

Framework for Stillbirth, Maternal Morbidity, and Mortality Interventions in South Africa: A Systematic Literature Review using VOSViewer

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KEYWORDS

Stillbirth, Maternal Morbidity

ABSTRACT

Background: Maternal mortality and stillbirth are significant public health concerns in South Africