of studies included. On the other hand, women's group interventions included in this review did not lead to any changes in the odds of stillbirth. This finding is not unique to the review reported here as similar results were reported in India¹³⁴ and also by Prost and colleagues in a meta-analysis of the effects of women's groups on maternal and newborn health outcomes¹³⁵. It was interesting to note that while both interventions reported no effect on stillbirths, women's group interventions had a positive reduction in maternal deaths and newborn deaths^{134,135}, raising the question about what changes need to be effected in women's groups to extend the benefits to stillbirths.

An important finding from this meta-analysis is that implementing community-based interventions alone without strengthening the quality and capacity of health facilities might not substantially reduce stillbirths in SSA. In another review, Lassi and colleagues concluded that unless the primary care system and community actors effectively work together, neither of them will be able to maximise or leverage the benefits the other has, thus reducing the maximum potential impact¹³⁶. The achievements in the Millennium Development Goals 4 and 5 in Pakistan were also primarily attributed to the successful merger between the community-based efforts and the formal health system¹³⁶. Therefore, as countries in this region plan and implement policies for reducing stillbirths, evidence provided by this study suggests that integrated efforts rather than community-only interventions are more effective.

2.5 Strengths and limitations of the study

This is an updated review of community-based interventions for stillbirth prevention in SSA and, to the best of the researcher's knowledge, provides the first assessment of the acceptability and completeness of reporting stillbirth prevention interventions in SSA. This review needs to be interpreted with the following limitations in mind. First, only recent interventions documented and published in peer-reviewed journals and the grey literature from January 1, 2000, to July 7, 2023, were included in this review. It is possible that there were successful community interventions conducted before 2000 or documented in paper records or news briefs that are inaccessible and, therefore, not included in this review.

Second, the included studies were categorised into community-based interventions or those with a health facility component. This classification was based on the information gathered from the retrieved articles. However, there is a possibility that some studies were misclassified due to incomplete information reporting in the articles. Also, some interventions may have implemented changes in health facilities but were not reported in published articles. Again, secondary data from seven studies were utilised for the assessment of intervention acceptability, and this is not a comprehensive review of the acceptability of community-based interventions; hence, the inferences from the findings may be limited; however, this does not diminish the importance of the conclusions, especially relating to acceptability for women.

Third, some retrieved studies assessed the effect of interventions on the composite indicator perinatal death, which included stillbirths and early neonatal deaths; however, these studies were excluded from the analysis reported here. Arguably, differentiating intervention effect on stillbirth from perinatal death is important for several reasons, including the difference in timing of both events (stillbirths – 28 weeks to time of labour, early neonatal death – first seven days after livebirth) and, therefore, the decision to exclude studies that had composite effect only is also a

strength of this review. This is because time-specific risk factors and their prevention strategies can only apply to one and not the other outcome when it comes to reducing perinatal death. For instance, implementing strategies during pregnancy to prevent maternal infections and stillbirths will not necessarily address the issue of early neonatal deaths caused by inadequate neonatal resuscitation if it was required. Instead, providing access to high-quality neonatal care can help prevent these early neonatal deaths. Also, separating stillbirths from perinatal deaths helps in accurately measuring and evaluating the impact of interventions.

Finally, the limited number of studies included in the meta-analysis and the high degree of heterogeneity in the subgroup analysis limit the possible conclusions from this review. The quality of studies included in the analysis could also be a limitation, especially for the subgroup analysis. While this does not mean that the included studies do not add useful information to the critical narrative synthesis, however, the synthesised evidence would have been more robust if all the included studies had been methodologically rigorous.

Overall, the review signalled the importance of integrated efforts in reducing stillbirths and may serve as a basis for formulating evidence-based policies and guidelines for stillbirth prevention.

2.6 Conclusion and recommendations

There are diverse community-based interventions for stillbirth prevention implemented through various strategies in SSA. However, the potential benefits of these interventions are undermined by incomplete reporting, which limits the replicability, intervention scale-up, and reliability of their evaluation. There is a critical need for periodic and comprehensive assessment of these interventions, including their acceptability to health actors, particularly women who are the primary potential recipients.

Harnessing the combined benefit of simultaneous interventions within health facilities and their surrounding communities could significantly reduce stillbirths if properly planned, implemented, and scaled within the health system. More robust evaluations of community-based interventions and controlled trials are needed to fully understand the effect of interventions on reducing stillbirths.

Chapter 3 Methodology

3.1 Background of Nigeria

The data collection for this research was conducted in Nigeria, which is a West African country bordered by Niger Republic to the north, Chad and Cameroon to the east, Benin Republic to the west, and the Gulf of Guinea and the Atlantic Ocean to the South. Nigeria has a three-tiered federal system of governance comprising the federal tier, the 36 states and the Federal Capital Territory, and 774 Local Government Areas (LGAs), which are further divided into 9,565 political wards. For administrative purposes, the country is divided into six geopolitical zones (North West, North Central, North East, South West, South South and South East)¹³⁷. States within these geopolitical zones share similar cultures, ethnic groups, and common histories.

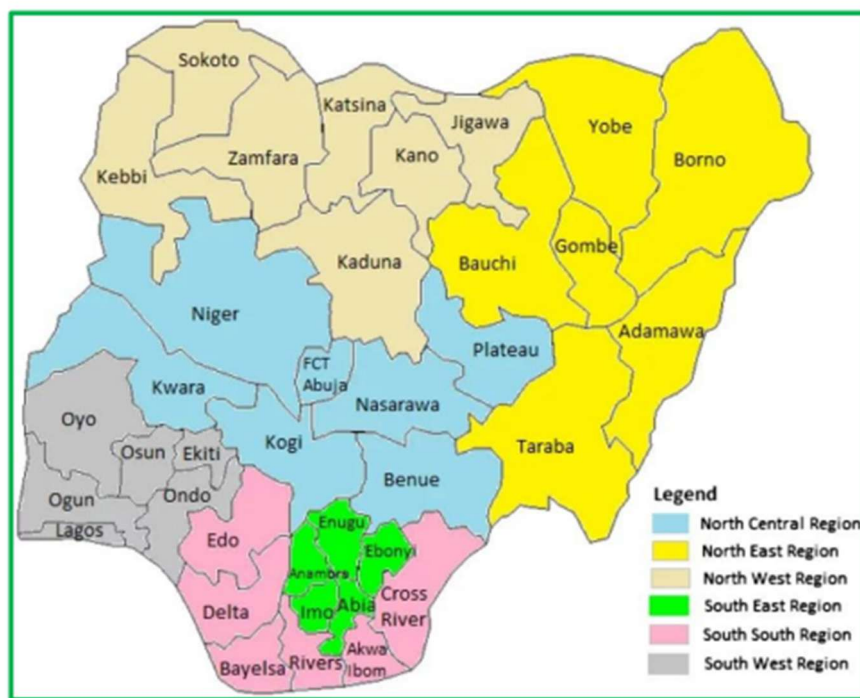
3.1.1 Geographical, economic and socio-demographic background

Nigeria has a population of over 218 million people¹³⁸, and it is projected that by the year 2100, Nigeria's population could reach 733 million, making it the world's third most populous country, trailing only India and China¹³. With an annual population growth of 2.4% and life expectancy at birth of 53 years, as estimated in 2021¹³⁸, this significant population growth could have far-reaching implications for Nigeria's economy, social structure, and natural resources. Nigeria is very culturally diverse, with over 350 ethnic groups and more than 500 languages, and this heterogeneity is reflected in some disease patterns and health outcomes in the country¹³⁷. The official language of Nigeria is English.

The population of Nigeria is predominantly young, with 45% of the population under 15 years of age. Women in the reproductive age group (15 – 49 years) constitute about 22% of the population¹³⁷. The total fertility rate has slowly declined from 6 in 1990 to 5.3 in 2018, and the prevalence of use of modern contraceptives remained unchanged at 12% in 2018²⁰. There are

substantial differences in fertility rates and modern contraceptive use across the geopolitical zones, ranging from 3.9 births per woman in southwest Nigeria to 6.6 births per woman in the North West²⁰. Modern contraceptive use among married women ranges from 2% in Yobe and Sokoto to 29% in Lagos State²⁰.

Nigeria is a lower-middle income country with a Gross Domestic Product (GDP) of USD 472 billion and USD 2,162 GDP per capita in 2022¹³⁸. According to the World Bank, in 2023, 30.9% of the Nigerian population lived on less than USD2.15 daily¹³⁹. Nigeria had the highest share of the global population living below the extreme poverty line in 2023¹⁴⁰. This is despite having the largest economy in Africa¹¹⁶. Subsistence agriculture is the most common occupation in Nigeria, while crude oil accounts for 90% of export earnings and over 75% of government revenue¹³⁷.



Source: National Strategic Health Development Plan II, (Federal Government of Nigeria, 2018)¹³⁷

Figure 3.1 – Map of Nigeria showing its 36 states and Federal Capital Territory (FCT).

3.1.2 The Nigeria health care system

The Nigerian health care system is a devolved three-tier health system administered in each area via the Federal Ministry of Health, State Ministry of Health, and Local Government Health Department. As shown in Fig 3.2, the local government areas are responsible for primary health care services, while the state governments provide secondary level care, and the federal government is responsible for tertiary level care. In practice, Nigeria runs a pluralistic health care system with public, private, third sector organisations (voluntary organisations, civil society, faith-based institutions, and non-governmental organisations), development partners (including multilateral agencies such as World Health Organization, United Nations Children's Fund), and traditional healers providing health care¹³⁷.

Nigerian health indicators are generally poor and lag behind countries with comparable income levels in Africa and other LMICs¹⁴. Only 3% of Nigerians aged 15–49 years have any form of health insurance coverage²⁰. With approximately 40% of Nigerians living in poverty and in social circumstances that lead to ill health, the threat of catastrophic health expenditure is always present for many families¹⁴¹. Also, the available national data often obscures the stark inequities between socioeconomic classes, rural and urban dwellers, and geographic regions. The out-of-pocket expenditure for health in Nigeria is very high and contributes to 77% of total health expenditure in Nigeria compared with the average of 37% in Africa and 18% globally¹⁴. In 2017, Nigeria's total government spending on health was only 4.6% of the gross domestic product, lower than the 7.2% and 10.3% average in Africa and globally, respectively¹⁴².

There are significant challenges facing health service provision in Nigeria, including limited access to essential healthcare services in rural areas, insufficient infrastructure, sub-optimal supply chain logistics, and inequalities in healthcare quality between urban and rural areas¹⁴. Additionally, there are perennial issues of critical health workforce shortages, uneven distribution of healthcare

workers, workforce retention, and motivation challenges that affect equitable healthcare delivery across Nigeria¹⁴³.

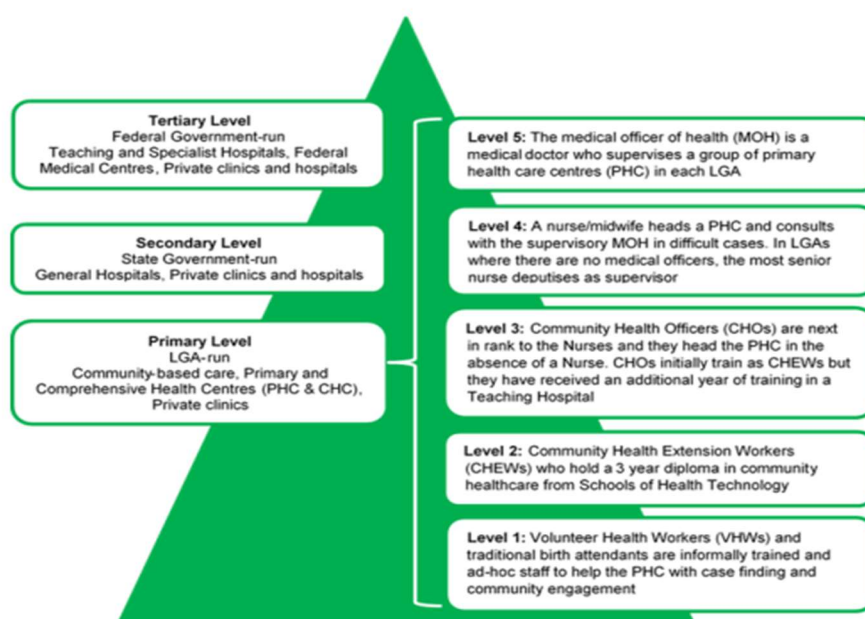


Figure 3.2: Nigeria's health System levels and organisation (Source: Federal Government of Nigeria, 2018)¹³⁷

3.2 Maternal and perinatal health care in Nigeria

According to the design of the health system in Nigeria, the primary healthcare centres provide a Basic Emergency Obstetric and Newborn Care (BEmONC) package, which typically includes the administration of parenteral antibiotics, administration of parenteral anticonvulsants, administration of parenteral uterotonics; removal of retained products (manual vacuum aspiration), assisted vaginal delivery, manual removal of the placenta, and resuscitation of the newborn¹⁴⁴. The secondary and tertiary facilities provide comprehensive emergency obstetric and newborn care (CEmONC), including all BEmONC services, and they can also conduct surgical interventions and blood transfusion¹⁴⁴. While these are the expected services, health facilities' service readiness assessments in Nigeria have shown that many facilities are not service-ready^{145,146} due to systemic issues such as staff shortages, essential drug stockouts, lack of

equipment, women often arriving at health facilities with obstetric emergencies only to realise that the desired services are not available necessitating further referrals and driving poor outcomes⁴².

Ideally, when a woman discovers she is pregnant, she is expected to register and begin her antenatal care at the PHC closest to her³². If she develops any pregnancy complications, for example, hypertensive disorders in pregnancy, her care is transferred to a secondary hospital where obstetricians are available to manage her care. In some cases, when care is beyond a secondary hospital's capacity, for instance, if the woman suffers a stroke as a complication of preeclampsia, the woman is referred to a tertiary facility equipped to handle such critical cases. In reality, women often bypass the primary or secondary facility to register in a secondary or tertiary facility (Figure 3.3). This has led to the underutilisation of PHCs and has placed significant strain on the resources and bed capacity of tertiary facilities^{147,148}.

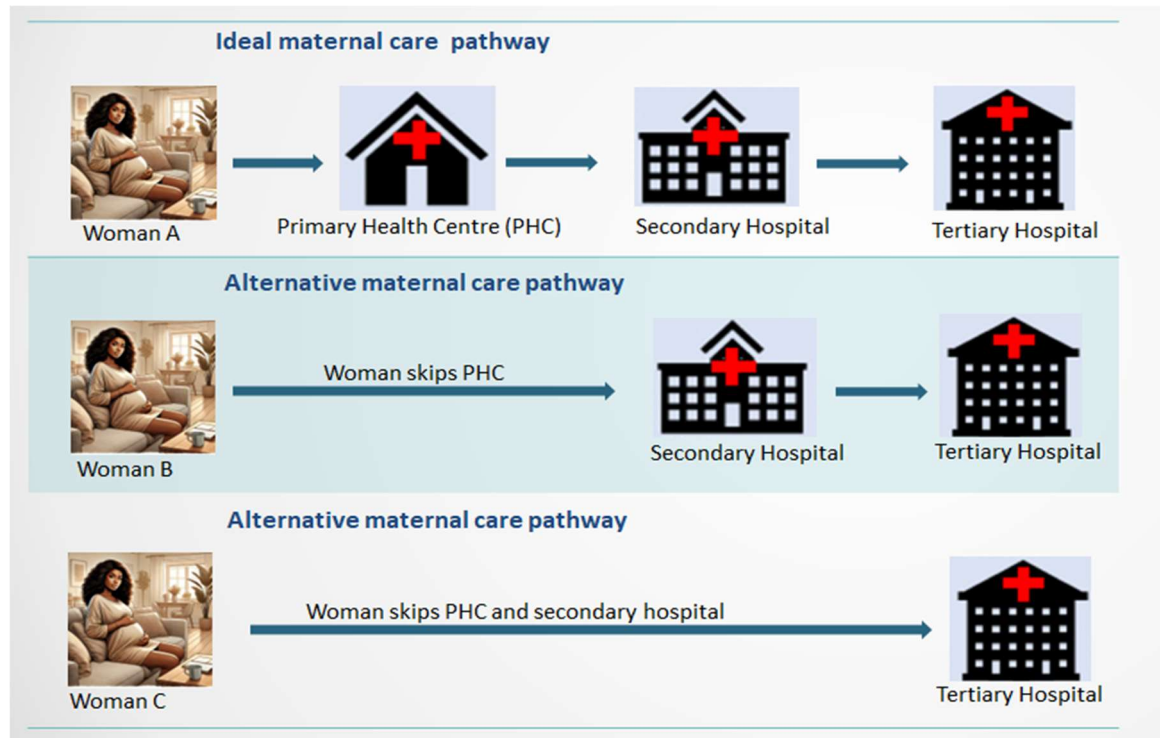


Figure 3.3: The care pathway for women seeking maternal health services in Imo State, Nigeria

In the past two decades, significant funding from the Nigerian government, donor agencies and private individuals has been dedicated to addressing Nigeria's poor maternal and newborn health status. Although there has been a marginal improvement in the maternal mortality ratio and stillbirth rate over the past two decades, Nigeria nevertheless remains one of the most significant contributors to these deaths globally¹⁴⁹. Similarly, Nigeria contributes about 10% of the global burden of stillbirths⁶. Within Nigeria, there are regional disparities in stillbirth incidence, with a greater burden estimated to be in the northern regions²⁰. Nigeria's six geopolitical zones (north-central, north-east, north-west, south-east, south-west, and south-south) had varying perinatal mortality rates in 2018. The southern regions each had a rate of 38 perinatal deaths per 1000 total births, while the Northcentral had 49 perinatal deaths per 1000 total births, and the Northwest had the highest at 56 per 1000 total births²⁰. In a nationally representative study based on the 2013 Nigeria Demographic and Health Survey, older maternal age, household poverty, higher birth order, having a facility childbirth, caesarean birth, rural residence and any use of contraceptives were found to be determinants of stillbirths in Nigeria¹⁶. Factors associated with lower odds of stillbirth²⁰, such as access to essential antenatal care, health facility deliveries, skilled birth attendants, and maternal education, are more prevalent in southern states compared with the northern states²⁰. However, despite the southern states' relatively high coverage of maternity care services, achieving the Every Newborn Action Plan's target of reducing stillbirths to ≤ 12 per 1000 births¹⁵⁰ remains a challenge, despite government efforts.

3.2.1 Stillbirths in Imo State

The studies requiring data collection for this thesis were conducted in Imo State, Nigeria. As described in Chapter 1, only two cross-sectional studies of stillbirths in tertiary hospitals in Imo State were found during the literature search. The Reproductive health Officer at the Ministry of Health, Imo State, who was contacted to explore the availability of surveillance data for stillbirth in the state, responded that the available data on the District Health Information System were

unreliable due to the poor reporting culture of many private secondary hospitals. These hospitals constitute the majority of the secondary facilities in the state.

3.3 Study area description

Imo State has an estimated population of 5,167,722 and an estimated total fertility rate of 4.5, below the national average of 5.3²⁰. Administratively, Imo State is divided into three senatorial districts, which are subdivided into 27 Local Government Areas (LGAs)³². The majority of its inhabitants are from the Igbo ethnic group, and the predominant religion is Christianity. In Imo State, 91.4% of women in the reproductive age group have received secondary education or higher²⁰. Additionally, 92% of households have access to clean water, and 70% have electricity, but the state's 12.5% poverty rate³⁸ and 26.1% unemployment rate³² make healthcare affordability challenging. In 2019, 68.6% of households in the state faced catastrophic health expenses (defined by the World Bank as exceeding 10% of total household income), with only 1.7% having health insurance coverage³⁸.

Imo State's healthcare sector grapples with daunting challenges due to population growth, resulting in insufficient funding and overextended resources³². The state's healthcare outcomes suffer due to decaying infrastructure, outdated medical equipment, an inefficient health information system, a dearth of health research, a weak referral system, and a shortage of healthcare professionals, with only one doctor per 3,333 residents and one nurse/midwife per 870 residents³². Despite reaching the Every Newborn Action Plan (ENAP) targets¹⁵¹ of attaining 90% coverage of four antenatal care visits in pregnancy, skilled birth attendance²⁰, and health facility births, Imo State is yet to witness a substantial reduction in stillbirth occurrence. In addition, inadequate surveillance impedes progress in stillbirth reduction in Nigeria.

Imo State's healthcare organisation closely resembles the federal government's three-tier system. There are 602 secondary care facilities (3.2% government and 96.8% non-government owned)

compared with two tertiary care facilities (both Government owned) in the state³². Over 70% of women in the state opt for private maternity services²⁰, underscoring the need for research into stillbirth occurrences, types, and risk factors in non-government secondary facilities, which provide the bulk of Comprehensive Emergency Obstetric and Newborn Care (CEmONC) services and constitute over 95% of secondary facilities in the state³². Despite secondary facilities providing most of the CEmONC in the state, the only studies of stillbirth conducted in the state were from two tertiary government facilities, which estimated a stillbirth rate of 60 – 180 per 1,000 total births^{33,34}.

3.4 Considerations for the selection of study design

The lack of epidemiological studies on stillbirths in Imo State limits the understanding of the determinants, prevalence and distribution of stillbirths and their type within the state. Without this foundation, it was not possible to design a comprehensive community-based study to support the prevention of stillbirths, given the multifaceted nature of this phenomenon. For this reason, the studies conducted were designed to fill the evidence gap in the more fundamental information.

Stillbirth occurrence in Nigeria follows a complex interplay of socioeconomic, demographic, cultural and health system factors¹⁵². Thus, using either a quantitative or qualitative approach alone would fall short of understanding this topic and answering the research questions listed in Chapter 1. While quantitative methods offer the advantage of statistical rigour and would allow the identification of risk factors for potential intervention, qualitative methods shed insights into participants' lived experiences, practices, and beliefs that influence health actions and outcomes. A mixed methods approach would enable leveraging the strengths of both quantitative and qualitative research to enrich the study findings and to generate comprehensive and contextually

relevant recommendations for preventing stillbirths in Imo State. For these reasons, a mixed methods approach was used.

3.4.1 Description of the mixed methods study

For this research, mixed methods research is defined as a type of research that combines elements of qualitative and quantitative research approaches for the broad purpose of extending the breadth and depth of understanding of the research phenomenon¹⁵³. The importance of the argument about clarity and precision in the terminologies and purposes of mixed methods research, given the epistemological implications of using terms such as “triangulation”, is acknowledged¹⁵⁴. Six purposes have been described for mixed methods research, namely: triangulation, complementarity, initiation, development, expansion, and enhancement of significant findings¹⁵⁵ (Table 3.1). The purpose of using mixed methods in this research is primarily for expansion, that is, to extend the depth and scope of the inquiry about stillbirths using qualitative and quantitative components¹⁵⁵. The qualitative research aims to provide context for understanding and describing the broad relationships between variables uncovered by the quantitative study¹⁵⁶.

Table 3.1: Purposes of mixed-method research

Triangulation	To corroborate results using data collected through different methods.
Complementarity	To seek elaboration, illustration or clarification of the results from one method with the data collected from the other method.
Initiation	To increase the depth and breadth of understanding of the phenomenon by exploring it from different methods and paradigms.
Development	These studies are sequential designs where the data from the initial data collection informs the development of the subsequent method.
Expansion	These studies extend the depth and scope of the enquiry by using different measures to explore different enquiry components.
Enhance significant findings	Significant findings from one method of data collection can be specifically explored by another data collection method, thereby enhancing the findings.
Adapted from Johnson et al., 2007. ¹⁵³	

There are over 40 mixed methods designs described in the literature¹⁵⁷, and a convergent parallel design was used for this study. In this design, the quantitative and qualitative strands of the research are conducted independently, and the results are brought together for the overall interpretation¹⁵⁸.

In planning a mixed method study, there are several considerations, which include implementation sequence, relative priority given to each study, level of integration of results and the theoretical framework¹⁵⁹. For the sequence, the quantitative data was collected before the qualitative data, as an explanatory sequential design was previously planned. However, due to logistical and in-country security reasons that impacted the planned timeline, the design had to be modified to a convergent parallel design. Both the quantitative and qualitative studies have equal priority, and the point of integration is at the level of the interpretation of results^{155,159}. The integration is presented in the discussion chapter. This design follows a pragmatist theoretical framework which accepts the pluralism of methods in the same study and posits that each

research element is located in a social, historical and cultural context¹⁵⁵. This framework emphasises that the research question is the most important aspect of any study and should determine the methods used and not be led by a specific research paradigm¹⁵⁵.

This DPhil research comprises two studies. The quantitative study utilises a case-control design to establish the incidence (using appropriate denominator data) of stillbirth, overall and by the type of stillbirth (antepartum and intrapartum) and to identify determinants or risk factors for the two types of stillbirths. A descriptive qualitative design using a contextualist approach was utilised for the qualitative study. This study sought to explore the perceptions and experiences of women who had stillbirths or near-misses for stillbirth and the healthcare workers who deliver maternal health services in the hospitals and communities in Imo State. The details of the methods for the two studies are provided in Chapters four and five, respectively.

3.5 Ethical considerations for the research

Ethics approval for this study was obtained from the Federal Medical Centre, Owerri (FMC/OW/HREC/VOL.II/68), Imo State Specialist Hospital and Oxford Tropical Research Ethics Committees (OxTREC Ref: 535-22). The specific ethical considerations for each study are discussed in Chapters four and five.

Chapter 4 An observational study investigating the incidence, types, and determinants of stillbirth in Imo State, Nigeria.

4.1 Introduction

This research reported in this chapter has been published in PLOS Global Health journal as one of the DPhil outputs ([Appendix 1](#)). The paper's texts, tables and figures were produced by the DPhil researcher and published under the Creative Commons CC-BY license and have been used in this chapter.

A description of the settings of this study, the setup of the healthcare system, and how women seek care in Imo State is described in [Chapter 3](#).

4.1.1 Background

A stillbirth is defined by the International Classification of Diseases 11th Revision as a baby born with no signs of life at 22 or more completed weeks of gestation¹. Where the gestational age is unknown, a baby born without signs of life with a birth weight of 500g or more is considered stillborn. However, the gestational age cut-off varies between health systems and jurisdictions, with the cut-off defined as 20 or more weeks of pregnancy in many high-income countries. For international comparisons and reporting, stillbirths are classified by gestational age into early gestation stillbirths (22⁺⁰–27⁺⁶ weeks) and late gestation stillbirths ($\geq 28^{+0}$ weeks)^{1,160}. In Nigeria, the cut-off of 28 weeks is used and thus was used for this study. The global, regional and country burden of stillbirth has been described in Chapters 1 and 3.

Addressing stillbirths in Imo State requires an understanding of the incidence and the specific risk factors which make women more likely to have a stillbirth. The risk factors associated with the occurrence of the two types of stillbirths in Imo State may be distinct from each other, requiring tailored interventions; however, research into this has been limited in Imo State. This study aims

to close this critical gap in the knowledge needed to plan healthcare interventions and policies to reduce the incidence of stillbirth.

4.1.2 Research questions

This study was designed to address the following two research questions:

1. What is the incidence of stillbirth, overall and by type of stillbirth, in Imo State, Nigeria?
2. What are the determinants of antepartum and intrapartum stillbirths?

4.1.3 Significance of the study

Through a literature review, previous studies on stillbirth in South-eastern Nigeria were identified, and they were either single-facility or multicentre cross-sectional studies^{22,27,33,34}. The identified studies were conducted in tertiary facilities and reported institutional incidence and factors associated with stillbirths. Similarly, the two studies conducted in Imo State were conducted in tertiary facilities^{33,34}. Despite providing the majority of maternal health services in the state, no study has been conducted in secondary hospitals or non-government facilities³². The paucity of epidemiological studies and the absence of studies within these types of facilities limits our understanding of stillbirths and maternal health outcomes in the state. The study reported here is important in Imo State because, like many parts of Nigeria, the influence of social issues affecting health, including disparities in healthcare access, socioeconomic inequalities, and harmful cultural practices on stillbirths are understudied^{32,38}. This study could potentially uncover region-specific risk factors, thereby facilitating the development of tailored interventions to effectively address them in Imo sState.

4.2 Methods

4.2.1 Geographical and health system context – about Imo State the study setting

A detailed description of the geographical and health system context of Imo State was provided in [Chapter 3](#).

This study was conducted in 20 secondary-level facilities in Imo State, which can provide Comprehensive Emergency Obstetric and Newborn Care (CEmONC). As described in Chapter 3, the World Health Organization (WHO) defines CEmONC facilities as those able to provide a key set of interventions and have skills required for identifying and managing complications during childbirth and newborn emergencies, called signal functions¹⁶¹(box 4.1).

Box 4.1 Signal Functions of Comprehensive Emergency Obstetric and Newborn Care

1. Parenteral administration of antibiotics
2. Parenteral administration of uterotonic drugs
3. Parenteral administration of anticonvulsants for preeclampsia/eclampsia
4. Manual removal of placenta.
5. Removal of retained products of conception
6. Assisted vagina birth (vacuum extraction, forceps)
7. Basic neonatal resuscitation
8. Neonatal bag and mask ventilation
9. Caesarean section

4.2.2 Study population

To ensure representativeness, a proportional recruitment of health facilities by the three senatorial zones in the state was planned. However, due to recurring political and civil unrest in the state, hospital recruitment was restricted to areas in the state considered 'safe' by local security intelligence agencies. Due to time constraints and security considerations, the first twenty

facilities that gave consent were included in this study. Hospital records of all women who gave birth at 28 weeks or later between January 1, 2020, and July 31, 2022, in the twenty selected facilities formed the sampling frame for the study.

4.2.3 Study design

A case-control study was conducted. Cases were defined as women reported as having stillbirths in their medical records, and controls were drawn from women who were reported as having a livebirth in the same period. The collection of two controls (one livebirth before and one after each case) was planned. However, due to limited resources and time for data collection, the controls were selected from maternity registers as the livebirth preceding each case in each facility to minimise selection bias. The same set of controls selected were utilised for the analysis of both intrapartum and antepartum stillbirths. If the medical records of the identified control were missing, the livebirth before it on the maternal register was selected. Also, when a stillbirth was preceded by another stillbirth, the two livebirths preceding both stillbirths were chosen as controls. The cases and controls were not matched other than by hospital and time of birth^{162,163}.

4.2.4 Sample size determination and selection

The sample sizes required to detect odds ratios ranging from 1.5 to 2.0 for risk factors associated with antepartum or intrapartum stillbirths were calculated using the Kelsey equation¹⁶⁴. These calculations assumed a risk factor prevalence of 5% to 25%, with 80% power at a 2-sided significance level of 5%¹⁶ (Table 4.1). A sample size of 146 cases and 292 controls using as case: control ratio of 1:2 was required for antepartum and intrapartum stillbirths, respectively. A design effect of 1.028 was assumed to adjust for clustering and in consideration of data collection feasibility (Table 4.2). The sample size was inflated further by 10% to allow for losses due to missing data. Thus, the minimum sample sizes required were 173 cases of antepartum stillbirths, 173 cases of intrapartum stillbirths and 346 controls.

Table 4.1: Sample size calculation using Kelsey equation.

				Number of cases required to detect the effect size (Kelsey equation)				
Prevalence of risk factor in controls	case: control ratio	power	CI	1.5	1.6	1.8	1.85	2.0
0.05	01:02	80	95%	1193	857	515	463	351
0.10	01:02	80	95%	675	469	285	257	151
0.15	01:02	80	95%	447	343	210	190	146
0.20	01:02	80	95%	388	283	175	159	123
0.25	01:02	80	95%	341	250	156	142	110

Table 4.2: Design effect and missing data inflation calculation

	Design effect		Adjusted sample size		10% inflation for missing data	
Intraclass correlation coefficient	15 hospitals	20 hospitals	15 hospitals	20 hospitals	15 hospitals	20 hospitals
0.001	1.038	1.028	606	600	667	692
0.01	1.38	1.28	806	748	1465	823
0.05	2.9	2.41	1694	1407	1950	1548

4.2.5 Theoretical framework

To facilitate both the design of data collection and subsequent statistical analysis, it was essential to develop a theoretical framework. This framework was required to identify and show interrelationships between known risk factors and the two types of stillbirths. The risk factors for antepartum and intrapartum stillbirths in Nigeria were identified through a literature review with a systematic search of Embase and MEDLINE databases. These potential risk factors were categorised into sociodemographic, obstetric and maternity care factors and biological factors adapting the Mosley and Chen (1984) theoretical framework and other studies^{165–167} (Figure 4.1).

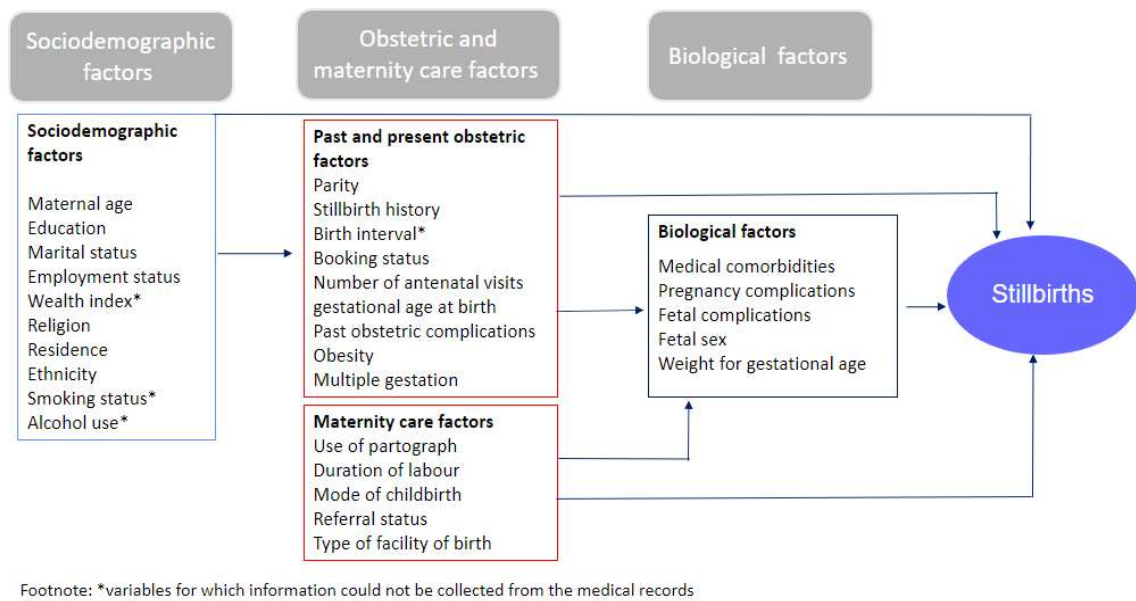


Figure 4.1: Theoretical framework

Being a retrospective study using medical records, the researcher was aware that the feasibility of extracting every variable defined in the framework would vary within and across hospitals. This is because the documentation practices and culture influence the variation in data availability in each facility. Hence, it was not possible to collect information about all indicators included in the framework for all cases and controls.

4.2.6 Study variables

Outcome variable: the outcomes of interest in this study were antepartum and intrapartum stillbirths. Antepartum stillbirths are stillbirths following antepartum fetal death (i.e. occurring before onset of labour), while intrapartum stillbirths are stillbirths following intrapartum fetal death (i.e. occurring during labour)¹. In some facilities, stillbirth types were classified using the skin appearance of the fetus at birth as proxies. Macerated stillbirths are stillbirths with the presence of signs of maceration at the time of birth, while fresh stillbirths are stillbirths with fresh skin appearance and no signs of maceration at the time of delivery¹. In this study, macerated

stillbirths were categorised together with antepartum stillbirths and fresh stillbirths were categorised with intrapartum stillbirths.

Exposure variables:

The exposure variables in this study were:

- Sociodemographic factors - maternal age, education, marital status, ethnicity, religion, employment status, and residence.
- Past and present obstetric factors - gravidity, stillbirth history, booking status, number of antenatal care, birth interval, gestational age at birth, past obstetric complications, obesity, multiple gestation. In this study, a woman was classified as unbooked if she did not register for antenatal care at the facility where she gave birth and her medical history did not indicate registration at any other hospital. A booked woman had either registered for antenatal care at the facility where she gave birth or had a history of being registered at another facility before being referred to the current one.
- Maternity care factors including the use of partogram, duration of labour, mode of childbirth, referral status, and type of facility of birth.
- Biological factors - medical comorbidities (E.g HIV), obstetric complications, fetal complications, fetal sex, birthweight for gestational age.

4.2.7 Data collection

Studies from Nigeria, as well as other countries in sub-Saharan Africa, indicate significant misclassification of stillbirths by health workers^{22,168}. For consistency, classification into antepartum and intrapartum stillbirths in this study was based on maternal records. There were two data sources for this study: maternity registers and selected patient records. Information about the total number of births and the outcomes during the study period were extracted from the maternity registers using pre-tested data collection forms.

For the second set of data, following the identification of cases and controls from maternity registers, information about each participant was collected from the participant's medical case folders by the researcher with support from trained midwives and nurses. Eighteen midwives and nurses from selected hospitals received one day of training to standardise their understanding of the study indicators and data collection processes. The training also provided an avenue for the midwives and nurses to ask questions and establish clarity about the data extraction process. Although the researcher piloted the questionnaire prior to data collection, the midwives and nurses had the opportunity to test the questionnaire in their facility using the most recent births to test their understanding prior to data collection. After assessing the data collected in this test, no changes were made as the midwives accurately captured the required data for each variable. In each facility, the researcher identified the cases and controls from the registers, and the midwives retrieved their medical records folders and set them aside for data extraction on dates agreed upon by the midwife and the researcher. To ensure high-quality data collection, the researcher was onsite in each hospital to support and supervise data collection and conducted daily validation to ensure completeness. Trained data clerks entered the data from the paper form into Microsoft Forms. The raw data was downloaded and stored on one of the encrypted drives at the Nuffield Department of Population Health, University of Oxford.

4.2.8 Statistical analysis

Quantitative variables were descriptively summarised using means or medians based on their distribution, while categorical variables were summarised using frequencies and percentages. The characteristics of cases (antepartum and intrapartum) and controls were compared. Only singleton pregnancies were included in the risk factor analysis. Restricting the analysis to singleton pregnancies ensures comparability since multiple pregnancies have different risk profiles and higher risks of complications¹⁶⁹. The risk factor analysis did not include variables with more than 15% missing information. The incidence of all and the two types of stillbirths were calculated for

the total sample and by facility types (public, mission, private) using counts of stillbirths and livebirths. Ninety-five per cent confidence intervals (95% CIs) for the incidence rates were also estimated using the Wald method.

Univariable logistic regression analysis was used to examine the individual associations between potential risk factors and antepartum and intrapartum stillbirth. Associations were expressed as crude odds ratios (ORs) with 95% confidence intervals (CIs). Departure from linearity in continuous and ordered categorical variables was examined using the LR test for heterogeneity. The theoretical framework guided variable selection for the multivariable analysis, and variables deemed to be associated with the outcome at univariable analysis with ($p < 0.10$) were included in the multivariable analysis.

Separate sequential logistic regression models were built for antepartum and intrapartum stillbirth. Socioeconomic factors were initially included, followed by obstetric and maternity care factors and biological factors. If the magnitude of the OR for an independent variable was reduced after sequential adjustments, the influence of the specific socioeconomic, obstetric or, maternity care or biological factors was further explored for association. Multicollinearity was assessed using variance inflation factors (VIFs). The associations between risk factors and stillbirth were presented using adjusted odds ratios (aORs) with 95% CIs.

For the final models for antepartum and intrapartum stillbirth, an assessment was conducted to examine the patterns and quantities of missing data for each variable included. Although missing data could theoretically be linked to other independent variables, missingness was not found to be associated with the outcome; hence, it was presumed that information were missing at random. Therefore, the primary models were complete case analyses. Multiple imputations by chained equations were used to deal with missingness and as a sensitivity analysis to compare the results with the results from the primary models.

To assess how well the models distinguish between the three risk factor groups (sociodemographic, obstetric and maternity care, and biological), the area under the receiver-operating characteristic (AUROC) curves for the models were compared. Population attributable fraction (PAF) is a measure in epidemiology used to estimate the proportion of cases in any population which can be attributed to a particular risk factor. The PAF gives an estimate of what proportion of the cases could be prevented if exposure to the specific risk factor is prevented from the population. Population attributable fractions (PAF) were calculated using Levin's formula. STATA version 17 was used for data management and analysis.

4.2.9 Ethical considerations

Ethics Committee approval was obtained from the Federal Medical Centre, Owerri (FMC/OW/HREC/VOL.II/68), Imo State Specialist Hospital and Oxford Tropical Research Ethics Committees (OxTREC Ref: 535-22). Each hospital director also provided social approval before data collection.

This study did not involve any intervention or interaction with the individuals included but was based on their medical records. However, the four fundamental moral principles of justice, non-maleficence, beneficence and autonomy guided the extraction and use of data¹⁷⁰. The researcher maintained the confidentiality of patient information, ensuring that sensitive medical data were securely handled and anonymised to protect individuals' privacy. All paper forms were destroyed by the researcher after data entry and verification. The electronic data did not include personal identifiers, further ensuring anonymity and privacy. All data collected were used exclusively for this study and were accessible only to the DPhil researcher. The deidentified data will be stored on a secured University of Oxford drive with password protection for five years from 2022, after which they will be destroyed following the university's guidelines on data security.

4.3 Results

Data were collected from 20 hospitals in 10 LGAs in two geopolitical zones. These hospitals included 12 private, five mission and three government hospitals (Table 4.3, Fig 4.2).

Table 4.3: Health facility characteristics

Health facility ID	Ownership	Local Government Area	Zone
1	Government	Aboh Mbaise	Owerri
2	Government	Oru East	Owerri
3	Mission	Nwangele	Orlu
4	Mission	Isu	Orlu
5	Mission	Owerri North	Owerri
6	Mission	Aboh Mbaise	Owerri
7	Private	Aboh Mbaise	Owerri
8	Private	Owerri North	Owerri
9	Private	Orlu	Orlu
10	Private	Owerri Municipal	Owerri
11	Mission	Owerri Municipal	Owerri
12	Private	Mbaitoli	Owerri
13	Private	Owerri North	Owerri
14	Private	Ahiazu Mbaise	Owerri
15	Private	Owerri Municipal	Owerri
16	Private	Owerri Municipal	Owerri
17	Government	Owerri west	Owerri
18	Private	Owerri North	Owerri
19	Private	Owerri west	Owerri
20	Private	Owerri Municipal	Owerri

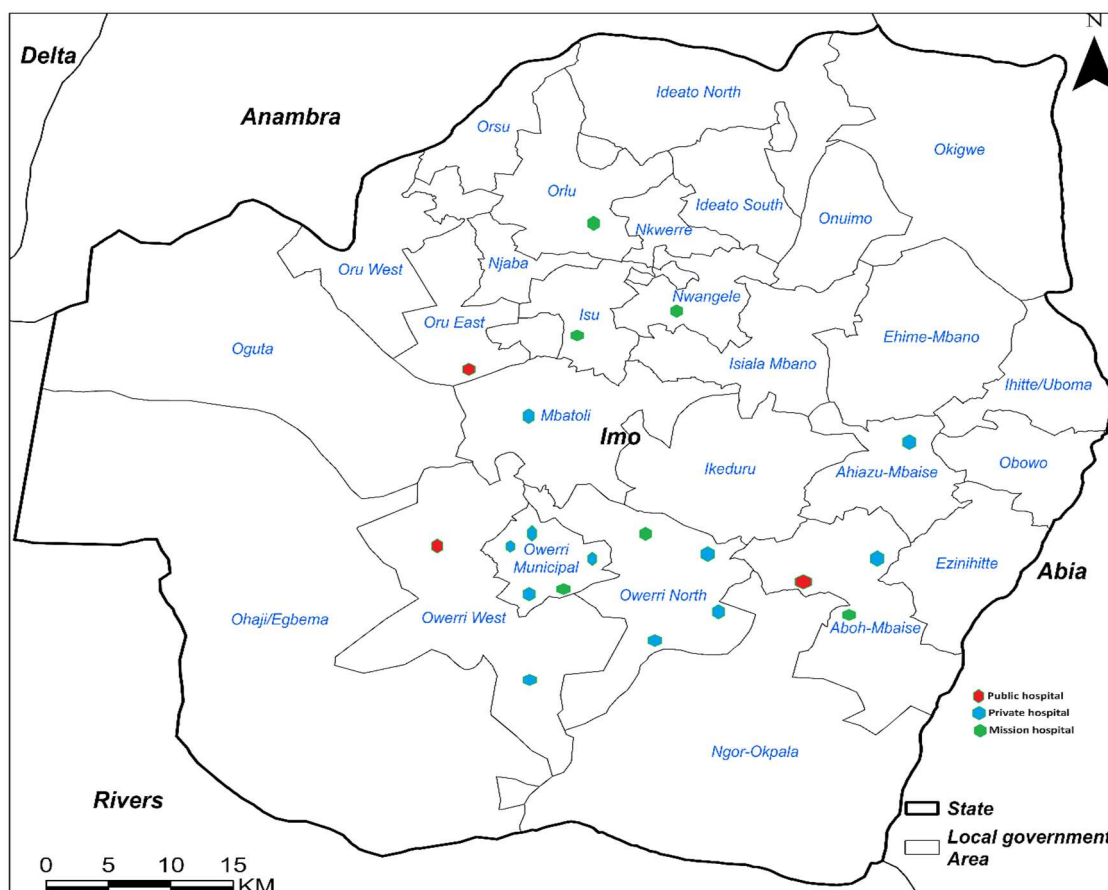


Figure 4.2 – Geographical distribution of health facilities included in the study

4.3.1 Incidence of stillbirths in study facilities

There were 11,278 total births in the 20 hospitals between January 1, 2020, and July 31, 2022. Of these, 10,898 were livebirths, and 432 were stillbirths, resulting in an overall stillbirth rate of 38 per 1,000 total births (95%CI: 34.8 - 41.9; [Table 4.4](#)). Forty-two per cent of stillbirths (n=182) were antepartum, while 49.5% (n=214) and 8.3% (n=36) were intrapartum and unclassified stillbirths, respectively. The rate of overall stillbirths was highest in mission hospitals (54 per 1,000 births; 95%CI 45.78 - 62.09), while private hospitals had the lowest rate (28 per 1,000 births; 95%CI 23.56 - 31.97). The rate of antepartum stillbirth was highest in public hospitals (24 per 1000 births; 95%CI: 18.29 - 30.49), while the rate of intrapartum stillbirth was highest in mission hospitals (30 per 1,000 births; 95%CI: 23.40 - 35.62).

Table 4.4: stillbirth rate per 1,000 total births by facility types.

Facility type	Total births N	Stillbirths n	Overall stillbirth rate per total 1000 births (95%CI)	Antepartum stillbirth n	Antepartum stillbirth rate (95%CI)	Intrapart um stillbirths n	Intrapartum stillbirths rate (95%CI)	Unclassified stillbirth n	Unclassified stillbirth rate (95%CI)
Public hospitals	2,460	110	45 (36.55 - 52.88)	60	24(18.29 - 30.49)	47	19 (13.70 - 24.52)	3	1 (0.16 - 2.60)
Mission hospitals	2,948	159	54 (45.78 - 62.09)	56	19 (14.07 - 23.92)	87	30 (23.40 - 35.62)	16	5 (2.78 - 8.08)
Private hospitals	5,870	163	28 (23.56 - 31.97)	66	11 (8.55 - 13.94)	80	14 (10.66 - 16.59)	17	3 (1.52 - 4.27)
Total	11,278	432	38 (34.76 -41.85)	182	16 (13.81 - 18.46)	214	19 (16.46 21.49)	36	3 (2.15 - 4.23)

Following the exclusion of missing records, unclassified stillbirths and twin gestations, 731 singleton records were included in the risk factor analysis (Figure 4.3). Within this sample, there were 157 antepartum stillbirths, 193 intrapartum stillbirths, and 381 livebirths, and these were used for the descriptive statistics analysis.

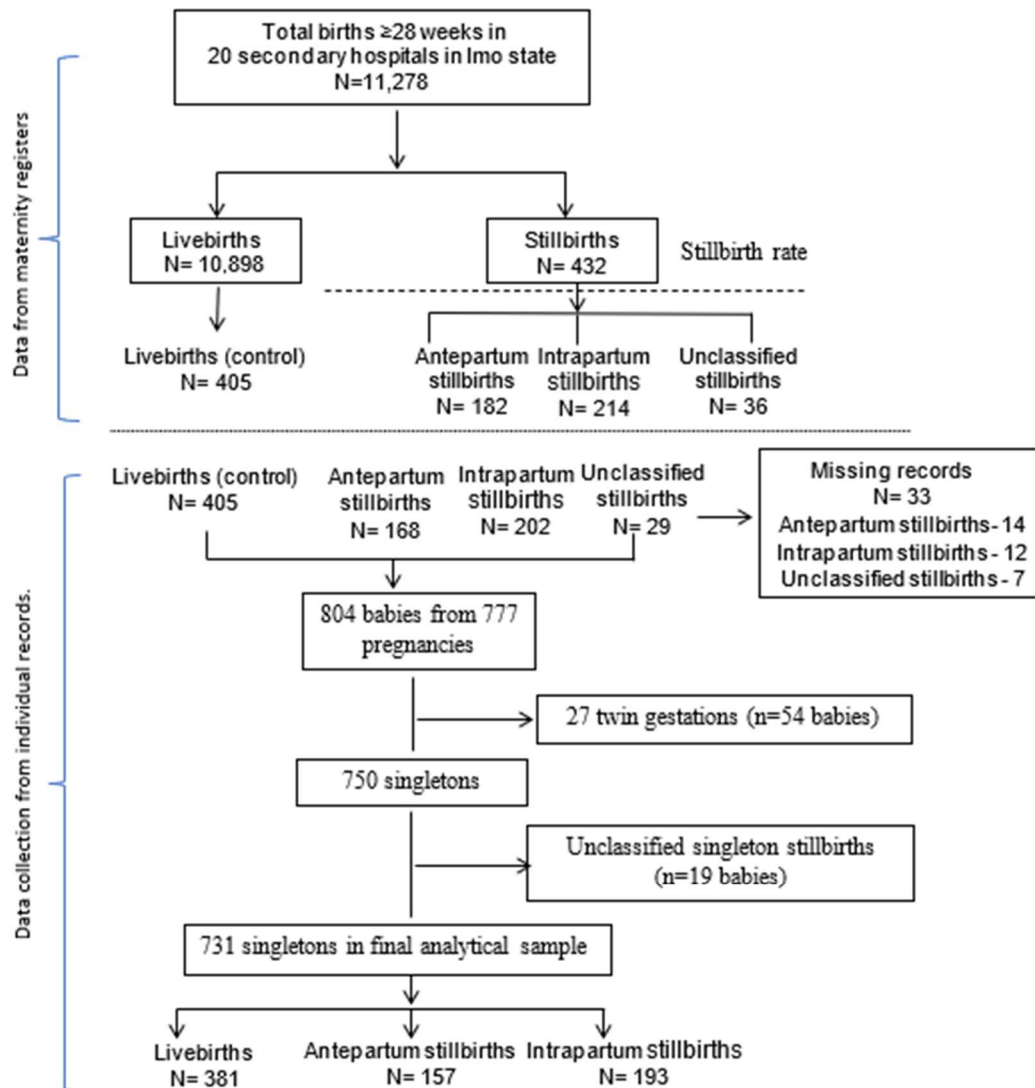


Figure 4.3: Flowchart for selection of study sample included in the risk factor analysis of singletons

4.3.2 Descriptive characteristics of the study population- cases and controls

The mean maternal age of the antepartum, intrapartum stillbirth and controls were 29.7, 29.9 and 28.7 years respectively (Table 4.5). Over three-fifths of the women in each group had no maternal education record. The majority of the women with a stillbirth (90.5% antepartum, 82.4% intrapartum) and livebirth (92.1%) were married. Around a third of the women who had antepartum stillbirths were self-employed (32.5%) compared with 23.3% of women who had

intrapartum stillbirths and 28% who had livebirths. The majority of the cases (61.8% antepartum and 63.7% intrapartum) and controls (58%) lived in rural areas. A lower proportion of the cases (47.8% antepartum, 46.1% intrapartum) than controls (58.3%) had 1- 3 previous births, with a higher proportion of cases having their first or 4+ births. Around 8% of cases and controls had a prior history of stillbirth, but between 13 and 17% had missing data for this variable. Only 8.9%, 5.7% and 5.7% of women with antepartum, intrapartum stillbirths and controls, respectively, reported a previous history of obstetric complications in previous pregnancies.

For the index pregnancy, about half (49.7%) of the women who had an antepartum stillbirth were not booked in any health facility, while 53.4% of pregnant women with an intrapartum stillbirth were booked in the facility where they gave birth, compared with 81.1% of controls. The highest percentage of antepartum stillbirths occurred in private facilities (35.7%), while most intrapartum stillbirths occurred in mission hospitals (42%). About 69% of controls had four or more antenatal care visits compared with 36% and 48% for women with antepartum and intrapartum stillbirths, respectively. While only 4.2% of controls gave birth preterm, around a third of the cases (women with antepartum stillbirth 35%, intrapartum stillbirth 27.5%) had a preterm birth. When indicated, a partogram was only used during labour for 19.4% of women with livebirths compared with 8.8% of women with intrapartum stillbirths. About 26.3% of women with livebirths had a caesarean section, compared with 29.9% and 45.1% of women with antepartum and intrapartum stillbirths, respectively. Nearly half of the women with antepartum stillbirths (47.1%) were referred from other health facilities compared with 38.9 % and 12.9% for women with intrapartum stillbirths and livebirths, respectively. Less than 10% of all cases and controls had coexisting medical comorbidities. The stillborn babies were more likely to be male (54.8% antepartum, 53.4% intrapartum) than female. Babies less than the 10th centile of weight for gestational age were more common in the antepartum stillbirth group compared with the other groups, while 20.3%

of the babies greater than the 90th centile were in the livebirth group; however, birthweight data was missing for over 60% of stillborn babies.

As over 90% of women in the sample were of Igbo ethnicity and identified as Christians, these variables were excluded from the risk factor analysis due to their limited variability across the outcome groups. Additionally, maternal education, employment status, and fetal weight for gestational age were omitted from subsequent analysis due to each having more than 15% missing data.

Table 4.5: Characteristics of cases and controls

	Cases Antepartum (N=157) n (%)	Cases Intrapartum (N=193) n (%)	Controls Livebirths (N=381) n (%)
Sociodemographic factors			
Mean maternal age (yrs) (SD)	29.7 (5.8)	29.9 (5.6)	28.7 (5.4)
Maternal age (yrs)			
<20	6 (4.3)	7 (4.1)	16 (4.5)
20-24	27 (19.3)	26 (15.0)	62 (17.4)
25-29	41 (29.3)	53 (30.6)	133 (37.4)
30-34	28 (20.0)	47 (27.2)	93 (26.1)
>=35	38 (27.1)	40 (23.1)	52 (14.6)
Missing	17 (10.8)	20 (10.4)	25 (6.6)
Highest maternal education			
No formal education	0 (0.0)	1 (0.5)	2 (0.5)
Primary education	2 (1.3)	3 (1.6)	5 (1.3)
Secondary education	11 (7.0)	10 (5.2)	48 (12.6)
Undergraduate	7 (4.5)	18 (9.3)	76 (20.0)
Any postgraduate	4 (2.6)	4 (2.1)	7 (1.8)
Missing	133 (84.7)	157 (81.4)	243 (63.8)
Marital status			
Married	142 (90.5)	159 (82.4)	351 (92.1)
Not married	6 (3.8)	13 (6.7)	9 (2.4)
Missing	9 (5.7)	21 (10.9)	21 (5.5)
Employment status			
Employed	16 (10.2)	18 (9.3)	50 (13.1)
Self-employed	51 (32.5)	45 (23.3)	108 (28.4)
Unemployed	23 (14.7)	18 (9.3)	63 (16.5)
Missing	67 (42.7)	112 (58.0)	160 (42)
Religion			
Christian	149 (94.9)	182 (94.3)	360 (94.5)

	Cases Antepartum (N=157) n (%)	Cases Intrapartum (N=193) n (%)	Controls Livebirths (N=381) n (%)
Others	4 (2.55)	2 (1.0)	5 (1.31)
Missing	4 (2.55)	9 (4.7)	16 (4.2)
Place of residence			
Rural	97 (61.8)	123 (63.7)	221 (58.0)
Urban	56 (35.7)	64 (33.2)	149 (39.1)
Missing	4 (2.6)	6 (3.1)	11 (2.9)
Ethnicity			
Igbo	151 (96.2)	187 (96.9)	372 (97.6)
Others	5 (3.2)	5 (2.6)	5 (1.31)
Missing	1 (0.64)	1 (0.5)	4 (1.1)
Obstetric and maternity care factors			
Parity			
0	60 (38.2)	71 (36.8)	128 (33.6)
1-3	75 (47.8)	89 (46.1)	222 (58.3)
4 or more	18 (11.5)	29 (15.0)	28 (7.4)
Missing	4 (2.6)	4 (2.1)	3 (0.8)
Stillbirth history			
No	117 (74.5)	153 (79.3)	294 (77.2)
Yes	13 (8.3)	14 (7.3)	29 (7.61)
Missing	27 (17.2)	26 (13.5)	58 (15.2)
Past obstetric complication			
No	143 (91.8)	182 (94.3)	351 (92.1)
Yes	14 (8.9)	11 (5.7)	30 (5.7)
Booking status			
Booked in facility of childbirth	62 (39.5)	103 (53.4)	309 (81.1)
Booked in different facility	17 (10.8)	16 (8.3)	12 (3.2)
Not booked in a health facility	78 (49.7)	74 (38.3)	60 (15.8)
Facility of childbirth			
Public	54 (34.4)	44 (22.8)	103 (27.0)
Private	56 (35.7)	68 (35.2)	147 (38.6)
Mission	47 (29.9)	81 (42.0)	131 (34.3)
Number of antenatal visits			
Unbooked	78 (49.7)	74 (38.3)	60 (15.8)
1-3 visits	4 (2.6)	9 (4.7)	12 (3.15)
4 or more visits	57 (36.3)	92 (47.7)	262 (68.8)
Missing	18 (11.5)	18 (9.3)	47 (12.3)
Median gestational age weeks (SD)	38 (4.2)	38 (4.0)	39 (1.4)
Gestational age (weeks)			
Preterm (28 – < 37 weeks)	55 (35.0)	53 (27.5)	16 (4.2)
Term (37 weeks-40 weeks)	88 (56.1)	124 (64.3)	338 (88.7)
Late-term (40 – 42 weeks)	12 (7.64)	13 (6.7)	27 (7.1)
Missing	2 (1.3)	3 (1.6)	0 (0)
Partogram use in labour			
No	105 (66.9)	124 (64.3)	253 (66.4)

	Cases Antepartum (N=157) n (%)	Cases Intrapartum (N=193) n (%)	Controls Livebirths (N=381) n (%)
Yes	11 (7.0)	17 (8.8)	74 (19.4)
Not indicated	41 (26.1)	52 (26.9)	54 (14.1)
Mode of childbirth			
Vaginal birth	110 (70.1)	106 (54.9)	281 (73.8)
Caesarean Section	47 (29.9)	87 (45.1)	100 (26.3)
Referral status			
Not referred	83 (52.9)	118 (61.1)	332 (87.1)
Referred	74 (47.1)	75 (38.9)	49 (12.9)
Biological factors			
Medical comorbidities			
No	145 (92.4)	187 (96.9)	373 (97.9)
Yes	12 (7.6)	6 (3.1)	8 (2.1)
Obstetric complications in this pregnancy			
No	51 (32.5)	48 (24.9)	294 (77.2)
Yes	106 (67.5)	145 (75.1)	87 (22.8)
Fetal sex			
Male	86 (54.8)	103 (53.4)	204 (53.5)
Female	52 (33.1)	72 (37.3)	174 (45.7)
Missing	19 (12.1)	18 (9.3)	3 (0.8)
Fetal weight for gestational age (GA)			
Small for GA (<10 th centile)	8 (9.0)	4 (3.5)	18 (7.3)
Normal for GA	17 (19.1)	27 (23.7)	175 (71.1)
Large for GA (>90 th centile)	5 (5.6)	13 (11.4)	50 (20.3)
Missing	59 (66.3)	70 (61.4)	3 (1.2)

4.3.3 Univariable analysis to explore the determinants of antepartum and intrapartum stillbirths

In the univariable analysis (Table 4.6), the factors associated with antepartum stillbirth were: maternal age OR 1.03, 95%CI 1.00 - 1.07); nulliparity (OR 1.39, 95%CI 0.93 - 2.08) or having four or more previous births (OR 1.90, 95%CI 1.0 - 3.64) compared with having 1 to 3 previous births; preterm birth compared with term birth (OR 13.20, 95%CI 7.22 - 24.16); referral from another facility (OR 6.04, 95%CI 3.91 - 9.32); being unbooked compared with booked women with four or more antenatal visits (OR 5.98, 95%CI 3.84 - 9.30); presence of medical comorbidities (OR 3.85 95%CI 1.55 - 9.63) and having any obstetric complication (OR 7.34, 95%CI 4.29 - 12.54). The following factors were not associated with antepartum stillbirths: being unmarried (OR 1.65,

95%CI 0.56, 4.71); urban compared with rural residence (OR 0.85, CI 0.58, 1.26); history of stillbirth (OR 1.13 95%CI 0.57 - 2.24); obstetric complication in previous pregnancy (OR 1.15 95%CI 0.59 - 2.22); childbirth in a mission hospital (OR 0.68 95%CI 0.42 - 1.09) or private hospital (OR 0.73 95%CI 0.46 - 1.14) compared with public hospitals; malaria in pregnancy (OR 2.47 95%CI 0.71 - 8.67) and female fetus (OR 0.71 95%CI 0.48 - 1.06).

Factors associated with intrapartum stillbirths were: maternal age (OR 1.04, 95%CI 1.00 - 1.07); being unmarried (OR 3.19, 95%CI 1.33 - 7.61); nulliparity (OR 1.38, 95%CI 0.95 - 2.02) or having four or more previous births (OR 2.58, 95%CI 1.45 - 4.59) compared with having 1 to 3 previous childbirths; preterm birth (OR 9.02, 95%CI 4.98 - 16.38) and late-term gestation (OR 1.31, 95%CI 0.66 - 2.62) compared with term; being referred from another facility (OR 4.31, 95%CI 2.83 - 6.53); being unbooked compared with booked women with four or more antenatal visits (OR 3.51, 95%CI 2.32 - 5.32); having a caesarean birth compared with vaginal birth (OR 2.31 95%CI 1.60-3.32); not using a partogram when indicated (aOR 2.13, 95%CI 1.21 - 3.77); and having any obstetric complication (OR 10.21, 95%CI 6.81-15.30). Factors not associated with intrapartum stillbirths were: urban compared with rural residence (OR 0.77 95%CI 0.53 - 1.11); history of stillbirth (OR 0.93 95%CI 0.48 -1.81); past obstetric complication (OR 0.71 95%CI 0.35 - 1.44); having childbirth in a mission hospital (OR 1.45 95%CI 0.92 - 2.27) or private hospital (OR 1.08 95%CI 0.69 - 1.71) compared with public hospitals; presence of medical comorbidities in pregnancy (OR 1.50 95%CI 0.51 - 4.37); and female fetus (OR 0.82 95%CI 0.57 - 1.18).

Table 4.6: Univariable analysis of risk factors associated with antepartum and intrapartum stillbirths

Variable	Antepartum SB Crude OR(95% CI)	p-Value	Intrapartum SB Crude OR (95% CI)	p-Value
Sociodemographic factors				
Maternal age (per 1 year increase)	1.03 (1.00-1.07)	0.06	1.04 (1.00 – 1.07)	0.02
Marital status				
Married	1 (ref)		1 (ref)	
Not married	1.65 (0.56 – 4.71)	0.35	3.19 (1.33- 7.61)	0.01
Place of residence				
Rural	1 (ref)		1 (ref)	
Urban	0.85 (0.58 – 1.26)	0.43	0.77 (0.53 – 1.11)	0.17
Obstetric and maternity care factors				
Parity				
0	1.39 (0.93 - 2.08))		1.38 (0.95 - 2.02)	
1-3	1 (ref)	0.06	1 (ref)	
4 or more	1.90 (1.0 - 3.64)		2.58 (1.45 – 4.59)	0.004
Stillbirth history				
No	1 (ref)		1 (ref)	
Yes	1.13 (0.57 – 2.24)	0.74	0.93 (0.48 – 1.81)	0.83
Gestational age				
Preterm	13.20 (7.22 - 24.16)		9.02 (4.98 - 16.38)	
Term	1 (ref)	<0.001	1 (ref)	<0.001
Late-term	1.71 (0.83 - 3.5)		1.31 (0.66-2.62)	
Number of ANC visits				
Unbooked	5.98(3.84 - 9.30)	<0.001	3.51 (2.32 - 5.32)	<0.001
1-3 visits	0.72 (0.48 – 4.92)		2.14 (0.87– 5.23)	
4 or more visits	1(ref)		1 (ref)	
Referral status				
No	1 (ref)		1 (ref)	
Yes	6.04 (3.91 - 9.32)	<0.001	4.31(2.83 – 6.53)	<0.001
Past obstetric complication (all)				
No	1 (ref)		1 (ref)	
Yes	1.15 (0.59 – 2.22)	0.69	0.71 (0.35 – 1.44)	0.34
Type of facility of birth				
Public	1 (ref)		1 (ref)	
Private	0.73(0.46- 1.14)		1.08 (0.69 – 1.71)	
Mission	0.68 (0.42 – 1.09)	0.23	1.45 (0.92 – 2.27)	0.20
Mode of childbirth				
Vaginal birth	-		1 (ref)	
Caesarean birth	-	-	2.31(1.60 – 3.32)	<0.001

Variable	Antepartum SB Crude OR(95% CI)	p-Value	Intrapartum SB Crude OR (95% CI)	p-Value
Biological factors				
Medical comorbidities (all)				
No	1 (ref)		1 (ref)	
Yes	3.85 (1.55 – 9.63)	0.004	1.50 (0.51 – 4.37)	0.46
Obstetric complications (all)				
No	1 (ref)		1(ref)	
Yes	7.34 (4.29 – 12.54)	<0.001	10.21 (6.81 – 15.30)	<0.001
Antepartum haemorrhage				
No	1 (ref)		1 (ref)	
Yes	4.4 (1.87 – 10.20)	0.001	7.91 (3.68 – 16.99)	<0.001
Hypertensive disease of pregnancy				
No	1 (ref)		1 (ref)	
Yes	7.52 (3.92 – 14.45)	<0.001	3.55 (1.78 – 0.06)	<0.001
Abnormal presentation				
No		-	1(ref)	
Yes	-		11.19 (4.21 - 29.73)	<0.001
Malaria in pregnancy				
No	1 (ref)	0.12	1	0.02
Yes	2.47 (0.71 – 8.67)		3.68 (1.22 – 11.13)	
Obstructed labour				
No	-	-	1 (ref)	
Yes	-		2.74(1.72 - 4.38)	<0.001
Fetal factors				
Sex				
Male	1 (ref)		1 (ref)	
Female	0.71 (0.48 – 1.06)	0.52	0.82 (0.57 – 1.18)	0.28
Use of partogram inlabour				
No	-	-	2.13 (1.21 - 3.77)	
Yes	-		1 (ref)	0.0001
Not Indicated			4.19 (2.19 - 8.03)	

4.3.4 Multivariable analysis to explore the determinants of stillbirths

4.3.4.1 Multivariable model for antepartum stillbirths

In the multivariable logistic regression using risk factors identified in the univariable analysis (Table 4.7), following the adjustment for maternal age and obstetric and maternity care factors, maternal age (aOR 1.05, 95%CI 1.00 - 1.11), nulliparity (aOR 2.02, 95%CI 1.15 - 3.56) compared with having 1-3 previous childbirths; preterm birth compared with term birth (aOR 13.61, 95%CI 6.24 - 29.65); referral from another facility (aOR 3.75, 95%CI 1.96 - 7.17); and being unbooked compared with booked and having four or more antenatal visits (aOR 2.58, 95%CI 1.37 - 4.85) were significantly associated with antepartum stillbirth (Table 4.7).

After adjusting for biological factors, maternal age was no longer associated with antepartum stillbirths (aOR 1.03, 95%CI 0.98 - 1.09), and the association was slightly attenuated for the obstetric and maternity care factors of being nulliparous (aOR 1.87, 95%CI 1.04 - 3.36); preterm birth (aOR 14.29, 95%CI 6.31-32.38); referred from another facility (aOR 3.75, 95%CI 1.96 - 7.17); and unbooked childbirth (aOR 2.58, 95%CI 1.37 - 4.85). Having any obstetric complication was associated with a four-fold increase in the odds of antepartum stillbirth (aOR 4.04, 95%CI 2.35 - 6.94), but pre-existing medical comorbidities did not vary significantly between antepartum stillbirths and livebirths (Table 4.7). There was no indication of multicollinearity in the model (mean VIF: 1.23, maximum VIF: 1.65).

Table 4.7: Risk factors (adjusted odds ratios) for antepartum stillbirths with progressive adjustment for potential confounders.

Variable	OR adjusted for sociodemographic factors (95% CI) (n=519)	OR adjusted for sociodemographic + obstetric and maternity care (95% CI) (n= 447)	OR adjusted for sociodemographic + obstetric and maternity care + biological factors (95% CI) (n= 447)
Sociodemographic factors			
Maternal age per 1 year increase in age	1.03 (1.00 - 1.07)	1.05 (1.00 -1.11)	1.03 (0.98 -1.09)
Obstetric and maternity care factors			
Parity			
0		2.02 (1.15 - 3.56)	1.87 (1.04 - 3.36)
1-3		1 (ref)	1 (ref)
4 or more		1.36 (0.56 - 3.31)	1.24 (0.47 - 3.26)
Gestational age			
Term		1 (ref)	1(ref)
Late-term		1.76 (0.74- 4.20)	1.58 (0.65 - 3.84)
Preterm		13.61 (6.24 - 29.65)	14.29(6.31 - 32.38)
Referral status			
Not referred		1 (ref)	1 (ref)
Referred		3.75 (1.96 - 7.17)	3.15 (1.61 - 6.15)
Number of ANC visits			
Unbooked		2.58 (1.37- 4.85)	2.07 (1.07 - 4.00)
1-3 visits		0.81 (0.18 - 3.55)	0.94 (0.20 - 4.37)
4 or more visits		1 (ref)	1 (ref)
Biological factors			
Medical comorbidities (all)			
No			1 (ref)
Yes			1.88 (0.55 - 6.41)
Obstetric comp. (all)			
No			1 (ref)
Yes			4.04(2.35- 6.94)

Maternal age, together with the obstetric and maternity care factors, had a good ability to discriminate between individuals with and without antepartum stillbirth (AUC 0.81), and this improved further to 0.85 on the addition of the biological factors ([Figure 4.4](#)).

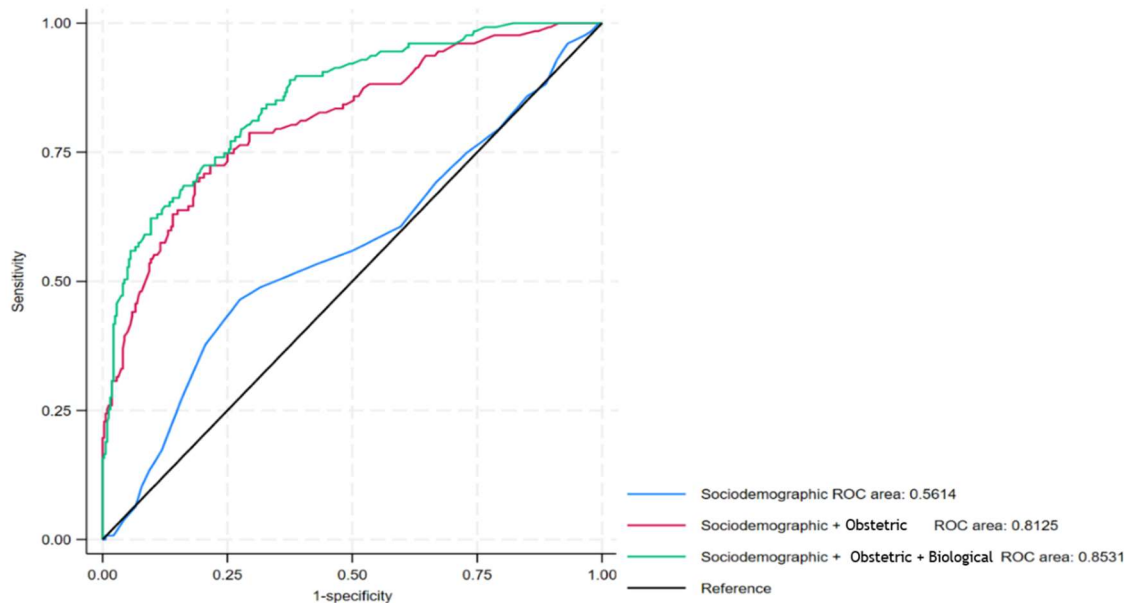


Figure 4.4: Area under the receiver-operating characteristic (AUROC) curve for sociodemographic, obstetric and maternity care and biological factors in relation to antepartum stillbirths.

4.3.4.2 Multivariable model for intrapartum stillbirths

For intrapartum stillbirth, after adjusting for maternal age, marital status and obstetric and maternity care factors, maternal age (aOR 1.05, 95%CI 1.00 - 1.10); preterm compared with term birth (aOR 13.07, 95%CI 5.97-28.61); being referred from another facility (aOR 3.42, 95%CI 1.74 - 6.70); having a caesarean birth compared with vaginal birth (aOR 2.01, 95%CI 1.13 - 3.57); and not using partogram when indicated (aOR 2.72, 95%CI 1.23 - 6.02) were significantly associated with the outcome, but parity and antenatal visits were not significantly associated with the outcome (Table 4.8).

After adjusting for biological factors, similar to the antepartum model, maternal age was no longer associated with intrapartum stillbirth (aOR 1.03, 95%CI 0.98 - 1.09). The magnitude of association was marginally attenuated for the obstetric and maternity care factors of being preterm (aOR 11.28, 95%CI 4.66 - 27.24) and being referred (aOR 2.50, 95%CI 1.19 - 5.24), but the effect size of

the aOR for not using partogram when indicated increased marginally (aOR 2.92, 95%CI 1.23 - 6.95). Caesarean section was no longer associated with intrapartum stillbirth (0.68, 95%CI 0.35 - 1.32). The effect of having any obstetric complication was much higher for intrapartum stillbirth compared with antepartum (aOR 10.71, 95%CI 5.92 - 19.37). There was no indication of multicollinearity in the model (mean VIF: 1.44, maximum VIF: 2.35).

Table 4.8: Risk factors for intrapartum stillbirths with progressive adjustments for potential confounders.

Variable	OR adjusted for Sociodemographic factors (95% CI) (n=508)	OR adjusted for sociodemographic + obstetric and maternity care (95% CI) (n= 450)	OR adjusted for sociodemographic + obstetric and maternity care + biological factors (95% CI) (n=450)
Sociodemographic factors			
Maternal age per 1 year increase in age	1.06 (1.02 - 1.11)	1.05 (1.00 -1.10)	1.03 (0.98 -1.09)
Marital status			
Married	1 (ref)	1 (ref)	1 (ref)
Not married	4.41 (1.74 - 11.18)	2.54 (0.81 - 7.97)	2.54 (0.65 - 9.92)
Obstetric and maternity care factors			
Parity			
0		1.70 (0.98 - 2.93)	1.29 (0.71 - 2.37)
1-3		1 (ref)	1 (ref)
4 or more		1.97 (0.91 - 4.24)	1.61 (0.67 - 3.87)
Gestational age			
Term		1 (ref)	1 (ref)
Late-term		1.28 (0.51 - 3.23)	1.03 (0.38 - 2.75)
Preterm		13.07 (5.97 - 28.61)	11.28 (4.66 - 27.24)
Referral status			
No		1 (ref)	1 (ref)
Yes		3.42 (1.74 - 6.70)	2.50(1.19 - 5.24)
Number of ANC visits			
Unbooked		1.45(0.74 -2.84)	1.28 (0.40 - 2.16)
1-3 visits		1.67 (0.56 - 4.99)	1.50 (0.43 - 5.04)
4 or more visits		1(ref)	1 (ref)
Mode of childbirth			
Vaginal birth		1 (ref)	1 (ref)
Caesarean birth		2.01 (1.13 - 3.57)	0.68 (0.35 - 1.32)
Partogram use			

No, but indicated		2.72 (1.23- 6.02)	2.92(1.23 - 6.95)
Yes		1 (ref)	1 (ref)
Not indicated		2.57 (0.97 - 6.74)	3.81 (1.33 - 10.92)
Biological factors			
Obstetric comp. (all)			
No			1 (ref)
Yes			10.71 (5.92 - 19.37)

The sociodemographic factors, maternal age and marital status, together with the obstetric and maternity care factors, had a good ability to discriminate between individuals with and without intrapartum stillbirth (AUC 0.80), and this improved further to 0.87 on the addition of the biological risk factors ([Figure 4.5](#)).

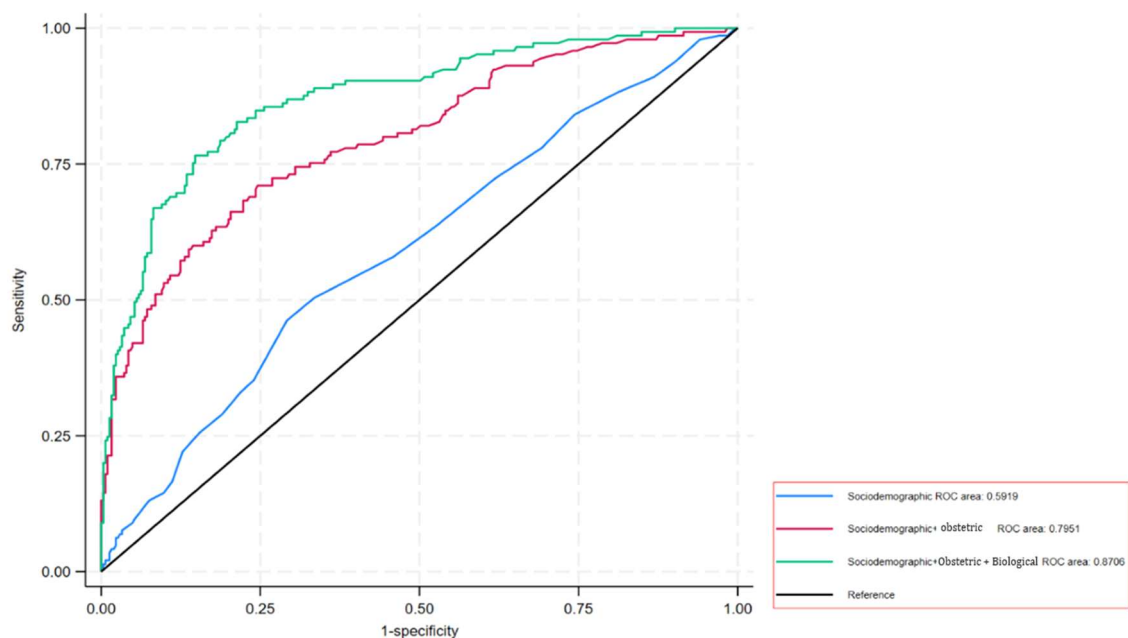


Figure 4.5: Area under the receiver-operating characteristic (AUROC) curve for sociodemographic, obstetric and maternity care, and biological factors in relation to intrapartum stillbirths.

4.3.5 Comparison between primary and imputed models

The primary models were fitted using complete case analysis. To assess the reliability of the conclusions drawn from the complete case analysis when there is missing data, models for antepartum and intrapartum stillbirths were fitted using multiple imputations with chained

equations (MICE). This involved using linear regression to predict missing continuous covariates (maternal age), logistic regression for missing binary covariates (gestational age) and multinomial logistic regression for missing categorical covariates (number of antenatal visits, parity).

The results from the complete case analyses for antepartum and intrapartum stillbirths were similar to those from the imputed models (Table 4.9, Table 4.10).

Table 4.9: Comparison of complete case and multiple imputation models for antepartum stillbirths

Complete case analysis- (447)				Multiple imputations by chained equation – MICE - 519			
Parameter	OR	SE	P value	Parameter	OR	SE	P value
Maternal age	1.04	0.03	0.20	Maternal age	1.03	0.03	0.263
Gest. age				Gest. age			
Term	1			Term	1	-	
preterm	13.62	5.63	<0.001	preterm	12.21	4.48	<0.001
Parity				Parity			
0	1.84	0.55		0	1.57	0.44	
1-3	1	-	0.12	1-3	1	-	0.28
4 or more	1.25	0.61		4 or more	1.17	0.53	
Number of ANC visits				Number of ANC visits			
Unbooked	2.09	0.70		Unbooked	2.26	0.72	
1-3 visits	0.92	0.71	0.08	1-3 visits	1.13	0.85	0.05
4 or more visits	1	-		4 or more visits	1	-	
Referral status	3.09	1.05	0.001	Referral status	2.94	0.93	0.001
Medical comorbidity	1.94	1.21	0.29	Medical comorbidity	2.21	1.27	0.17
Pregnancy complication	4.06	1.12	<0.001	Pregnancy complication	4.03	1.01	<0.001

Table 4.10: Comparison of complete case and multiple imputation models for intrapartum stillbirths

Complete case analysis (453)				Multiple imputation by chained equation – MICE (508)			
Parameter	OR	SE	P value	Parameter	OR	SE	P value
Maternal age	1.03	0.26	0.19	Maternal age	1.05	0.06	0.04
Marital status				Marital status			
Married	1	-		Married	1		
Not married	2.79	1.93	0.14	Not married	3.74	2.41	0.04
Gest. age				Gest. age			
Term	1	-		Term	1	-	
preterm	11.08	4.93	<0.001	preterm	8.29	3.31	<0.001
Number of ANC visits				Number of ANC visits			
Unbooked	1.42	0.53		Unbooked	1.35	0.47	
1-3 visits	1.40	0.88	0.58	1-3 visits	1.62	0.97	0.53
4 or more visits	1	-		4 or more	1	-	
Mode of childbirth				Mode of childbirth			
Vaginal				Vaginal			
Caesarean	1	-		Caesarean	1		
	0.69	0.23	0.27		0.69	0.22	0.241
Referral status	2.33	0.87	0.02	Referral status	2.71	0.96	0.01
Partogram use				Partogram use			
Yes	1	-		Yes	1		
No	3.02	1.33	0.03	No	2.56	1.05	0.05
Not indicated	3.91	2.09		Not indicated	3.01	1.49	
Pregnancy complication	11.17	3.34	<0.001	Pregnancy complication	11.34	3.22	<0.001

4.3.6 Population attributable fraction for risk factors

The PAF estimates showed that within the study population, the risk factors with the greatest potential for impact on antepartum stillbirth were obstetric complications (49%), referral from another facility (34%), and prematurity (33%). For intrapartum stillbirth, the risk factors with the greatest potential for impact were obstetric complications (70%) and failure to use a partogram when indicated (62%) (Table 4.11).

Table 4.11: Population attributable fractions for risk factors in the final models.

Risk factors	Antepartum stillbirths		Intrapartum stillbirths	
	PAF (%)	95% CI	PAF (%)	95% CI
Marital Status	-	-	4.2	0.4 – 7.8
Prematurity	32.9	27.7 – 37.7	26.5	20.3 – 32.3
Nulliparity	21.5	2.4 – 36.9	14.2	-9.0 – 32.5
Below 4 antenatal visits	27.5	6.6 – 43.7	10.2	-16.4 – 30.8
Caesarean childbirth	-	-	- 21.0	- 74.3 – 15.9
Referred from another hospital	34.4	22.8 – 44.3	25.2	11.6 – 36.7
Medical complication	3.3	-1.4 – 7.8	-	-
Not using partogram when indicated	-	-	62.2	27.0 – 80.5
Any pregnancy complication	49.2	39.6 – 57.2	70.0	65.4 – 74.0

4.3.7 Effect of obstetric complications on stillbirths

The presence of one or more obstetric complications is associated with over four-fold and ten-fold increase in the risk of antepartum and intrapartum stillbirths, respectively. Several maternal and fetal complications were identified in this study, and the antepartum and intrapartum models were further adjusted to estimate the effect of each complication on stillbirth occurrence.

The most common complication in women who had an antepartum stillbirth was hypertensive disorders of pregnancy (22.3%), followed by premature rupture of membranes (10.2%). Following

full adjustments, hypertensive disorders of pregnancy (aOR 14.20, 95%CI 5.76 – 34.99) and abnormal presentation (aOR 7.80, 95%CI 2.20 – 27.67) had the greatest odds for antepartum stillbirths. The PAF estimate suggests that 21.3% of antepartum stillbirths could be avoided if hypertensive disorders of pregnancy are prevented or managed (Table 4.12).

The most common complications in women who had intrapartum stillbirths were obstructed labour (23.8%) and antepartum haemorrhage (16.1%). Antepartum haemorrhage (aOR 17.75, 95%CI 5.60 - 56.27) and abnormal presentation (aOR 17.14, 95%CI 5.03 – 58.38) led to the most significant increase in the odds of intrapartum stillbirths. The complication with the greatest potential for impact was prolonged labour (20%), according to the PAF estimates (Table 4.12).

Table 4.12: Effect of obstetric complications on stillbirths after adjusting for sociodemographic and obstetric and maternity care factors.

Complication	Antepartum stillbirths (n = 157)				Intrapartum stillbirths (n= 193)			
	n (%)	Crude OR (95% CI)	aOR (95% CI)	PAF (95% CI)	n (%)	Crude OR	aOR	PAF (95% CI)
Prolonged labour	-	-	-	-	46 (23.8)	2.74 (1.71 – 4.38)	6.85 (3.23 – 14.50)	20% (17.4 – 22.5)
Malaria	5 (3.2)	2.47 (0.71 – 8.67)	1.34 (0.22 – 8.18)	0.8% (-3.4 – 4.9)	9 (4.6)	3.68 (1.22 – 11.13)	4.73 (1.17 - 19.16)	3.8% (2.4 – 5.2)
Premature rupture of membranes	16 (10.2)	3.82 (1.73 – 8.43)	1.13 (0.23 – 5.51)	0.9% (-10.8 – 11.3)	22 (11.4)	4.33 (2.05 –9.13)	4.84 (1.46-16.06)	9.8% (6.7 – 12.9)
Abnormal presentation	14 (8.9)	7.36 (2.60 – 20.81)	7.80 (2.20– 27.67)	6.9% (5.6 – 8.1)	25 (13.0)	11.19 (4.21 –29.73)	17.14 (5.03 – 58.38)	13.0% (12.0 – 14.0)
Uterine rupture	4 (2.5)	3.29 (0.73– 14.89)	2.84 (0.43 – 18.98)	6.9% (5.6 – 8.1)	13 (6.7)	9.1 (2.56 –32.33)	8.32 (1.75 – 39.57)	1.5% (- 0.06 – 3.1)
Antepartum haemorrhage	15(9.6)	3.63 (1.12 – 11.73)	5.85 (1.74- 19.60)	7.8% (5.9 – 9.8)	31 (16.1)	7.91 (3.68- 16.99)	17.75 (5.60 - 56.27)	15.6% (14.5 – 16.7)
Hypertensive Disorders of Pregnancy	35 (22.3)	7.52 (3.92 – 14.45)	14.20 (5.76 – 34.99)	21.3% (19.8 – 22.7)	23 (11.9)	3.54 (1.78 – 10.06)	8.21 (3.08 –21.89)	12.1% (10.4 – 13.7)

4.4 Discussion

4.4.1 Main findings

The overall stillbirth rate in the 20 hospitals was 38 per 1000 births, while the rates of antepartum and intrapartum stillbirths were 16 and 19 per 1,000 births, respectively. The rate of the overall and the two types of stillbirths differed by hospital type. However, given that maternal service indicators such as staff-to-patient ratio and availability of essential skills and supplies, amongst others, were not captured and assessed in this study, it is difficult to discuss to understand why these results were different for the different types of facility without making potentially erroneous assumptions. Consequently, the findings are discussed without segregation, noting that all types of facilities were included in the study.

Three risk factors: preterm birth, being referred from another facility and having obstetric complication/s, were independently associated with both antepartum and intrapartum stillbirth. However, being unbooked for pregnancy care and nulliparity increased the risk of antepartum stillbirth and not intrapartum stillbirth. Having adjusted for other factors, maternal age and marital status were not associated with either type of stillbirth. Not using a partogram when indicated significantly increased the risk of intrapartum stillbirth. Specifically, abnormal presentation, antepartum haemorrhage and hypertensive disorders of pregnancy increased the risk of both antepartum and intrapartum stillbirths, while prolonged labour, prolonged rupture of membrane, malaria and uterine rupture increased the risk of intrapartum stillbirths.

4.4.2 Comparison with the existing literature

There was a lower stillbirth rate in this study; about a third³³ and a fifth³⁴ of the rates reported in previous studies conducted in tertiary facilities in Imo State, which were not surprising as tertiary hospitals care for high-risk women. Intrapartum stillbirth is considered a sensitive indicator of the timeliness and quality of intrapartum care¹⁷¹. About half of the stillbirths in this study occurred in

the intrapartum period compared with 8% in Western Europe¹⁷¹, which aligns with findings from other studies of stillbirths in sub-Saharan Africa and other low- and middle-income countries¹¹. This highlights an opportunity for improvement using critical life-saving interventions in the intrapartum period. In comparison with other Nigerian studies that informed the theoretical framework^{16,43,172}, neither maternal age nor marital status was associated with an increase in the odds of antepartum stillbirth or intrapartum stillbirth in this study population. This finding contrasts with other studies from high and some low-income settings where older maternal age has been linked to a higher risk of stillbirth¹⁷³. This could be due to the limited variability of these factors in the study population.

The obstetric and maternity care factors of prematurity and referral status were associated with increased odds of both stillbirth types in the study population. In this study, preterm birth is likely to be an indicator of non-viability or poor development of the fetus, leading to antepartum or intrapartum death before reaching term. This can be caused by complications of hypertension, diabetes, anaemia, malaria, and infections, which were common in the study population and reported by other studies^{8,22,33,34,174–177}. The factors leading to antepartum stillbirths may precipitate preterm labour as a physiological response to fetal death. In these instances, the death of the fetus can initiate inflammatory or hormonal changes that prompt early delivery, making preterm birth a likely outcome following stillbirth. Thus, improving detection and care for these predisposing factors is essential to improve outcomes. Women who were referred from a different hospital emerged as a particularly vulnerable group for both types of stillbirths, with over four-fold and three-fold increases in the risk of antepartum stillbirth and intrapartum stillbirth, respectively. Previous studies found that when high-risk pregnancies needed referral, longer travel distances, lack of ambulances for easy transfer, and issues such as lack of beds or limited capacity at receiving hospitals further necessitating second referrals increase the risk of stillbirth^{22,43}. Sometimes, when women are given referral notes and directed to the closest

facilities, they may choose to skip closer health facilities due to financial barriers or past negative experiences with care^{43,45}. Women generally require referral when they develop an obstetric or fetal complication at the referring facility, which may explain the excess risk of stillbirth associated with referral; there is a need to explore and understand if there are additional risks posed by the referral mechanism itself and possible inherent delays in management.

While previous studies have found associations between women's parity and booking status with stillbirths generally^{16,172}, in this study, these two factors were only important for antepartum but not intrapartum stillbirths. This finding highlights the value of examining antepartum and intrapartum stillbirth risk factors separately. This distinction is important, as it accounts for the distinct pathways and risk factors that are likely to influence each type of stillbirth differently. Unbooked or unsupervised pregnancies had twice the risk of antepartum stillbirth compared with booked women who had at least four antenatal visits. However, the definition and classification of unbooked pregnancies vary significantly across studies in Nigeria, which complicates the interpretation of epidemiological findings. For instance, a study in Imo State defined unbooked women as those who either had not registered for antenatal care or had three or fewer visits¹⁷⁸.

Conversely, another study in Anambra State described unbooked women as those who had no antenatal care in their facility¹⁷⁹, while a study in Calabar described unbooked women as those who did not receive any formal antenatal care at any hospital with skilled attendants¹⁸⁰. This lack of a standardised definition has important public health implications, as the varying classifications may obscure the true associations between antenatal care attendance and adverse pregnancy outcomes, such as stillbirth¹⁸¹. Furthermore, it was found that nulliparous individuals had nearly twice the risk of antepartum stillbirths compared with women with 1-3 previous births. These findings suggest that early antenatal booking and tailored care for nulliparous women may help detect risk factors and emerging complications, which, with appropriate management, has the potential to reduce the risk of antepartum stillbirths. In cases of intrapartum stillbirths, when a

woman arrives at a health facility with a fetal heart rate present, fetal survival depends upon the swiftness and quality of care the woman receives at that point. The results reported here suggest that using a partogram when indicated (and provided the findings are acted upon) has the potential to prevent about 62% of stillbirths. Visually tracking labour progress using a partogram and monitoring key indicators such as the fetal heart rate has the capacity to enable timely intervention for complications. The overall use of partograms in this study population was poor (19.4%), and in a recent survey of obstetric care providers in Imo State, although 94% claimed to use partograms for monitoring in labour, only 2% of sampled medical records contained information about its use¹⁸². Factors contributing to this inconsistency included time constraints, staff shortages, unavailability of partograms, and insufficient training¹⁸².

The presence of obstetric complications was an important factor for both types of stillbirths. PAF estimates suggest that 49% of antepartum stillbirths and 70% of intrapartum stillbirths in the population have the potential to be prevented if these complications were absent, which in clinical terms means prevention or early diagnosis and appropriate management. Hypertensive disorders of pregnancy are a leading cause of stillbirth in this region, observed in 7% - 14% of stillbirths^{22,33,34,174}. In this study, when these disorders were present, they resulted in an eleven-fold and four-fold increase in the odds of antepartum and intrapartum stillbirth, respectively. Targeted interventions, such as early detection and management of hypertensive disorders and strengthening antenatal care with skilled birth attendants, can help mitigate these risks and reduce stillbirth rates¹⁸³. Appropriate management also mitigates the risks for the mother, which include eclampsia and death.

Abnormal fetal presentation was associated with more than five-fold increased odds of antepartum stillbirth and over an eight-fold increase in the odds of intrapartum stillbirth. While assisted vaginal birth is an option for some women with abnormal presentation, where the baby is still alive, some women need caesarean section, which has been shown to have sociocultural

implications leading to delayed consent¹⁸⁴. Ugwu and De Kok, in their research into women's refusal or delay in caesarean section in Nigeria, found that cultural, gender, and religious influences shape attitudes toward childbirth, associating vaginal birth with womanhood and caesarean section with curses, weakness, and societal stigma, potentially leading to delays in accepting necessary interventions¹⁸⁴.

Malaria in pregnancy has previously been linked to an increased risk of all stillbirths in studies conducted in Imo State and other settings^{185,186}; however, it was only associated with an increased risk in intrapartum stillbirth in this study, potentially due to the small number of women with a documented diagnosis of malaria. The AUROC curve confirms that collectively, nulliparity, preterm birth, unbooked pregnancy, referral, failure to use partogram and pregnancy complications explained a substantial proportion of the risk of stillbirth in this population. This emphasises the need for booking and the provision of high-quality antenatal and intrapartum care, and CEmOC as crucial interventions for risk reduction.

4.4.3 Strengths and limitations of the study

This study's strengths lie in being the first of its kind to assess and compare risk factors for antepartum and intrapartum stillbirths in secondary facilities in Imo State. A case-control design and analysis were used to identify risk factors compared with previous studies in the state, which were descriptive cross-sectional studies. The study's sample size, combined with the use of primary data, strengthened the reliability of the findings¹⁸⁷. Additionally, including all three types of secondary health facilities in Imo State and accounting for both rural and urban hospitals enhanced the relevance of the results. The application of robust analytical methods further ensured the rigour and validity of the study's conclusions.

It is crucial to acknowledge limitations in the form of incomplete data stemming from inconsistent documentation and stillbirth management practices in some of the selected facilities. For instance, due to high levels of missing data for birth weight, smoking status and educational attainment, important risk factors identified by previous studies could not be investigated as potential risk factors in this study population. These gaps likely limited the depth of analysis, potentially skewing findings. The data collection process may have introduced some biases in the study, principally due to the reliance on physical patient records in the study hospitals compared with settings which have electronic medical records with standardised templates for patient information documentation. The robustness and quality of each hospital's documentation practices and the completeness of data varied significantly, and the efficiency of their filing systems influenced the number of cases retrieved. Another limitation is that stillbirth types in hospital records are prone to misclassification, as has been shown in previous studies^{22,168}.

The use of surrogate markers of intrapartum (fresh) and antepartum (macerated) stillbirths in some study hospitals has implications for the study findings. Evidence from a study which assessed the adequacy of skin maceration for the distinction of antepartum from intrapartum stillbirth showed a significant disparity (fresh stillbirth = 309 vs intrapartum stillbirth = 44), suggesting overcounting for intrapartum stillbirths¹⁸⁸. However, the authors acknowledged that the disparity may be due to limited information on fetal heart sounds or fetal movement, especially in women referred from other facilities. These women were strictly classified as having antepartum stillbirths as there were no heart sounds on admission to the study hospital, although the stillbirth could potentially have been intrapartum. It was equally difficult to ascertain the presence of fetal heart sounds at the start of labour for many women referred between hospitals in this DPhil study. This potential misclassification should be considered when interpreting the results. Despite these constraints, the study findings provide valuable insights into the primary risk factors for the two types of stillbirths, offering a foundation for targeted interventions and emphasising the necessity

for improved clinical care documentation to aid the delivery of high-quality care and data collection for future research.

4.4.4 Study implications and recommendations

The study findings have significant policy and planning implications. It is imperative to establish robust systems for routinely collecting, classifying and reporting stillbirths in this setting. Progress will be slow without relevant data in the region. Equally crucial is the need to strengthen referral pathways and emergency readiness in secondary hospitals. Several interventions have been implemented for stillbirth reduction in Imo State in the past, such as the national midwifery service scheme and free maternal health services^{46,189}. This study suggests that interventions targeting nulliparous women, routine screening for hypertensive disorders during antenatal care and their appropriate management, mandatory use of partogram for labour monitoring, and adequate services to counsel and engage women in the planning of childbirth when they have an abnormal presentation may be beneficial. These have the potential to improve care for high-risk groups and proactively mitigate/reduce potential risk factors, reduce stillbirth rates and improve outcomes for both mothers and babies.

4.5 Reflective notes from data collection

Unlike the information obtainable in many high-income settings, patient information and treatment records are documented in physical folders in all hospitals included in this study. Therefore, the quality of data extracted from each hospital was significantly dependent on the robustness of documentation and the efficiency of the hospital's filing system. During data collection, the researcher encountered different situations that led to several reflections, seven of which have been highlighted briefly.

A. Weighing stillborn babies.

Many hospitals did not weigh stillborn babies, and in some hospitals where they were weighed, there was inconsistent documentation of the weight. This omission suggests a lack of standardised procedures for handling stillborn babies. Without accurately documenting the weight, hospitals cannot accurately determine potential causes of stillbirth, such as fetal growth restriction. This omission can hinder efforts to understand and address factors contributing to stillbirths in this setting. In this study, for instance, despite the established link between birth weight and stillbirths, the researcher could not include birth weight in the analysis due to high levels of missing data.

B. Disorganised filing systems and missing folders

Following the identification of cases and controls from the hospital registers, each participant's medical folder had to be identified from the medical records department for the data extraction. Inefficient filing systems, such as alphabetical filing, where many people bear similar names and data management protocols within some hospitals, made it challenging to identify intended participant folders. In some instances where folders were not identified, the livebirth was replaced by the preceding livebirth on the register. However, stillbirth cases that were not located had to be excluded from this study. This hampers the ability to conduct comprehensive analyses and audits, even at the hospital level, to improve healthcare delivery.

C. Inadequate patient history-taking

During a woman's first visit to the hospital, a full clerking by the doctor is very useful for her management and also helps other clinicians and health workers who will subsequently interact with her. Even in emergencies, it is advised that following de-escalation of the emergency, a health worker obtains a complete history to aid clinical management. The researcher observed varying levels of completeness in patient history taking within and across hospitals, making it difficult to extract basic social demographic information from patient folders. Incomplete or inaccurate

patient documentation limits understanding of patient demographics and poses a challenge for monitoring and addressing health disparities or tailoring healthcare services accordingly.

D. Absence of test results for basic antenatal screening tests

According to the local and global guidance for antenatal screening, every woman who presents for her first antenatal visit should have screening tests, which include blood grouping (including Rhesus typing), complete blood count, infectious disease screening, urine analysis for infection and protein, genetic testing for chromosomal anomalies and ultrasound. The test results then determine the frequency of follow-up visits and tests. Due to the prohibitive costs, some antenatal tests are sometimes deferred or not done at all.

The researcher observed that despite the low cost, many women in the sample had few or no screening for hematocrit or haemoglobin throughout pregnancy. In some cases, medical doctors recorded the test requests, but the results were not found in the patients' folders. In other instances, it was unclear whether the tests were requested because there was no documentation in the patient's medical records. Due to the high prevalence of anaemia in pregnancy in Nigeria, it is standard practice to give all pregnant women iron supplementation. Nevertheless, given the known effects of anaemia on fetal growth and maternal well-being and the importance of knowing the type of anaemia, screening for anaemia is of great importance in tailoring patient management approaches to their specific needs.

E. Are there disparities in the quality of care provided to unbooked versus booked women?

Although this was beyond the scope of this research, the researcher observed that, generally, there was less documentation of care provided for unbooked women compared with booked women. This may be due to the prioritisation of the urgent medical care provision especially when they come with obstetric complications. These women tend to self-refer, adding to the pool of referred women who have been shown to have a significantly higher risk for stillbirth. A remaining

question the researcher had was around emergency responsiveness and if there are potential biases or deficiencies in healthcare delivery when unbooked patients visit the facility, which may contribute to the increased risk of stillbirth in this population.

F. Poor data use in many facilities.

The researcher observed that there was poor data use in many of the facilities included in this study. While some facilities had monthly statistics depicting services provided and outcomes, it was clear from initial conversations with health workers that the available data were not always periodically analysed. Inadequate data management practices limit evidence-based decision-making that may hinder efforts to improve healthcare quality and safety within participating facilities.

G. Diagnostic accuracies and threshold for concerns

The high prevalence of severe anaemia among patients in one hospital located in the state capital raised concerns about the accuracy of diagnostic processes and potential errors in test results. Surprisingly, almost all patients had anaemia in this hospital. When this concern was relayed to the hospital matron, she attributed it not to diagnostic errors but instead made reference to women always being assumed to be anaemia in the absence of diagnostic tests due to the high prevalence of anaemia in pregnancy in Nigeria. Conversely, another hospital within the same community reported a remarkably lower prevalence of anaemia for women who underwent the tests. Reflecting on these, one can only wonder about the potential implications of diagnostic errors, their impact on care and the safety measures put in place to mitigate such errors.

Chapter 5 A qualitative study exploring the perceptions of stillbirth among women and healthcare workers in Imo State, Nigeria.

5.1 Introduction

5.1.1 Background

Given the high burden of stillbirths in Nigeria, improving healthcare access, use, and service delivery remain paramount strategies for improving outcomes. However, despite several interventions by the Nigerian government, there continues to be an enormous stillbirth burden and significant disparities in healthcare access and outcomes, especially for women in underserved communities¹⁶.

The World Health Organization (WHO) suggests that timely and appropriate evidence-based actions related to maternal health promotion, disease surveillance, risk factor detection and management in the antenatal period could help reduce pregnancy and childbirth complications and also reduce stillbirths¹⁸³. In 2016, the WHO model of a minimum of four antenatal appointments was updated to a minimum of eight visits to reduce perinatal mortality and improve women's experience of care¹⁸³. Empirical studies in Nigeria have shown that access to healthcare services and self-care decisions made during pregnancy are influenced by several factors. These include sociocultural norms, religion, socio-economic status, access to information, geographical location, and health system factors, among others^{148,190,191}.

Within Nigeria, Imo State in the south-eastern region has the highest (97%) percentage of women who have four or more antenatal visits, skilled birth attendance (94%) and health facility childbirth (95%)²⁰. However, these have not translated to the expected rate of reductions in maternal and perinatal complications and deaths. Two tertiary facility studies conducted in Imo State in 2012 reported stillbirth rates of 180³⁴ and 60³³ per 1,000 births, respectively, while the quantitative

study conducted as part of this DPhil project found a rate of 38 per 1,000 births in 20 secondary facilities. Factors such as suboptimal quality of care, late access to health facilities, and unavailability of equipment or health workers to provide emergency obstetric care, among other factors, have been identified in other Nigerian studies as drivers of poor maternal and fetal health outcomes¹⁹². Given the very high percentages of access to antenatal care, there might be other factors related to women's self-care during pregnancy leading to stillbirths. Exploring women's perception of these broader issues and the perception of health workers on stillbirth occurrence could potentially shed light on the systemic issues and gaps in healthcare delivery in Imo State, which exacerbate the risk of stillbirths. A comprehensive understanding of these factors is required to inform actionable measures and interventions that could potentially reduce the burden of stillbirths.

5.1.2 Research questions

1. What are women's perceptions of enablers and barriers to healthcare access during pregnancy?
2. What factors influence women's healthcare and self-care decisions during pregnancy within their communities?
3. What are health workers' perceptions of community-related factors influencing stillbirth occurrence?
4. What are health workers' and women's perceptions and understanding of how stillbirths can be prevented at the community level?

5.1.3 Significance of the study

In the past few decades, there has been an increased push for evidence-driven interventions for improving health outcomes including maternal newborn health outcomes. For stillbirth prevention, previous studies in high-burden countries have suggested that in addition to improving the quality of service delivery in hospitals, effective engagement with communities and

families is important for creating new norms surrounding pregnancy and healthcare delivery to improve outcomes^{46,193}. In Imo State, no previous study of this nature has been conducted to explore stillbirth prevention within communities. This study aims to deepen understanding of the factors that facilitate or hinder access to healthcare during pregnancy and factors influencing women's healthcare decisions within their communities by exploring women's and healthcare providers' perspectives. Insights generated will be essential for developing targeted interventions to improve maternal and newborn health outcomes in Imo State and comparable settings.

5.2 Methods

5.2.1 Ontological and epistemological underpinnings of the study

Simply put, the ontological position refers to a researcher's view about the nature of the topic of inquiry, and the epistemological position reflects their view of what can be known and how we can know about the topic of inquiry¹⁹⁴. This research work sits within a subtle realist paradigm and posits ontologically that depending on the researcher's subjective perceptions and observations, different methods will produce different pictures of the same social phenomenon being studied¹⁹⁵. Subtle realism acknowledges the existence of an objective reality independent of human perception, but it also admits that the researcher's understanding of this reality is contextually influenced. This ontological stance combined with a contextualist epistemology, which is the view that the "truth-conditions" of knowledge claims vary with the contexts in which those claims are made¹⁹⁶, is the framework within which this research works. Recognising the criticisms of the epistemic neutrality of a contextualist approach (sometimes called "evading epistemology")¹⁹⁶, this study prioritises answering the research questions most effectively rather than generating epistemic theories.

5.2.2 Study design

Unlike study designs that use data to generate or test theories, the purpose of this study was to describe women's and health workers' perceptions and lived experiences; hence, a qualitative descriptive design was chosen^{197,198}. This design, chosen for its ability to provide straightforward descriptions of phenomena, is especially favoured by researchers seeking to understand the specifics of *who*, *what*, *where* and *why* events occur¹⁹⁷⁻¹⁹⁹. With a focus on understanding the individual participant's experience in its specific context, this design adopts an inductive approach while ensuring data integrity without distortion of the phenomenon under investigation^{197,199}. As with all descriptions, the interpretation of findings in this design will "always depend on the perceptions, inclinations, sensitivities and the sensibilities of the describer"²⁰⁰.

5.2.3 Positionality and reflexivity

England²⁰¹ suggested that qualitative research is not a product but a process which represents a shared space shaped by both the participants and the researcher. The idea of using oneself as a research instrument in qualitative research adopting a subtle realist methodology acknowledges that the researcher's subjectivities are likely to influence both the research process and the subsequent presentation of findings, and as such, striving to achieve pure objectivism is a naïve quest²⁰². "Positionality is thus determined by where one stands in relation to 'the other'"²⁰³. Bearing these in mind, the researcher's position in this study was both as an outsider and an insider.

In the context of Imo State, the researcher was an insider culturally. Being from the Igbo tribe, the researcher was familiar with most of the issues the women described in their responses, and this enabled follow-up questions to be asked that helped clarify each woman's stance in nuanced conversations. Also, as a medical doctor, the researcher's clinical training and familiarity with the

health system in Imo State helped to improve contextual understanding of the issues related to stillbirths in participants' narratives, enriching the depth and credibility of the research.

On the other hand, the researcher has neither experienced pregnancy and childbirth nor practised as a clinician in Imo State; thus, the researcher is not an insider in this regard. However, this outsider position facilitated a more reflexive approach to data analysis and interpretation, minimising the potential influence of any preconceived notions or biases while still recognising the subjective nature of qualitative research²⁰⁴. Inherent biases and experiences, such as pre-existing opinions on the research topic and commitment to the Christian faith, were recognised and approached with humility and openness in each interaction. The researcher's medical training facilitated sensitive engagement with women and health workers, creating a safe and respectful environment for participants. Rapport and trust were further strengthened by the researcher's connections to the State, being from the Igbo tribe and fluent in the local language, which allowed seamless communication and encouraged participants to share their experiences openly.

Also, the researcher, being a doctor, was mindful of the potential power dynamics at play while speaking with nurses, community health workers and the women. This was overcome by reminding participants that they were the true experts and that the researcher was there to learn from their experiences. Through reflective practice and active listening, the researcher continuously evaluated the interview and discussion approach and adjusted the engagement to ensure that the researcher's positionality did not overshadow the narratives being shared.

An empathetic and encouraging tone was maintained throughout the focus group discussions and interviews. The researcher avoided giving impressions of right or wrong answers to the participants through body language, gestures, or tone of voice. Questions were posed neutrally, responses were awaited, and in cases of silence from participants, questions were reiterated with

further explanation, avoiding the suggestion of potential answers. A conversational tone was consistently maintained in interactions with the participants rather than an interrogative one.

The researcher's background and subjectivity inevitably influenced the approach to data analysis. The researcher's understanding of health-related issues discussed by participants was shaped by experiences within the health system. This knowledge helped to ensure a grasp of the subtle nuances in participants' responses, enriching the analysis. Despite the benefit of this knowledge, it also poses a risk of framing participants' responses through a 'biomedical lens'. Reflexive practices such as peer debriefing with second coders and engaging with colleagues from different backgrounds were employed to critically examine the themes and conclusions drawn from the data, to check interpretations and to challenge any biases.

5.2.4 Ethical considerations

The four fundamental moral principles – autonomy, beneficence, justice and non-maleficence postulated by Beauchamp and Childress¹⁷⁰ formed the ethical foundations of this study. These principles guided every aspect of the research process, from participant recruitment to data analysis, ensuring utmost integrity, respect, and responsibility towards both participants and society at large. Strategies utilised to achieve ethical goals through data collection, management and storage are described below.

Ethical approval for data collection was obtained from the Oxford Tropical Research Ethics Committee and Federal Medical Centre Ethical Committee, and social approvals were obtained from Medical Directors of the hospitals that facilitated participant identification and recruitment (Appendix 5). The potential risks and adverse effects that participants may experience were identified as follows:

- The risk of emotional distress from recalling previous stillbirth(s) or near-miss events.

- The potential risk of pressure to participate as hospital health workers supported the recruitment process.
- The risk of health workers abandoning care responsibilities during the time it takes to participate in the study.
- The fear of retribution from health workers (for women) and supervisors (from health workers).
- Challenges or discomfort peculiar to the participant's local circumstance (e.g. holding a different opinion about a cultural norm)

The steps taken by the researcher to mitigate these risks and adverse effects included:

- Participants were notified that support systems were in place in case the discussions elicited discomfort or triggered traumatic memories.
- Participants were told they didn't have to answer any questions that made them uncomfortable. They were also assured that they could pause or end the interview at any time without needing to explain why.
- Participants were given the Participant information sheet [Appendix 5], including the researcher's (DPhil student) phone number and were informed to reach out if they considered being a part of the study. On reaching out, only those who provided informed consent following the introductory call were included.
- Participants were assured that strict confidentiality measures would be implemented to safeguard their anonymity, ensuring that their quotes would remain untraceable.
- Interviews with health workers included in the study were conducted during their off-duty hours or after their regular shifts to ensure minimal disruption to their clinical duties.
- The researcher was culturally aware and tried to accommodate each participant's concerns.

All data collected during the study were de-identified and used only within the boundaries of the agreement that guided its use. Each participant was given a participant identifier [using HHW for hospital health worker, CHW for community health worker, SB for stillbirth and NM for near misses]. Field notes, audio recordings, and transcripts were kept confidential and secured on the university's servers and in locked drawers. Only the principal researcher and second coders had access to them. The data will be securely stored with password protection for five years from 2023, after which they will be destroyed following the University's policy on data security.

5.2.5 Study setting

This study was conducted in Imo State, Nigeria. A detailed description of the setting and organisation of the health care system in the state is provided in [Chapter 3](#).

5.2.6 Recruitment of participants

5.2.6.1 Inclusion and exclusion criteria

The inclusion and exclusion criteria are shown in Table 5.1.

Table 5.1: Study inclusion and exclusion criteria

Inclusion criteria	○ Women	○ Women in reproductive age group (18 – 49) ○ Women who had a stillbirth in secondary facilities in Imo State between January 2020 to June 2023, OR ○ Women who had a 'near-miss' in secondary facilities in Imo State between January 2020 and June 2023, as confirmed by a health worker. Near-miss was defined as women who had severe fetal complications that did not end in stillbirth (for example, moderate to severe asphyxia, Intrapartum fetal distress, placental abruption, Intrauterine Growth Restriction, Oligohydramnios, etc.)
	○ Health workers	○ Doctors, midwives, and nurses involved in maternal and newborn care based in secondary health facilities. ○ Community-based health workers, including nurses, midwives, Community Health Extension Workers (CHEWS), Junior Community Health Extension Workers (JCHEWS) involved in maternal and newborn care. These health workers are usually attached to primary health centres.

Exclusion criteria	○ Mothers who are below 18 years (age of consent) ○ Potential participants who did not consent to participate in the study ○ Women who had their childbirth outside of a secondary facility (including home births, births with traditional birth attendants and primary health centres) to ensure consistency in data and expected quality of care. ○ Volunteer participants whose account of “difficult childbirth” could not be confirmed by a health worker as meeting the study inclusion criteria. ○ Health workers who are not directly involved in providing maternal and newborn healthcare services.
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5.2.6.2 Inviting women to participate in the study

The ideal strategy would have been to recruit from the 432 women who had stillbirths and were included in the quantitative study, and also women who had near-misses in the same health facilities, for ease of relatability to the quantitative findings²⁰⁵. Therefore, recruitment was started from the hospitals included in the quantitative study. Permission to recruit mothers was obtained from health facility managers. Nurses and midwives helped to identify women who had stillbirths and near-misses between January 2020 and June 2023. The health workers made the initial contact with the women and shared the contact details of interested women. Due to the sensitivity of the research topic, many eligible women were unwilling to participate in this study. Therefore, a snowball approach²⁰⁵ was also used, with women passing on the invitation to other women who had stillbirths at different facilities.

5.2.6.3 Inviting health workers to participate in the study

Relationships established during the quantitative data collection in the study hospitals were leveraged for health worker recruitment. Participants were invited through personal invitations (by email or telephone), and notices about the study and participant recruitment were put up with the permission of the hospital management. Notices and announcements were also put out

through the local government health department office, which is the administrative centre for community health workers stationed in primary health centres.

5.2.6.4 Process once potential participants were identified

Additional details about the study were provided to women and health workers who expressed an interest in participating in the study via phone calls and in person. The Participant Information Sheet (PIS) content was explained to all interested persons, and a copy of the PIS was given. They were encouraged to reach out for clarifications and indicate willingness to participate within five days. The interview dates and locations were scheduled to suit each person. The focus group participants were asked to suggest suitable dates and modes of interview, and they were grouped based on these preferences. To avoid undue pressure to participate, no financial incentive was given.

5.2.7 Sampling

Imo State has a mixed healthcare system, and current evidence suggests that several factors such as affordability, experience of care, location, and availability of skilled health workers may influence the choice of childbirth facility^{45,206}. A purposive sampling approach was utilised to recruit participants for the study²⁰⁷. The researcher sought to ensure the representation of the different hospital types and locations, the experiences of women who have experienced stillbirth and near-misses, and health workers who work in the hospital and at the community level. Given the limited time and resources and the aim to incorporate diverse perspectives, the researcher targeted recruiting 10 women who had stillbirths, 10 women who had near-misses across private, public and mission hospitals, and 10 facility-based and 10 community-based health workers in urban or rural locations. This approach prioritised diversity of experiences over data saturation within the available resources²⁰⁷.

5.2.8 Data collection

5.2.8.1 Instruments: semi-structured topic guides

Separate topic guides were developed for the three different groups. All three topic guides were developed in English language based on the research questions and desk review findings. One topic guide was developed for women who had stillbirths, and one was developed for women who had near-misses. A different topic guide was developed for health workers, with some questions and probes tailored for those who work in hospitals and those who work in communities. The initial topic guides developed were refined iteratively following consultations with colleagues and a woman who had experienced stillbirth, especially in thinking about how to ask these questions sensitively to women who had stillbirths. The final topic guides used for the interviews and discussions are shown in Appendix 6.

5.2.8.2 Pilot interviews

Pilot interviews were conducted with one health worker and one woman who had a near-miss meeting the study criteria to ascertain the suitability of the interview guide²⁰⁸. Judging by the rich insights garnered, the flow and depth of conversations, as well as feedback following review with DPhil supervisors, no changes to the topic guides were made, and these interviews were included in the main study²⁰⁹.

5.2.8.3 Data collection process

Women and facility-based health workers were interviewed individually due to the sensitivity of the topic and scheduling challenges. Each participant selected their preferred interview date, location and mode of interview (telephone / online / face to face), posing the least disruption to their daily routines. Community health workers took part in small focus groups, and where this

was not possible due to logistics, paired interviews were conducted instead. Focus groups were held either in person after peak service times at the health centres or virtually via Zoom at an agreed time. Focus groups were chosen because they encourage interaction among participants, which can lead to the emergence of diverse viewpoints and robust descriptions that might not have been possible in individual interviews²¹⁰. All interviews and focus group discussions were conducted by the DPhil researcher. Consent for the study was provided in two ways, depending on the mode of the interview. Participants signed physical consent forms for in-person interviews, and verbal consent was provided and recorded for online interviews.

The researcher established rapport with the participants using preliminary questions, gently easing participants into the interview, thus reducing the chances of social desirability bias²¹¹. While interviewing and facilitating the focus groups, the researcher utilised open-ended questions to help elicit “context-bound subjective insight” from participants and also validate meaning²¹². Following each question, the researcher paused for responses to avoid directing the discussions. Participants were also invited to make additional inputs relating to the aspects of the topic discussed, that they felt were not covered by the interview/discussions.

Participants were offered the choice of using English language, “pidgin” English, or Igbo language, which is also the primary researcher’s mother tongue. All participants consented to audio-recorded sessions using a mobile device, and the researcher also took field notes. Each interview or focus group discussion was transcribed soon after completion. The researcher and a trained research assistant fluent in all three languages transcribed, translated and back-translated the audio files from Igbo to English to ensure cross-cultural equivalence and preserve the participants’ actual meaning²¹³. The researcher reviewed and edited all transcripts while listening to the audio files to change grammatical and typographical errors to increase the readability of the transcripts while preserving the character of the participants’ comments²¹⁴.

5.2.9 Data analysis

Transcripts and field notes were utilised for data analysis, which began as soon as the first transcript was available. The field notes complemented the coded data by highlighting non-verbal cues and other environmental factors observed during the interview, adding layers of meaning to the data, which may not have been apparent from the transcripts alone^{215,216}. Inductive thematic analysis was conducted in parallel with ongoing data collection and insights from the analysis were taken into subsequent interviews and focus group discussions. This approach allowed for the rephrasing of questions and follow-up prompts based on the emerging findings. Following transcription and translation, the transcripts were read and re-read for familiarity. The transcripts were coded descriptively in Microsoft Word using the open coding technique²¹⁷. The codes were refined, combined and compared iteratively as data collection and analysis continued, enabling the researcher to keep an open mind and consider all the possible meanings.

Themes describing the content were developed, and these were mapped onto four critical periods in the pregnancy continuum where interventions could potentially be made to prevent stillbirths: (1) health in pregnancy, (2) choice of care, (3) use of antenatal services, and (4) timely access to intrapartum emergency obstetric care. The Socioecological Model (SEM), which is a comprehensive framework for understanding the complex interplay of individual, interpersonal, community, and societal factors that influence health, was used to organise the data²¹⁸. The inductive findings were mapped onto the levels of the SEM to contextualise the results; however, the themes within each SEM level were not predetermined but emerged as analytic categories directly developed from the data, reflecting the participants' unique perspectives.

Throughout the analysis, the researcher utilised the constant comparison technique to examine the differences and similarities between individual interviews emanating from within and across hospital types, different cadres of health workers and between codes generated from earlier

interviews and the later interviews²¹⁹. To increase the validity of the analysis, the DPhil researcher analysed all the transcripts, and three second coders analysed different subsets (10 – 15%) of the transcripts. The three second coders have different cultural backgrounds and health service experiences in other regions of Nigeria and the UK. This was a deliberate choice to expose my interpretation to challenge from multiple perspectives. All codes and themes were discussed and agreed upon by the researcher and second coders. The researcher remained reflexive throughout the data collection and analysis, keeping in mind personal, professional perspectives and experiences of health and health-seeking behaviours during pregnancy and childbirth, which could lead to stillbirth.

5.3 Results

There were 38 participants in this study: 20 women (10 women who had stillbirths, 10 women who had near-misses), 10 hospital-based health workers and eight community-based health workers (Table 5.1, Table 5.2). In the analysis, there were mostly similarities and no notable differences in the perspectives of women who had stillbirths and women who had near-misses; hence, the findings are presented collectively to capture the shared experiences and insights across both groups.

5.3.1 Characteristics of the participants

Characteristics of the women

The sociodemographic characteristics of the women are shown in Table 5.2. Characteristics of women who had stillbirths were comparable to those of the women who had near-misses. Two women had two consecutive stillbirths during the study period. The childbirth most commonly affected for the women was their first (11 women). All but three women were employed and all women had at least secondary education.

Table 5.2: Sociodemographic characteristics of women included in the study

	Age range	Marital status	Parity	Childbirth affected	Level of education	Employment	Type of facility	Geographical location
SB01	36-40	Married	3	2 nd	Tertiary	Self-employed	Public	Urban
SB02	31-35	Married	2	1 st	Secondary	Self-employed	Private	Urban
SB03	25-30	Married	4	3 rd and 4 th	Secondary	Self-employed	Public	Rural
SB04	21-25	Cohabiting	1	1 st	Secondary	Unemployed	Private	Rural
SB05	21-25	Married	1	1 st	Tertiary	Civil servant	Private	Rural
SB06	21-25	Married	2	1 st	Secondary	Self-employed	Mission	Rural
SB07	36-40	Married	4	1 st	Tertiary	Teacher	Private	Urban
SB08	26-30	Married	3	1 st (1 twin), 2 nd	Secondary	Unemployed	Mission	Rural
SB09	21-25	Married	3	1 st	Secondary	Hairdresser	Private	Rural
SB10	31-35	Married	2	2 nd	Secondary	Self-employed	Private	Rural
NM01	21-25	Married	1	1 st	Tertiary	Front desk clerk	Mission	Rural
NM02	31-35	Married	6	6 th	Secondary	Technician	Mission	Rural
NM03	31-35	Married	3	3 rd	Tertiary	Nurse	Private	Urban
NM04	21-25	Married	1	1 st	Tertiary	Civil servant	Mission	Rural
NM05	31-35	Married	2	3 rd	Tertiary	Nurse	Private	Rural
NM06	31-35	Married	4	2 nd	Tertiary	Self-employed	Mission	Urban
NM07	21-25	Married	3	3 rd	Secondary	Unemployed	Private	Rural
NM08	21-25	Married	1	1 st	Secondary	Self-employed	Private	Rural
NM09	31-35	Married	2	2 nd	Secondary	Self-employed	Public	Rural
NM10	36-40	Married	1	1 st	Secondary	Self-employed	Public	Rural
SB – Stillbirth; NM-Near-miss; Self-employed – owns a small business								

Characteristics of the health workers

The characteristics of the health workers are shown in Table 5.3. Eighteen health workers participated in the study, including four doctors, nine nurses/midwives, one senior auxiliary nurse, two community health extension workers (CHEWs), one health assistant and one food science officer. Their years in service ranged from three to twenty-one years. Five health workers worked

in mission hospitals, three worked in private hospitals, while two and eight worked in public and primary health centres, respectively.

Table 5.3: Sociodemographic characteristics of health workers included in the study

	Designation	Years in service	Hospital type	Geographical location
HHW01	Nurse/midwife	8	Mission	Rural
HHW02	Doctor	9	Public	Urban
HHW03	Senior Auxiliary Nurse	4	Mission	Rural
HHW04	Doctor	21	Private	Rural
HHW05	Nurse/midwife	14	Mission	Urban
HHW06	Nurse/midwife	15	Public	Rural
HHW07	Doctor	5	Mission	Rural
HHW08	Nurse/midwife	7	Private	Urban
HHW09	Nurse/midwife	14	Private	Rural
HHW10	Doctor	9	Mission	Rural
CHW01	Nurse/midwife	16	PHC	Rural
CHW02	Nurse	5	PHC	Rural
CHW03	CHEW	8	PHC	Rural
CHW04	Health Assistant	4	PHC	Rural
CHW05	CHEW	3	PHC	Rural
CHW06	Nurse	12	PHC	Rural
CHW07	Food science officer	7	PHC	Urban
CHW08	Nurse	6	PHC	Rural
HHW: Hospital health worker; CHW: Community health worker; PHC- Primary Health Centre				

5.3.2 Summary of the findings

Using the socioecological model (SEM), the data were organised into three SEM levels and seven themes ([Fig 5.1](#) and [Table 5.4](#)). The levels are the woman, socio-economic and cultural factors, and health system factors. The themes are: knowledge/information, trust, resources, sociocultural and family influences, power/support, perceived quality of care, and access to health services. The codes generated during the analysis were further grouped into four key topics in the pregnancy continuum at each level: health in pregnancy, choice of care, use of antenatal care (ANC) services and childbirth services. The views of women and health workers are presented

concurrently for these four critical time points. The findings are divided into the participant's accounts of factors leading to stillbirths and their insights into possible solutions.

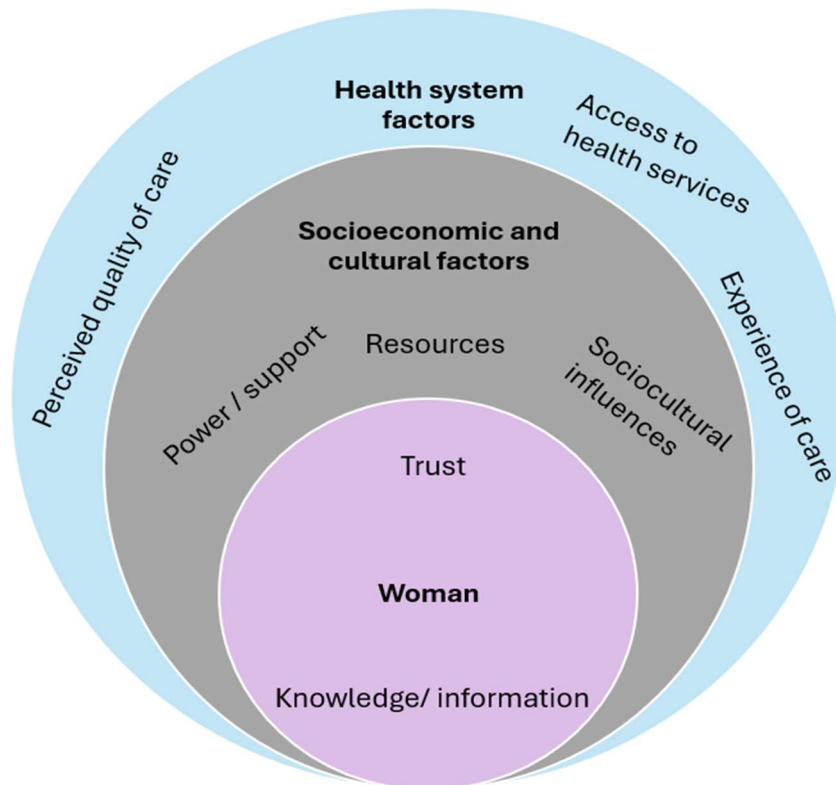


Figure 5.1: socioecological model of community-based factors influencing stillbirths

5.3.3 Participants' accounts of community-based factors influencing stillbirths

This section describes the participant's account of important community-based factors influencing stillbirths and they are summarised in [Table 5.4](#).

Table 5.4 Participants' accounts of factors leading to stillbirths (see definition of colour coding in the footnote legend)

		<u>Pregnancy continuum</u>			
Level	Theme	Health in pregnancy	Choice of care	Use of antenatal services	Childbirth services
Woman	Knowledge	Low level of health awareness Use of alcohol Primiparas don't know much Ignorance of pregnancy danger signs	Low level of health awareness Lack of familiarity with health worker	Low level of health awareness Unclear about the purpose of ANC Competing priorities	Fear of C-section
		Inadequate use of prenatal vitamins Self-medication	Experience of a previous stillbirth	Ignorance of danger signs	Ignorance of gravity of complications Understanding of safe childbirth
		Inaccurate sources of health information	Perceived skills of health workers Reputation of the health facility		Hospitals push for C-sections for gains. Perceived readiness to deal with emergencies
	Trust	No remote access to health workers for clarifications	experienced or stories of negligence in the facility Government facilities have more skilled staff versus private		
Socio-economic and	Resources	Poverty Malnutrition	Poverty Multiple registrations	Poverty	No means of emergency transport Poverty
		Self-medication	Many screening tests are required for registration		

		<u>Pregnancy continuum</u>			
Level	Theme	Health in pregnancy	Choice of care	Use of antenatal services	Childbirth services
cultural factors	Sociocultural and family influences	Unsolicited advice for pregnant women Use of herbal concoctions	Unsolicited advice Active choice for TBA	Late start of ANC	Women pressured into using TBAs Holds opinion of religious leader higher than health worker Some women do not use medical facilities for first childbirth Delayed arrival in labour Delayed information about CS to avoid patient absconding. Delay in decision-making
		TBAs attempting to turn the baby.	Reputation of the health facility	No decision-making power	Accepting CS as denial of faith Social stigma for CS
				Health workers believe cultural norms.	
	Power/support	Inadequate spousal support Inadequate family support	No decision-making power	Processes health diagnosis with friends and family	No decision-making power Rich family member decides
		Has to do tedious chores	Rich family member decides	Inadequate spousal or family support	Fatalism

		<u>Pregnancy continuum</u>			
Level	Theme	Health in pregnancy	Choice of care	Use of antenatal services	Childbirth services
Health system factors	Perceived quality of care		Fragmented care in public secondary and tertiary hospital Trainee health workers are seen as incompetent. Consultants attend to you in private hospitals Prioritises preferred facility over closer facility Stories of poor outcomes of care PHCs pay more attention to Primiparas Government hospitals have more skilled workers.	Lived or stories of bad experiences of care Failure to take women’s complaints seriously. Miscommunication between women and health workers Failure of health workers to explain the condition clearly to women. Perceived superficial care during ANC appointment	Failure to refer Failure to identify danger signs by health workers Reluctance to refer for personal gain
				Preference for certain health worker	The negative effect of stillbirth stories in the hospital
					Lived or stories of bad experience of care
	Access to health services	No or inadequate health talk during antenatal visits	Distance to the health facility Lack of qualified staff at PHCs	Bad road/distance Insecurity	Strength of referral linkage Multiple referrals
			Inadequate training for PHC staff	Unavailability of required equipment	No doctor to give required emergency service at night Unavailability of required equipment
Legend – views from health workers and women; – views from health workers - views from women					

5.3.3.1 Woman's health in pregnancy

Some risk factors for stillbirth are related to the health and self-care of the mother. This section describes the multiple influences on women's health at different levels of the socioecological model.

The woman

Knowledge

Most health workers believed that a woman's level of awareness affects her actions and lifestyle, which could either promote health or adversely affect her health during pregnancy. They reported that when a woman is "ignorant" about health issues, she may not see her own role in the prevention of poor health outcomes and, as such, may engage in harmful behaviours such as alcohol consumption.

"Some mothers ignorantly have a lot of practices that might predispose them to all these things. Like in this vicinity, you see pregnant mothers consuming alcohol at a very high rate without knowing. (...) They don't know that with good care, some of these things [stillbirths] could be prevented." (HHW06)

Some health workers specifically reached out to first-time mothers to ascertain what they knew and correct wrong impressions and information that they may have.

"Most of these women, they have little or no idea, especially those that just got pregnant, maybe it's their first time, the primip. (...) I try to find out what they know about a particular health issue, what they have presumed or what the information they actually got from outside the hospital. So, from what they know, you can counsel them on what it actually is." (HHW08)

The women and health workers acknowledged the benefits of taking prenatal vitamins, which are routinely prescribed to improve the health of the mother and the growing fetus. Interviewees reported various reasons why women might not take the vitamins: disliking the smell, general aversion to medications, and forgetfulness.

"You give them the medications and they throw them away thinking that maybe they are outsmarting the doctor. But they don't know they are only short-changing themselves." (SB03)

"I didn't even take any single drug. (...) I didn't take any sort of medication for the pregnancy duration." (NM07)

Health workers and some women also highlighted the widespread lack of awareness of the dangers associated with self-medication, emphasising that pregnant women who engage in this common practice often do not understand the increased risk of stillbirths.

"We tell them to ensure that they don't take over-the-counter medication during pregnancy. For instance, I've seen a woman who lost the baby because she went to the chemist, and they were giving her laxis (furosemide) over a very long period of time. So, by the time she delivered that baby, there was no single water remaining." (HHW06)

Trust: sources of trusted information

Trust was an important factor for health information because it empowered women to believe in and act upon the information they received. When asked about how they address health concerns or learn about what to expect during pregnancy, many women mentioned that they rely on their mothers or other experienced relatives and friends for information.

"There is this other woman living in our compound; she's a nurse. She's the one I ask about everything. My mother, too, was there for me to ask; she would always use her airtime to call me and advice me. Telling me things that would be happening and how to go about the pregnancy." (NM09)

Having access to health information from trusted family and friends can be advantageous yet also problematic, as it provides support but also exposes women to potential misinformation. Many health workers believe that women might make risky choices because they trust misleading information from family or friends over information from health workers.

"That family influence, it is heavy and very strong because nobody will believe that the immediate family, the mother or the father or the siblings will set out to harm her. But they don't trust you, the doctor; matter of fact, they question your knowledge." (HHW10)

Some women acknowledged that relying on people they know and trust for health information may expose them to misinformation and harm.

"Maybe when they are asking someone else who does not know or does not have the right information. It will be like the blind leading the blind." (NM01)

Some women, in their quest for pregnancy information, turned to books, google searches, and social media groups like Facebook and WhatsApp focused on maternal health, which can sometimes be sources of misinformation and eventual harm. Health workers and the women highlighted the risks associated with relying on such information.

“One thing about me is this, thanks to Google, I don’t just take what someone tells me. When someone tells me something I try to research.” (SB01)

There was a case [of misinformation] that happened that she [pregnant woman] told them, her baby is not too fine on Facebook, and she was advised to go and grind uda [negro pepper] and uziza seed [West African black pepper] and pour it inside schnapps [alcoholic drink] and drink, that the baby will be bouncing.” (CHW07)

“No, I use to read it on books, social media. You know when you are in a group, you see people talking about their experience. So, I believe that when you look at this person’s experience and this person, you are compared to what is happening to you will see that it’s almost the same thing.”(SB02)

Most women recognised the importance of reliable health advice and reported that they trusted their health workers to have accurate information. However, when they were not physically in the hospital and required urgent answers to a health question, the inability to access the health worker via telephone or other means could be a barrier. Some women reported sharing their health concerns directly with health workers over the phone, while some hospitals set up WhatsApp groups for pregnant women, where they could receive clarifications for questions about their health while within their communities.

“Nurse C. was helping me, some things I don’t know or confused about, I call her, and she directs me.” (NM10)

“If I call this man [doctor] as early as 2am he will answer.” (NM06)

“I can only speak for [redacted] mission hospital because that’s where I have experience. They have a WhatsApp platform (...) where women ask questions at any time, and they get answers from health workers.”(NM06)

Socioeconomic and cultural factors.

Resources

The economic resources available to a woman influence her health during pregnancy. Both women and health workers reported that most women generally know about the expected diet modification and the importance of antenatal vitamins and rest during pregnancy, but some women may not have the resources to follow this advice. According to the health workers, this group of women have the right information and desire to take the antenatal vitamins but do not have the resources to do so.

“One of the causes is malnutrition. You know, and most of our food here, especially the staple food is mostly carbohydrates. All those micronutrients are lacking in most of our food here. Then if you now tell the women to be to be buying fruits every day, that a pregnant woman should be on daily fruits, natural fruits, they'd ask you, will you provide money?” (HHW07)

Due to the low health insurance coverage and the need to pay out of pocket for health services each time a woman has to consult with a health worker, some women sometimes resort to self-medication, buying drugs recommended by friends or patent medicine vendors. These medicine vendors are individuals or businesses, often without formal pharmacy or any medical degree, who sell medications.

“Women should stop taking medications that have not been prescribed by a doctor because the maternities [traditional birth attendants] can give you a medication that shouldn't be taken by a pregnant woman, and when you take it, you will have problems.” (NM02)

Sociocultural and family influences

Most participants reported that there is a sense of collective responsibility towards pregnant women in their communities, and as such, women constantly receive unsolicited advice from neighbours and friends. Irrespective of trust, women could feel pressured to act on this advice.

“When it's your first baby everybody will want to tell you what to do and what not to do. At this rate, it's very hard because the advice will keep coming even if you try to shun them, people will always keep telling you. These advice will come (...) you can't run away from it.” (NM06)

Reliance on traditional medicine and practitioners was also reported as potentially harmful for women and their babies. In some communities, it is considered normal to take 'herbal concoctions' to prevent umbilical cord coiling or reduce the weight of the babies, but some health workers reported that these could cause fatal complications for the baby. Likewise, traditional birth attendants are believed by some communities to have exceptional skills, but health workers reported that their antepartum interventions, such as an attempt at turning a breech baby, could inadvertently lead to stillbirth.

"Almost all of them visit the traditional birth attendant or the herbalist. Some may tell you they are going to take medicine that will untie the cord, some medicine that will make the baby to turn. This is somebody who has breech in late trimester. The person will be going to a native doctor or traditional birth attendant to turn the baby. And in the process of trying to turn the baby, they cause either APH [antepartum haemorrhage] or getting the cord to tangle." (HHW04)

Power/support

A woman's health may also be influenced by the perceived support she receives within her social network. All the women reported that they had adequate spousal and family support during pregnancy, but health workers believe that many women do not get the support they need. Some health workers also expressed particular concerns for young girls who become pregnant in an unstable relationship.

"They get pregnant, and the partner, or the friend whosoever abandons them, and they are left to carry the pregnancy. They carry the burden of the pregnancy all alone by themselves with little or no help or assistance from anybody." (HHW02)

The communal family structure and power dynamics within a woman's home may affect her health. In a setting where a woman is expected to do hard chores while pregnant, she may have little agency to make health decisions, and it may be difficult for the woman to advocate for herself.

"In the morning, they [woman and her husband] will eat garri [granulated cassava]. After garri [granulated cassava], they will go to the farm. When they come back, even without taking a bath, they will ask the woman to go and cook. With that stress in pregnancy, no good meal, financial problems in the family... it can lead to that [stillbirth]." (CHW01)

“But when the family, if all they know is to pass comments like ‘She should go and cut up firewood, is she pregnant with Jesus? When I was pregnant, I was climbing things, I was climbing heights, so she should do chores.” (HHW09)

Health system factors

Access to health services

All participants acknowledged the critical role of antenatal education in enabling pregnant women to make good health choices. Most women said they and the women they knew learned most of what they know about pregnancy and childbirth from facility-based group antenatal health education sessions. However, some hospitals did not offer any antenatal sessions. There were also barriers to accessing the sessions if they were not held on the same day as the antenatal clinic or were perceived to take too long, as some women had to minimise their time away from work or their place of business.

“So, you cannot expect me to come on Tuesday and still come because of health talk and I’ll still come on Friday. No, you’re supposed to have it every day when they are there. (SB02)

I went for antenatal full-time. But it’s just that I used to go late because they don’t usually start early. If you go early, you will stay till almost 11 AM before they will now start. So, I used to go around 11, 12. (...) it’s only two times that I stayed for health talk because I used to come late.” (NM10)

5.3.3.2 Choice of care

This section describes participants’ accounts of factors that influence where, how, when and from whom a woman chooses to receive maternity care.

The woman

Knowledge and trust

Women’s choices of facility were influenced by what they knew or had heard about facilities from trusted family members and friends. This included the availability of equipment, staff attitudes and perceived staff competence, assessed by first-hand knowledge or from reputation in the communities.

Generally, women thought of pregnancy as a critical period of their lives requiring the best possible care. Some women saw pregnancy as a journey which could either end in life or death.

“They [health workers] really need to be careful with the women because the journey of pregnancy is a journey that could end with either life or death. It is not an easy journey.”(SB10)

Most health workers reported that some women choose facilities based on their perception of the quality of services provided, while women themselves said they prioritised having a sense of safety.

“I think that primarily women consider the presence of good hospital equipment. Because that gives a sense of assurance that you and your unborn baby are protected. And an assurance that you will see your baby in peace without any problems.” (SB06)

Previous experience of pregnancy losses appeared to be a motivation for some women to prioritise the availability of experts in the facility they choose for their next childbirths.

“Because when you get to a hospital, and the doctor is checking with his stethoscope, he would notice and tell you that the baby is no longer alive. So it was after the delivery that she [TBA] was now telling me that the baby died in the womb. So, it was a mistake; I went to the maternity [traditional birth attendant].” (NM07)

Some women also decided to use a facility based on their familiarity with the health workers. They could either go back because of previous good service or rely on a personal connection to a member of staff who they feel will advocate for them in the facility to ensure a good outcome.

“Almost all their nurses are very close to me. So, when I go there, they give me attention the way I like. You know, when you are dealing with someone you know, someone that is close to you, you get some kind of privilege.” (NM06)

“Because my husband kept disturbing me saying that his brother’s wife works there that at least they will take very good care of me. These are all the reasons why I went.” (SB03)

Concerns about birth outcomes made women closely evaluate the services they could potentially receive in a facility of choice. In addition to the availability of equipment, women assessed and formed impressions about health workers' skills, experience and friendliness during their antenatal interactions. These impressions influenced their decision to continue receiving care or seek other facilities.

"My mind is not usually settled with private hospitals because they don't have experienced Doctors and Nurses; that's why I ran away from there." (NM10)

"So, in case you have any question, if you ask, they will answer you quietly without using harsh voice on you. So that is why I prefer them. Some nurses, ah!! some of them are terrible." (NM04)

"The reason some of our pregnant mothers leave the health centre that is near to them to another place is that some of the health workers are very, very aggressive to our pregnant mothers, and it's not good. When you are aggressive to them or the way you talk to them will even make them leave the facility." (CHW08)

The perceived quality of care provided also influenced women's decision to use health services. In some cases, women choose to travel long distances to access their first-choice hospitals because they perceived that health workers in their chosen facilities were better skilled or experienced, and they prioritised their trusted facilities over the closer ones.

"I usually come there all the way from [city in neighbouring state]. So, when it's time for my antenatal, I normally come down to the village for it. And from the village, I will now go for the antenatal." (NM09)

On the other hand, health workers reported that some women's decision to continue using a health facility may be swayed in the event of recent poor outcomes like maternal or newborn death.

"But they will say, 'Ah! That hospital, Margaret went there to deliver, she did not come back with her baby o; let's go to another facility,' something like that. So that's another thing, it will affect them unless it's something that they see the evidence or effort." (HHW09)

Socioeconomic and cultural factors

Resources

Women also consider the cost of care before choosing a facility. They may be able to identify facilities with higher quality care that would be safer for their babies but be unable to afford to use them.

"Most people may not be able to access care where they tell you that they do not have money to go to rich people's cadre of facility to deliver." (HHW06)

Health workers noted that the fear of having a stillbirth may lead many women to adopt a cautious approach during the antenatal period. They reported that women may register antenatally at multiple facilities, to provide them with options if they develop intrapartum complications. If due to financial or other considerations, a woman starts her labour with a traditional birth attendant or a low-cost facility, she can transfer in case of complication to another hospital where she is registered, thereby avoiding the higher fees associated with presenting as an unregistered patient. However, if the initial facility fails to recognise the complications early to facilitate a swift referral, this supposed benefit may instead create a danger.

“So, the lady told me that, see, it is not only this our hospital that she registered that if she sees that we do charge [a lot of money] here, that she will go and register another place, that she will give birth in another place that she registered in three different maternities. That, if she tries there and it does not work, she will come here, and then she will not need to buy an emergency card.” (HHW03)

“We had CS yesterday; the woman was at a maternity in labour. She was bleeding, and they did not send her to us early. After they referred her, we checked, and the fetal heart was not there.” (HHW03)

Health workers reported that a woman’s ability to access her first-choice facility may be impacted by the quantity of mandatory antenatal screening tests the hospital enforces before a woman is considered registered and can access maternal health services. Some women who are unable to afford the tests may opt for antenatal services with a traditional birth attendant or have no antenatal care at all until they have enough money for the tests.

“There are so many tests that are being asked for them to carry out during some certain times. Some will tell you, ‘When I’m close to my due date, I will go.’ And by then, some other health issues might have happened or are about to take place that will be too late to be prevented.” (CHW07)

“So, some prefer going to traditional birth attendants, which is not good, because they feel that when they go to government facilities, there are some investigations that they are supposed to do, which the TBAs will not even care about, like HIV test, they will not care, they are not interested.” (CHW08)

Sociocultural and family influences

As reported above, women received unsolicited advice within their communities regarding their care, ultimately influencing their choice of care and outcomes. A hospital's reputation within the family or community could also strengthen or weaken a woman's trust and confidence in using the facility.

"Someone came to my shop to tell me her experience of almost losing her baby, even my younger sister too. She went to [redacted] hospital to give birth; she almost lost her son. They were calling the nurse to come that the baby was already coming, and the nurse was telling her that if the baby was coming out, she wouldn't even have the sanity to be talking about it. Why will anyone want to go there?" (NM06)

However, some health workers reported that many women patronised traditional birth attendants based on their local word-of-mouth reputation for successful births.

"So, the myth there is like they tell you, oh my mother, my grandmother, my grandfather or rather my grandmother and my great-grandmother was delivered in the house, and it was this woman, this particular old nurse that was taking all the deliveries and nothing ever happened." (HHW10)

"The community people just say this lady was a traditional midwife back in the day and was an expert in childbirth. They have handled all sorts of births no matter how complicated." (SB01)

Power/support

In families where the decisions about a woman's health are not considered to be an individual matter for her, women are obliged to listen and, in many cases, adhere to the suggestions of the mothers or mothers-in-law when choosing a facility.

"Culturally, a woman is supposed to be subjected to the husband, the husband's people like the mother-in-law, like their own direct mothers." (HHW06)

"She wanted to register in a hospital, but her mother-in-law emphatically told her that she should register in a maternity [traditional birth attendant] as her son [the husband] does not have that kind of money to register her in a hospital." (NM02)

The choice of hospital for antenatal care may also be influenced by the preferences of the woman's wealthy relatives, who have to shoulder the cost of her care if the husband cannot.

“When the mother-in-law and the relatives of the husband are in charge and the husband doesn’t have that cash. Then she would be nodding, whatever they say is ‘yes’.” (CHW01)

Health system factors

Perceived quality of care

How care is organised in some hospitals influences women’s choice of health facilities. Though women generally acknowledged the greater pool of skilled health workers in government secondary and tertiary facilities, some felt a sense of discontinuity in their care when they met different doctors at subsequent antenatal visits. This discontinuity in care left some women dissatisfied.

“Sometimes the problem there is that the person you meet today is not the same person you meet the next time. So, and they will keep giving you almost the same routine, you know, tell you to be doing that routine, which is very tiring.” (SB02)

Some women disliked being attended to by trainee doctors and nurses, especially when the consultants did not review their cases personally.

“There are sometimes you will go they will just send all these juniors to take care of us. Their staff and nurses cannot even take care of you, they will just send all these junior nurses. What can junior nurses do for you? Is a junior nurse a doctor? They cannot even take care of you. I don’t even like that, seriously.” (SB08)

A few women felt that primary health centres provide better care for first-time mothers as they give them more personalised attention compared with what is feasible in bigger hospitals.

“Anybody who is pregnant, especially those who are with the first pregnancy, it is necessary for the person to be going and to be going to the primary health centre. It’s not just to be going to big hospitals. (...) You go and meet a midwife or someone who is very experienced, that person will give you more attention than the big hospital.”(SB09)

Also, most women believed that government hospitals tend to have more skilled staff in comparison with private or mission hospitals; hence, those prioritising health worker expertise may choose government facilities on this basis.

“My mind is not usually settled with Private hospitals because they don’t have experienced Doctors and Nurses, that’s why I ran away from there. My sister used to give birth in a private hospital so what they do I don’t really like. I like health centre, all these government ones, those people that have experience, that’s my own choice.” (NM10)

However, some women reported that the experience of care was worse in government hospitals compared with private or mission hospitals.

“Bad health worker attitude is usually in the government hospitals; I had a bit of the experience during my pregnancy. For the private hospital, they really look after you properly, but you see those governments hospitals? That's where the bad experience really happens. In the private hospitals, they are looking for customers, so they really attend to people when they arrive. If the problem the person has come with is very complex and they cannot handle it, they refer you to a different facility, which is much better compared with just abandoning the person [like in government hospitals]. You don't even know if the person is dying or not.” (NM08)

Access to health services

The distance to a facility was an important factor that influenced women's decisions. Many women chose to access care at the closest hospital to their homes, which they perceived to have a good quality of care.

“That [hospital] was where I was attending my antenatal because it was close to where I was living then.” (SB01)

A few health workers reported that some women also choose farther facilities to prevent their friends and neighbours from knowing when they visit hospitals to avoid speculations about their pregnancy.

“Some will say, ‘No, this one that's close to the house, people will see me there. Let me go to where people might not know that I may give birth soon’.” (CHW07)

5.3.3.3 Use of antenatal care services

All participants recognised the importance of regular antenatal check-ups in preventing stillbirths.

This section reports the factors influencing the commencement, consistency and use of all antenatal care services.

The woman

Knowledge

Health workers reported that a woman's level of health awareness will influence how she uses antenatal care (ANC) services.

"I say it is ignorance because they don't know when to book or come. Sometimes they will say 'I'm okay. What am I going to the antenatal clinic for?'" (CHW01)

Similarly, some women reported that they have observed that women who are having their second or higher-order babies may consider ANC visits a "waste of time" (SB02) or a "waste of money" (NM01) as some believe that they "know" (SB02) how to take care of themselves and "just goes to a chemist and buys the routine drugs" (NM01) instead of going in for ANC appointments especially if the woman "feels well". It was evident that some women were unclear about the purpose of antenatal visits.

"Some of them feel that since they are not sick, should they go for antenatal? In fact, a lot of them come for antenatal when they don't feel fine. They feel that's the best time for them to come since they are not feeling fine." (CHW07)

"When you've had your first and second baby, within you, you start telling yourself that you are already a mini doctor, what is there that I don't know about?" (NM06)

In some cases, this mindset may come from a lack of knowledge about the purpose of regular antenatal appointments, including early identification of problems, even in an apparently uncomplicated pregnancy.

"The only thing that you go to hospital and the doctors will tell you, 'Are you taking your drugs? Madam, what can we do for you? What is it? Are you feeling anything? Are you feeling any pain?' So, when they see that you don't feel anything and you know the drugs you're supposed to take. So, some feel that going to that hospital is just wasting of time." (SB02)

Sometimes women had competing priorities that may lead them to miss scheduled appointments. For some women working in paid employment, as part of their benefits, they are allowed to visit the antenatal clinics on the days of their appointment. Some self-employed women who do not understand how an antenatal appointment visit can protect their health weigh the benefits of shutting their business to go in for their antenatal care appointment against the imperative to earn money for their family.

"What is it that they [health workers] want to tell me that will make me leave my shop or business or work to come and hear, so this is just the truth and the general reason why most women no longer go for antenatal after a number of pregnancies." (NM06)

During antenatal health education, most hospitals cover a range of topics, including teaching women to recognise and respond to danger signs. If a woman is unable to recognise these danger signs while in the community, she may not realise the need to seek help or report the signs she has noticed.

"I used to be wet, I would stay a little and get wet (...) Imagine that I went to [the market town in neighbouring state] to get my goods, then when I returned, I came back very late, I was seeing the water o. (...) but I insisted that I would go because when I put to bed, going to the market would become a problem for me." (NM10)

Socioeconomic and cultural factors

Resources

Participants reported that some women are aware of the importance of early and consistent health check-ups, but poverty can be an obstacle to attending. A woman has to pay for consultations, tests, treatments and medications prescribed at each visit and will have to consider the cost of transportation if her chosen facility is not within walking distance from her home.

"You know they have to pay. You know, once you go for antenatal, like for [redacted] hospital you have to pay 1,000 naira [over half of a day's wage]. That 1000 naira every visit is for consultation and for urinalysis, that one thousand naira. Then, if you go to [redacted], which is a private hospital, you pay almost 5000 naira every visit. 2,000 for consult, 3,000 for urinalysis. Which is because it is a private hospital. Then you could imagine a woman whose husband is not that financially capable of giving her 5,000 naira for every visit or someone who works that is on a salary. You could imagine someone bringing out 5,000 [nearly three days' wages] every visit." (SB01)

Some health workers also reported that in some cases, women and their relatives save up to be able to afford a consultation when a woman notices any danger signs at home but then cannot afford the medications or other treatment that arise from the visit. In such cases, the woman may go home and take herbal remedies, which may have detrimental effects on the woman and/or her baby.

"You know, for most women, things are hard now, they may come with really high fever, and after they have seen a doctor and gotten a prescription, many of them still say they have no money to buy the medications." (HHW01)

"We have written medications for you, but you can't buy it, and because of that, you resort to herbal concoctions. Then some of them will leave you and still buy the herbal concoctions. Even though they still have to pay for it, but I suspect it's cheap." (HHW06)

In agreement with this, a few women recounted stories from their encounters with friends who believed that *“only rich women go to antenatal consistently, because after antenatal, they recommend the same medications for you; hence it is only those that have excess money that go for antenatal constantly.”* (NM01)

Sociocultural and family influences

Both women and health workers reported that in some rural communities, women are advised by community members not to register for ANC until they get to four months or more, believing that shorter contact with the hospital is best for the pregnant woman.

“Another problem we see here is that people believe that for a woman, once you get pregnant. She's supposed to start ANC when she gets to 4 or 5 months. They don't believe in early attendance.” (HHW07)

Where another family member is the controlling decision maker, they may enforce this traditional practice against a mother's will and prevent her from accessing any antenatal check-ups in the first half of pregnancy.

“Then she [pregnant woman] will be dying in silence o, because she is under the control of the mother-in-law or the relatives of the husband. So they won't allow her to go to the hospital. They will say it's too early. They will wait until six months or seven months, so that small time, you will just deliver. In the process, no routine drug o, no good diet o, no exercise o, nothing! No health education, so all those things affect them.” (CHW01)

Some health workers reported that stillbirths and other serious complications can occur when skilled health workers subconsciously believe some cultural norms. This may make them slow to highlight danger signs, or they may even suggest traditional remedies, putting the lives of both mother and child at risk. Some sicknesses or conditions (e.g. eclamptic fits) are considered spiritual in some communities and should only receive spiritual interventions.

“They will always tell you that it [the sickness] is more spiritual, that even though I am a health worker, but that does not mean that I have thrown away my traditional practices. Somebody can be wearing white as a staff nurse, but in that person's personal life, the person outside the institution's standards goes on and applies some of those, substandard practices.” (HHW02)

Power/support

Health workers said that some women rely on the stories and experiences of trusted friends and family members to shape their engagement with ANC services. When a woman is given a diagnosis or discovers an uncertain symptom during pregnancy, they process this information with their family and friends. The disposition of these family members and how quickly they act influences the health outcomes for the women.

“Women may not take decisions for their own health except those influential people in their life comes in to discuss the situation and really push them to please get up, let us go to the hospital.” (HHW06)

“Once somebody is sick, you see, when somebody has an acute attack of anything, to your greatest surprise, the family will take the person to church first for prayers before they come to the hospital. So, the person might die there at church or die on their way to the hospital. So that time wasted means a lot.” (HHW07)

Some women also indicated they were more motivated to keep their scheduled appointments if their husbands were equally participating in their care, especially during the first pregnancy.

“As soon as my husband heard it, he quickly took me to the hospital because he is the kind of person who really tries to avoid problems whenever I'm pregnant. So, whatever I complain about, he brings me to the hospital, and he says that whatever the doctor suggests we should do, we should do it just so that there will be peace and so that everyone will be alive.” (NM02)

Health system

Perceived quality of care

Women's decisions about attending ANC could also be influenced by their own experiences of care, especially in their interaction with health workers. In one woman's account, following a negative encounter with a health worker in a primary health centre, she opted to continue the health check-ups with a traditional birth attendant, who she considered more friendly and patient in answering her questions.

“There was the time I was really very sick in my early pregnancy. So, I went to the health centre to look for the nurses, my sister and I were waiting for the nurses to come attend to us. Meanwhile, they were at the backyard watching a movie on their phone and we were seriously waiting for them. (...) So, it was really that sort of character that made me change from using the primary health centre to the maternity [traditional birth attendant] I use for my antenatal.” (NM08)

One woman reported witnessing discrimination by some health workers. She reported that due to the volume of patients at the facility, some women “tip” or “bribe” nurses who attend to them quicker than other women.

“You know, some hospitals, since I started going to this hospital, usually if you go there then, there is this nurse, you know nurses, they will come and be attending to you and telling you about yourself, you will have to be giving something to them. You could come and probably give them 1,000 or 500 and ask them to take this, you understand. The person might then give more attention to you.” (SB09)

A few health workers reported that some women may be inconsistent in attending antenatal appointments if their preferred nurse is not on duty and they choose to miss the appointment.

“For some women, they prefer a particular nurse to attend to them. If the nurse is not there, they will not show up. Some of them, the attitude of our nurses too, the way they approach to them makes them not to keep up the appointments.” (CHW06)

There could be miscommunication between health workers and women during hospital consultations. Some women complained that health workers sometimes failed to take their concerns seriously or did not give them sufficient information to enable them to take the right actions.

“At times, there are some people that when they go to the hospital, the way the doctor will see it, some doctors will see the women and make light of their complaint, but in reality, something is actually going seriously wrong inside.” (SB01)

“But what I didn’t understand about the hospital was that when I got there, I would tell them what the problem was and how my body felt, they write me a prescription. I would then open my mouth and ask the doctor what the issue is; the doctor cannot tell me anything; he will say I should go and meet the pharmacy.” (SB09)

One health worker described how a pregnant woman who had previously given birth to a stillborn baby had confided during a counselling session that she did not understand the advice given by the healthcare worker. This prompted the healthcare worker to reflect on her communication and how well her patients understand her counsel.

“I told her mother, ‘Say the truth, haven’t we been monitoring this [your baby’s] presentation? Didn’t I tell you that look at these are the things we are looking out for? That if this doesn’t happen, that this is where we are going.’ She responded that I did not explain it very well. I said, ‘How else do I explain it?’”(HHW02)

As reported above, some women may choose to skip their antenatal appointments if their previous visits felt superficial or lacked antenatal health teaching.

Access to health services

The distance to health facilities, poor roads, and the growing political insecurity in Imo State influenced how some women accessed ANC. Some women reported dreading the thought of needing emergency services at night. A few women reported having to wait long hours through the night or on days declared as a no-movement day by the secessionist group IPOB (Indigenous People of Biafra) when they had urgent health concerns during pregnancy.

“I’m scared, and you know that Okigwe is not safe. I was begging God that please, I don’t want to have any problem or to give birth to my baby at night. Due to the situation of things and insecurity in that side.” (NM10)

“Then I told my husband to take me to that maternity. But my husband said no as it was not yet daylight and the area was very dangerous.” (SB04)

Women also expressed concerns that, although they had diligently attended antenatal appointments, their baby's health could be put at risk because the facility's essential equipment, services and doctors were not available when needed.

“You could imagine in a situation like that when she checked, the nurse finished checking me, what she told me was that I would wait till tomorrow morning to go for a scan. You could imagine something that happened around 12 midnight. Then from 12 till 6 am, and this was on a Saturday, before I even got somewhere to scan, it was 10 in the morning. So how many hours? Do you think that if the baby was under threat that, it would be able to survive?”(SB01)

5.3.3.4 Use of childbirth services

This section describes the factors that influence a woman's actions and decisions in the hours and days leading to her childbirth and in particular, highlights the complex influences surrounding decisions about assisted childbirth and caesarean section (C-section).

The woman

Knowledge

Some women had a fear of caesarean section, in particular, if they believed (incorrectly) that having a C-section would automatically mean that all subsequent births must be by C-section. When a caesarean section was recommended, health workers reported that some women may “run away” (HHW07) from the facility, choosing to attempt vaginal childbirth with renowned TBAs who have promised to help them achieve a vaginal birth.

“They will hurriedly only offer CS and put fear into you, and it is now CS forever. That means all of your childbirth and delivery will now be CS. So, because of that, don't you ever come near a hospital.” (HHW02)

Health workers reported that when a woman is unable to recognise a pregnancy danger sign or does not understand the gravity of a symptom that they might have developed at term, they may delay seeking care, endangering herself and the fetus.

“So, she came here, her BP was 160/100, I said go home, pick your bag, go to hospital or you rest. She said no, she was carrying her ready-made clothes, she would sell at [town market], despite all I said, she left for the market, and she eventually lost that baby.” (CHW01)

Similarly, in one woman's account, despite noticing her ruptured membranes, she reported travelling across states for business.

“I even carried it [ruptured membranes] that way and went to [neighbouring state]. I went to [neighbouring state] to get my goods.” (NM10)

Participants described how in some hospitals and communities, spontaneous vaginal childbirth is called “safe delivery”, which may imply that other routes of childbirth are “unsafe”. Some health workers opined that this orientation may influence how quickly a woman consents to childbirth interventions.

“They are not considering safe delivery as healthy mother, healthy baby, irrespective of the fact whether it is vagina or CS. For them the definition of safe delivery is a woman that delivered vaginally, but once you deliver via CS, it is no longer a safe delivery.” (HHW02)

Trust

Some health workers reported that when a woman believes that the hospital is pushing for a C-section for monetary gain, they might be reluctant to accept it.

“You know another that thing, they think that many doctors are sectioning people because of money. Before you say anything, they have started shouting.” (HCW04)

“There is this percentage of the populace that says especially for the private hospital, they want to make big money. That is why anybody that comes here, they say section, section.” (HCW02)

As reported above, a woman’s confidence in coming into a hospital for childbirth, especially if she has made multiple registrations or initially tried labour at home or with a TBA, depends on her perception of the available skills and equipment in the facility, based on her assessment in previous visits.

Socioeconomic factors

Resources

Women reported that access to emergency transportation is crucial, as women without it may struggle to reach the hospital if they go into labour or notice an urgent symptom, especially at night.

“My sister said, ‘no, this is not what we will do, we will not stay back because the area is unsafe, and I am in labour.’ That we would not feel bad, that we should leave since we had a car. So, my sister drove to [redacted] public hospital.” (NM10)

When a woman is transferred to another hospital on account of pregnancy complications at term, her financial resources, including her ability to pay out of pocket for urgent investigations and treatment, is another factor that influences outcomes. Some women may opt for cheaper hospitals or in resigning to fate, may choose to get discharged when they have exhausted their resources. In one nurse’s account, it took her intervention and standing surety at a hospital to save the life of her patient.

“I checked the BP; it was 240/150; I said, ‘Let’s rush to [redacted] mission hospital.’ I did not know that she left for [redacted] private hospital in [neighbouring town] to go home after two days. They said she feels better instead of staying there and accumulating bills. I later found her, and I took her straight to [redacted] mission hospital. Dr P. was there; I said, ‘Dr P, don’t waste time; put this woman in bed; I have checked the blood pressure. It’s around 245/150 or so.’ They did all the necessary tests, and the baby was already dead,

stillbirth. She spent about one month there, and her bill was 350,000 Naira [approximately the average annual salary in Nigeria]. One of the fathers in law, they sold land, another person came and paid for them.” (CHW01)

Sociocultural and family influences

Health workers reported that at the time of birth, women are sometimes pressured into using facilities preferred by their mothers or mothers-in-law against their own wishes.

“The last stillbirth we had, the woman her mother took her to a native doctor, where the woman stayed for 2 days. (...) She is registered in the facility and has been coming for antenatal.” (HHW01)

In some cases, a woman’s religious belief might be an obstacle to emergency intervention. Some women when confronted with the gravity of their medical emergency, may seek the counsel of their religious leaders before accepting suggested interventions. Health workers and women reported that some Christian denominations teach women that Christians ought to deliver like “Hebrew women” (SB07) without medical interventions, and as such, C-section is “not their portion” (HHW08). Health workers reported that it is much more difficult to get consent for interventions when a woman has a faith-based objection.

“She was counselled on CS, but she said ‘it wasn’t her portion’ and had to go to a maternity home. When they had tried labour for like two days in the maternity, she had to come back to the hospital; unfortunately, before anything could be done, the baby was gone already.” (HHW08)

However, a community health worker described her personal experience of standing her ground and refusing the counsel of her pastor.

“I was at [redacted] hospital, I was booked for CS. I called my pastor and said, ‘Please, I just need you to pray for me; this is what is happening.’ He said I should leave there immediately; I told him that I’m not going to leave because that’s the only way I can give birth. I’m due and the consultant said it has to be an emergency CS. So, you can imagine, some will listen to their pastors and go.” (CHW04)

A few health workers reported that some communities believe that women should avoid medical facilities for their first childbirth, as health workers may pressurise them into having a CS if labour does not progress quickly.

“There is this notion that it is not good for a first-time pregnant mother to come to the Hospital or Orthodox centre [formal health facility] to deliver. They will tell you that

because it's your first time, they will not be patient with you to allow you to go through the duration of labour (...) they will hurriedly only offer CS.” (HCW02)

Childbirth is largely social in many communities in Imo State. Women compare stories of their experiences, and some may want to prove that they had a smoother experience than their peers. Some health workers reported that some women wait at home until their labour has significantly progressed before they come to the facility in order to claim a brief labour. When such women develop complications at home, it increases their chance of having a stillbirth.

“Yes, some of them like to spend time at home in labour so that when they come, they can tell their friends later that, ‘I arrived and I delivered shortly after; I didn’t waste time’. (CHW05)

“They use it to talk when they go back to the village. [mimicking mothers] ‘My friend eh, Labour was not difficult for me; immediately I arrived, I gave birth. I didn’t even wait up to 2 minutes. They never knew that you have to be monitoring both mother and baby in labour.’ (CHW03)

All participants reported that there is a marked sociocultural stigma associated with C-sections in many communities, and what a woman and her family believe about the stigma will influence the actions they take when a C-section is recommended.

“You know, sometimes they feel that CS is a bad thing. I think sometimes it's because they feel people will castigate them. The village people will say, ‘She was unable to push out her own child. She is unable to bear her own child.’ (CHW04)

Some women may be “mocked” (HHW01) or derided at women’s meetings for not being “strong enough” (HHW02) or not having “strong hip bone” to push out their babies.

“There is this stigmatisation among the communities that she cannot push a baby. She is not strong enough to push a baby.” (HHW02)

In response to the widespread stigma and the risk that a woman will abandon formal healthcare after she has been informed about the need for a C-section, some health workers may delay the information about a woman needing a C-section until she is in labour to ensure she gets the full ANC.

“Sometimes we don't tell them [about CS] early enough, because if you tell them that they will undergo surgery, you won't see them again. And by the time they come, they will be carried into the hospital in an extreme case, and by then, the baby would have died, and the woman's life will also be in jeopardy.” (HHW04)

However, other health workers argued that beginning the counselling early enough and involving influential family members is key to receiving timely consent at the time of birth.

"I start on time because some people [doctors] will tell you, don't start on time. Wait until the woman is term, because the reason is, if you start on time they will run away. You'll not see them again. Probably when you see them, you will now hear that that child has died, or something even, or even the woman died. If you start on time, they will run away, but then, if you allow it to get to at the point it becomes an emergency, some of them will still run away, or you may even stand the chance of losing the child. I think the best thing is to start on time and be begging to their conscience." (HHW07)

In some cases, health workers worked with women to conceal the fact that they had a C-section from their relatives visiting during hospital admission.

"Imagine where somebody gave birth Via CS in the hospital and people were coming to visit her. Because of stigmatisation, she called me and said I should please help cover the news. That even if any of the relatives come around to ask that I should please not mention that it was CS." (HHW02)

Power/support

When facing an emergency, health workers reported that there are different ways by which women arrive at a decision. While some women are able to decide by themselves, others will need the permission of their husbands.

"Many women, by the time you try to explain to them, they will tell you, 'Doctor, wait. I have to relay to my husband first; let him come and decide. Whatever my husband says, that is it.'" (HHW02)

Their husbands may also need the permission of other family members or may need to consult with their religious leaders to give their blessing before they consent to treatment, all of which delays intervention.

"Even when the husband comes, sometimes the husband will still have to wait for another relative to come before they will now take decision. Sometimes, they even wait for their religious or spiritual leaders to help them make decisions." (HHW07)

A few women may also opt to do nothing, leaving it all up to God to decide what the outcome will be.

"They now told us to take the baby to federal medical centre [tertiary hospital] where we will put the baby in an incubator. I said that I wasn't going to go, that if it is the will of God that this baby will live, but if it is not, that the baby will die." (NM02)

As reported above, emergency intervention during labour also comes with additional cost implications, and for some women, they have to defer to the decision of the rich relative who may not physically be in the hospital but is expected to contribute to offsetting the cost leading to further delays in the decision.

“A husband, and more so if the man himself is not financially independent, it's a very big factor. I have had cases where it happened. The woman does not want any bad outcome; the man doesn't want to hear anything that goes wrong with his wife, but he is not the one financially stable to pay. He doesn't have it financially, so he is now his neck and his hands are tied. He now goes back to maybe a brother-in-law or mother-in-law who is, in quote, like the decision maker. And of course, that one will tell you, ‘All my children, I gave birth to them vaginally, what do you mean?’” (HHW02)

Health system

Perceived quality of care

Both women and facility-based health workers pointed out the risk to the pregnancy outcome when there were delays in referrals to secondary facilities from primary health centres and traditional birth attendants. Health workers highlighted that due to the critical workforce shortages in the state, community health workers are having to perform duties beyond their competence and sometimes lacked the training needed to recognise danger signs at the primary health centre.

“The problem there could be because of the quality of staff. Most health centres, you know, most of the health centres, there should be a doctor at the health centre. I think there should be a doctor. But you rarely get doctors in government health centres, even sometimes, you don't even get qualified nurses, it's CHEWS [community health extension worker], the community health extension workers, sometimes it is even some temporary staff that are recruited.” (HHW07)

One community-based health worker emphasising the quality of care suggested that some PHC workers may also delay referrals for personal gain, as women and their families would usually offer gifts to health workers after a successful childbirth.

“I still talk about referral; if you see a case that is not yours [beyond you] and you want to chop [gain] that money, you want to get everything, you will end up having issues with the community.” (CHW01)

Health workers reported that in addition to the increased likelihood of poor outcomes, late referral from PHCs or TBAs has a broader impact. When a pregnancy ends with a poor outcome, the news taints the reputation of the facility where the stillbirth or other adverse event occurred. This creates a negative feedback loop in which communities attributed the poor outcome to a lack of skill on the part of the health workers at the secondary facility. Women are therefore, even less likely to use the hospital, creating the risk of further late referrals ending in poor outcomes.

“So, when they hear this particular bad story, it keeps ringing in their heads. So, they'd rather stick to the one their friends who are not doctors or healthcare personnel will tell them to go to because they themselves went to that one and delivered their kids. So, you find someone listening to her neighbour, a spare parts dealer, saying, ‘This is where I put to bed, and they did all wonders’, and the place the person is sending you to is not even a maternity home. Then the doctor is telling you, ‘No, come to the hospital,’ but you wouldn't go there because you are scared, because you heard that Emeka's mum died while putting to bed there, not even knowing the circumstances surrounding her death.” (HHW10)

“The community may be looking at you like someone who is not competent enough to be there. So, they can't even refer somebody else to that place to come and deliver because they will say that you don't know your job since the other baby died.” (CHW06)

As reported above, if a woman has witnessed, experienced or heard stories of disrespectful care at a hospital, she may avoid using such hospitals for childbirth. The women described many instances of verbal and physical abuse, abandonment and discrimination that they either heard about, personally witnessed or experienced during childbirth.

“She went to [redacted] hospital to give birth, and she almost lost her son. They were calling the nurse to come that the baby was already coming, and the nurse was telling her that if the baby was coming out, she wouldn't even have the sanity to be talking about it. Why will anyone want to go there?” (NM06)

“The nurse was asked to use the pump on me. As she was setting the hot water, other nurses mentioned to her that the doctor was sharing okpa [Bambara nut pudding]. The nurse that was asked to use the pump on me left me there and went to receive her okpa [Bambara nut pudding].” (SB01)

They were beating me, Kai! I suffered. One nurse was beating me as if there was no tomorrow. At a point, I said, ‘Nurse, do you realise that you are beating a human being and not an animal? Why are you beating me like this?’ She said I needed to push better. I said I was pushing well, or does she want me to die to prove it? She started shouting at me and said many things.” (NM01)

“There is something I observed in hospitals: some serious cases may arrive, but because the person doesn't have money, they will leave the person, and after some time, you will hear that the baby died.” (SB06)

Access to health services

A key issue arises when a woman requires intrapartum referral to another hospital, as parts of the referral process may significantly influence her outcome. In some facilities, health workers proactively contact the obstetrics department of the receiving facilities to inform them about the patient and some women are accompanied by staff to ease the transfer of their care. However, other women were only given referral letters. It was also reported that some women arrive at the receiving facility and realise that the desired service is not available or the required health worker is unavailable, and as such, they have to be referred again.

“I refer immediately I see anything; I’ll suggest different hospitals we have linkages with to you. I don’t do trial and error. So, they choose and we inform the hospital as I have their phone numbers.” (CHW01)

“So, the doctor told them to go to the General hospital, that those ones have oxygen to revive the woman. Instead of coming to the General Hospital, they still went to another private clinic who now referred them out as well. So, by the time they brought the woman to the General Hospital, rigour has already taken place everywhere is stiffening and everything.” (HHW06)

As reported above, participants said that the unavailability of necessary health services or health workers to provide emergency services, especially at night, can also lead to stillbirths.

5.3.4 Participant insights into potential solutions

The participants shared their insights into factors, actions and strategies that could potentially prevent or reduce the community-related factors driving the occurrence of stillbirths. These were grouped into interventions focusing on the woman, her family and community, the hospital and health workers and the government ([Fig 5.2](#)).



Figure 5.2: Participant insights into potential solutions

5.3.4.1 Interventions focused on the woman

Health Education: All participants highlighted the value of antenatal health education. Women specifically highlighted the usefulness of receiving health education at every visit with sufficient time to ask questions and receive clarifications kindly from health workers.

“There are some hospitals that people will go to, and they will not teach them anything. So, I would like the Government to pay attention to that thing, and also, we, the women, when we come around, let it be that we have learnt something.” (SB09)

“Speaking harshly to women will make them suppress their questions. They will be dying in silence thinking, I don't know which one I would say now, and this person [health worker] will get upset.” (NM04)

Health workers suggested that during the group health education sessions, it is important to identify and tailor ANC teaching for first-time mothers. One health worker said it is particularly helpful to start by identifying what each woman knows already in order to know what needs correction and what area to give more attention.

“When they have come, and it is their first pregnancy, we pay particular attention to them. We begin to teach them; we inform them of the routines for pregnancy.” (CHW05)

Health workers suggested that antenatal education must include teachings about complications and danger signs of pregnancy and an intentional reorientation of the women about the prevailing social myths. This includes myths about the indication, safety and subsequent childbirths after a caesarean section.

“During the antenatal visits, the women are being told that there are two ways you can give birth, either vaginally or through CS. CS is still another form of childbirth; it's not a death sentence.” (CHW05)

Women appreciated having channels for clarification and getting their questions answered while in their communities. Those who received ANC in hospitals that established WhatsApp platforms for engagement between health professionals and mothers expressed satisfaction with this additional service. Also, women who had phone numbers of health workers or hospitals, enabling them to receive clarifications and reduce misinformation, found this aspect of their care very important.

“Once I observe anything that I deem I do not understand, maybe unusual, I always call my health care provider. My nurses, the doctors, I'm always with their phone numbers.” (SB07)

“I can only speak for [redacted] mission hospital because that's where I have experience. They have a WhatsApp platform, although not as operational as it used to be when it was initially opened, where women ask questions at any time, and they get answers from health workers.” (NM06)

In Imo State and other Igbo tribe-dominated states, there is an annual homecoming meeting where all women are expected to return to their hometowns in August for “August meetings”. These are well-attended annual gatherings where women discuss community development and address social issues. They are also a platform for skill acquisition and education. All participants agreed that leveraging these August meetings to offer maternal health education could reach both pregnant women and other women at the meetings. Given the communal nature of families in Nigeria, this approach would extend the benefit of health education to the attendees’ broader social circles.

“Very soon, we will start August meeting, so it’s good that we visit churches’ community August meetings, sensitise them so that from there all these pregnant women will know what they are supposed to do.” (CHW08)

The participants also suggested that massive grassroots sensitisation campaigns in markets, churches and other occasions that pull crowds together will be helpful in reaching women and people in their social circles.

“There is always a way; it’s either through ongoing health education to the women, to all those relatives, those stubborn ones who wouldn’t allow their outdated practices to go away, or even symposium, even organising outreaches via churches.” (HHW06)

Positive peer counselling: Health workers suggested that positive peer counselling, which involves inviting women to share their experiences of stillbirth, was a powerful and relatable way of passing information to other women in an antenatal education group.

“She is now the one in second pregnancy now coming for antenatal and now educating other women after the formal antenatal lectures. She says, ‘Whatever the doctors tell you, please comply o, don’t have my kind of experience.’” (HCW02)

A peer example could also be used to reassure a woman who refuses what the health worker believes to be a life-saving intervention for her baby.

“In cases where a woman adamantly refuses CS, it’s no longer one health worker who should handle it. You just have to call in other staff and her relatives to come and also tell her. Then, show her other women who had the same experience or did the surgery, and they were all fine. Allow her to have maybe one-on-one interaction with the persons.” (NM05)

Economic empowerment for women: Participants suggested that in addition to providing the right information for women, economic empowerment through skill acquisition or grants for small businesses could help women be able to pay for health services independently.

"We continue to say that women should not be left without work. Most women need to be empowered so that when they have their own little funds, they'll be able to access care whether their husbands give them money or not."(HHW06)

5.3.4.2 Interventions focused on the woman's family and community

Engagement of family in antenatal care: Both health workers and women agreed that it is very helpful to engage both women, their husbands and other influential family members in antenatal care.

"Most husbands need to be sensitised. They also need to understand the danger of inappropriate management during pregnancy. If they are sensitised and they know, nobody would really want the wife to die."(HHW06)

"Once you explain the condition to the patient and the relatives, I think they will love to do that to save their lives." (NM05)

Health workers saw value in identifying potential influencers in the women's care through conversation during her ANC and engaging them early in pregnancy to ensure they are sensitised.

"Sometimes, we ask them once they come for antenatal to come with their mothers-in-law once in a while. Even after birth, if their mother-in-law is helping them in the ward, health education can be emphasised. (...) Because if they don't have that idea, they will still be doing the wrong things at home." (HHW05)

"Even sometimes I go as far as speaking to the church leaders. Because when you know that this is the person that will talk to them and they accept the care, you demand the number of that person, so you will talk to that person. You will first change the mindset of that person so that the person will now talk to them in the language that they will understand. So sometimes we go that far to get them involved." (HHW07)

In an emergency, health workers might need to engage directly with family members or religious leaders to expedite decision-making.

"I will tell them to inform me if they [influential relatives] are refusing to listen. Because I as a health worker, should have a way to penetrate whoever that is influencing that decision either through phone calls." (HHW06)

"If we convince the women [about C-section], of course, oftentimes when there is difficulty [convincing the family], myself, what I would tell them is, invite your husband or invite whoever let the person come. If I'm sure that the woman herself has understood and has accepted. Then, I will no longer leave that work for the woman alone to do. I will come in and intervene and try to talk to the third party." (HHW02)

Dialogues with religious leaders: Due to the strong influence of religion on women and their families' decision to accept C-sections, health workers suggest that there might be a benefit in organising periodic forums moderated by the state government health managers, where religious leaders and health workers discuss issues in the intersection of religion and medical interventions.

"It should be an obligation for whoever can even advise them both [health workers and religious leaders]. Call those in health and those in the church and have a seminar or training with them to avoid them deceiving these pregnant women. Because these pregnant women sometimes they solely believe in them [religious leaders]." (HHW05)

Engaging community and political leaders: The participants suggested that to change community attitudes, there should be outreach to traditional leaders to tackle entrenched myths and behavioural norms which are harmful to health.

"Even the village head or the clan head can still help talk to them in the languages they will understand for these things to be prevented. (...) I think the village clan or the village head or those in power or those that they listen to can help us communicate to them in languages they understand in order for the work to be easier for the health workers and so that that message or that information can be disseminated properly to our mothers." (CHW05)

Participants also suggested it would be impactful to engage with influential political and traditional figures in the community whose buy-in and voice can sway the beliefs and actions of the people they lead.

"Yes, I think the women leaders can also be very helpful. The political women leaders, we can approach them and let them help us announce anytime they have women gathering that women should endeavour to come to the health centre when they're pregnant, let us monitor their pregnancy. This will make our life a whole lot easier and will also help save their lives." (CHW04)

Identifying and training women as community champions: Two women suggested that appointing, training and equipping women champions with accurate pregnancy health information may be a key way of reaching pregnant relatives, friends and neighbours within their spheres of influence.

“There are already some women who have this kind of passion I have. It’s just for you to source for them and then teach them. Let them be aware and then the message grows. Like you know some of us now, at least in my own area, I know some people too. So, by talking with them, teaching them, then the messages trickles down, it continues. That’s just that.” (SB07)

5.3.4.3 Interventions focused on the hospitals and healthcare workers

Regular training and provision of equipment: Participants suggested that health workers should have regular and repeated training to ensure they have updated knowledge and skills to identify and intervene when a woman develops a complication in pregnancy.

“They refer late, some of them. When you go there [primary health centre], you find that many of them don’t go for regular training. I don’t think that they have regular training because some of them have lost the basics. They don’t know the current standards of obstetric care. They refer very, very late.” (HHW07)

While participants said that an ideal scenario would be ensuring that all hospitals (especially the PHCs) are adequately staffed by well-trained nurses and midwives, as a short-term solution for the critical workforce shortages, participants suggested continuous retraining and supervision for the community workers having to function in higher than their usual capacity.

“Before the health attendant asks the patient to go [discharge them], let them call the trained nurse on the phone (...) At times we should teach them some certain things. Because some of these auxiliaries or, let’s say, health attendants, they are well experienced practically though without the certificate (...) since we don’t have [qualified staff], we have to make use of what we have, and still keep on going until employment comes.” (CHW06)

The health workers also suggested the introduction of basic tools like a partogram, which is not used in many primary health centres and can be beneficial in identifying when they need to transfer to a secondary hospital.

“That’s why you must use a partograph. When there is fetal distress, you’re supposed to know. The truth is that the CHEWS [community health extension workers] don’t know what a partograph is.” – CHW01

Incentivising antenatal care: Based on the perceived success of several incentivised antenatal care programmes in many parts of Nigeria, both health workers and women suggested that incentivising antenatal care attendance may help to ensure women are regular for their

appointments. The incentives could be by way of discounted or free drugs, free consultations, subsidised hospital charges or gifts for the women at each visit.

"Like in my place, it's very hard for them to go to antenatal, but the gift will make women come." (HHW03)

"Maybe if there is a way that once in a while, they can give gifts to the women, probably when they get home, they will tell their friend who is pregnant that they should go." (NM03)

Functional feedback systems: Some women believed that the reason why bad experiences of care remain unchecked in many facilities is because there is no culture of respect and no adequate system for reporting poor behaviour.

"They should have rules to make sure health workers take care of the patients and not be rude or harsh to the patients. Just like in [redacted] mission hospital now, the nurses are always calm to the patients, not because they want to but because of the rules that are there. It would help to calm situations down." (NM06)

Women suggested that each hospital should set up feedback systems to capture their experiences and actively use the findings to improve the quality of services provided.

"The way they will know the good ones? Just like the way you came and asked me now, at times, there are times when... if it were to be when the government was doing well, on antenatal days, maybe they can send someone would come as a client, maybe a woman. They'll be asking those women questions, 'How do these doctors behave?' you gather information from them." (SB01)

The women also suggested that health workers need to be respectful, clear and patient when providing explanations.

"The doctor or the health worker needs to exercise patience because the word 'patient', you have to be patient with the person. Anybody that is sick is usually unhappy." (SB01)

Care standardisation: All participants believed that hospital management should put in efforts to ensure that a good standard of care is accessible at every point when women access the hospital. The recommended efforts include hiring and retaining skilled workers, purchasing the right equipment, and ensuring services are available throughout the day and night.

"So that's why I said that Nigerian hospitals contribute to the deaths. That's one of the challenges, so in a hospital like that where there is such a thing [maternal emergencies], there is supposed to be a standby scan so that if there is any emergency like that, there will be no need to ask me to wait till tomorrow morning." (SB01)

Prioritising death reviews

Some health workers emphasised the importance of a formal process to review stillbirths in order to improve maternal and newborn health outcomes. They suggested that a thorough review would identify both hospital-related and community factors that contribute to stillbirths. One health worker highlighted the benefits of including community representatives at these reviews and the importance of monitoring the implementation of the resolutions agreed upon at the meeting, to improve health outcomes.

“I think we should prioritise death reviews. If we can be doing it quarterly or once in a while, they will do a review of any stillbirth in a facility and set up a committee that will monitor implementation of the changes.” (HHW05)

“This maternal, newborn and stillbirth death review, they had a woman from the village as part of the committee. If any woman dies during childbirth, she [village committee member] would be the person to report [and relay feedback to ward health committee]. I don't know whether I'll be indicting the government here (...) along the line, the stipend they [village committee member] were getting stopped.(...) When we stopped giving them the stipend, they stopped coming.” (HHW06)

5.3.4.4 Interventions focused on the government

Improve public facilities: Both women and health workers suggested that the government needs to devise strategies to attract and retain health workers in public facilities, especially in primary health centres in rural areas.

“If our government can do something that will make these our semi-urban and rural areas to also be attractive for our doctors. So that's we wouldn't be running away like that from those areas and also serve.” (HHW02)

“The government is not doing enough. If they improve the conditions of service, people will, many will stay back. and a lot will come to the rural areas.” (HHW04)

Health workers who have worked in other states said the hospitals in Imo State are under-equipped, under-staffed and largely under-utilised in comparison with public secondary facilities in other states.

“In that aspect, this place where we are [Imo State] is zero. I'm telling you with experience, practical experience. The modern primary health care where I worked, in fact I started

from the specialist hospital in Borno State. (...) The primary health care where I worked in the north is more standard than [redacted] General Hospital, Imo State. (...)The government is not supporting us here.” (HHW09)

Most participants believe that the relative affordability of public hospitals compared with private hospitals would help improve access to maternal health services if the public secondary facilities were improved.

“Some of the general hospitals are not very well equipped. Like have the NICU [neonatal intensive care unit] incubators. If they the government can help and provide these equipment, in these government hospitals, people might not find it that difficult. Because some of them might be considering the financial aspect of going to some of these big private hospitals and now go to a very local place to go and deliver and in that process, they might lose their baby.” (NM05)

Tackling the cost barrier to health access: Both women and health workers enjoined the government to increase their efforts towards improving the coverage of the state health insurance services.

“Then the government should also include people into the care plan as in health insurance, the local governments can. I think there are some states [that have] health insurance. Like in this our state now, there is state health insurance, but it is mostly for civil servants.” (HHW07)

Participants unanimously agreed that the removal of the significant cost barriers to care access would greatly improve the care-seeking and access to maternity care. Some participants also suggested that the government adopt the free maternal and newborn health service policy currently rolled out in some states in Nigeria, or at the minimum, significantly subsidise access to services.

“The reason is this, you know once something is free, you have more people. As long as it’s free and they are not going to spend money.” (SB01)

“The Government can subsidise the rate of drugs, especially those ones that are taken regularly; a pregnant woman must take routine drugs, a pregnant woman must take malaria prophylaxis. So those drugs should be subsidised.” (HHW07)

Regulate sales of herbal remedies: Women and health workers highlighted the need for the local government health authority to step in and regulate the popular sale of herbal concoctions in Imo State.

“You know, if you caution them [herbal concoction sellers] in the market, then the women will trace them to their houses to go and buy it. But if you start from the market if you arrest one person today and arrest another person tomorrow, they will start hiding. But gradually, they will stop it, just like this female circumcision of a thing.” (CHW03)

Regulate traditional birth attendants: Health workers stated that since the women continue to trust the traditional birth attendants, it may be helpful for the government to design periodic training in basic skills for them and encourage them to understand the limits of their abilities so they can recognise and make timely referrals in the event of intrapartum emergencies in their homes.

“Due to some TBAs [traditional birth attendants] level of their knowledge, they may not know anything like that [danger signs]. So, you have to educate them; see in case you see something like this, know that it is not in a range that you can manage in the maternity or a traditional birth attendant can manage. Refer the patient where there is a doctor for expert management.” (HHW09)

“Since these women usually will always like to go to them, so if they can refer cases early, I think it can reduce stillbirths. Then, if you train them well, then tell them how to attend to these women in labour in a safe environment. It can also help.” (HHW01)

Convene multidisciplinary forums/task force for health: The health workers emphasised the need for a multidisciplinary approach to solving the challenges around stillbirth. One health worker opined that it was essential to bring together clinicians, public health specialists and communities so that everyone had a stake in implementing preventive strategies.

“How we approach that health advocacy is something that, as healthcare personnel, we need to sit down on a round table, interdisciplinary, talk with the public health specialists. Because, if you see it as a public health problem, then they need to be there with you to plan or map out your strategy and guide you as to how you permeate certain communities with your health reforms so that it is acceptable to them. You can't bring a reform that is not acceptable to the community that you are trying to help.” (HHW10)

5.4 Discussion

All the study participants believed that to successfully reduce stillbirths in Imo State; there are multiple factors which need to be understood and addressed. At the level of the woman, her health knowledge, the information accessible to her, and the level of trust she has for people providing her health information will influence her health-related actions and decisions. A

woman's family dynamics, her relationship to the prevailing societal norms, and her support systems all affect her health during pregnancy and her decisions to seek care or choice of care. Lastly, at the level of the health system, the availability, accessibility, affordability, and perceived quality of care will all influence how women use maternity services. The women and health workers suggested potential solutions to reduce stillbirths targeting the woman, her family and community, the hospital and health workers, as well as the government.

5.4.1 Enablers and barriers of healthcare access.

Understanding the enablers and barriers of healthcare access is important for developing tailored interventions for stillbirth prevention. Many of the enablers and barriers shared in the participants' accounts are similar to those reported in previous studies in other settings^{220–222}. Trust played a critical enabling role in healthcare access for pregnant women in Imo State. When deciding on a facility for maternity care, women often assessed the skills and experiences of health workers based on their interactions or feedback from trusted family members or people within their social circles. When women believed that healthcare professionals were competent and reliable, they were more likely to seek maternity care and adhere to medical advice. Women's trust in a hospital was strengthened by the perceived availability of necessary medical equipment to enable intervention in an emergency. A lack of trust in the health system has been reported in several states in Nigeria. In Anambra State, a state neighbouring Imo State, the implementation of the Subsidy Reinvestment and Empowerment Programme (SURE-P) in maternal health was reported to have increased women's trust in the health system²²³. Women beneficiaries of the SURE-P programme reported that the programme's emphasis on the recruitment of doctors, nurses and midwives, mobilisation of trained community health workers, availability of high-quality drugs and removal of financial barriers contributed to their increased trust and utilisation of maternal and child healthcare services²²³.

Having accurate health information was important in enabling women to make informed choices for their health during pregnancy. Antenatal health talks given in most facilities provided essential information for women about pregnancy and childbirth. Systematic reviews and assessments of antenatal health education initiatives have shown that they are low-cost interventions which can significantly improve women's knowledge of danger signs, encourage early access to interventions, and thus improve maternal and fetal outcomes^{115,224}, but these benefits are lost if antenatal education is not offered in a way that is accessible for women to attend. Having remote access to health workers outside of women's antenatal appointment days was another important enabler. When a pregnant woman is faced with a health concern outside of her appointment days, her social networks, including mothers, sisters, friends and neighbours, contribute their own advice. However, this opens the door to misinformation, which can affect pregnant women negatively. In Imo State, as in many other regions of Nigeria, reliance on informal sources of health information leads to the perpetuation of myths and harmful practices^{225,226}. For example, health workers and some women described the misconceptions about umbilical cord coiling. There is a belief in some communities that umbilical cord coiling can be prevented by taking certain local herbs, which, in the health workers' opinion, endanger the life of the fetus. To combat misinformation and myths such as this, efforts must be directed towards improving general health literacy in the wider population and providing trusted channels for accurate information.

A woman's capacity and readiness to act when she develops an urgent symptom or sign is crucial for her baby's survival. Access to means of emergency transport is essential as delays in reaching the facility have been shown to significantly impact outcomes⁴². The willingness of the woman and her family to seek medical care in emergencies instead of religious or alternative means of care was also important, ensuring timely access to evidence-based life-saving interventions. Having the money to pay for the required services was another enabler. With the documented poor health coverage in the state³⁸, financial barriers can obstruct access to necessary emergency

care, leading to adverse health outcomes, including stillbirths. Finally, when the woman arrived at the health facility, the availability and reliability of healthcare services were important for care access. Frequent doctor absences, health worker strikes, or non-availability of certain services reported in studies in Nigeria discourage women from using health facilities^{222,227}.

In addition to cost-related barriers, women also highlighted that the negative experiences of care they heard about, witnessed or experienced can deter further healthcare access. Similar issues have been reported in previous studies in Imo State⁴⁵. Women in this study cited instances of abandonment, verbal abuse, lack of dignity and respect, physical abuse, and discrimination against poor women. Such mistreatment discourages women from seeking care and adhering to medical advice. The parallels between the study findings and those of earlier research highlight a persistent problem in the healthcare system that should be addressed to improve access to and demand for quality healthcare for women.

5.4.2 Factors that affect women's health care and self-care decisions

As soon as a woman discovers she is pregnant in Imo State, she is faced with several decisions that directly or indirectly affect her health and well-being throughout the pregnancy, as well as the pregnancy outcome.

A woman's level of health knowledge can significantly influence her health decisions and outcomes during pregnancy. Women learned about health during pregnancy from women around them and health workers. While women generally trusted the information received in hospitals, when health concerns arose in the community, they often turned to those around them. Some women recognised the risk of misinformation from non-medical sources and actively sought reliable advice through personal calls to health workers or institutional WhatsApp groups, where available. A 2016 systematic review shows that mobile health interventions are increasingly being

successfully applied in low-resource settings with improved maternal, fetal and newborn outcomes, as this provides women with timely and accurate information for health actions²²⁸.

Poverty compounded the challenges faced by pregnant women and greatly influenced their self-care decisions. Even when a woman had the right information, poverty could limit her access to quality health services and nutrition, which could increase the risk of stillbirths. Malnutrition is prevalent in low-income communities and has been associated with conditions like anaemia, low birth weight, and increased risk of infections, which can compromise fetal development, increasing the chances of a stillbirth¹³⁶. Health education is an important and effective low-cost intervention that has been applied in several maternal health projects⁴⁶; however, from the participants' account, it was clear that having the right information does not always guarantee the desired health behaviours. While improving knowledge about the importance of addressing the nutritional risk factors of stillbirths is critical, there are additional layers of complexity that often override this knowledge.

The participants described a scenario where some women who, despite being well-informed about the importance of taking prescribed vitamins, would not take them or other medications prescribed during pregnancy due to personal aversion to medications or not liking the taste. In another scenario they described other women eager to act on the knowledge they've received but are unable to due to economic reasons. These examples show that the relationship between health knowledge and behaviour is not always linear; hence, health education interventions must look beyond a narrow focus of providing education to one that addresses the broader sociocultural and economic factors that influence women's decisions. Health workers must listen to each woman to understand their circumstances, concerns and challenges and incorporate such insights into their health service provision. For example, a simple adjustment could be acknowledging the women's concerns about the taste of the antenatal vitamins and addressing

those concerns, perhaps by suggesting coping strategies or reframing the conversation. This could involve both emphasising the role of the vitamins and empowering women to see taking them as their contribution to their baby's well-being, which could resonate with their values.

Another key decision women needed to make was the choice of where and when to receive maternity care. Previous studies in Nigeria have shown that in many families, the decisions about a woman's health and care are shared between the woman, her spouse and sometimes other relatives²²⁹. In this study, when it was up to the woman to decide, women would often prioritise the availability of skilled staff and equipment which offered a sense of reassurance in case an emergency occurred in the course of pregnancy and childbirth. Other factors considered include the friendliness of health workers, the cost of care, as well as the quality and content of antenatal teachings. Similar to a previous study in Imo State and other parts of Nigeria, women may overlook a suboptimal care experience if they believed that the health workers had the skills to prevent adverse outcomes, placing safety above the quality of care experience⁴⁵. On the other hand, some women may prioritise the experience of care, as one participant reported leaving a formal care facility for a traditional birth attendant's home due to poor health worker attitude.

These health behaviours have implications for women's health and wellbeing. A systematic review of maternity care in Africa shows negative experiences of care are prevalent, however, there is some evidence indicating that private and faith-based facilities may offer better experiences compared with the public facilities²³⁰. Despite the extensive research on experiences of care and respectful maternity care in Africa, there are relatively few interventions addressing the gaps identified in the studies²³¹. Available interventions have largely focused on health provider training, especially during health facility childbirth²³¹. However, evidence from this study and other literature suggests that there is mistreatment throughout the antenatal to post-natal period and beyond, which is influencing how women seek healthcare, not just at the point of

childbirth²³¹. Addressing these issues requires a comprehensive approach that not only trains health workers but also considers the full spectrum of care experiences from the antenatal to postnatal periods. Such interventions, which include improvement of healthcare infrastructure, respectful maternal care policies, and patient experience feedback mechanism would ensure that women receive high-quality care from antenatal to postnatal periods.

Although women generally consider the proximity of a health facility in deciding where to get care, similar to previous studies, some women in this study bypassed a closer facility to receive care in a specific facility of choice^{45,232}. This pattern of health-seeking has implications for the woman, especially if a woman develops a complication requiring emergency attention. The WHO recommends that comprehensive emergency obstetric care be available within 2–3 hours' travel time of every woman¹⁴⁴, however, women are bypassing closer facilities for reasons such as trust in the quality of care²³³ or choice. Perhaps this policy needs to be revisited by policymakers deciding on where to build facilities to pay attention to factors beyond geographical distance such as quality of care, community reputation and trust, cost of care and others which women prioritise²³⁴.

A woman's health decisions were also frequently shared with or controlled by other members of her family, including her husband, mother and mother-in-law. Depending on how complex this dynamic is in a woman's family, this cultural norm could significantly affect the health-seeking behaviour of a pregnant woman, especially during emergencies when timely intervention is critical. This finding is not unique to women in Imo State and has been reported in other studies within Nigeria, Africa and Asia^{235,236}. This requirement for family consensus in a woman's health decisions can translate to missed opportunities for lifesaving interventions as critical responses are required in emergencies, especially when immediate intervention is required to manage, for example, severe fetal distress or severe maternal complications.

Mothers-in-law were highlighted as having considerable influence over their daughters-in-law's health decisions in many families. If a mother-in-law preferred a traditional birth attendant over formal healthcare facilities, this could delay or prevent access to essential antenatal and/or emergency care. This preference may possibly be rooted in the familiarity, reputation and trust for the traditional birth attendants; however, this poses risks to the mother and her baby as many of them are not medically trained and may lack the necessary resources to achieve a safe birth or skills to intervene in emergencies²³⁷. The insistence of some mothers-in-law to delay the start of antenatal care in some cases till the sixth month of pregnancy was concerning. According to the WHO, establishing early antenatal care within the first 12 weeks of pregnancy is important, especially in high morbidity and mortality regions like Nigeria¹⁸³. Early antenatal care is important as it helps health workers to identify and manage potential complications quickly. It also allows health workers to commence health education, which can support proper maternal nutrition and other positive health habits that are beneficial during pregnancy. Delayed onset of antenatal care and traditional birth attendant preference for maternity care increases the chances for undiagnosed complications, which contributes to adverse outcomes such as stillbirth. This scenario is not unique to Imo State or Nigeria and has been reported in several low-resource, high stillbirth burden countries²³⁸. However, in the past few decades, countries like India, Ethiopia, Brazil and Pakistan made significant efforts to integrate traditional birth attendants into their formal healthcare system and, through extensive public health campaigns have seen significant improvement in maternal and perinatal outcomes²³⁹.

Adherence to antenatal care appointments is crucial for adequate maternal and fetal well-being and monitoring. The adherence to antenatal care appointments by the women in this study was influenced by cultural, socio-economic, and logistical factors. While some women had the right information about the benefits of antenatal care visits, they sometimes faced considerable

barriers that hindered regular attendance. It was concerning to note that some women with uneventful pregnancies perceived antenatal care visits as unnecessary and a waste of time and resources. This perception highlights a significant gap in understanding the value of antenatal care visits and that fetal health issues may not manifest immediately as maternal symptoms, requiring routine monitoring to proactively identify and address potential complications¹⁸³.

Another considerable deterrent for antenatal care visits was the financial burden associated with each visit. Given that only 1.7% of adults in Imo State have any form of health insurance cover³⁸, women had to consider the cost of services, coupled with transportation expenses, particularly in regions with poor road infrastructure, making regular antenatal care attendance a significant challenge. WHO recommends that women have a minimum of eight antenatal contacts before childbirth to reduce perinatal mortality and improve women's experience of care¹⁸³. In Nigeria, the coverage of four or more antenatal care visits improved from 51% to 57% between 2013 to 2018²⁰. Imo State has the highest antenatal care utilisation in Nigeria, with 96% attending four antenatal care visits and 73% attending eight or more antenatal care visits in 2021³¹. The discrepancy between this relatively high uptake of antenatal care and health outcomes may be due to issues such as inadequate health infrastructure, poor quality of intrapartum care, inconsistent supply chain for essential medicines³², and the quality of antenatal care services, including inadequate screening or management of high-risk pregnancies, or other socio-cultural factors highlighted in this study such as the significant stigma surrounding C-Section²⁴⁰.

Some women expressed a deep-seated fear of C-sections, stemming from either concern about safety or the societal pressure and desire to avoid ridicule from their peers who may refer to them as not being "woman enough" to achieve a vaginal birth. This stigma is further exacerbated by prevailing cultural and religious beliefs, especially among some Pentecostal denominations²⁴¹, where undergoing a C-Section is perceived as a lack of faith. For such women, phrases such as "It

is not my portion” or *“I shall deliver like the Hebrew women”* illustrate their strong belief in natural childbirth and divine intervention. In health worker accounts, women who used such phrases often delay consent or may refuse C-section¹⁸⁴. Some mothers-in-law who take pride in the record that no one in their lineage has ever undergone a C-section and rich relatives expected to finance the childbirth may also strongly oppose C-section. This may compel the pregnant woman to seek out traditional birth attendants and other often less safe alternatives to attempt a vaginal birth. Also, further delays due to consultations with pastors or other religious leaders extended the timelines for medical intervention, increasing the chances of adverse outcomes for the mother and the baby. According to a national survey in 2018, 2.7% of all childbirths in Nigeria were through C-section²⁰, but Imo State has the highest rate (9.1%) in Southeast Nigeria, and in the country is second only to Lagos State (12.5%)²⁰. While a C-section can be a critical lifesaving intervention for the mother and baby, the timeliness of the intervention is important. Therefore, it is plausible that delayed referrals, delayed consent and other socioeconomic factors reported in this study may reduce the benefits of C-sections seen in Imo State.

C-section is more widely accepted and utilised in high-income countries; however, there are concerns about the over-medicalisation of childbirth. Within a global C-section rate of 21%, C-section rates in Latin America and the Caribbean are as high as 43%²⁴². The WHO guidance is that the reasonable C-section rate should not be higher than 10–15% of all childbirths in each country²⁴³. In contrast, the low utilisation in low-income countries (e.g. 5% C-section rate in sub-Saharan Africa²⁴²) has multifactorial causes ranging from insufficient healthcare infrastructure and lack of resources and, similar to this study, sociocultural reasons like the stigma associated with C-section¹⁸⁴.

To improve maternal and perinatal health outcomes in high-burden areas, the WHO recommends facility-based childbirth and that women be assisted by skilled childbirth attendants²⁴⁴. Only 39.4%

of childbirths in Nigeria occur within a health facility, and 43.3% are assisted by a skilled birth attendant²⁰. Imo State has the highest proportion of women having health facility childbirths (94.5%) and women assisted by skilled birth attendants at the point of childbirth (98.2%) in Nigeria. Despite these impressive statistics, the burden of stillbirth remains high in the state. An additional insight from this study is that many women have multiple antenatal care registrations, including at traditional birth attendants, with some having the intention of using the traditional birth attendants for childbirth and having the hospital only as a backup in case of intrapartum complications. In such cases, outcomes critically depend on the traditional birth attendant's ability to recognise and promptly refer women with complications. If they arrive late at hospitals and eventually have their babies, the proposed benefits of skilled birth attendance may not be attained.

5.4.3 Health workers' perceptions of community-related factors leading to Stillbirths

The views of health workers in this study were closely aligned with the perspectives of the women interviewed, highlighting a shared understanding of the challenges and barriers leading to the stillbirth burden in Imo State. Health workers offered additional depth to the understanding of health system factors and their interaction with community factors which exacerbate stillbirth rates.

Health workers reported that late referrals from traditional birth attendants and primary health centres is an important factor for stillbirths. This finding is consistent with existing literature, which shows that traditional birth attendants lack formal medical training and may not recognise when a woman needs to be referred to a hospital²³⁹. Health workers highlighted that primary health centres, which are often understaffed and have staff performing tasks beyond their training and capabilities, who may also fail to recognise and manage complications or refer promptly. Avoiding these delays is important because timely medical interventions are critical for managing

complications that can lead to stillbirths.⁴² When women arrive late to the referral hospitals, they often present with severe complications, which may include an intrauterine death, reducing the chances of timely interventions^{7,43}.

The implications of late referrals extend beyond individual cases, contributing to a broader erosion of trust in the healthcare system. Women who experienced poor outcomes in hospital settings and their families associated these outcomes with the quality of care, reinforcing a cycle of mistrust and reluctance to seek early medical intervention. This mistrust can be detrimental to public health efforts, as delayed care further exacerbates the risks associated with childbirth²²³.

5.4.4 Insights into potential solutions

The study participants provided valuable insights into potential solutions for community-related factors leading to stillbirths targeting the woman, her family, the healthcare provider, the hospital and the government. The participants highlighted the need for a comprehensive approach involving the relevant stakeholders to ensure improvement in maternal and newborn health outcomes.

Health education initiatives targeting the woman, her family and the broader community were the core of the suggested interventions in this study. The participants suggested that structured and ongoing maternal health education tailored to each woman and her family, focused on improving health knowledge and awareness of danger signs, will help reduce the risk of stillbirths. The effectiveness of such interventions in low-resource settings is well documented and can significantly improve maternal outcomes by addressing both general and specific health concerns^{115,245}. Additionally, incorporating positive peer counselling into group ANC sessions was suggested as a means to enhance maternal knowledge and support using the relatable experiences of fellow women. This method aligns with existing evidence that peer support can

positively influence health behaviours⁹⁴. Given the reported communal influence on pregnant women's decisions and actions, health education initiatives need to extend beyond the woman and her family to the communities. Through sustained grassroots mobilisation and media sensitisation, prevailing myths surrounding maternal health and childbirth can be effectively addressed. The participants emphasised that community-based sensitisation efforts must include traditional leaders and other respected figures (including religious leaders) in society. Including these trusted persons enables the initiatives to effectively harness local knowledge and utilise the available networks to spread health information and promote positive health behaviours²⁴⁶.

The study participants unanimously agreed that engaging family members, such as husbands and mothers-in-law, in a woman's antenatal care is crucial in many ways. This includes providing an avenue to align family members' beliefs with medical advice, ultimately reducing stillbirths. Previous studies suggest that engaging family members in antenatal care can improve perceived social support, birth preparedness assistance, and encourage positive maternal behaviours and has been shown to improve outcomes^{183,247}. Additionally, due to the religious influence on health decisions, participants suggested that organising dialogues involving health and religious leaders to address the intersection of medical interventions and religion is a promising strategy for integrating cultural beliefs with indicated medical interventions. This strategy has proven effective in other Nigerian studies that engaged religious leaders to help reconcile the spiritual and medical perspectives of maternal and newborn health services to improve uptake^{248,249}.

Women's economic empowerment was also identified as a key strategy for improving access to maternal healthcare services. When governments invest in schemes that increase women's economic stability and financial autonomy, they are better able to afford healthcare, reducing the risks associated with cheaper healthcare alternatives. This approach is supported by existing

literature, which emphasises that economic stability enables timely and adequate maternal healthcare access, reducing the financial burdens of pregnancy²⁵⁰.

Study participants, particularly healthcare workers, emphasised the role of perceived quality of care in hospitals within the communities in influencing the decision to seek care. They recommended that the government standardise health facilities, as a perception that women receive high-quality services regardless of the chosen facility would lead to more consistent and effective healthcare delivery in the state. This, in turn, would encourage more people to utilise hospital services, which echoes the findings of studies conducted in other parts of Nigeria^{148,223}. Additionally, women suggested that establishing functional feedback systems will help monitor the quality standards from the service user's perspective and identify and address gaps in care.

The participants highlighted the government's overarching role in addressing the financial barriers to healthcare access. Expanding health insurance coverage in the state and subsidising essential maternal health services is vital for ensuring that health is more accessible and that women receive the necessary care during pregnancy²⁵¹. Participants also suggested that the government step in to enforce the regulation of traditional birth attendants and the public sales of herbal remedies in the state. This regulatory approach can help balance traditional practices with evidence-based medical care, which is important for improving health outcomes. Furthermore, health workers proposed establishing multisectoral forums to address community-related factors relevant to stillbirth to facilitate collaboration among relevant stakeholders and ensure interventions are comprehensive and acceptable. Due to the nature of development project funding and weak governance in health systems in many low- and middle-income countries, Reddy and Sen argued that many development efforts in reproductive health in Nigeria were siloed, with sectors working independently, resulting in missed opportunities for outcome improvement²⁵². In contrast, using a participatory multisectoral approach in Uganda, Ekirapa-

Kiracho et al. achieved improvement in maternal service access and health outcomes²⁵³. Some health workers in the study reported here suggested that this approach might be the missing factor explaining why some projects face implementation challenges and why their impact does not last beyond the funding cycle.

5.4.5 Strengths and limitations of the study

A key strength of this study lies in the diversity in the recruitment of women (including those with stillbirths and near-misses) and health workers (both community-based and facility-based), which aimed to draw in different perspectives providing a nuanced understanding of the community-based factors contributing to stillbirths and successful birth outcomes. The involvement of hospital and community-based health workers alongside mothers draws in views on the systemic issues driving stillbirths alongside personal experiences, making the study findings relevant for policy and practice. The study's focus on community-based viewpoints enabled the respondents to provide unique insights into societal beliefs and practices, which may not be captured in facility-focused research alone. Finally, to the researcher's knowledge, this is the first study of its kind conducted in Imo State, contributing valuable local insights to the literature for stillbirth prevention in the State and similar settings.

The study has important limitations that must be acknowledged while interpreting the findings. One significant limitation is that despite the diversity in recruitment, the researcher was unable to attain data saturation with the women due to limited resources, making it challenging to draw definitive conclusions about the differences in perspectives. Moreover, the women's accounts of their pregnancies that resulted in a stillbirth or near-miss were deeply intertwined with other pregnancies. This overlap complicates the ability to isolate and analyse the specific factors influencing their decisions and actions in each pregnancy.

Another limitation is the potential recall bias, as women may not remember in detail or may reinterpret their past experiences based on their current understanding²⁵⁴. However, the alignment of the findings from multiple perspectives (data triangulation) helped to increase the reliability and validity of the findings²⁵⁵. Additionally, some participants may have been prone to a social desirability bias, defined as study participants tailoring their responses to what they perceive as socially acceptable or expected, given that the researcher is a doctor and was familiar with a few of the respondents through the quantitative work²⁵⁶. To counter this, the researcher ensured the interviews were conducted in a private and comfortable setting, and study participants were assured about the confidentiality of their responses. Conversations with women often involved them sharing their first-hand experience of the discussion topic and their perceptions of what they believed other women did. A comparison between the first and second-hand reports showed that women admitted personally deviating from expected norms in pregnancy, like missing routine medications or infrequent attendance at antenatal care. This finding suggests that social desirability bias was likely to be minimal, as participants openly discussed their behaviours that deviated from expected. The researcher also ensured that neutral and non-judgmental language was used throughout the interviews to encourage honest and open responses.

To strengthen future research, it would be beneficial to increase the number of participants to enrich the depth and breadth of the data and enable more nuanced comparisons in perspectives. Also, utilising longitudinal studies which track women's experiences in real-time could provide more accurate insights into their evolving perceptions, though this may have important ethical implications, especially in the acute grief phase after a woman has had a stillbirth.

5.5 Conclusion

This study accentuates the importance of community-based interventions for stillbirth prevention in Imo State, Nigeria. The findings highlight the need for a multifaceted, comprehensive approach that not only improves the quality of hospital care but also promotes health education, family engagement in maternity care, economic empowerment for women, and collaboration with community leaders to address the socio-cultural and systemic factors contributing to stillbirths. Key strategies, such as engaging community champions and providing continuous health worker training to improve skills and care experiences, are essential for building trust and improving care quality.

Tackling economic and infrastructural barriers, such as antenatal care costs, inadequate referral systems, lack of equipment and unregulated traditional birth practices, is vital for enhancing pregnancy outcomes. Locally tailored interventions, including incentivising antenatal care and standardising care practices, were suggested for reducing stillbirths.

Overall, this study highlights the need for culturally sensitive, community-driven interventions co-developed and co-implemented by the women, their families and communities, healthcare providers, and policymakers. Strengthening community support and quality of healthcare delivery can pave the way for achieving sustainable reductions in stillbirths in Nigeria and comparable settings.

Chapter 6 Discussion and conclusions.

6.1 Summary of Findings

This DPhil research provides a comprehensive examination of stillbirths in Imo State with an emphasis on community-based influences on stillbirth occurrence that could potentially be targeted for prevention. Overall, 38 out of every 1,000 babies born in the 20 secondary hospitals included in this study were stillborn. The stillbirth rate differed by hospital type: 45 per 1,000 total births in public hospitals, 54 per 1,000 total births in mission hospitals, and 28 per 1,000 total births in private hospitals.

The risk factors associated with antepartum stillbirths were slightly different from those for intrapartum stillbirths. Antepartum stillbirths were associated with nulliparity, unbooked pregnancies, referrals, prematurity, and obstetric complications. Intrapartum stillbirths were associated with failure to use a partogram when indicated, referrals, prematurity, and obstetric complications. Personal views from women and health workers provided a deeper understanding of some of the risk factors for stillbirth while offering insights into potential strategies for prevention. Factors such as the woman's health knowledge, her source of health information, harmful cultural norms, a woman's socioeconomic and family context, and inadequacies within the health system exacerbate the risk of stillbirths in Imo State.

The systematic review and meta-analysis findings established that community-based stillbirth prevention strategies have been implemented in many parts of Sub-Saharan Africa (SSA), but they are only effective if combined with hospital-based interventions. Similarly, the qualitative study participants reported here recommended this dual approach to reducing stillbirths in the state. The participants suggested a multipronged approach including health education for women, their families and communities; women's empowerment; engaging families in antenatal care;

standardising healthcare; removing financial barriers; regulating alternative care providers; and most importantly, ensuring that any implementation strategy is co-produced with service users and integrated with hospital-based interventions to ensure effectiveness.

6.2 Integration of findings

The following sections discuss topics related to stillbirths in Imo State, which were raised by one of the thesis studies and further enhanced by the second study. These areas are explored alongside existing literature, findings from the quantitative and qualitative studies, and the researcher's insights.

6.2.1 Exploring the potential of community-based prevention of stillbirths in Imo State

The findings from this DPhil research suggest that there is both local interest and encouraging evidence from similar contexts in support of community-based stillbirth prevention in Imo State. The systematic review showed that four types of community-based interventions for stillbirth prevention using nine different strategies have been implemented in different parts of sub-Saharan Africa, including Nigeria¹⁸⁹. The meta-analysis indicates that community interventions in low-resource settings effectively reduce stillbirths only when combined with hospital-based interventions²⁵⁷. This finding aligns with previous global systematic reviews, which reported higher intervention effectiveness when community interventions are combined with hospital interventions for maternal and newborn health^{46,136}. The findings reported here support these conclusions, emphasising the importance of a hospital's capacity to render emergency maternal health services when women arrive at the hospital following community sensitisation to seek help. The impact of these community initiatives to improve health seeking in hospitals will be limited if hospitals lack preparedness or capacity to render the required services^{43,46}.

Given the well-established healthcare systems in high-income settings, community interventions targeting pregnant women can operate with greater independence as women are often able to get access to high-quality maternity care when needed. In these contexts, community interventions focus on support, early detection of complications, and education²⁵⁸. However, in sub-Saharan Africa, especially Nigeria, where the healthcare system is under-resourced¹³⁷, health insurance coverage for women of reproductive age is about three per cent²⁰ and access to emergency obstetric care is limited, a more integrated approach is needed. This need is pronounced in Imo State, where the healthcare system still faces numerous resource and infrastructural constraints, limiting timely access to life-saving emergency obstetric services³². With only 1.7% adult health insurance coverage³⁸ and the 68.6% catastrophic health expenditure for families in Imo State³⁸, it is not surprising that some women resort to alternative care practices or unsafe use of medicines based on the recommendation of friends and family, as uncovered in the qualitative study. Given these realities, women and their families may not readily seek facility-based care without community-based interventions actively encouraging and facilitating this transition while collaborating with all stakeholders to remove identified access barriers. Therefore, community interventions in settings like Imo State must be closely linked with healthcare facility interventions to be effective. This strategy has been exemplified by the success of the community health workers programme in Uganda, which was shown to improve maternal and newborn outcomes significantly through integrated interventions²⁵⁹.

To ensure effectiveness, community interventions need to be tailored to meet women's needs, with measures in place to ensure the interventions are both acceptable and beneficial to foster participation and sustainability. As found in the systematic review, intervention acceptability studies in SSA often focus on the health workers delivering the interventions and not the women. This trend could reflect the broader societal norms in which women have limited autonomy in decision-making about their healthcare. An analysis conducted using the Sekhon et al.

intervention acceptability framework⁵⁸ showed that when women are included, the focus was mostly on affective attitude, with none of the included studies exploring the ethical implications of the intervention and the opportunity cost of participation. The absence of these considerations might suggest an underlying assumption that women's input is secondary, potentially linked to their marginalisation in many communities²⁶⁰. To improve the uptake and sustainability of community interventions, it is important to engage women alongside other stakeholders in the co-creation, co-implementation and co-evaluation of the stillbirth prevention interventions.

6.2.2 Understanding the disparities in stillbirth occurrence in Imo State

The stillbirth rate in the study hospitals reported here was notably lower than the rates reported in two tertiary hospital studies conducted in Imo State in 2012^{33,34}. This disparity may be due to the improvement in the stillbirth rate in the ten years between both studies and the complex nature of cases referred to these tertiary hospitals from the primary and secondary hospitals in the state¹³⁷. Stillbirths were more common in the rural hospitals included in this DPhil study than in the urban hospitals. The qualitative interviews with healthcare workers confirmed this observation, attributing it in part to the lack of skilled workers in rural areas due to inadequate working conditions. Aligning with findings in previous studies, the health workers in the study reported here highlighted that rural postings are generally less attractive, hence the shift towards urban centres^{261,262}. A study conducted in another southeastern state in Nigeria reported that health system governance issues such as poor human resource planning, rural-urban salary differentiation, the building of tertiary centres in urban areas, and personal issues like career prospects for health workers and the potential negative effect of rural residence on the health worker's families, are some of the reasons for the inequalities in health worker distribution and retention²⁶³. In keeping with findings from elsewhere, health workers in this study reported that community health extension workers in rural primary health centres often work with minimal

clinical supervision, handling clinical tasks beyond their usual training. These factors likely contribute to the higher stillbirth rates in rural areas.

The absence of detailed service provision data in the study reported here limited the exploration of the differences in stillbirth rates in public, private and mission hospitals included in this study. Insights from previous studies suggest that women with lower economic status choose mission hospitals due to the perceived lower cost barriers, especially in emergencies, as they may sometimes receive subsidised or free maternal healthcare on humanitarian grounds²⁶⁴. Hence, if poorer women are seeking care from mission hospitals, this may partly explain the elevated stillbirth risk in mission hospitals, given the known association between poverty and stillbirths¹⁶. To address this disparity, the government could consider tailored support for mission hospitals in the state to improve access to essential maternal and newborn care services for women from low-income backgrounds. The support could be in the form of financial subsidies, regular skills training for mission hospital staff, strengthening referral systems, including subsidised ambulance services where required, and bridging resource gaps for essential medicines and equipment. These will enable these mission hospitals to deliver safer and more equitable care for at-risk women in the state.

Many women in this study perceived public hospitals to have better-skilled health workers; however, they reported that the consultants may be more accessible in private hospitals. This perception may stem from the recruitment of only registered nurses and midwives in public hospitals, unlike many private and mission hospitals where auxiliary nurses are commonly employed²⁶⁵. In the Nigerian context, an 'auxiliary nurse' is a health care worker who has received only informal nursing training in a medical facility²⁶⁵. Due to the informal nature of the training across various hospitals, the skills acquired vary depending on the facility. Due to the rising costs of running hospitals and inflation in the country, hospital managers often resort to employing

auxiliary nurses alongside licensed nurses to bring down the cost of running the facility^{265,266}. Aborede et al. argue that the continued reliance on poorly trained auxiliary nurses and the poor regulation of their training contributes to the increased maternal, newborn and childhood mortality, especially within the private sector providers²⁶⁶. Additionally, they suggested that the failure of the government to address this issue has led to a proliferation of 'quack' nurses as women inadvertently associate the auxiliary nurses with hospitals, inspiring confidence in the women to seek them out for home childbirths, exacerbating the risk of stillbirths²⁶⁶. While various reasons may influence women's choice of hospital, it behoves the government of Imo State to ensure an appropriate standard of care is maintained across all hospital types to ensure the safety of the woman and their children, regardless of where the women choose to give birth.

6.2.3 The communal culture and its impact on stillbirth

From the findings in this study, it is clear that a woman's community significantly influenced her health choices and behaviour throughout pregnancy. The value of communal involvement in raising and nurturing children is deeply embedded in the Igbo culture, as reflected in many Igbo idioms and common sayings. For instance, *"ofu onye anaghị enwe nwa, nwa bụ nwa oha,"* translates to "one person cannot own a child; a child belongs to the whole clan." Another saying, *"Nne na amụ nwa, ọha na-ele so ya,"* means "The mother gives birth to a child, but the community watches over it." Similarly, *"Ora na-azụ nwa"* means "The community raises a child." These expressions showcase a cultural norm where there is a feeling of shared responsibility in the community for the well-being of pregnant women and children.

This communal mindset can be an asset for improving maternal, newborn and child health, but it also has the potential to cause problems in the context of Imo State as shown in the study reported here. On the one hand, the strong sense of communal responsibility means that pregnant women are not isolated and can tap into a broad social support system throughout pregnancy, potentially

contributing to better outcomes²⁶⁷. On the other hand, this communal approach towards pregnancy exposes women to misinformation and pressure to act on the misinformation. With pregnant women in this study receiving suggestions from the people around them regarding the timing of antenatal booking, where to receive pregnancy care, health behaviours in pregnancy and the health facility to have their baby eventually, the impact of such guidance on stillbirths deserves closer scrutiny. For instance, in the quantitative study reported here, nulliparous women face nearly double the risk of antepartum stillbirths compared with women who have previously given birth. Without the benefit of prior childbirth experience, these women may be more prone to misinformation and acting on this information, a point noted by the interview participants in the study reported here. There is contrasting evidence about the association of nulliparity with stillbirths, with the majority reporting an increased risk^{16,34,268}, and some a reduced risk²². Some researchers argue that the increased stillbirth risk in nulliparous women in high-income settings could be linked to increasing maternal age^{268,269}, whereas in low-income settings, it may be due to younger maternal age, limited access to healthcare and lack of timely access to antenatal care²⁷⁰. An additional finding from this DPhil study is that in addition to the known healthcare access barriers, the pressures from a woman's community may pose further barriers to timely and adequate healthcare access during pregnancy, especially when such pressures involve following incorrect advice.

Furthermore, women's limited healthcare decision-making autonomy²⁷¹, alongside the respectful Igbo culture, often means that younger women are expected to defer to the advice of older community members. As seen in this study, well-intentioned but poorly informed community members may give advice that endangers both the women and their babies.

Notwithstanding the associated challenges, this communal culture presents an underutilised opportunity for improving maternal and newborn outcomes. The natural inclination of community members to look out for pregnant women could be harnessed and improved upon through sustained grassroots health education and behavioural change interventions. Through these interventions, it would be possible to mobilise an ‘army’ of community health advocates who have and can spread the right health information and provide the right support for women throughout their pregnancy, ultimately reducing the risk of stillbirths in the state. An excellent example is the contribution of the Women’s Development Army (WDA) programme to the improvement of maternal and newborn health indices in Ethiopia²⁷².

In the past two decades, low-resource countries which have critical gaps in human resources for healthcare services have increasingly relied on community health volunteers, who are sometimes called lay health workers, community health workers, or unpaid community volunteers²⁷³. Ethiopia launched her community health extension programme in 2004 and successfully integrated it into the primary healthcare system. Building on this success, the WDA was launched in 2010 to amplify the programme’s impact. The structure was such that families of women who learned and practised the 16 health extension packages were recognised as ‘model families’. These women were then appointed as leaders and assigned to serve five households surrounding them²⁷².

The role of the WDA leaders included identifying and tracking pregnancies and illnesses, immunisation monitoring and relaying information about these families to health workers during biweekly meetings with the primary healthcare staff. Their familiarity with the health workers and trusted relationships in the community allowed them to effectively identify and refer women needing medical attention, reducing delays in receiving healthcare²⁷². Following the WDA

introduction in 2010, maternal deaths decreased from 676 per 100,000 livebirths in 2011 to 412 per 100,000 livebirths in 2016, while under-five mortality also reduced from 88 per 1,000 livebirths in 2011 to 67 per 1,000 livebirths in 2016²⁷². In this DPhil study, some women reported they already teach what they know to neighbours and friends and suggested that training and empowering such volunteers could make for an enhanced positive impact.

6.2.4 Attitude towards antenatal care

The quantitative study showed that women who are unbooked when they attend hospitals for labour care and thus have not received antenatal care have a two-fold increased risk of stillbirths compared with booked women who have had a minimum of four antenatal visits. The qualitative insights shed light on the potential ways being unbooked increases the risk of antepartum stillbirths in the study population. The participants identified sociocultural factors such as the preference for traditional birth attendants (TBAs) over formal maternity care, delays in initiating antenatal care, limited decision-making autonomy, misinformation and inadequate access to accurate health information within their communities as key contributors to the elevated antepartum stillbirth risk in this group in general and being unbooked in particular.

It is recommended that women commence antenatal care in the first 12 weeks of pregnancy¹⁸³. Antenatal care provided by skilled birth attendants is an important strategy for improving maternal and newborn health outcomes¹⁸³. However, in Imo State, high antenatal care coverage has not translated into the expected improvement in birth outcomes, indicating a need to examine how antenatal care coverage is measured and what constitutes an ANC visit. In the study reported here, just over two-thirds of women attended four or more antenatal visits. Similarly, according to the 2021 Multiple Indicator Cluster Survey (MICS), 96% and 73% of women in Imo State attended four and eight or more antenatal care visits³¹, respectively, during their most

recent pregnancy. These are some of the highest figures in Nigeria. Yet, birth outcomes remained suboptimal.

Insights from participants in this study offer some potential explanations. Health workers reported that some women register for antenatal care with multiple centres, including TBAs, leading to fragmented care where important risks may be missed. Additionally, drawing from my professional experience and awareness of the local context, some hospitals consider women as "unbooked" if they have had no contact with the hospital for 12 consecutive weeks or more after registering. As described previously, the lack of a standardised definition for unbooked women in epidemiological studies in Nigeria complicates efforts to adequately understand stillbirth risk in this group^{178–180}. The participants in the qualitative study reported here observed that even when women avoid multiple bookings and have attended antenatal care appointments, the superficial nature of care, where doctors ask basic questions and prescribe routine drugs, might lead some women to question the value of antenatal care visits, causing them to miss appointments for extended periods, returning only when they feel unwell or develop complications.

These pointers from the participants' accounts challenge the high antenatal care coverage derived from the DHS and MICS, which is based on household surveys. It remains unclear whether a woman's reported antenatal care visits from the DHS and MICS occurred at a single facility or across multiple facilities. The findings in the study reported here bring into focus a key question about antenatal care coverage in Imo State: is it more crucial to focus on the number of visits or the quality of care delivered during each visit? Even with frequent visits, the benefits of such visits are diminished if the essential feto-maternal assessments and interventions required are lacking

¹⁸³ .

Another related insight from the qualitative study is how women's attendance at antenatal care appointments may sometimes be beyond their control even when they personally wish to attend. The opinions of family members can strongly influence women's interaction with health care, and thus, their health and overall outcomes are affected. In some cases, women are pressured into using TBAs for antenatal care against their wishes due to power dynamics, particularly from their mothers or mothers-in-law who respect TBAs, or in other cases, based on the preference of the family member expected to cover the cost of care.

6.2.5 Behaviours influencing intrapartum care and attitude towards C-section

The findings from the quantitative study align with previous research, which indicates that intrapartum stillbirths are more common than antepartum stillbirths in sub-Saharan Africa^{3,4}. In an ideal scenario in Nigeria, the intrapartum period spanning from the establishment of true labour contractions until the birth of the baby and the placenta should take place in a health facility, where a skilled birth attendant monitors the labour. However, the reality in Imo State is that there are critical gaps in monitoring during the intrapartum period.

Health workers in the study reported here highlighted that some women delay seeking intrapartum care to create a perception of short labour time, while others may choose TBAs or prayer houses or even home births, seeking hospital care only when complications occur. These healthcare choices with the associated delays leave women unmonitored early in the intrapartum period, missing early warning signs and opportunities for critical interventions. Quite often, studies of intrapartum care in Imo State and Nigeria generally focus on the period spent within a hospital. Without an adequate understanding of women's pre-hospital decisions and the timeliness of their actions, for instance, these studies may fail to highlight the compounded risks women face before reaching skilled care, which exacerbates stillbirth risks. A comprehensive approach such as the mixed-methods design adopted in this DPhil research is crucial to fully

identify the challenges and interventions needed to reduce intrapartum stillbirths in these settings.

Intrapartum stillbirths are regarded as an indicator of the quality of care during labour, reflecting the deficiencies in monitoring, skilled care provision and timely interventions²⁷⁴. The risk factors associated with intrapartum stillbirths have been discussed in detail in chapter four; in brief, the failure to use a partogram to monitor labour was identified as a risk factor. Added to this, the insights from women and health workers shed additional insights into reasons why babies may die in the intrapartum period.

Although the study reported here did not specifically focus on intrapartum monitoring, health workers mentioned key gaps that they believed contribute to stillbirths in health facilities. These include the lack of essential diagnostic equipment, unavailability of doctors when timely intervention is required, cost barriers, insufficient skills for intrapartum monitoring, including the use of partograms, particularly in primary health centres, the inability of community health workers and TBAs to recognise complications, and delayed or multiple referrals. While these factors suggest poor quality of intrapartum care, other intrapartum care quality indicators, such as continuity of care, respectful care, and emotional support from companions, amongst others, were not assessed as part of the quantitative study in the participating hospitals²⁷⁵.

Interventions to improve intrapartum outcomes must include access to emergency caesarean section. While the life-saving potential of C-sections is well-documented, in settings like Imo State, it is important to consider the sociocultural and family implications of C-sections as they may complicate the decision process, limiting the effectiveness of the procedure. Some women and their families face potential stigmatisation, and when they have faith-based objections to C-

sections, an additional moral dilemma with the decision to undergo a C-section, sometimes leading to delayed decisions which from the fetal perspective may be fatal.

The C-section rate in the study reported here was 26.3%, higher than a rate of 17.6% found in a recent meta-analysis of data across health institutions in Nigeria²⁷⁶. Beyond monitoring the rates of C-sections, researchers and policymakers need to also understand the factors influencing the acceptance of C-sections, especially in the most vulnerable populations. Insights from such studies could better inform efforts to improve health outcomes when a C-section is indicated. There is conflicting evidence regarding the association of C-section births with an elevated risk of stillbirths in Nigeria; understanding the pathways of this association requires further investigation^{16,22}. Evidence from the study reported here suggests that addressing the underlying sociocultural barriers and health system inefficiencies could potentially ensure timely access to C-sections, maximising its benefit and reducing adverse outcomes.

6.2.6 Referral as a risk factor for stillbirths

Being referred to a different hospital was associated with more than three-fold and 2.5 times increase in the odds of antepartum and intrapartum stillbirths, respectively, among the study population. Referral pathways in Imo State could be from a primary to a secondary facility or sometimes across secondary facilities when a specific service is not available. Tertiary facilities receive very complex cases from all facilities in the state. Interventions that focus on strengthening referral systems have shown benefits in improving maternal and newborn health outcomes²⁷⁷. However, health workers in this study highlighted that women and their families face multiple challenges in accepting referrals, including additional out-of-pocket payments in another facility, distance, availability of transportation and perceptions of the quality of services, especially the experience of care in the new facility. The delays in accepting and acting on the decision to transfer care to another facility can substantially increase the chances of stillbirth.

Additionally, some women and families are reluctant to transfer care due to a negative loop of fear stemming from stories of adverse outcomes in the referral facility they have been advised to go to. Health workers in this study reported that when complications arise during labour while a woman is at a TBA or a primary care centre, the health outcomes would largely depend on the health provider's ability to recognise complications early and facilitate prompt referral to an appropriate hospital. Reluctance to accept referrals is often reinforced by community narratives because the news about deaths in hospitals often circulates in communities without an understanding of the circumstances surrounding these deaths. As a result, these community narratives contribute to an erosion of trust in hospital-based care, especially in the affected hospital, further deterring timely referrals.

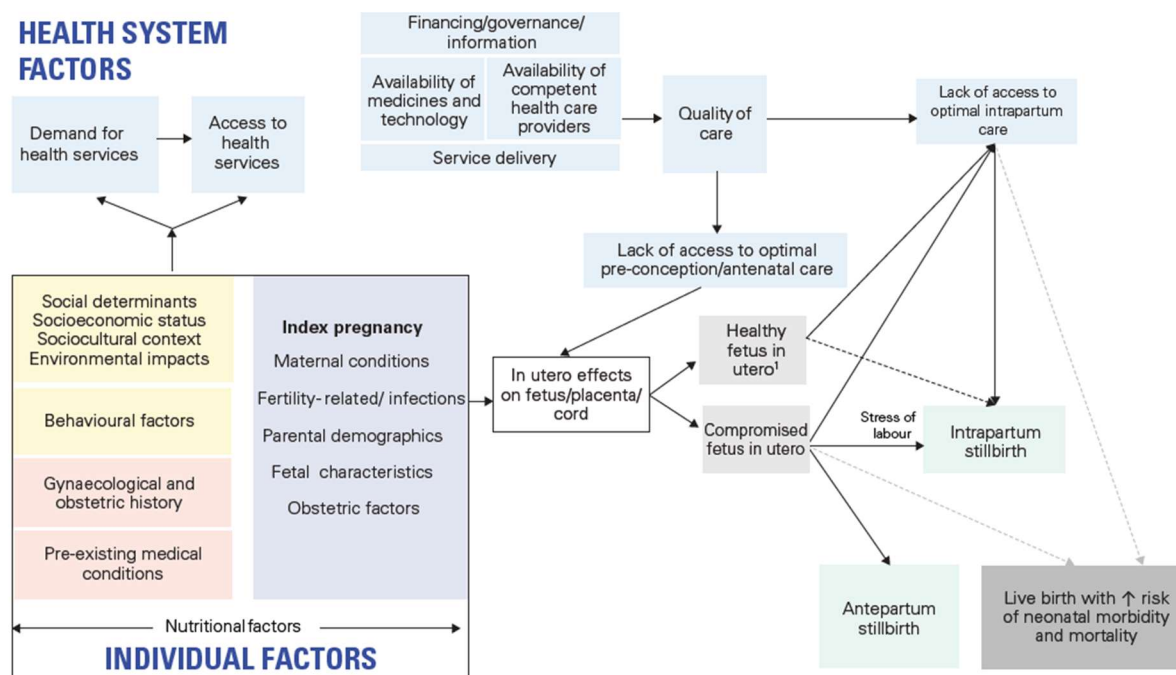
Therefore, to effectively address the elevated risk of stillbirth in women who require referrals, comprehensive interventions are needed to address the economic, individual, sociocultural and transportation barriers to referral acceptance.

6.2.7 Government prevention efforts

The Nigerian government has implemented several intervention projects targeted towards improving maternal, newborn and child health outcomes. Between 2000 and 2019, there was a 19% reduction in the stillbirth rate in Nigeria, potentially attributable to these interventions⁵. A recent scoping review of maternal and newborn health interventions in Nigeria showed that most interventions have focused on the intermediate and social determinants of maternal and newborn health within health facilities, with limited interventions targeting structural social determinants and community context²⁷⁸. A number of these projects were national-level projects, implemented across many Nigerian states, and where evaluations were conducted, had varying reports of effectiveness. Examples of such projects include the Saving One Million Lives initiative targeting

maternal, newborn, and child health interventions²⁷⁹, the midwives service scheme, which increased the supply of skilled midwives in rural communities^{280,281}, and the primary health care under one roof project, which targeted the integration of primary health services and public health intervention at the primary care level for greater efficiency²⁸². Some implementation projects in Nigeria are sadly marred by corruption, leading to misappropriation of the available resources, undermining the intervention impact^{14,283}.

Often, there are challenges in the adaptation of national-level projects at the state level due to variations in infrastructure, resources, and sociocultural factors across regions, especially in very diverse countries like Nigeria. For example, some programme designs may not account for differences in the number of health workers available, hospital capacity, or the population's health-seeking behaviours in each state. A similar scenario also holds for state-level projects as there is marked variability in capacity and resources across the local government areas in Imo State³² as well as other states in Nigeria. These variabilities can lead to differences in implementation and outcomes, with some areas achieving success while others struggle, highlighting the need for flexible implementation frameworks that can be adapted to local contexts for more consistent results.



¹In rare instances, a fetal death resulting in stillbirth may occur in an otherwise healthy fetus due to a catastrophic cord accident with insufficient time to receive care.

Figure 6.1 High-level framework on factors impacting stillbirth in LMICs, reproduced from Blencowe et al.¹⁵²

A recently developed conceptual framework for understanding the pathways to stillbirths in low-middle-income countries (Figure 6.1) suggests that the determinants of stillbirths are often intertwined with individual, socioeconomic, behavioural and health system factors influencing birth outcomes¹⁵². Such frameworks provide a structured approach for policymakers and health system managers to identify critical intervention points for stillbirth prevention.

The evidence for stillbirth prevention provided by this DPhil research highlights several intervention focus areas that align with the framework's insight on individual and health system factors on the pathway of stillbirth occurrence. Examining the framework in the context of Imo State, this DPhil research provides valuable evidence regarding the behavioural, sociocultural, and health system factors unique to Imo State and their potential role in stillbirth occurrences in the

state. However, given the competing limited resources, stakeholders in Imo State may need to prioritise strategic focus areas for intervention.

The quantitative findings reported here indicate that addressing obstetric complications and improving referral systems have the greatest potential to impact antepartum stillbirths. For intrapartum stillbirths, management of obstetric complications and improved intrapartum monitoring, including partogram use, is vital. For both types of stillbirths, the quantitative study suggests prioritising health system factors in the framework, specifically the quality of care. However, the qualitative findings add a critical layer of understanding to the often difficult-to-measure sociocultural influences underlying these factors. For example, hypertensive disorders in pregnancy, which is the leading complication associated with antepartum stillbirths in this study, may not be sufficiently addressed by merely providing screening tools. Without the supportive context from the qualitative study highlighting factors like delay in initiation of antenatal care, inadequate maternal health education, inconsistent antenatal visit attendance, and communal influences on health behaviours, implementation of a generic screening intervention without tailoring the programme to the women's realities could be doomed to failure. Hence, the implementation of prevention frameworks needs to account for local contextual realities to maximise their effectiveness.

Furthermore, with Nigeria's historical focus on hospital-based interventions²⁷⁸, integrating sociocultural approaches to interventions could prove transformative in Imo State. These community-focused strategies address barriers that may appear health-system-related but are embedded in the sociocultural norms. For instance, while lack of access to antenatal care is an important health system factor on the pathway to stillbirths, some women face non-health-system-related barriers, such as mothers-in-law insisting on delayed antenatal care initiation.

The key strategies suggested for preventing stillbirth in this study emphasise empowering women, families, and communities, as well as strengthening health systems. Health education for women and their families, especially in the antenatal period, is essential to empower women to make informed healthcare decisions, while economic empowerment and health subsidies have been shown to reduce the cost barriers to accessing quality care¹⁸⁹. For these interventions to be effective, they must be acceptable and designed in a way that they meet women's needs and constraints. For instance, some women reported that the group-based health education sessions in some hospitals were sometimes scheduled on separate days from women's antenatal appointments, or they may start late and run over, making it problematic for women who are unable to take multiple days off work or stay longer during hospital visits. Consequently, even women who want to participate in these health education sessions are sometimes unable to benefit from them.

The participants in this study stressed the importance of engaging important stakeholders in the community, including the women, for intervention development and implementation. Particularly, participants emphasised the need to involve religious, political, and community leaders in dialogues to dispel myths and jointly create an enabling environment for women to receive the social and institutional support they need to access high-quality care throughout pregnancy and childbirth.

Finally, there is a need to generate evidence about effective stillbirth prevention interventions to identify successful components and reduce research waste. Interventions implemented for maternal health and stillbirth prevention in Imo State and other parts of Nigeria are often multipronged projects²⁷⁸. They address various factors such as health education, policy changes, health service provision and other factors thought to contribute to the complex causes of poor maternal health outcomes, including stillbirths. Such projects require comprehensive evaluations

to inform the replication of successful strategies. Evaluations enable better decision-making for refining ongoing programmes and justifying the scale of successful interventions, given the limited health resources in Nigeria. Sadly, these evaluations, although crucial, are often limited²⁸⁴. Kana et al., in a review of maternal and child health interventions in Nigeria, reported difficulties in obtaining inventory and evaluation reports of interventions²⁸⁴ as many of these reports are held by government agencies and funders and are not published in academic journals or elsewhere. Of the national maternal and newborn health projects implemented in Imo State, the researcher was only able to identify a few evaluation reports for malaria prevention programmes during pregnancy. The absence of accessible data on what works in these complex interventions hinders the ability to learn from and scale up effective strategies.

The limited success of previous interventions in reducing stillbirths may be related to their predominant focus on health facility-based approaches, compared with community-focused interventions, as highlighted in the scoping review by Nasir et al.²⁷⁸ While these largely hospital-focused interventions achieved some progress by addressing the easier wins for stillbirth prevention, the more complex challenges such as sociocultural and community-level changes, which are far more difficult to tackle, have remained insufficiently prioritised. Furthermore, the participants in the qualitative study emphasised the need for long-term thinking in designing programmes that address deeply rooted community barriers, such as the stigma surrounding C-sections. They suggested that successful strategies would require repeated cycles of interventions and a sustained government-led approach rather than the short-term approaches often favoured by donor-funded projects.

The design of stillbirth intervention projects in Imo State must be undertaken with a deep understanding of the diversity in health behaviours often seen within the same target population. A uniform approach may lead to ineffective outcomes of interventions as women facing the same

challenge may respond in very different ways. For instance, in the qualitative study, it was reported that some pregnant women were overmedicating, often using inappropriate medications obtained from local drug vendors, while others were unable to access essential medicines. A robust public health response to this dual reality would acknowledge that this scenario is not simply about poverty limiting access to essential medicines. Although the economic barriers exist for some women, other women have the means to access medications but may make risky choices due to misinformation and/or cultural beliefs. A similar example is that some women do not register in hospitals for antenatal care, while others have multiple registrations.

Therefore, public health responses in Imo State need to go beyond one-size-fits-all solutions, recognising both ends of the spectrum. Public health interventions, as in this example, should ensure appropriate medication access for those facing economic barriers while simultaneously guiding those who can access medications towards safer usage. To achieve such a robust public health response, there is a need to examine existing policies critically, and question approaches that may have worked in some places and seemingly failed in others. Rather than relying on quick fixes or unadapted template-based projects, focusing on multifaceted interventions that are context-specific, co-designed with relevant stakeholders, including women, adaptable and culturally relevant, offers more hope for achieving meaningful change in stillbirths in the state.

6.3 Strengths and limitations of the study

This DPhil project has several significant strengths. By adopting a mixed methods approach, this research provides a comprehensive understanding of the available evidence of community-based interventions previously implemented in sub-Saharan Africa; it sheds light on the determinants of stillbirth in Imo State and leverages qualitative data to provide a nuanced understanding of the identified determinants. Additionally, the study draws on the perspectives of women who have

used hospitals and health workers in Imo State. This approach allowed for the grounding of preventive strategies suggested in the participants' lived experiences and insights, which is important for the co-creation of meaningful interventions.

This research also utilised data from diverse sources, which enhanced the robustness of the insights generated. It incorporates insights from a review of previous community-based interventions in SSA and includes quantitative data collected from public, private, and mission hospitals located both in urban and rural areas of the state to ensure representativeness and diversity in the findings. Additionally, the separation of risk factor analysis for antepartum and intrapartum stillbirths allowed for the identification of risk factors specific to the two types of stillbirths. Furthermore, the inclusion of women who have experienced stillbirths and near-misses, as well as health workers from hospitals and community settings, in the qualitative study broadened the perspectives, providing a more comprehensive and holistic understanding of the determinants of stillbirths, thereby strengthening the findings.

Finally, to the best of the researcher's knowledge, this is the first study in Imo State to assess the determinants of intrapartum and antepartum stillbirths using a mixed-methods approach. The qualitative study offers deeper insights into the sociocultural, behavioural, and systemic factors influencing the occurrence of stillbirths in the state. This study fills a gap in the local information in Imo State, providing valuable evidence for policymakers to develop contextual and targeted interventions to address the underlying factors leading to stillbirths and improve maternal and childbirth outcomes.

A key limitation of this study is the restriction of data collection to local government areas (LGAs) in Imo State, which were considered safe at the time of data collection, limiting the geographic representativeness of the findings. However, including the three LGAs in the capital city, which

are considered the most demographically and socioeconomically diverse in the state, provides valuable insights potentially reflecting the broader trends in the state³². Additionally, inadequate documentation of care processes and women's sociodemographic factors affected the availability of potentially important variables for risk factor analysis, reducing the overall robustness of the quantitative analysis. For instance, the association of variables such as maternal education, maternal and birthweight, and duration of labour, among others with stillbirths, could not be assessed due to inconsistent documentation of these variables across hospitals. These limitations should be considered when interpreting the findings, as they may affect the validity of the study conclusions.

A further limitation resulted from the constrained resources available for this DPhil project. Due to limited budget and time restrictions, the sample size was limited to what was necessary for achieving internal validity. However, a larger sample size for the quantitative study could have provided greater statistical power to detect risk factors with smaller effect sizes that may not have been detected in the current quantitative analysis. Additionally, a larger qualitative sample would have allowed the researcher to conduct additional interviews until both theoretical and data saturation were achieved, ensuring that no relevant themes were overlooked. To partly address this potential limitation, and an attempt was made to ensure some variation among participants within each study group for the qualitative study^{207,285}.

6.4 Study implications for policy and practice

This research highlights the need for a comprehensive and multifaceted community-focused approach to stillbirth prevention in Imo State. Combining insights from the quantitative findings on associated risk factors with the qualitative insights from the women and health workers has generated robust evidence, adding to the already existing evidence synthesised by the systematic review. This has significant policy implications. The findings call for the development of a

comprehensive stillbirth prevention strategy addressing factors contributing to stillbirths at the level of the woman, her community and the health system.

In Imo State, where communal bonds shape daily life and women spend more time in their communities than in hospitals, a community-centred approach would not just be beneficial but essential for prevention. Building on the systematic review findings that highlight women's limited involvement in designing and evaluating interventions, policymakers must include women, their families and community leaders in the intervention design process. This approach focusing on inclusion and co-creation will ensure that interventions are tailored to the community's needs, promoting intervention adoption, sustainability and long-term impact. There is a need to collectively champion stillbirth prevention, aligning efforts in supporting women and reducing risks. Evidence from other settings in SSA shows that integrating prevention through existing community structures can enhance health participation and outcomes^{286,287}.

The findings also emphasise the importance of addressing the broader social determinants of stillbirths. Participants in this study suggested potential interventions, which are presented in [Figure 5.2](#). This research indicates that achieving meaningful progress requires a comprehensive strategy that not only improves the quality of maternal healthcare within facilities but also addresses community-driven risks. The current study aligns with previous studies advocating for integrated strategies which could yield greater benefits^{136,257,288}.

6.5 Study recommendations

The key recommendations emerging from this research are presented below.

- **Recommendations for health workers**
 - Health workers should undergo regular training focusing on identification and managing obstetric complications as well as improving doctor-patient

interactions. When health workers are equipped with these skills, they can improve the overall quality of care and health outcomes.

- Establishment of feedback mechanisms to ensure women can share their care experiences and empower health workers to make necessary improvements.
- Developing and enforcing the use of standardised maternal care protocols and guidelines to reduce variations in practice and care outcomes. The partogram is a simple and effective tool for monitoring labour. It should be used to monitor women in labour regardless of whether the baby is still alive at the onset of care in labour.
- Prioritise antenatal care for nulliparous women. This could be in the form of targeted health education, tailored support and more frequent monitoring to reduce stillbirth risk.
- Improve counselling for C-sections by involving persons close to the woman who could potentially influence her healthcare decisions, for example, her husband, in the counselling process. This approach could help to reduce the surrounding stigma and ease acceptance of the procedure.
- Improve care process documentation in patient records, as accuracy and completeness of documentation are important for delivering good quality care as well as supporting retrospective studies. Effective data extraction and risk factor analysis are contingent on robust process documentation.
- Routinely weigh all babies, including those who are stillborn. This is essential for monitoring trends and for epidemiological studies investigating stillbirths.
- Health workers should conduct routine reviews of stillbirths and near-misses to identify patterns and areas for targeted quality improvement initiatives and policy adjustments.

- **Recommendation for policymakers**

- Develop policies that address the persistent financial barriers to maternal healthcare, which often prompt women and their families to seek alternative and sometimes suboptimal care. This might include strategies such as expanding health coverage and providing subsidised or incentivised maternal health services in public facilities, which could improve equitable access to quality maternal health services.
- Design and implement comprehensive health education programmes targeting the entire community through sustained health awareness campaigns. It is clear that women should not be educated in isolation as their health behaviours are heavily influenced by their families and communities.
- Institute multisectoral/multidisciplinary maternal health forums at the grassroots level, with periodic engagement meetings to foster local collaboration in addressing specific local maternal health challenges. Strategies might include, for example, leveraging the annual August meetings, identifying and training women health champions for health promotion, identifying traditional and political maternal health champions, and setting up emergency transport systems. These strategies would empower the community to adopt an active role in reducing stillbirths, with health workers providing feedback during community meetings to maintain engagement and motivation.
- Enact policies to regulate alternative care providers in Imo State. With the continued reliance on alternative care providers in the state, it is important to establish standards that ensure proper training, safer practices, and accountability by alternative care providers.

- **Recommendation for researchers**

- Conduct integrated health systems research incorporating healthcare quality improvement initiatives, such as staff training and partogram use to optimise facility-based services, alongside tailored community intervention to improve the demand and reduce barriers to access.
- Future research should assess the effectiveness of past and ongoing community-based and facility-level stillbirth prevention interventions in Imo State to provide valuable insights for scaling up effective interventions.
- Researchers should consider conducting randomised controlled trials of culturally tailored interventions suggested in this study, such as trained community health champions or community health dialogues. These trials could offer robust evidence on effective stillbirth interventions.

6.6 Conclusions

This study aimed to estimate the incidence and investigate the determinants of antepartum and intrapartum stillbirths and utilise women's and health workers' insights to generate evidence-based recommendations for community-based stillbirth prevention in Imo State, Nigeria.

Key findings from this research are in agreement with previous research suggesting that a multifaceted approach involving the women who receive care, their families and communities, the health providers and the government is required to effectively prevent stillbirth occurrence in the state.

The identified risk factors associated with stillbirths, although consistent with previous research in Nigeria, provide new evidence by showing that factors such as unbooked pregnancies and nulliparity mostly affect antepartum stillbirths, not intrapartum stillbirths^{172,289–291}, whereas the use of partogram and obstetric complications mainly affect intrapartum stillbirths. Additionally,

the qualitative findings highlighted the often hidden and hard-to-measure social conditions that underlie these risk factors, demonstrating the broader social mechanisms contributing to stillbirths in the State.

Overall, this study reaffirms that stillbirths remain an important public health concern in Imo State; however, the underlying factors go beyond clinical care. A comprehensive approach is required, combining both health system reforms and community-driven approaches, with key recommendations including improving health education, quality of care standardisation, strengthening referral systems, and regulation of alternative care practices. Importantly, the study emphasises that in addressing the known risk factor, interventions must also target the underlying social factors at the root of these risks. Interventions should be co-designed and implemented in collaboration with local stakeholders, including women, even if they have been proven effective in other parts of Nigeria and Sub-Saharan Africa, to ensure their local relevance and acceptability in improving maternal and neonatal health outcomes.

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Appendices

Appendix 1: Publications in peer-reviewed literature from this research

Publication I: Types, reporting and acceptability of community-based interventions for stillbirth prevention in sub-Saharan Africa (SSA): a systematic review

Gwacham-Anisiobi, U., Boo, Y.Y., Oladimeji, A., Kurinczuk, J.J., Roberts, N., Opondo, C. and Nair, M., 2023. Types, reporting and acceptability of community-based interventions for stillbirth prevention in sub-Saharan Africa (SSA): a systematic review. *EClinicalMedicine*, 62.

Articles

Types, reporting and acceptability of community-based interventions for stillbirth prevention in sub-Saharan Africa (SSA): a systematic review



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Summary

Background Community-based interventions are increasingly being implemented in Sub-Saharan Africa (SSA) for stillbirth prevention, but the nature of these interventions, their reporting and acceptability are poorly assessed. In addition to understanding their effectiveness, complete reporting of the methods, results and intervention acceptability is essential as it could potentially reduce research waste from replication of inadequately implemented and unacceptable interventions. We conducted a systematic review to investigate these aspects of community-based interventions for preventing stillbirths in SSA.

Methods In this systematic review, eight databases (MEDLINE(OvidSP), Embase (OvidSP), Cochrane Central Register of Controlled Trials, Global Health, Science Citation Index and Social Science Citation index (Web of Science Core Collection), CINAHL (EBSCOhost) and Global Index Medicus) and four grey literature sources were searched from January 1, 2000 to July 7, 2023 for relevant quantitative and qualitative studies from SSA (PROSPERO-CRD42021296623). Following deduplication, abstract screening and full-text review, studies were included if the interventions were community-based with or without a health facility component. The main outcomes were types of community-based interventions, completeness of intervention reporting using the TIDier (Template for Intervention Description and replication) checklist, and themes related to intervention acceptability identified using a theoretical framework. Study quality was assessed using the Cochrane risk of bias and National Heart, Lung and Blood Institute's tools.

Findings Thirty-nine reports from thirty-four studies conducted in 18 SSA countries were eligible for inclusion. Four types of interventions were identified: nutritional, infection prevention, access to skilled childbirth attendants and health knowledge/behaviour of women. These interventions were implemented using nine strategies: mHealth (defined as the use of mobile and wireless technologies to support the achievement of health objectives), women's groups, community midwifery, home visits, mass media sensitisation, traditional birth attendant and community volunteer training, community mobilisation and transport vouchers. The completeness of reporting using the TIDier checklist varied across studies with a very low proportion of the included studies reporting the intervention intensity, dosing, tailoring and modification. The quality of the included studies were graded as poor (n = 6), fair (n = 14) and good (n = 18). Though interventions were acceptable, only 4 (out of 7) studies explored women's perceptions, mostly focusing on perceived intervention effects and how they felt, omitting key constructs like ethicality, opportunity cost and burden of participation.

Interpretation Different community-based interventions have been tried and evaluated for stillbirth prevention in SSA. The reproducibility and implementation scale-up of these interventions may be limited by incomplete intervention descriptions in the published literature. To strengthen impact, it is crucial to holistically explore the acceptability of these interventions among women and their families.

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Gwacham-Anisiobi, U., Boo, Y.Y., Oladimeji, A., Kurinczuk, J.J., Roberts, N., Opondo, C. and Nair, M., 2024. Effects of community-based interventions for stillbirths in sub-Saharan Africa: a systematic review and meta-analysis. *EClinicalMedicine*, 67.

Effects of community-based interventions for stillbirths in sub-Saharan Africa: a systematic review and meta-analysis



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Summary

Background Sub-Saharan Africa (SSA) alone contributed to 42% of global stillbirths in 2019, and the rate of stillbirth reduction has remained slow. There has been an increased uptake of community-based interventions to combat stillbirth in the region, but the effects of these interventions have been poorly assessed. Our objectives were to examine the effect of community-based interventions on stillbirth in SSA.

Methods In this systematic review and meta-analysis, we searched eight databases (MEDLINE [OvidSP], Embase [OvidSP], Cochrane Central Register of Controlled Trials, Global Health, Science Citation Index and Social Science Citation index [Web of Science Core Collection], CINAHL [EBSCOhost] and Global Index Medicus) and four grey literature sources from January 1, 2000 to July 7, 2023 for relevant studies from SSA. Community-based interventions targeting stillbirths solely or as part of complex interventions, with or without hospital interventions were included, while hospital-only interventions, microcredit schemes and maternity waiting home interventions were excluded. Study quality was assessed using the Cochrane risk of bias and National Heart, Lung and Blood Institute's tools. The study outcome was odds of stillbirth in intervention versus control communities. Pooled odds ratios (ORs) were estimated using random-effects models, and subgroup analyses were performed by intervention type and strategies. Publication bias was evaluated by funnel plot and Egger's test. This study is registered with PROSPERO, CRD42021296623.

Findings Of the 4223 records identified, seventeen studies from fifteen SSA countries were eligible for inclusion. One study had four arms (community only, hospital only, community and hospital, and control arms), so information was extracted from each arm. Analysis of 13 of the 17 studies which had community-only intervention showed that the odds of stillbirth did not vary significantly between community-based intervention and control groups (OR 0.96; 95% CI 0.78–1.17, $I^2 = 57\%$, $p \leq 0.01$, $n = 63,884$). However, analysis of four (out of five) studies that included both community and health facility components found that in comparison with community only interventions, this combination strategy significantly reduced the odds of stillbirth by 17% (OR 0.83; 95% CI 0.79–0.87, $I^2 = 11\%$, $p = 0.37$, $n = 244,868$), after excluding a study with high risk of bias. The quality of the 17 studies were graded as poor ($n = 2$), fair ($n = 9$) and good ($n = 6$).

Interpretation Community-based interventions alone, without strengthening the quality and capacity of health facilities, are unlikely to have a substantial effect on reducing stillbirths in SSA.

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Published Online 22
December 2023
<https://doi.org/10.1016/j.eclinm.2023.102386>

Publication III: Rates and risk factors for antepartum and intrapartum stillbirths in 20 secondary hospitals in Imo State, Nigeria: a hospital-based case-control study.

Gwacham-Anisiobi, U., Opondo, C., Cheng, T.S., Kurinczuk, J.J., Anyaegbu, G. and Nairl, M., 2024. Rates and risk factors for antepartum and intrapartum stillbirths in 20 secondary hospitals in Imo State, Nigeria: A hospital-based case control study. *PLOS Global Public Health*, 4(10), p.e0003771.

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RESEARCH ARTICLE

Rates and risk factors for antepartum and intrapartum stillbirths in 20 secondary hospitals in Imo state, Nigeria: A hospital-based case control study

Uchenna Gwacham-Anisiobi✉, Charles Opondo, Tuck Seng Cheng, Jennifer J. Kurinczuk, Geoffrey Anyaegbu, Manisha Nairl

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ArticleAuthorsMetricsCommentsMedia CoveragePeer Review

Abstract

Introduction

Methods

Results

Discussion

Supporting information

References

Reader Comments

Figures

Abstract

Despite Nigeria's stillbirth rate reducing from 28.6 to 22.5 per 1,000 births from 2000–2021, progress trails comparable indicators and regional variations persist. We assessed stillbirth incidences and associated risk factors in 20 secondary hospitals in Imo state, to generate essential local evidence to inform policymaking to reduce mortality. The total numbers of births and their outcomes were determined through hospital maternity registers. An unmatched case-control study was conducted. We collected retrospective data about 157 antepartum and 193 intrapartum stillbirths, and from 381 livebirths (controls). Potential risk factors were categorised into sociodemographic, obstetric and maternity care and biological determinants using a theoretical framework. Independent multivariable logistic regression models were used to investigate the association of risk factors with each stillbirth type. The overall stillbirth rate was 38 per 1,000 total births. The rate of antepartum and intrapartum stillbirths were 16 and 19 per 1,000 respectively. The risk factors independently associated with antepartum stillbirths were nulliparity (adjusted odds ratio (aOR) 1.87, 95%CI 1.04–3.36); preterm birth (aOR 14.29, 95%CI 6.31–32.38); being referred from another facility (aOR 3.75, 95%CI 1.96–7.17); unbooked pregnancy (aOR 2.58, 95%CI 1.37–4.85); and obstetric complications (aOR 4.04, 95%CI 2.35–6.94). For intrapartum stillbirths, associated factors were preterm birth (aOR 11.28, 95%CI 4.66–27.24); referral (aOR 2.50, 95%CI 1.19–5.24); not using a partogram (aOR 2.92, 95%CI 1.23–6.95) and obstetric complications (aOR 10.71, 95%CI 5.92–19.37). The findings highlight specific risk factors associated with antepartum and intrapartum stillbirths, shedding light on potential areas for targeted interventions.

Publication (in development)

One research output is currently in review and yet to be published at the time of submission of this thesis.

Publication IV: When culture meets care: exploring sociocultural obstacles to medical advice in pregnancy in Nigeria.

Appendix 2: systematic review search strategy

Search strings used in different databases

CINAHL

#	Query	Results
S19	S4 AND S12 AND S15 AND S18	324
S18	S16 OR S17	144,649
S17	TX Angola or Benin or Botswana or "Burkina Faso" or Burundi or Cameroon or "Cape Verde" or "Cabo verde" or "Central African Republic" or Chad or Comoros or Congo or Djibouti or "Equatorial Guinea" or Eritrea or Ethiopia or Gabon or Gambia or Ghana or Guinea or "Ivory Coast" or "Cote d'Ivoire" or Jamahiriya or Jamahiriya or Kenya or Lesotho or Liberia or Libya or Libia or Madagascar or Malawi or Mali or Mauritania or Mauritius or Mayote or Mozambique or Mocambique or Namibia or Niger or Nigeria or Principe or Reunion or Rwanda or "Sao Tome" or Senegal or Seychelles or "Sierra Leone" or Somalia or "South Africa" or "St Helena" or Sudan or Swaziland or Tanzania or Togo or Tunisia or Uganda or "Western Sahara" or Zaire or Zambia or Zimbabwe or "Central Africa" or "Central African" or "West Africa" or "West African" or "Western Africa" or "Western African" or "East Africa" or "East African" or "Eastern Africa" or "Eastern African" or "South African" or "Southern Africa" or "Southern African" or "sub Saharan Africa" or "sub Saharan African" or "subSaharan Africa" or "subSaharan African"	138,405
S16	(MH "Africa") OR (MH "Africa South of the Sahara+")	83,873
S15	S13 OR S14	37,639
S14	TI ((stillbirth* or ((perinatal or fetal or foetal or fetus or intrauterine or intra-uterine) N1 (death* or mortality)))) OR AB ((stillbirth* or ((perinatal or fetal or foetal or fetus or intrauterine or intra-uterine) N1 (death* or mortality))))	9,810
S13	(MH "Perinatal Death") OR (MH "Pregnancy Complications/MO") OR (MH "Pregnancy Outcomes")	33,562
S12	S5 OR S6 OR S7 OR S8 OR S9 OR S10 OR S11	367,211
S11	TI (((community N2 intervention*) or community mobilization or community mobilisation or birth attendant* or community health worker* or community worker* or home visit* or women* groups or mother* groups or mobile health or mhealth or m-health or mobile phone* or cellphone* or cell phone* or smartphone* or health promotion or health education or national program* or nutritional intervention* or nutritional program* or smoking cessation or ((stop* or quit*) N2 smok*))) OR AB (((community N2 intervention*) or community mobilization or community mobilisation or birth attendant* or community health worker* or community worker* or home visit* or women* groups or mother* groups or mobile health or mhealth or m-health or mobile phone* or cellphone* or cell phone* or smartphone* or health promotion or health education or national program* or nutritional intervention* or nutritional program* or smoking cessation or ((stop* or quit*) N2 smok*)))	169,349
S10	(MH "Cellular Phone+")	8,775
S9	(MH "Smoking Cessation") OR (MH "Smoking Cessation Programs")	24,094
S8	(MH "National Health Programs")	69,175
S7	(MH "Health Education") OR (MH "Nutrition Education") OR (MH "Health Promotion")	101,657
S6	(MH "Midwives+") OR (MH "Community Health Workers")	20,196

S5	(MH "Community Health Services") OR (MH "Community Programs") OR (MH "Community Health Centers")	38,184
S4	S1 OR S2 OR S3	273,961
S3	TI (pregnan* or maternal care) OR AB (pregnan* or maternal care)	154,084
S2	(MH "Maternal Health Services+")	33,843
S1	(MH "Pregnancy") OR (MH "Expectant Mothers")	219,431

[Web of Science](#)

Web of Science Core Collection – Science Citation Index and Social Science Citation Index

#1	TS=(pregnan* or maternal care)
#2	TS=((community NEAR/2 intervention*) or community mobilization or community mobilisation or birth attendant* or community health worker* or community worker* or home visit* or women* groups or mother* groups or mobile health or mhealth or m-health or mobile phone* or cellphone* or cell phone* or smartphone* or health promotion or health education or national program* or nutritional intervention* or nutritional program* or smoking cessation or ((stop* or quit*) NEAR/2 smok*))
#3	TS=(stillbirth* or ((perinatal or fetal or foetal or fetus or intrauterine or intra-uterine) NEXT (death* or mortality)))
#4	TS=(Angola or Benin or Botswana or "Burkina Faso" or Burundi or Cameroon or "Cape Verde" or "Cabo verde" or "Central African Republic" or Chad or Comoros or Congo or Djibouti or "Equatorial Guinea" or Eritrea or Ethiopia or Gabon or Gambia or Ghana or Guinea or "Ivory Coast" or "Cote d'Ivoire" or Jamahiriya or Jamahiryia or Kenya or Lesotho or Liberia or Libya or Libia or Madagascar or Malawi or Mali or Mauritania or Mauritius or Mayote or Mozambique or Mocambique or Namibia or Niger or Nigeria or Principe or Reunion or Rwanda or "Sao Tome" or Senegal or Seychelles or "Sierra Leone" or Somalia or "South Africa" or "St Helena" or Sudan or Swaziland or Tanzania or Togo or Tunisia or Uganda or "Western Sahara" or Zaire or Zambia or Zimbabwe or "Central Africa" or "Central African" or "West Africa" or "West African" or "Western Africa" or "Western African" or "East Africa" or "East African" or "Eastern Africa" or "Eastern African" or "South African" or "Southern Africa" or "Southern African" or "sub Saharan Africa" or "sub Saharan African" or "subSaharan Africa" or "subSaharan African") OR CU=(Angola or Benin or Botswana or "Burkina Faso" or Burundi or Cameroon or "Cape Verde" or "Cabo verde" or "Central African Republic" or Chad or Comoros or Congo or Djibouti or "Equatorial Guinea" or Eritrea or Ethiopia or Gabon or Gambia or Ghana or Guinea or "Ivory Coast" or "Cote d'Ivoire" or Jamahiriya or Jamahiryia or Kenya or Lesotho or Liberia or Libya or Libia or Madagascar or Malawi or Mali or Mauritania or Mauritius or Mayote or Mozambique or Mocambique or Namibia or Niger or Nigeria or Principe or Reunion or Rwanda or "Sao Tome" or Senegal or Seychelles or "Sierra Leone" or Somalia or "South Africa" or "St Helena" or Sudan or Swaziland or Tanzania or Togo or Tunisia or Uganda or "Western Sahara" or Zaire or Zambia or Zimbabwe or "Central Africa" or "Central African" or "West Africa" or "West African" or "Western Africa" or "Western African" or "East Africa" or "East African" or "Eastern Africa" or "Eastern African" or "South African" or "Southern Africa" or "Southern African" or "sub Saharan Africa" or "sub Saharan African" or "subSaharan Africa" or "subSaharan African")
#5	#1 AND #2 AND #3 AND #4

[Medline](#) (Ovid MEDLINE® Epub Ahead of Print, In-Process & Other Non-Indexed Citations, Ovid MEDLINE® Daily and Ovid MEDLINE®) 1946 to present

1	Pregnancy/ or Pregnant Women/	955073
2	exp Maternal Health Services/	55907
3	(pregnan* or maternal care).mp.	1092842
4	1 or 2 or 3	1101186
5	community health services/ or community participation/	50120
6	Midwifery/ or Community Health Workers/	26676
7	health education/ or health promotion/	135767
8	National Health Programs/	33239
9	Smoking Cessation/	31679
10	exp Cell Phone/	20631
11	((community adj2 (intervention* or program*)) or community mobilization or community mobilisation or midwives or midwifery or birth attendant* or community health worker* or community worker* or home visit* or women* groups or mother* groups or mobile health or mhealth or m-health or mobile phone* or cellphone* or cell phone* or smartphone* or text messag* or health promotion or health education or national program* or nutrition* intervention* or nutrition* program* or smoking cessation or ((stop* or quit*) adj2 smok*).mp.	356531
12	5 or 6 or 7 or 8 or 9 or 10 or 11	425883
13	perinatal death/ or fetal death/ or stillbirth/	31143
14	fetal mortality/ or perinatal mortality/	2895
15	Pregnancy Outcome/	55913
16	Pregnancy Complications/mo	1807
17	(stillbirth* or ((perinatal or fetal or foetal or fetus or intrauterine or intra-uterine) adj (death? or mortality))).mp.	54931
18	13 or 14 or 15 or 16 or 17	102988
19	Africa/ or exp "Africa South of the Sahara"/	269038
20	(Angola or Benin or Botswana or "Burkina Faso" or Burundi or Cameroon or "Cape Verde" or "Cabo verde" or "Central African Republic" or Chad or Comoros or Congo or Djibouti or "Equatorial Guinea" or Eritrea or Ethiopia or Gabon or Gambia or Ghana or Guinea or "Ivory Coast" or "Cote d'Ivoire" or Jamahiriya or Jamahiriya or Kenya or Lesotho or Liberia or Libya or Libia or Madagascar or Malawi or Mali or Mauritania or Mauritius or Mayote or Mozambique or Mocambique or Namibia or Niger or Nigeria or Principe or Reunion or Rwanda or "Sao Tome" or Senegal or Seychelles or "Sierra Leone" or Somalia or "South Africa" or "St Helena" or Sudan or Swaziland or Tanzania or Togo or Tunisia or Uganda or "Western Sahara" or Zaire or Zambia or Zimbabwe or "Central Africa" or "Central African" or "West Africa" or "West African" or "Western Africa" or "Western African" or "East Africa" or "East African" or "Eastern Africa" or "Eastern African" or "South African" or "Southern Africa" or "Southern African" or "sub Saharan Africa" or "sub Saharan African" or "subSaharan Africa" or "subSaharan African").mp.	530182
21	19 or 20	556312
22	4 and 12 and 18 and 21	573

Global Index Medicus – limit to AIM

(pregnan* OR maternal) AND (community OR "birth attendant*" OR "home visit*" OR "womens groups" OR "mothers groups" OR "mobile health" OR mhealth OR m-health OR "mobile phone*" OR cellphone* OR "cell phone*" OR smartphone* OR "health promotion" OR "health education" OR "national program*" OR "nutritional intervention*" OR "nutrition intervention*" OR "nutrition program*" OR "nutritional program*" OR "smoking cessation" OR "stop smoking" OR "quit smoking") AND (stillbirth* OR "perinatal death*" OR "perinatal mortality" OR "fetal death*" OR "fetal mortality" OR "foetal death*" OR "foetal mortality" OR "fetus death*" OR "fetus mortality" OR "foetus death*" OR "foetus mortality" OR "intrauterine death*" OR "intrauterine mortality" OR "intra-uterine death*" OR "intra-uterine mortality")

Global Health

1	Pregnancy/ or Pregnant Women/	108579
2	(pregnan* or maternal care).mp.	137929
3	1 or 2	137929
4	community health/ or community health services/ or community involvement/ or community nutrition/ or community programmes/	20873
5	community health workers/ or midwives/ or traditional birth attendants/	4224
6	health education/ or health promotion/	46325
7	health programmes/	26608
8	Smoking Cessation/	7464
9	mobile telephones/	4145
10	nutrition programmes/ or nutritional interventions/	7303
11	((community adj2 (intervention* or program*)) or community mobilization or community mobilisation or midwives or midwifery or birth attendant* or community health worker* or community worker* or home visit* or women* groups or mother* groups or mobile health or mhealth or m-health or mobile phone* or cellphone* or cell phone* or smartphone* or text messag* or health promotion or health education or national program* or nutrition* intervention* or nutrition* program* or smoking cessation or ((stop* or quit*) adj2 smok*)).mp.	112424
12	4 or 5 or 6 or 7 or 8 or 9 or 11	140360
13	fetal death/ or stillbirths/	4990
14	perinatal mortality/	1664
15	(stillbirth* or ((perinatal or fetal or foetal or fetus or intrauterine or intra-uterine) adj (death? or mortality))).mp.	9048

16	13 or 14 or 15	9048
17	exp "africa south of sahara"/	205521
18	(Angola or Benin or Botswana or "Burkina Faso" or Burundi or Cameroon or "Cape Verde" or "Cabo verde" or "Central African Republic" or Chad or Comoros or Congo or Djibouti or "Equatorial Guinea" or Eritrea or Ethiopia or Gabon or Gambia or Ghana or Guinea or "Ivory Coast" or "Cote d'Ivoire" or Jamahiriya or Jamahirya or Kenya or Lesotho or Liberia or Libya or Libia or Madagascar or Malawi or Mali or Mauritania or Mauritius or Mayote or Mozambique or Mocambique or Namibia or Niger or Nigeria or Principe or Reunion or Rwanda or "Sao Tome" or Senegal or Seychelles or "Sierra Leone" or Somalia or "South Africa" or "St Helena" or Sudan or Swaziland or Tanzania or Togo or Tunisia or Uganda or "Western Sahara" or Zaire or Zambia or Zimbabwe or "Central Africa" or "Central African" or "West Africa" or "West African" or "Western Africa" or "Western African" or "East Africa" or "East African" or "Eastern Africa" or "Eastern African" or "South African" or "Southern Africa" or "Southern African" or "sub Saharan Africa" or "sub Saharan African" or "subSaharan Africa" or "subSaharan African").mp.	254069
19	17 or 18	254069
20	3 and 12 and 16 and 19	208

[Embase](#)

1	Pregnancy/ or Pregnant Woman/	706848
2	Maternal Health Service/	2491
3	(pregnan* or maternal care).mp.	1053822
4	1 or 2 or 3	1054326
5	community care/ or community program/ or community participation/	64304
6	midwife/ or traditional birth attendant/ or health auxiliary/	36796
7	health education/ or health promotion/	198131
8	health program/	115819
9	Smoking Cessation/	65208
10	exp mobile phone/	40381
11	((community adj2 intervention*) or community mobilization or community mobilisation or birth attendant* or community health worker* or community worker* or home visit* or women* groups or mother* groups or mobile health or mhealth or m-health or mobile phone* or cellphone* or cell phone* or smartphone* or health promotion or health education or national program* or nutritional intervention* or nutritional program* or smoking cessation or ((stop* or quit*) adj2 smok*)).mp.	407885
12	5 or 6 or 7 or 8 or 9 or 10 or 11	577786
13	exp fetus death/ or perinatal death/	45795
14	fetus mortality/ or exp perinatal mortality/ or prenatal mortality/	31138
15	*Pregnancy Outcome/	23932
16	(stillbirth* or ((perinatal or fetal or foetal or fetus or intrauterine or intra-uterine) adj (death? or mortality))).mp.	72641
17	13 or 14 or 15 or 16	104253
18	exp "africa south of the sahara"/ or africa/	332190

19	(Angola or Benin or Botswana or "Burkina Faso" or Burundi or Cameroon or "Cape Verde" or "Cabo verde" or "Central African Republic" or Chad or Comoros or Congo or Djibouti or "Equatorial Guinea" or Eritrea or Ethiopia or Gabon or Gambia or Ghana or Guinea or "Ivory Coast" or "Cote d'Ivoire" or Jamahiriya or Jamahiriyia or Kenya or Lesotho or Liberia or Libya or Libia or Madagascar or Malawi or Mali or Mauritania or Mauritius or Mayote or Mozambique or Mocambique or Namibia or Niger or Nigeria or Principe or Reunion or Rwanda or "Sao Tome" or Senegal or Seychelles or "Sierra Leone" or Somalia or "South Africa" or "St Helena" or Sudan or Swaziland or Tanzania or Togo or Tunisia or Uganda or "Western Sahara" or Zaire or Zambia or Zimbabwe or "Central Africa" or "Central African" or "West Africa" or "West African" or "Western Africa" or "Western African" or "East Africa" or "East African" or "Eastern Africa" or "Eastern African" or "South African" or "Southern Africa" or "Southern African" or "sub Saharan Africa" or "sub Saharan African" or "subSaharan Africa" or "subSaharan African").mp.	551988
20	18 or 19	586890
21	4 and 12 and 17 and 20	531

Proquest

noft((pregnan* or "maternal care")) AND noft(((community NEAR2 intervention*) or community mobilization or community mobilisation or birth attendant* or community health worker* or community worker* or home visit* or women* groups or mother* groups or mobile health or mhealth or m-health or mobile phone* or cellphone* or cell phone* or smartphone* or health promotion or health education or national program* or nutritional intervention* or nutritional program* or smoking cessation or ((stop* or quit*) NEAR2 smok*))) AND noft((stillbirth* or ((perinatal or fetal or foetal or fetus or intrauterine or intra-uterine) NEAR2 (death* or mortality))))

CENTRAL

ID Search
#1 MeSH descriptor: [Pregnancy] this term only
#2 MeSH descriptor: [Pregnant Women] explode all trees
#3 MeSH descriptor: [Maternal Health Services] explode all trees
#4 #1 OR #2 OR #3
#5 MeSH descriptor: [Community Health Services] this term only
#6 MeSH descriptor: [Community Participation] this term only
#7 MeSH descriptor: [Community Health Workers] explode all trees
#8 MeSH descriptor: [Midwifery] explode all trees
#9 MeSH descriptor: [Health Promotion] this term only
#10 MeSH descriptor: [Health Education] this term only

#11 MeSH descriptor: [National Health Programs] this term only
#12 MeSH descriptor: [Smoking Cessation] explode all trees
#13 MeSH descriptor: [Cell Phone] explode all trees
#14 (((community NEAR/2 intervention*) or community mobilization or community mobilisation or birth attendant* or community health worker* or community worker* or home visit* or women* groups or mother* groups or mobile health or mhealth or m-health or mobile phone* or cellphone* or cell phone* or smartphone* or health promotion or health education or national program* or nutritional intervention* or nutritional program* or smoking cessation or ((stop* or quit*) NEAR/2 smok*))) :ti,ab,kw
#15 #5 OR #6 OR #7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14
#16 MeSH descriptor: [Perinatal Death] explode all trees
#17 MeSH descriptor: [Fetal Death] explode all trees
#18 MeSH descriptor: [Perinatal Mortality] explode all trees
#19 MeSH descriptor: [Fetal Mortality] explode all trees
#20 ((stillbirth* or ((perinatal or fetal or foetal or fetus or intrauterine or intra-uterine) NEXT (death* or mortality)))) :ti,ab,kw
#21 #16 OR #17 OR #18 OR #19 OR #20
#22 #4 AND #15 AND #21
#23 MeSH descriptor: [Africa South of the Sahara] explode all trees
#24 MeSH descriptor: [Africa] this term only
#25 (Angola or Benin or Botswana or "Burkina Faso" or Burundi or Cameroon or "Cape Verde" or "Cabo verde" or "Central African Republic" or Chad or Comoros or Congo or Djibouti or "Equatorial Guinea" or Eritrea or Ethiopia or Gabon or Gambia or Ghana or Guinea or "Ivory Coast" or "Cote d'Ivoire" or Jamahiriya or Jamahiriya or Kenya or Lesotho or Liberia or Libya or Libia or Madagascar or Malawi or Mali or Mauritania or Mauritius or Mayote or Mozambique or Mocambique or Namibia or Niger or Nigeria or Principe or Reunion or Rwanda or "Sao Tome" or Senegal or Seychelles or "Sierra Leone" or Somalia or "South Africa" or "St Helena" or Sudan or Swaziland or Tanzania or Togo or Tunisia or Uganda or "Western Sahara" or Zaire or Zambia or Zimbabwe or "Central Africa" or "Central African" or "West Africa" or "West African" or "Western Africa" or "Western African" or "East Africa" or "East African" or "Eastern Africa" or "Eastern African" or "South African" or "Southern Africa" or "Southern African" or "sub Saharan Africa" or "sub Saharan African" or "subSaharan Africa" or "subSaharan African") :ti,ab,kw
#26 #24 OR #25
#27 #22 AND #26

<https://trialsearch.who.int/>

1. Pregnancy OR Pregnant (title row)

AND

Community(intervention row)

2. (pregnant OR pregnancy) AND community AND (stillbirth OR stillbirths OR fetal death OR fetal deaths OR fetal mortality OR perinatal death OR perinatal deaths OR perinatal mortality)

<https://www.clinicaltrials.gov/>

1st search:

Stillbirth OR Perinatal death OR Perinatal mortality OR fetal death OR fetal mortality(title row)

AND

Community(intervention row)

2nd search:

Pregnancy OR Pregnant(Condition row)

AND

Community (intervention row)

3rd Search:

(pregnant OR pregnancy) AND community AND (stillbirth OR stillbirths OR fetal death OR fetal deaths OR fetal mortality OR perinatal death OR perinatal deaths OR perinatal mortality) (Other terms)

GOOGLE

(pregnancy OR pregnant) AND (community OR "birth attendants" OR "home visits" OR "womens groups" OR "mothers groups" OR "mobile health" OR mhealth OR m-health OR "mobile phones" OR cellphones OR "cell phones" OR smartphones OR "health promotion" OR "health education" OR "nutritional interventions" OR "nutrition interventions" OR programs OR programmes OR "smoking cessation" OR "stop smoking" OR "quit smoking") AND (stillbirths OR "perinatal deaths" OR "perinatal mortality" OR "fetal deaths" OR "fetal mortality" OR "foetal deaths" OR "foetal mortality" OR "fetus deaths" OR "fetus mortality" OR "foetus deaths" OR "foetus mortality" OR

"intrauterine deaths" OR "intrauterine mortality" OR "intra-uterine deaths" OR "intra-uterine mortality")

(pregnancy OR pregnant) AND (community OR "birth attendants" OR "home visits" OR mhealth OR "mobile phones" OR "health education" OR "nutritional interventions" OR programs OR "smoking cessation" AND (stillbirths OR "perinatal deaths")) site:.org

Limit 2000 to date

Appendix 3: Systematic review data extraction tools

Tool 1 for extraction of TidieR Checklist assessment of included papers

	S/N	
	Title	
	Authors and year	
	Country (ies)	
	reported Study design (s)	
	Study design (your judgement)	
	Project Name	
	Why? Describe any rationale, theory or goal of the elements essential to the intervention.	
	WHAT? Materials – describe physical or informational materials used in the intervention.	
	WHAT? Procedure: describe each of the procedures, activities and/or processes used in the intervention, including enabling or supporting activities	
	Who provided? For each category of intervention provider, describe their expertise, background and any specific training given.	
	How? Describe the modes of delivery (e.g. face, or by some other mechanism such as the internet or telephone). Was it delivered individually or in a group?	
	Where? Describe the types of locations where the intervention occurred, including any necessary infrastructure or relevant features.	
	When and how much? Describe the number of times the intervention was delivered and over what period of time, including the number of sessions, their schedule, and their duration, intensity or dose.	
	Tailoring. If the intervention was planned to be personalised titrated or adapted, then describe what, why, when and how	
	How well? Planned: if intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity, describe them	
	How well? Actual: if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned.	

Tool 2 for extraction of study characteristics.

S/N																									
Covidence ID																									
Title																									
Authors and year																									
Country (ies)																									
Study design																									
Type of intervention																									
Duration																									
Number of clusters (int/post)																									
Group size (int/post)																									
Number of stillbirths (int/post)																									
denominator (total births)																									
SBR (1000 births)																									
Number of clusters (control/Pre)																									
Group size (control/Pre)																									
Number of stillbirths (control/Pre)																									
denominator (total births)																									
Reported stillbirth rate																									
Reported Odds Ratio																									
Reported Risk Ratio																									
lower Confidence interval																									
upper CI																									
P value																									
Additional comments																									

Tool 3 for extraction of acceptability data in included studies.

		S/N			
		Covidence ID			
		Title			
		Authors and year			
		Country (ies)			
		Study design (s)			
		Number of participants			
		1. Affective Attitude (how an individual feels about the intervention)			
		2. Burden (perceived amount of effort that is required to participate in the intervention)			
		3. Ethicality (the extent to which the intervention has a good fit with an individual's value system)			
		4. Intervention Coherence (the extent to which the participant understands the intervention and how it works)			
		5. Opportunity Costs (the extent to which benefits, profits, or values must be given up to engage in the intervention)			
		6. Perceived Effectiveness (the extent to which the intervention is perceived as likely to achieve its purpose)			
		7. Self-efficacy (the Participant's confidence that they can perform the behaviour(s) required to participate in the intervention)			
		Other useful comments			

Appendix 4 : Quality assessment of included papers.

Quality assessment for Pre-post studies - National Heart, Lung, and Blood Institute Appraisal Checklist													
S/N	First author and year	1	2	3	4	5	6	7	8	9	11	12	Total
1	Sloan 2018	1	1	1	1	1	0	1	0	1	1	1	8(75)
2	Seim 2014	1	1	1	1	1	0	1	0	0	0	0	6(50)
3	Serbanescu 2019	1	1	1	0	1	0	1	0	0	0	0	5(45)
4	Sibley 2014	1	1	1	0	1	1	1	0	1	1	N/A	8(73)
5	Conlon 2019	1	1	1	0	1	0	1	0	0	0	0	5(45)
6	Hounton 2009	1	1	0	0	1	0	1	0	1	0	0	5(45)
7	Shikuku 2020	1	0	0	0	0	1	1	0	1	0	0	5(45)
8	Okonofua 2023	1	1	1	1	1	1	1	0	N/A	0	N/A	7(78)
1. Was the research question or objective in this paper clearly stated? 2. Were eligibility/selection criteria for the study population prespecified and clearly described? 3. Were the participants in the study representative of those who would be eligible for the test/service/intervention in the general or clinical population of interest? 4. Were all eligible participants that met the prespecified entry criteria enrolled? 5. Was the sample size sufficiently large to provide confidence in the findings? 6. Was the test/service/intervention clearly described and delivered consistently across the study population? 7. Were the outcome measures prespecified, clearly defined, valid, reliable, and assessed consistently across all study participants? 8. Were the people assessing the outcomes blinded to the participants' exposures/interventions? 9. Did the statistical methods examine changes in outcome measures from before to after the intervention? 10. Were statistical tests done that provided p values for the pre-to-post changes? 11. Were outcome measures of interest taken multiple times before the intervention and multiple times after the intervention (i.e., did they use an interrupted time-series design)? 12. If the intervention was conducted at a group level (e.g., a whole hospital, a community, etc.) did the statistical analysis take into account the use of individual-level data to determine effects at the group level? 1: fully reported; 0: Not reported; N/A: Not applicable													

Quality assessment for qualitative studies - Critical Appraisal Checklist												
S/N	First author and year	1	2	3	4	5	6	7	8	9	10	Total (%)
1	Palaia 2019	1	1	0	1	0	0	1	0	1	1	6(60)
2	Joseph 2021	1	1	1	0	1	0	1	0	1	1	7(70)
3	Kamau 2020	1	1	1	1	1	0	1	1	1	1	9(90)
4	Skinner 2018	1	1	1	0	1	0	0	1	1	1	7(70)
5	Musabyimana 2018	1	1	1	1	1	0	1	1	1	1	9(90)
6	Mwendwa 2015	1	1	1	1	1	0	1	0	1	1	8(80)
7	Patel et al N.D	1	0	1	1	1	0	1	0	1	1	8(80)
8	Azaare 2022	1	1	1	0	1	0	1	0	1	1	7(70)
1. Was there a clear statement of the aims of the research? 2. Is a qualitative methodology appropriate?" 3. Was the research design appropriate to address the aims of the research? 4. Was the recruitment strategy appropriate to the aims of the research? 5. Was the data collected in a way that addressed the research issue? 6. Has the relationship between researcher and participants been adequately considered? 7. Have ethical issues been taken into consideration? 8. Was the data analysis sufficiently rigorous? 9. Is there a clear statement of findings? 10. How valuable is the research? 1: fully reported/shown; 0: Not reported; N/A: Not applicable												

Quality assessment for cross-sectional and cohort studies - National Heart, Lung, and Blood Institute																
S/N	First author and year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Total (%)
1	Fatti 2016	1	1	0	1	0	1	1	0	1	0	1	0	0	1	8(57)
2	Okafor 2015	1	1	1	1	0	1	1	0	0	0	1	0	N/A	0	7(54)
3	Headstrom 2022	1	1	1	1	0	1	1	0	1	1	1	0	1	1	11(79)
4	Mostert 2021	1	1	0	1	1	1	1	0	1	0	1	0	0	1	9(64)
5	Makuluni 2021	1	1	0	1	0	1	1	0	0	0	1	0	0	0	6(43)
1. Was the research question or objective in this paper clearly stated? 2. Was the study population clearly specified and defined? 3. Was the participation rate of eligible persons at least 50%? 4. Were all the subjects selected or recruited from the same or similar populations (including the same time period)? Were inclusion and exclusion criteria for being in the study prespecified and applied uniformly to all participants? 5. Was a sample size justification, power description, or variance and effect estimates provided? 6. For the analyses in this paper, were the exposure(s) of interest measured prior to the outcome(s) being measured? 7. Was the timeframe sufficient so that one could reasonably expect to see an association between exposure and outcome if it existed? 8. For exposures that can vary in amount or level, did the study examine different levels of the exposure as related to the outcome (e.g., categories of exposure, or exposure measured as continuous variable)? 9. Were the exposure measures (independent variables) clearly defined, valid, reliable, and implemented consistently across all study participants? 10. Was the exposure(s) assessed more than once over time? 11. Were the outcome measures (dependent variables) clearly defined, valid, reliable, and implemented consistently across all study participants? 12. Were the outcome assessors blinded to the exposure status of participants? 13. Was loss to follow-up after baseline 20% or less? 14. Were key potential confounding variables measured and adjusted statistically for their impact on the relationship between exposure(s) and outcome(s)? 1: fully reported; 0: Not reported; N/A: Not applicable																

Quality assessment for (cluster) Randomised control trials –Cochrane Risk of Bias II assessment tool								
S/N	First author and year	1a	1b	2	3	4	5	6
1	Mohammed 2016	High	Some concerns	Low	Low	Low	Low	Some concerns
2	Colbourn 2013	Low	Low	Low	Low	Low	Low	Low
3	Lewycka 2013	Some concerns	Low	Low	Low	High	Low	Some concerns
4	Lund 2014	Some concerns	Low	Low	Low	Low	Low	Some concerns
5	Alexander 2018	Low	Low	Low	Low	Low	Low	Low
6	Matendo 2011	Some concerns	Low	Low	Low	Low	Low	Some concerns
7	Leight 2018	High	High	Low	Low	Low	Some concerns	High
8	Scott 2019	Low	Low	Low	Low	Low	Low	Low
9	Pasha 2013	Some concerns	Low	Low	Low	Low	Low	Some concerns
10	Ilboudo et al 2022	Low	Some concerns	Low	Low	Low	Low	Some concerns
11	Kone et al 2022	Low	Low	Low	Low	Low	Low	Low
12	De Kok et al 2022	Low	Low	Low	Low	Low	Low	Low
		Domain 1a. Randomization process Domain 1b: Risk of bias arising from the timing of identification or recruitment of participants Domain 2. Deviations from intended interventions Domain 3. Missing outcome data Domain 4. Measurement of the outcome Domain 5. Selection of the reported result Domain 6. Overall Bias						

TidieR Checklist assessment for included studies

		TidieR assessment criteria								
S/N	First author and year	1	2	3	4	5	6	7	8	9
1	Mohammed 2016	Y	Y	Y	Y	Y	Y	NR	NR	NR
2	Chen 2011	Y	Y	Y	Y	Y	Y	Y	Y	NR
3	Colbourn 2013	Y	Y	Y	Y	Y	Y	Y	Y	NR
4	Gloyd 2001	Y	Y	Y	Y	Y	Y	NR	NR	NR
5	Kaestel 2005	Y	Y	Y	Y	Y	Y	NR	NR	NR
6	Lewycka 2011	Y	Y	Y	Y	Y	Y	NR	NR	NR
7	Lund 2014	Y	Y	Y	Y	Y	Y	NR	NR	NR
8	Okafor 2015	Y	Y	Y	Y	NR	NR	NR	NR	NR
9	Seim 2014	Y	Y	Y	Y	Y	Y	NR	Y	NR
10	Serbanescu 2019	Y	Y	Y	Y	Y	NR	Y	Y	NR
11	Sibley 2014	Y	Y	Y	Y	Y	Y	Y	Y	Y
12	Pasha 2013	Y	Y	Y	Y	Y	Y	Y	Y	Y
13	Hounton 2009	Y	Y	Y	Y	Y	Y	NR	NR	NR
14	Alexander 2018	Y	Y	Y	Y	Y	Y	NR	Y	NR
15	Fatti 2016	Y	Y	Y	Y	Y	Y	NR	Y	NR
16	Joseph 2021	Y	Y	Y	Y	Y	NR	NR	NR	NR
17	Kamau 2020	Y	Y	Y	Y	Y	Y	NR	NR	NR
18	Matendo 2011	Y	Y	Y	Y	Y	Y	NR	NR	NR
19	Mostert 2021	Y	Y	Y	Y	Y	NR	NR	NR	NR
20	Skinner 2018	Y	Y	Y	Y	Y	NR	NR	NR	NR
21	Sloan 2018	Y	Y	Y	Y	Y	Y	NR	NR	NR
22	Scott 2019	Y	Y	Y	Y	Y	NR	NR	NR	NR
23	Shikuku 2020	Y	Y	Y	Y	Y	Y	NR	NR	NR
24	Leight 2018	Y	Y	Y	Y	Y	Y	NR	NR	NR
25	Musabyimana 2018	Y	Y	Y	Y	Y	NR	NR	NR	NR
26	Bryan 2017	Y	Y	Y	Y	Y	NR	NR	NR	NR
27	Patel N.D	Y	Y	Y	Y	Y	Y	NR	NR	NR
28	Makuluni & Stones	Y	Y	NR	NR	NR	NR	NR	NR	NR
29	Azaare et al 2022	Y	Y	Y	Y	Y	Y	NR	NR	NR
30	Ilboudo et al 2022	Y	Y	Y	Y	Y	Y	Y	Y	NR
31	Kone et al 2022	Y	Y	Y	Y	Y	Y	Y	Y	Y
32	de Kok et al., 2022	Y	Y	Y	Y	Y	Y	Y	Y	Y
33	Headstrom et al., 2022	Y	Y	Y	Y	Y	Y	Y	Y	Y
34	Okonofua et al., 2023	Y	Y	Y	Y	Y	Y	NR	NR	NR

		TidieR assessment criteria								
S/N	First author and year	1	2	3	4	5	6	7	8	9
	1. Why? Described any rationale, theory or goal of the elements essential to the intervention 2. What? Materials – describe physical or informational materials used in the intervention. Procedure: describe each of the procedures, activities and/or processes used in the intervention including enabling or support activities 3. Who provided? For each category of intervention provider, describe their expertise, background and any specific training given 4. How? Describe the modes of intervention delivery (eg face to face or by some other mechanism such as the internet or telephone). Was it delivered individually or in a group? 5. Where? Describe the types of location where the intervention occurred, including any necessary infrastructure or relevant features 6. When and how much? Describe the number of times the intervention was delivered and over what period of time including the number of sessions, their schedule, and their duration, intensity or dose 7. Tailoring. If the intervention was planned to be personalised titrated or adapted, then describe what, why, when and how 8. Modification: If the intervention was modified during the course of the study, describe the changes (what, why, when, and how). 9. How well? Planned: If intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity, describe them. Actual: if intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned.									
	Y: fully reported, NR: Not reported									

Acceptability constructs and supporting quotes from included studies

First author and year	Acceptability construct and supporting quotes in included papers
Palaia 2019	1. Affective Attitude (how an individual feels about the intervention) <i>"It was a very ambitious goal that in the first year [we would have a] 50% reduction in MMR. We looked at people [SMGL partners] and said, "Are you going to make this? This goal is very high." And they said, "It is good to aim high and then see how things work. At least we got to 30%. And then progressively we'll be able to reduce the maternal mortality ratio by more than 30%." (subnational host government)</i> <i>"I know that there's the typical sort of bureaucratic challenges, rivalries, funding challenges—all the things that are always inherent in any kind a project. It just seemed like [the partners] really had the mission first and foremost in mind ... I think that's one of things that made SMGL function, was that the partners were sort of aligned on the key topline objective." (goal alignment - global partner)</i> <i>Huge decisions like how many years to keep SMGL going [were] largely driven by funding. ... I think the USG held a huge role in decision making because we had the big purse. (power dynamics – big global partner)</i> <i>[A]nd by big P [Partner] and small p [partner], it had to do with who had the biggest investments and therefore gets the biggest seat at the table. So that was a little bit concerning for us, because those big P partners seemed to have had more of the say in the partnership (small global partner)</i> 2. Burden (perceived amount of effort that is required to participate in the intervention) <i>"I think the partnership was aiming to achieve first of all, having a pool of varied resources. So we have a lot more than if we had one or two people involved, both financial as well as the technical support and understanding. And also just bringing the varied experiences from the different partners, I think, from the very beginning." (partner expertise – field representative)</i> <i>"I think that effective leadership made a difference— there was always a sense of team. And that doesn't happen without effort. There was remarkably little ego, which is really hard to do with these separate agencies with their own separate missions coming together for one mission as a team, so a lot of that was just really strong leadership and management, and tone setting, those types of things." (effective leadership - global leader)</i> 3. Ethicality (the extent to which the intervention has good fit with an individual's value system) <i>"They [the MOH] weren't even represented on the Leadership Council in the early days. And I think that was a serious mistake and something that I hope has been corrected and will continue to be corrected. The problem is that you don't have high officials in a host government who are willing to sit through long conference calls or travel to Washington for meetings talking about leadership and governance (US govt rep – govt representation in programs)</i>

	4. Intervention Coherence (the extent to which the participant understands the intervention and how it works) <i>"The partners were kind of cobbled together pretty quickly, it seemed without a lot of thought of what would they do, how they would contribute in distinctive ways. And that's something that took a long time to resolve, and I'm not sure it even really was resolved (partnership role clarity – global partner)</i> <i>"Partners have not done activities in the district without consulting the DHO [District Health Office], the Chief Administrative Officer, and with the Chief Administrative Office, the District Executive Committee. And monthly there have been project coordination meetings and that makes us own whatever we do, that we are implementing in these areas." (Country ownership - sub national govt)</i> 5. Opportunity Costs (the extent to which benefits, profits or values must be given up to engage in the intervention) <i>"I think some of the ground work that would ordinarily happen when trying to put together a partnership of this size, it just didn't because speed seemed really important. There's this real desire to get something off the ground quickly, and so there wasn't the planning and the groundwork that you would usually see with something like this until it was catching up and learning more information, figuring out how to plug in. So it wasn't the ideal dynamic." (local partner)</i> <i>"I think in any partnership, a funding cycle has different sorts of decision makers and timelines, and I would not say we were fast. There were several delays in our funding, but it was often [because], you know, we didn't have congressional approval or things like that. So it's hard to control but it's the reality of how funding gets allocated." (Global partner – bureaucracy)</i> 6. Perceived Effectiveness (the extent to which the intervention is perceived as likely to achieve its purpose) <i>"It's kind of a hallmark of SMGL that we don't just produce fluff, we actually provide health outcome data, which is extremely rare in USAID-led projects. I'm very proud of the M&E [monitoring and evaluation] we have done and our ability to work across agency silos capturing outcomes in a really sterling, topnotch way." (strength of MEL – US govt rep)</i> <i>"The district and local leadership were very excited about it. And then when it started to show pretty incredible successes, the government really got behind it, embraced it and wanted to roll it up and package it as one of their everyday work." (Country ownership - sub national govt)</i> 7. Self efficacy (the Participant's confidence that they can perform the behaviour(s) required to participate in the intervention) <i>"A lot of infrastructure improvements have been done ... and equipment—those can probably stay longer. Maybe, five years or more. A lot of capacity has been built of the health workers and a number of them have been taken on by the districts of the government of Uganda. They have been put on the government payroll, so I believe with that knowledge that has been passed on to them, that is something that can stay on in the long term." (sustainability –country national government)</i>
	1. Affective Attitude (how an individual feels about the intervention) <i>"Make your story very short; I have other businesses to attend to. After all, what you are saying is not new to me."</i>

Joseph 2021	<i>"I am old enough to know my responsibility when pregnant, you are still too young to advise me." (WG in MDC recounts embarrassments from clients)</i> <i>"If anything bad happens to me you will be liable."</i> <i>"I will deal with whoever told you that I am pregnant."</i> <i>"Give us the money that you are given instead of tormenting us with your questions."</i> <i>(WG in KDC recounts embarrassments from clients)</i> 2. Burden (perceived amount of effort that is required to participate in the intervention) <i>"Rains were a hindrance to our efforts in sensitising the community on the use of ANC services. We used to hold public meetings in open spaces but when it rained, we had to postpone them. Attendance by community members in these meetings during the peak of the rainy season was also poor. In several occasions, we postponed the meetings in the middle as rains continued. In some months, it rained consecutively for the whole week and thus disrupted our work plan." (FGD with WGS, in MDC)</i> <i>"My partner always wanted to know the amount of money I was paid. No matter how often I told him that we were not paid, he never understood. You know, when you spend such a long time walking all over the village and come back home very tired with nothing in the pocket, very few partners will understand why you keep committed to the intervention." (IDI with WG, in MDC)</i> 3. Ethicality (the extent to which the intervention has good fit with an individual's value system) <i>"At times I failed to tell my husband where I was going. This is because he was not supportive of the interventions we were implementing. I knew the risk of telling him where I was going daily since I knew his reaction." (IDI with WG, in MDC)</i> 4. Intervention Coherence (the extent to which the participant understands the intervention and how it works) <i>"We worked closely with health workers; and in the facilities and this made our work persuasive. For instance, whenever we referred pregnant women to the facility for more information, health workers would attend to them very well. Similarly, whenever we invited them to attend our community sensitisation meetings, they would come and help us in clarifying some of the health issues." (IDI with WGS in KDC – Health system support)</i> <i>"We are the one who received clients who were sensitized by the WGs. And in most cases, we used to attend sensitisation meetings that were held at the village level and clarified several ANC issues that were technical such family planning issues." (IDI with WG Supervisor in KDC).</i> 5. Opportunity Costs (the extent to which benefits, profits or values must be given up to engage in the intervention)
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	<i>"I Often, I arrived home late because I had to walk a long distance from my home to the meeting venue. I would get back home late after meetings and I often found my little children asleep. This most often annoyed my husband." (IDI with WG, in MDC).</i>
Kamau, 2020	1. Affective Attitude (how an individual feels about the intervention) <i>"She was very happy to see us at her home because if she did not take IFAS in order to increase her blood levels and improve on her pregnancy maybe there were going to be some complications. . . . she explained to me how she felt after giving birth that she had enough energy and did not have low blood levels." (Female CHV, health facility 2)</i> <i>"I personally felt good because now I had something that I would be taking to them and teach them about IFAS in details. I felt that this was going to help many women" (Female CHV, health facility 5).</i> <i>"This was a good project because it bridged a gap and an area {IFAS counselling} which health workers have not taken seriously." (Nurse in charge of ANC services, health facility 1)</i> <i>"This one for the community approach is good because they must bring IFAS for you, and they emphasize on the importance. You see that they consider it important and you also become serious" (ANC woman, health facility 2)</i> 2. Burden (perceived amount of effort that is required to participate in the intervention) <i>"I can say dealing with pregnant women is not easy since they tend to have bad moods and I would find one in a bad mood who would not even want us to talk and she thinks the IFAS are for my own benefit and not hers" (Female CHV, health facility 3)</i> <i>"Just a little bit, you know for me as a man, visiting peoples' home week after week might raise some questions somewhere. But now considering that I have been doing other jobs at the grass roots level it was not a huge challenge because I had explained well to them why I was following up on IFAS for pregnant women" (Male CHV, health facility 1)</i> <i>"...at times you call someone, the husband picks the phone, you talk for some time trying to explain who you are to them because that is someone's else wife you called. . . ." (Male CHV, health facility 2)</i> <i>"It was not tedious on our side. When the client is supposed to take IFAS from CHV, you spend less time with them." (Nurse in charge of ANC services, health facility 2)</i> <i>"The major problem is lack of facilitation {remuneration}." (Male CHV, health facility 1)</i> <i>". . . .sometimes he did not come on time and kept me waiting" (ANC woman, health facility 1, IDI)</i> 3. Ethicality (the extent to which the intervention has good fit with an individual's value system) <i>"I would say the health professionals are much better, we cannot solely give the responsibility to the CHVs. We have to do this professionally, bearing in mind the woman is pregnant. . . .there can be other problems." (Nurse in charge of ANC services, health facility 2)</i> 4. Intervention Coherence (the extent to which the participant understands the intervention and how it works)

	"In short, taking IFAS from the hospital or facility should not be the end but there should be ways of following up especially to the grass roots because I have realized that some of the mothers who get IFAS from the hospital throw them in the toilets or they just keep and do not take them" (Male CHV, health facility 1) 6. Perceived Effectiveness (the extent to which the intervention is perceived as likely to achieve its purpose) <i>"The number of clients who have come to the facility has increased because we are able now to reach them, to reach more clients so that they can come to the facility and . . ."</i> (Female CHV, health facility 3) <i>"Aaaah, they are the ones who were looking for you to tell you that so and so is pregnant, and they need to begin ANC early. . . ."</i> (Female CHV, health facility 3) <i>". . .we have visited them during this program of IFAS and they have been taking them and now they are teaching the other women about the importance of taking IFAS and other services as well."</i> (Female CHV, health facility 3) <i>"Antenatal care attendance improved because CHVs were really mobilizing mothers to come to the clinic. For the deliveries we had, I would say we did not have many serious cases due to low Hb. Also, IFAS adherence improved."</i> (Nurse in charge of ANC services, health facility 1) <i>"The ones who are far will access the supplements easily I come from far, so it is easy for them to bring me the supplements and the transport has reduced."</i> (ANC woman, health facility 2) 7. Self efficacy (the Participant's confidence that they can perform the behaviour(s) required to participate in the intervention) <i>"There are many benefits because I learned that IFAS increases the blood levels in a woman and it makes her with baby to be healthy. It helps the mothers to avoid so many problems which they face when giving birth. We learned the sources of iron and how to cook like spinach and not to overcook which we pass to the mothers and teach the same thus creating awareness to the community"</i> (Female CHV, health facility 2). <i>"When I came for the first time, I was taught on how to give IFAS to mothers in the community we started the job immediately and when we started we were able to get a lot of pregnant women in our villages and we taught them on how to use IFAS."</i> (Male CHV, health facility 2)
Skinner, 2018	1. Affective Attitude (how an individual feels about the intervention) <i>"I'd like to encourage (the) MomConnect program, it needs to go further because it will help many more people."</i> (KZN M) <i>"It is clear to me although I got confused when I received the message about what to do when the baby is not moving at all...I asked the nurse because that got me really scared but she managed to make me understand."</i> (FS P) 2. Burden (perceived amount of effort that is required to participate in the intervention) <i>"Xhosa has deep words that are difficult to understand...Yes English at least you can even look up (English) in your dictionary."</i> (WC M)

"No, it was just when I connected I accidentally put in Afri-kaans but then I reconnected again in English...Both mes-sages still come onto my phone but I only read the English ones because I don't understand Afrikaans." (GP M)

3. Ethicality (the extent to which the intervention has good fit with an individual's value system)

"So I even showed a friend of mine who is pregnant and told her that she can dial this number because she is not connected on MomConnect...So I showed her how to do it from the paper." (WC P)

"He can see that the message is written MomConnect, and when he reads it. For my side, if I left my phone at home, when I get back my partner tells me that I have a message from MomConnect." (FS P)

4. Intervention Coherence (the extent to which the participant understands the intervention and how it works)

"Sometimes you get it in the morning, but usually you get it around 9:00 or 10:00...Yes, but sometimes it delays and you receive it late...And sometimes when there is a delay, they often send a message apologising." (KZN M)

6. Perceived Effectiveness (the extent to which the intervention is perceived as likely to achieve its purpose)

"They (MomConnect messages) are so helpful because even after you give birth, they also tell you how to take care of the baby; in case you notice something wrong with the baby, go to the clinic." (KZN M)

"I do not want to lie I don't read posters, I don't get inter-ested in reading and learning about what is in the posters. (WC P)

They sent me something that my unborn has eye-brows, that way I can see my baby's development." (KZN P)

"There was a time when my child couldn't pass the stools for twodays. I was at work and I called them. They told me that because she is still being breastfed." (MP M)

7. Self efficacy (the Participant's confidence that they can perform the behaviour(s) required to participate in the intervention)

"When I registered with MomConnect they informed me that 'I must pack my ID, my clothes, sanitary towels and the child's clothes' things like that...It was simple to raise a child with MomConnect because I took every advice I got from MomConnect. (MP P)

The messages play a huge role; like, you receive a message explaining something that you are already experiencing and you were about to go to the clinic 'for no reason'." (KZN M)

Musabyimana 2018	1. Affective Attitude (how an individual feels about the intervention) <i>“They accept it! Now you will find women who take the initiative to look for a CHW to share the information that she is pregnant. Some also ask the CHW if the information about the fact that she is pregnant was sent through RapidSMS! After delivery, some also remind the CHW to send a message about the event. But this is not yet 100% of women.”-CHW supervisor at HC level in a District not supported by UNICEF</i> <i>“CHWs are very pleased to use the system! They are happy to see how they are assisting women and women are asking them to send both common and alert messages for their emergency cases.”—CHW supervisor at HC level in a UNICEF supported District</i> 2. Burden (perceived amount of effort that is required to participate in the intervention) <i>“We are motivated to use the system. However, some community members have a poor mind-set regarding RapidSMS thinking that we are selling their information and getting paid for the information we send. As a result, sometimes they hide the needed information.”—CHW from a District not supported by UNICEF</i> <i>“We were trained only once. The challenge we have is that we work with colleagues who were never trained”.—CHW from a District not supported by UNICEF</i> <i>“CHWs take measurements of the child. . .Okay! They have the tools, they take the measurements, then they classify children as “red” or “yellow” .But the indicators used confuse them. They mix them up: some use mid-upper arm circumference(MUAC),others weight for age, weight for height,. . .there is a need to have a look on how to train them better or maybe there is a need to recruit more qualified personnel. There is a need for improvement.”—District official participant from a UNICEF supported District</i> <i>“Equipment are not yet available.. .We need the right equipment to take measures from pregnant women and children. For example, we need instruments to measure the height and weight of pregnant women because those measures were not taken at the health facility.. ..We also need thermometers to measure temperature.”—CHW from a non-supported Distric</i> <i>“We know that we are volunteers and RapidSMS necessitates a lot of community-based work. It seems like there should be a financial motivation for all this work, but we do not receive it.. .If we were paid for our time, we would be more motivated to work as CHWs because there would be compensation to help support our families.”—CHW from a District not supported by UNICEF</i> 3. Ethicality (the extent to which the intervention has good fit with an individual's value system) <i>“We don’t have access to the information in RapidSMS. The data manager and the CHW supervisor are the only ones who have access to this information. For example, we would like to be able to check whether all the women who delivered at our health center were registered in RapidSMS, because we have their name in our registers.”-Provider from a District not supported by UNICEF</i> 4. Intervention Coherence (the extent to which the participant understands the intervention and how it works)
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	<i>"I wonder whether pregnant women should provide their phone number, since they are the beneficiaries. Then both she and the CHW would receive the RapidSMS messages.. . This system would help remind parents; we are very busy and we sometimes forget all our responsibilities to our children".- Father from an urban area</i> <i>"This would help someone living a long distance from the health center, as they could use RapidSMS to ensure they have an appointment. Healthcare providers could also then use it to see the order of consultations for the day. This would reduce the time patients spend queuing for an appointment."</i>—Central level participant 5. Opportunity Costs (the extent to which benefits, profits or values must be given up to engage in the intervention) <i>"In addition, the phones given to CHWs are old. Now they are buying phones using their own money. Providing them with new phones would provide them with a type of motivation."</i>—CHW supervisor at HC level in a UNICEF supported District 6. Perceived Effectiveness (the extent to which the intervention is perceived as likely to achieve its purpose) <i>"I can see we dropped maternal mortality we reached MDG, about maternal reducing maternal mortality we reached MDG.. .and the impact is very positive for me and may be statistically you can't report what is related to RapidSMS only because there were so many interventions in the area. But generally it is contributing so much toward the reduction of maternal land newborn and child mortality."</i>—Central level participant <i>"RapidSMS has helped a lot to prevent maternal, child and neonatal death. Through the collaboration between the health facility and CHWs and the information shared with RapidSMS, once the mother is reminded and attends the needed service on time, provider are motivated to do their best to keep the newborn and the mother alive".</i>—CHW from a district not supported by UNICEF <i>". . .through RapidSMS I know when there is a newborn with this congenital abnormality and what health center they use. When this happens ,we can initiate contact with the hospital and physicians who perform the repair procedures for such children.. . I get this information and can act without teven leaving my office."</i>—CHW Supervisor from a district not supported by UNICEF <i>In our Monday staff meetings, we share information from the RapidSMS system with departments that can use it. For example, we give department related information to the head of maternity care unit at the health center. The same is done for immunization services, and soon.. ."</i>—Health center staff in a UNICEF-supported district 7. Self efficacy (the Participant's confidence that they can perform the behaviour(s) required to participate in the intervention) <i>"What needs to be improved is the use of the data we are collecting. Health facility staff and everyone who has access to RapidSMS should be trained on data analysis so that they can benefit from the system and know what type of information is provided by the system."</i>—CHW supervisor at DHf from a District not supported by UNICEF
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Mwenda, 2015	1. Affective Attitude (how an individual feels about the intervention) <i>"We do not have to walk to the health centre to send a report. Mothers can directly be reported in the case of a problem. Nurses recognise our work, they know we work hard."</i> <i>"If you send a message and it is confirmed you feel happy and feel encouraged to keep using RapidSMS"</i> 2. Burden (perceived amount of effort that is required to participate in the intervention) <i>"We use our own knowledge because training is not enough."</i> <i>"Most of our phones are old they don't work well."</i> <i>"Sometimes there is an emergency and no battery charge then we cannot send RapidSMS. Again if you don't have the 100 Rwandan francs and the health centre is far, where do you charge?"</i> <i>"RapidSMS is a new technology and is difficult sometimes. One has to consult the form with codes all the time and it takes our time."</i> <i>"It complicates and increases our work. One has to stop everything she is doing and concentrate when sending reports. When you have a baby and family responsibilities it is difficult and then it creates conflict with family responsibilities. Husbands are obstacles; they say we are supposed to be in the farm not reporting on RapidSMS."</i> <i>"We have not used a technology before so it takes long to learn how to send the messages."</i> <i>"The codes are abbreviated in English; codes should be abbreviated in Kinyarawanda."</i> <i>Sometimes we lose connectivity then we can't send SMS."</i> 4. Intervention Coherence (the extent to which the participant understands the intervention and how it works) <i>"The system needs to point out mistakes, otherwise we send the same wrong mistake many times."</i> <i>"Automated responses in emergency situations should include advice to CHWs on how to deal with the emergency."</i> 5. Opportunity Costs (the extent to which benefits, profits or values must be given up to engage in the intervention) <i>"Most of the time ambulances are not available. We then have to use traditional transport to take the mother to the nearest health centre. Mothers at times deliver on the way to the health centre before an ambulance comes."</i> 6. Perceived Effectiveness (the extent to which the intervention is perceived as likely to achieve its purpose) <i>'Supervisors can know when one is having problems sending RapidSMS. They see in the system, who is sending reports, they help us during our monthly meeting.'</i> <i>"RapidSMS helps us to send messages quickly and MOH gets reports immediately. Before we used papers which were stored at the health centre"</i> <i>"This kind of reporting makes the 'whole country' know a mother who is experiencing a difficulty and help can be sent to her"</i>
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	7. Self efficacy (the Participant's confidence that they can perform the behaviour(s) required to participate in the intervention) Mothers now give us the information we need because they know we are communicating with the MOH. “Supervisors can know when one is having problems sending RapidSMS. They see in the system, who is sending reports, they help us during our monthly meeting.”
Patel, no date	1. Affective Attitude (how an individual feels about the intervention) <i>“It sent me to the clinic to deliver and I did that safely without any bad thing happening to me. I delivered safely. That is the beauty of it.”</i> <i>“It has been so beneficial to the pregnant women and the children under-5 because they do not pay when the vehicle is transporting them. In the past, we used to transport pregnant women in donkey carts and on bicycles but today there is ready and reliable means of transport for them in emergencies.” (Community volunteer during FGD)</i> <i>“Everyone has his problem and when the vehicle picked me the driver knew that it was a painful thing being in labor so they also became careful with the way they were driving and we got there safely. Now I will not be able to speak for another person but for my experience it was comfortable.” (IDI with female user of SERC services)</i> <i>“We think that the child was saved by the nurses because of the timeliness of our arrival. We were happy when we got into the hands of the nurses.” (IDI with female user of the service)</i> 2. Burden (perceived amount of effort that is required to participate in the intervention) <i>“Our youth, if they could help us to repair our roads small, small and when the motors come, they can be running without problems.”</i> <i>“There are beasts at night and also ghosts. From where I come, there are so many spirits that it is not advisable to move out at night. The people sit protected in the vehicle whiles you are left alone in front. In addition to that you are not supposed to speed the vehicle and you can imagine how exposed you are if someone intends to harm you.” (Driver during an FGD)</i> 4. Intervention Coherence (the extent to which the participant understands the intervention and how it works) <i>“Some of the pregnant women will be complaining that they came and they are thrown away, they don’t care about them. Because there is no understanding between the pregnant women and the midwife when she tells them it’s not time for them to deliver and they should wait. Because of that, the women say the workers are not serious, but for me, the way I know about the work I know they are serious.”</i> 5. Opportunity Costs (the extent to which benefits, profits or values must be given up to engage in the intervention)

“There are issues like discomfort, safety and others when you are being transported but as a sick person you do not have those issues in mind when there is an emergency. Anything can hurriedly get you to the place on time is what you will be looking for. All vehicles have the tendency of falling when transporting people so it will not be fair relating safety issues to the Motorking alone.” (Male FGD participant)

6. Perceived Effectiveness (the extent to which the intervention is perceived as likely to achieve its purpose)

If not for the Motorking, women especially pregnant women and children would have been suffering a lot.... It is able to go to the interior [of communities] to carry cases like the one I told you about with the woman who was in labor and nearly died if not for the sake of the Motorking ambulance.” (IDI with community sub-chief)

“When a woman is in labor and is not quickly sent to the health facility she might deliver. She might also lose either the baby or even herself. Kids like this, once they are weak, they can easily pass on. So the impact I see is that the emergency referral saves lives.” (SERC driver during FGD)

Appendix 5: Ethics approval documents

A: Oxford Tropical Research Ethics Committee approval

Oxford Tropical Research Ethics Committee

University of Oxford
Research Services, Research Governance, Ethics & Assurance
Boundary Brook House, Churchill Drive, Oxford OX3 7GB
Tel: +44 (0)1865 (2)82106
E-mail: oxtrece@admin.ox.ac.uk



3 July 2022

Dr Uchenna Gwacham-Anisiobi
National Perinatal Epidemiology Unit,
Nuffield Department of Population Health
Richard Doll Building, University of Oxford,
Old Road Campus Headington, Oxford, OX3 7LF

Dear Dr Gwacham-Anisiobi

Full Title of Study: Incidence, types, determinants, and perceptions of stillbirth in Imo state Nigeria: a mixed-methods study

OxTREC Reference: 535-22

Thank you for your email of 27 June and for your updated documentation. I am pleased to confirm that approval has now been granted for this study. This is valid for the planned duration of the study as detailed in the application and is subject to receiving local ethical approval (if this approval has not yet been received).

The documents approved for this study are as follows:

Documents:	Version:	Date:
PIS HCW	1	24 June 2022
PIS Women	1	24 June 2022
Consent form	1	24 June 2022
Poster advert	1	24 June 2022

Any subsequent changes to the application must be submitted to the Committee as an Amendment. This should include a letter to give the reasons for the proposed modifications and all revised documents with changes tracked.

Please ensure that you submit a completed Annual Report form on every anniversary of this approval and a final End of Study Report. The relevant forms can be found on the [OxTREC website](#). Finally, please note the following **important information**:

Data safety—all studies

It is the responsibility of the PI to ensure that all data collected during the course of the study is stored and transferred safely and securely. Further guidance and advice are available from the [Research Data Team](#).

Yours sincerely
DocuSigned by:

BA168DF4624B463...
Dr Karen Melham
Sponsorship and Ethics Lead

for
Research Ethics Manager, OxTREC

Tel: +44 (0)1865 (2)82106
Email: oxtrece@admin.ox.ac.uk Web: <https://researchsupport.admin.ox.ac.uk/governance/ethics>

B: Federal Medical Centre Owerri Ethical approval

FEDERAL MEDICAL CENTRE
P. M. B. 1010, Orlu Road Owerri, Imo State, Nigeria

Medical Director
DR. K. I. ACHIGBU
MBBS, FRCGP
Chief Consultant Paediatrician

Ag. Head of Clinical Services
DR. CHUKWUMAM D.O.C
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Chairman of Board
SENATOR (DR) ISHAQ SALMAN

Head of Administration
KELECHI O. OTUNEME
B.TECH, M.B.A, M.Sc, MPM, APMP, SAPPH

25157

FMC/OW/HREC/VOL.II/68 June 8, 2022.

Dr Uchenna Gwacham-Anisiobi,
National Perinatal Epidemiology Unit,
Nuffield,
Department of Population Health,
University of Oxford,
Oxford,
England.

Dear Dr Uchenna Gwacham-Anisiobi,

ETHICAL APPROVAL

**RE: "INCIDENCE, TYPES, DETERMINANTS AND PERCEPTIONS OF STILLBIRTH
IN IMO STATE NIGERIA: A MIXED-METHODS STUDY"**

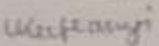
The Health Research Ethics Committee has reviewed your proposal on the above study.

I am pleased to inform you that ethical approval has been granted for the conduct of your research.

You are advised to adhere to your methodology as stated in the proposal and submit a copy of your dissertation to this Committee on completion of your study.

This approval is valid for one year.

Yours faithfully,



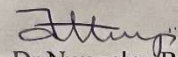
DR. I. I. IKE (MBBS, FMCPAED)
CHAIRMAN, HEALTH RESEARCH ETHICS COMMITTEE.

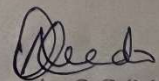
C: ISSH approval

IMO STATE SPECIALIST HOSPITAL (ISSH), OWERRI

ETHICAL COMMITTEE

This is to inform you... DR UCHENNA GWACHAM-ANISIOBI
that approval has been/~~has not been~~ given for you to collect data from Imo State Hospital, Owerri
based on the methodology stated in your project proposal.


Dr Nwanebu, B.N
Chairman


Nwanedo, O.C (Mrs)
Secretary

D: Participant information sheet for health workers

Oxford Population Health Department
National Perinatal Epidemiology Unit
Old Road Campus, Headington, Oxford OX3 7LF

Uchenna Gwacham-Anisiobi
Uchenna.gwacham-anisiobi@ndph.ox.ac.uk



Opinions about the death of a baby in the womb after 28 weeks of pregnancy (stillbirth) in Imo State Nigeria

PARTICIPANT INFORMATION SHEET

Oxford Tropical Research Ethics Committee (OxTREC) Approval Reference: [Insert]

We would like to invite you to take part in this research project. Before you decide it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether you wish to take part.

Why is this research being conducted?

We are conducting this research to understand the views of health workers and women in the State as to why stillbirths occur and how they can be prevented. We hope that the findings from this study will inform policy at the Ministry of Health and guide the design of interventions and programmes to reduce stillbirths in Imo state and beyond.

Why have I been invited to take part?

You have been invited to take part in this study because you are a health worker, providing maternal health services to women in Imo state; you are 18 years or above. About 30 women and 30 health workers will be recruited to be a part of this study.

What's involved for me?

One of the researchers will contact you on the phone or at a physical meeting to go through this participant information sheet, describe the process of the study and answer any questions you may have. The researcher will also ask what your preferred date is for the interview. Once we have a suitable date, the researcher will ask if you prefer to be interviewed in person at an agreed quiet location or on the phone.

On the day of the interview, the researcher will call you on the phone or meet you at the agreed location. The researcher will go over the participant information sheet with you again and explain the procedure for the interview. If you agree to participate, we will ask you to sign a consent form and will give you a copy to keep. The researcher will request your permission to record the interview to ensure we capture all you say accurately, but no one will be identified by name on the recording. The recording will be stored on the University of Oxford servers and only the research team members will have access to it. The information recorded is confidential.

The interview will consist of five broad questions regarding your views of stillbirths, why they occur, and what could be done to prevent them. The interview will last about 30-45 minutes.

What will happen to my data?

Data protection policies require that you know how we intend to use your data. The University of Oxford is the data controller with respect to data collected in this study and is responsible for making sure your information is used properly. We will not collect identifiable data beyond what is necessary

for the interview and such data will be anonymised. We will collect your initials, age, designation and type of facility where you work.

Research documents such as consent forms which will have your personal information will be kept temporarily in secure cabinets at Health Strategy and Delivery Foundation, Owerri at the end of the interview. They will then be scanned and uploaded to the University of Oxford servers, while the hard copies will be destroyed. Audio recordings will be anonymised and stored in encrypted drives and destroyed by a designated member of the IT department after five years of publication of the research. Other research data like de-identified (anonymous) transcripts and field notes will be stored in the University of Oxford servers for five years after the publication of the research. The research team alone will have access to the data.

Are there any risks in taking part?

We have prioritised participants' comfort in designing this study. We know your time is valuable and we have chosen specific topics to explore which should not exceed the 45 minutes allocated.

It is possible that you may find talking about stillbirths upsetting; especially if you or your loved one has had a stillbirth. You are free to ask the researcher to pause or stop the interview at any time.

The findings from the research will be written up in a dissertation, academic publications, conference presentations and blog posts. It will not be possible to identify each participant in the study as the data will be anonymised and combined with responses from other participants to produce the final research outputs. A copy of my dissertation will be deposited both in print and online in the [Oxford University Research Archive](#) where it will be publicly available to facilitate its use in future research.

What are the benefits of taking part?

There are no direct benefits to you for participating in this study. However, there may be indirect benefits as it is hoped that insights from this research will inform policy and guide interventions to prevent stillbirths which will potentially be useful to women and health workers in the State.

You will receive N7,500 (15GBP) reimbursement for reasonable travel costs and lunch. There will be no payment for taking part in this study.

Do I have to take part?

No, you don't have to take part. It is up to you to decide whether or not to take part. You can withdraw from the study, without giving a reason, by informing me of this decision. The deadline by which you can withdraw any information you have contributed to the research is 02/01/2023. At this point, all data from the study would have been anonymised and combined and it would be difficult to isolate your data. If you choose to withdraw before this date, your data will be identified (using the code assigned to you during the interview) and deleted from our records

Has the study been reviewed by an ethics committee?

This study has received ethics approval from a subcommittee of the University of Oxford Tropical Research Ethics Committee (OxTREC) (Ethics reference: xxxxx). The study also received approval from the Federal Medical Centre Owerri Research Ethics committee. (Ethics reference: FMC/OW/HREC/VOL.II/68).

What if I have any questions or want to raise a concern?

If you have a concern about any aspect of this study, please contact Uchenna Gwacham-Anisiobi – uchenna.gwacham-anisiobi@ndph.ox.ac.uk or Manisha Nair – manisha.nair@ndph.ox.ac.uk, and we will do our best to answer your query. We will acknowledge your concern within 10 working days and give you an indication of how it will be dealt with. If you remain unhappy or wish to make a formal complaint, please contact the Chair of the Research Ethics Committee at the Federal Medical Centre Owerri who will seek to resolve the matter as soon as possible:

The Chair, Ethical Committee, Federal Medical Centre Owerri, email : hospitalfmc162@yahoo.com

Data protection

The University of Oxford is responsible for ensuring the safe and proper use of any personal information you provide, solely for research purposes.

Further information about your rights with respect to your personal data is available from <http://www.admin.ox.ac.uk/councilsec/compliance/gdpr/individualrights/>.

E: Participant information sheet for women

Oxford Population Health Department
National Perinatal Epidemiology Unit
Old Road Campus, Headington, Oxford OX3 7LF

Uchenna Gwacham-Anisiobi
Uchenna.gwacham-anisiobi@ndph.ox.ac.uk



Opinions about the death of a baby in the womb after 28 weeks of pregnancy (stillbirth) in Imo State Nigeria

PARTICIPANT INFORMATION SHEET

Oxford Tropical Research Ethics Committee (OxTREC) Approval Reference: [Insert]

We would like to invite you to take part in this research project. Before you decide it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether you wish to take part.

Why is this research being conducted?

We are conducting this research to understand the views of health workers and women in the State as to why babies die in the womb (stillbirth) and how that can be prevented. We hope that the findings from this study will inform policy at the Ministry of Health and guide the design of interventions and programmes to reduce stillbirths in Imo state and beyond.

Why have I been invited to take part?

You have been invited to take part in this study because you were pregnant and had childbirth at 28 weeks or beyond in the last two years in Imo state; you are 18 years or above. About 30 women and 30 health workers will be recruited to be a part of this study.

What's involved for me?

One of the researchers will contact you on the phone or at a physical meeting to go through this participant information sheet, describe the process of the study and answer any questions you may have. The researcher will also ask what your preferred date is for the interview. Once we have a suitable date, the researcher will ask if you prefer to be interviewed in person at an agreed quiet location or on the phone.

On the day of the interview, the researcher will call you on the phone or meet you at the agreed location. The researcher will go over the participant information sheet with you again and explain the procedure for the interview. If you agree to participate, we will ask you to sign a consent form and will give you a copy to keep. The researcher will request your permission to record the interview to ensure we capture all you say accurately, but no one will be identified by name on the recording. The recording will be stored on the University of Oxford servers and only the research team members will have access to it. The information recorded is confidential.

The interview will consist of four broad questions regarding your views of stillbirths, why they occur, and what could be done to prevent them. The interview will last about 30-45 minutes.

What will happen to my data?

Data protection policies require that you know how we intend to use your data. The University of Oxford is the data controller with respect to data collected in this study and is responsible for making sure your information is used properly. We will not collect identifiable data beyond what is necessary

for the interview and such data will be anonymised. We will collect your initials, age, number of pregnancies and births and the type of facility where your last childbirth took place.

Research documents such as consent forms which will have your personal information will be kept temporarily in secure cabinets at Health Strategy and Delivery Foundation, Owerri at the end of the interview. They will then be scanned and uploaded to the University of Oxford servers, while the hard copies will be destroyed. Audio recordings will be anonymised and stored in encrypted drives and destroyed by a designated member of the IT department after five years of publication of the research. Other research data like de-identified (anonymous) transcripts and field notes will be stored in the University of Oxford servers for five years after the publication of the research. The research team alone will have access to the data.

Are there any risks in taking part?

We have prioritised participants' comfort in designing this study. We know your time is valuable and we have chosen specific topics to explore which should not exceed the 45 minutes allocated.

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What are the benefits of taking part?

There are no direct benefits to you for participating in this study. However, there may be indirect benefits as it is hoped that insights from this research will inform policy and guide interventions to prevent stillbirths which will potentially be useful to women and health workers in the State.

You will receive N7,500 (15GBP) reimbursement for reasonable travel costs and lunch. There will be no payment for taking part in this study.

Do I have to take part?

No, you don't have to take part. It is up to you to decide whether or not to take part. You can withdraw from the study, without giving a reason, by informing me of this decision. The deadline by which you can withdraw any information you have contributed to the research is 02/01/2023. At this point, all data from the study would have been anonymised and combined and it would be difficult to isolate your data. If you choose to withdraw before this date, your data will be identified (using the code assigned to you during the interview) and deleted from our records.

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will do our best to answer your query. We will acknowledge your concern within 10 working days and give you an indication of how it will be dealt with. If you remain unhappy or wish to make a formal complaint, please contact the Chair of the Research Ethics Committee at the Federal Medical Centre Owerri who will seek to resolve the matter as soon as possible:

The Chair, Ethical Committee, Federal Medical Centre Owerri, email : hospitalfmc162@yahoo.com

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Further information about your rights with respect to your personal data is available from <http://www.admin.ox.ac.uk/councilsec/compliance/gdpr/individualrights/>.

F: Consent form

Oxford Population Health Department
National Perinatal Epidemiology Unit
Old Road Campus, Headington, Oxford OX3 7LF
Uchenna Gwacham-Anisiobi
Uchenna.gwacham-anisiobi@ndph.ox.ac.uk



Consent to take part in the interview

Opinions about the death of a baby in the womb after 28 weeks of pregnancy in Imo State Nigeria

OxTREC reference number: XXXX

1. I confirm that I have read the information sheet for the above study. I have had the opportunity to consider the information and ask questions, and have had these answered satisfactorily.	Yes / No
2. I understand that my participation is voluntary and that I am free to withdraw at any point [until ____/____/____], without giving any reason.	Yes / No
3. I understand who access to personal data will have provided, how the data will be stored and what will happen to the data at the end of the project.	Yes / No
4. I understand that I will not be identifiable from any publications, presentations, or blog posts and the information I share with the researcher are confidential.	Yes / No
5. I consent to being audio recorded	Yes / No
6. I understand how to raise a concern or make a complaint.	
7. I agree to take part in this study.	Yes / No

Name of participant

Date

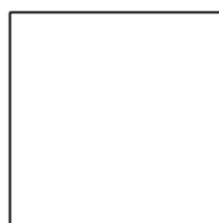
Signature

Name of person
taking consent

Date

Signature

Name of participant



Thumbprint of participant

F: Study Invitation

Oxford Population Health Department
National Perinatal Epidemiology Unit
Old Road Campus, Headington, Oxford OX3 7LF

Uchenna Gwacham-Anisobi
Uchenna.gwacham-anisobi@ndph.ox.ac.uk



Opinions about the death of a baby in the womb after 28 weeks of pregnancy (stillbirth) in Imo State Nigeria

Ethics Approval Reference: [Insert]



Source: UNICEF Nigeria

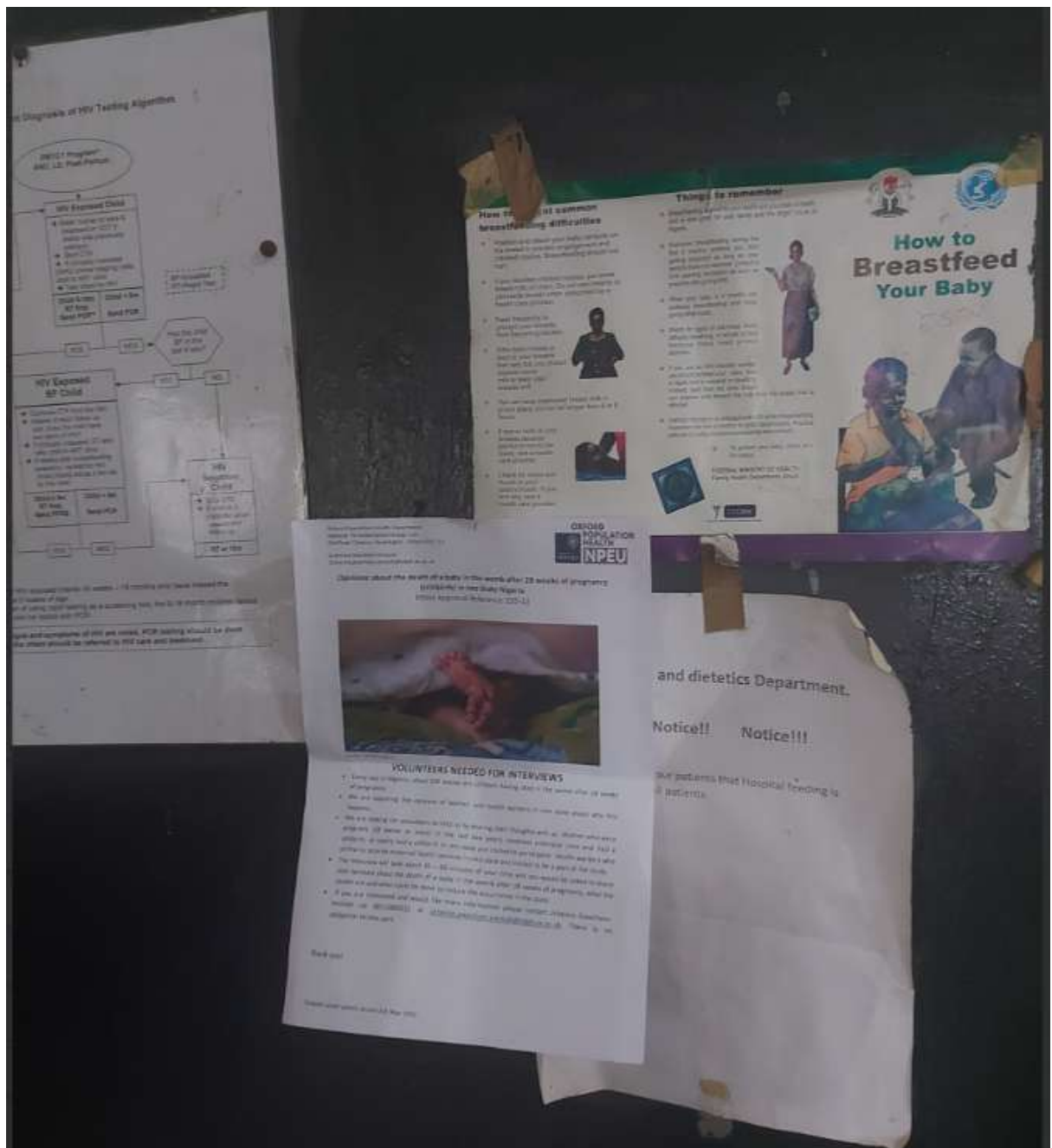
VOLUNTEERS NEEDED FOR INTERVIEWS

- Every day in Nigeria, about 500 babies are stillborn having died in the womb after 28 weeks of pregnancy.
- We are exploring the opinions of women and health workers in Imo state about why this happens.
- We are looking for volunteers to help us by sharing their thoughts with us. All women who were pregnant (28 weeks or more) in the last two years, received antenatal care and delivered in Imo state are invited to participate. Health workers who primarily provide maternal health services in Imo state are invited to be a part of the study.
- The interview will take about 30 – 45 minutes of your time and you would be asked to share your opinions about the death of a baby in the womb after 28 weeks of pregnancy, what the causes are and what could be done to reduce the occurrence in the state.
- If you are interested and would like more information, please contact Uchenna Gwacham-Anisobi on 08116866211 or uchenna.gwacham-anisobi@ndph.ox.ac.uk. There is no obligation to take part.

Thank you!

Template poster advert, version 2.0, May 2021

G: Invitation notice in a study hospital



Appendix 6: Data collection tools

A: Quantitative data collection tool

Hospital Information from registers			
Unique ID		OW01FA OW - 2 letters of LGA, 01FA – first facility)	
	Total deliveries	Total livebirths	Total stillbirths
2020			
2021			
2022			

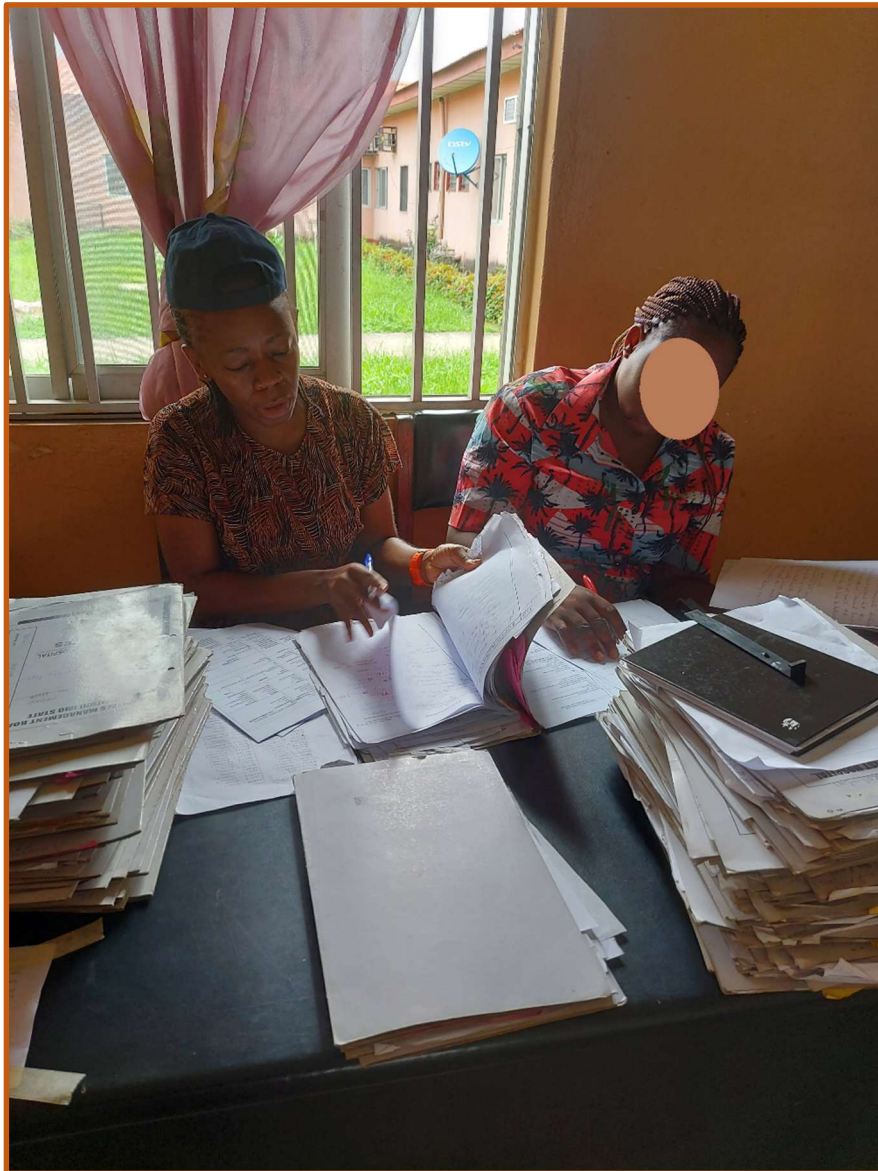
Participant data sheet – from case folders		
Section	Indicators	
	Unique ID	OW01FA001 (OW - 2 letters of LGA, 01FA – first facility, 001 – patient 1)
	Maternal age	
	Maternal education	No formal education Primary education Secondary education University/polytechnic Any post-graduate Not documented
	Maternal employment	Employed Self-employed Unemployed Not documented
	Marital Status	Single Married Co-habiting Divorced Not documented
	Ethnicity	Igbo Hausa Yoruba Others _____
	Religion	Christian Muslim Traditional Others _____
	Place of residence	Rural Urban

		Not documented
	Alcohol use	Current Gave up drinking during pregnancy Gave up drinking prior to pregnancy Never
	Smoking status	Smoker Non-smoker Not documented
	Lives with a smoker	Yes No Not documented
	Gravidity	
	Parity	
	Single or multiple pregnancy	
	Previous stillbirth	Yes No
	Past obstetric complication reported?	Yes No
	If yes, which?	List them
	Maternal height	
	First weight recorded during pregnancy	
Medical Comorbidities	Any co -morbidity reported?	Yes No Not documented
	If yes, which?	List them
Pregnancy and birth information	Expected date of delivery (by LMP or first USS estimate)	
	Date of childbirth	
	Pregnancy interval	(where applicable, number of months from last delivery to the estimated month of conception/LMP)
	Booking status	Booked in facility Booked in another facility Not booked anywhere Not documented
	Place of booking	Traditional birth attendant Religious house Primary facility

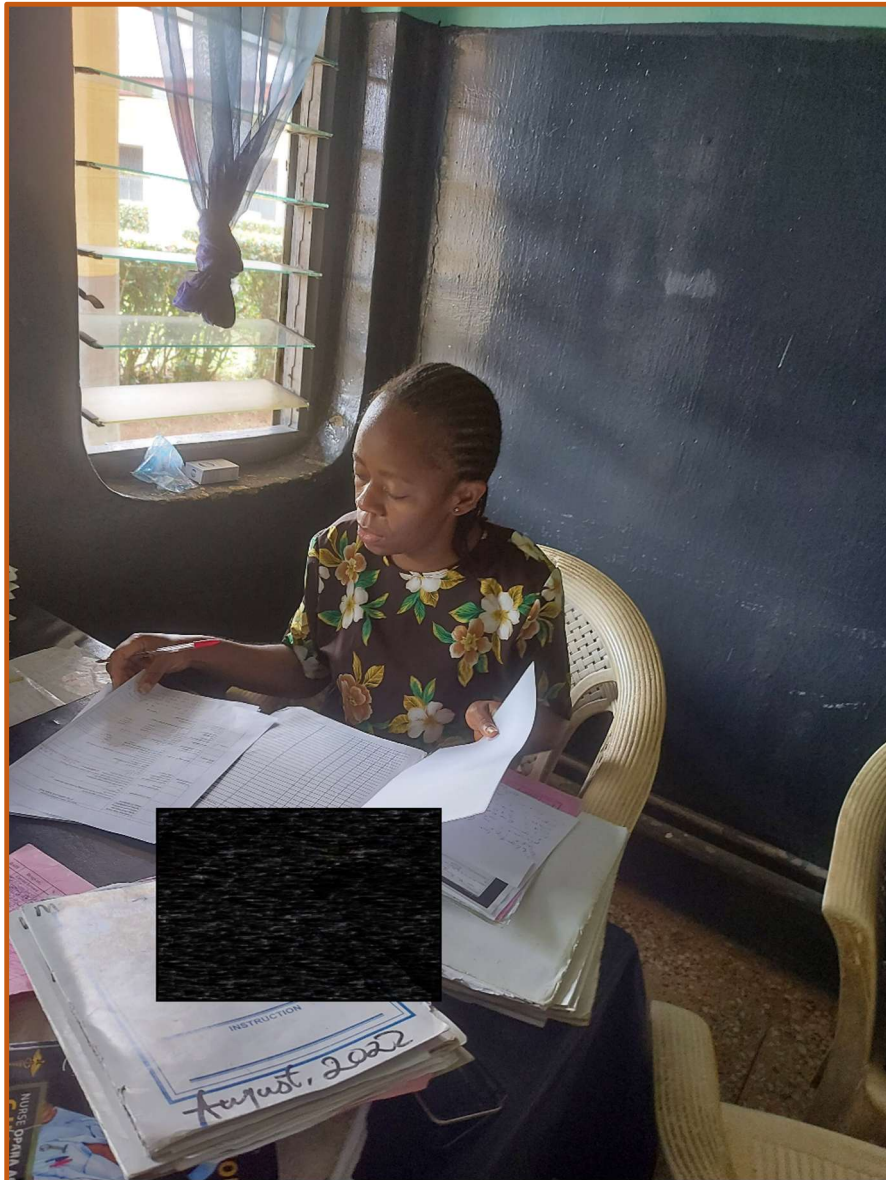
		Secondary facility Tertiary facility	
	Number of ANC visits	Where available	
	Date of last ANC		
	Place of Delivery	Primary facility Secondary facility Tertiary facility	
	Facility ownership	Public Private Mission	
	Referral status	N/A Referred from TBA Referred from a religious house Self-referral following a trial of labour at home Referred from Primary health centre Referred from the secondary facility Referred from a private hospital	
	If referred, how many stops (facilities) did patient get to before facility of childbirth?		
	Mode of childbirth	Spontaneous vaginal birth Assisted Vaginal birth (including forceps and vacuum) Elective CS Emergency CS	
	Use of partograph	Yes No Came in the second stage Not indicated (Elective CS)	
	Admission to birth interval	(Number of hours between time of admission and time of birth) Time of admission Time of birth	
	Cervical dilatation on admission (CM)		
Pregnancy complication	Any complication reported?	Yes No	
	If yes, which?	Abruptio placenta Other Antepartum hemorrhage PROM or PPROM Chorioamnionitis Hypertensive disorders of pregnancy (including Pre/Eclampsia) Obstructed Labour Uterine rupture Other complications -----	
		First PCV during pregnancy	Date

	Assessing for Anemia	Last PCV during pregnancy		Date	
Fetal information		Baby 1	Baby 2		Baby 3
	Birth outcome	Livebirth Stillbirth	Livebirth Stillbirth	Livebirth Stillbirth	
	Gestational age at birth (in weeks)				
	Fetal complications	Congenital anomalies Prematurity Others			
If Stillbirth	Fetal heart rate on admission	Present Absent	Present Absent	Present Absent	
	Sex				
	Birth weight				
	Type of stillbirth	Fresh (intrapartum) Macerated (antepartum) unclassified			
	Attempted resuscitation of Fresh stillbirth	Yes No Not documented			
If Livebirth	Infant birthweight				
	Infant sex				

B: Images from data collection



Data collection at hospital number 20 with the support of a trained midwife.



Data collection at hospital number five.

C TOPIC GUIDE FOR IN-DEPTH INTERVIEWS - Women

Introduction

Pleasantries and Introduction.

I am meeting you today as I am currently studying pregnancies and their outcomes in Imo State. You may be aware that there are many pregnancies resulting in the death of mothers or babies in Imo State, and this affects many families some of which you may know personally. My particular interest is the death of babies in the womb after 28 weeks of pregnancy. You have been invited to participate in this study because you are a woman and in the last two years, you have carried a pregnancy past 28 weeks. What we will discuss here will remain confidential.

I will start by asking your opinion about the death of babies in the womb after 28 weeks, what you think causes this, you can share what you suggest could be done to reduce the occurrence of stillbirth. The entire session should take about 30 - 45 minutes. With your permission, I would like to record this session solely for the purpose of note taking, nothing you say on record will be linked to you.

Questions to be discussed

Questions will be modified slightly for women who had stillbirths in order to address the sensitivity related to the topic.

Women who did not have stillbirths

1. What do you think about babies dying in the womb or during birth? **Probe** Do you know of anyone who might have experienced this? How does that make you feel? Why do you think babies die in the womb or during birth? **Probe:** Is that all? Are any of these reversible?
2. What role do women and their families have in preventing stillbirths? **Probe:** Do you think women know they can contribute in the way you have described? Why is this so?

3. Throughout your last pregnancy, was there any time you were worried about the well-being of your baby in the womb? **Probe:** What did you do?
4. What role do health workers have in preventing stillbirths? **Probe:** How well are they playing this role? What more can health workers do to prevent stillbirths?

Women who had stillbirths

The death of a baby in the womb is a very difficult experience for many women. I am speaking with you today to understand and explore ways to prevent death of other babies in the future.

1. Can you share your experience of losing your baby?
2. Did you at any point feel something was not right with your baby? **Probe** What did you do about it?
3. Did your family support you in anyway during the period of your pregnancy? **Probe:** Did you inform them when you felt something was not right with your baby? Is there something else your family could have done?
4. How did health workers support you throughout pregnancy? **Probe:** were you informed of things to watch out for in terms of your growing baby's wellbeing? What more could the health workers have done?

TOPIC GUIDE FOR INDEPTH INTERVIEWS – Health workers

Introduction

Pleasantries and Introduction.

I am meeting with you today as I am currently studying stillbirth occurrences in Imo State. It is unfortunate that Nigeria still has an unacceptably high burden of stillbirths with far-reaching impact on families and the health system. You have been invited to participate in this study because you are a health worker, and you work closely with women through the course of pregnancy and birth. What we will discuss here will remain confidential.

I will start by asking your opinion about stillbirths, and the causes and you can share what you suggest could be done to reduce the occurrence of stillbirth. The entire session should take about 30 - 45 minutes. With your permission, I would like to record this session solely for the purpose of note taking, nothing you say on record will be linked to you.

Questions to be discussed

1. What do you think about stillbirths? **Probe** Do you know anyone personally who has had a stillbirth recently? How does that make you feel?
2. Why do stillbirths occur in Imo State? **Probe:** Is that all? Are any of these factors you have mentioned reversible?
3. What role do health workers have in preventing stillbirths? **Probe:** How well are they playing this role? Are all women getting similar support from health workers in the state? What more can health workers do to prevent stillbirths?
4. From your experience, have there been times you felt there were other things that could have been done to prevent a particular case of stillbirth? **Probe:** What factors prevented these actions?
5. What role do women and their family have in preventing stillbirths? **Probe:** Do you think women in the State know they can contribute in the way you have described? Why is this so?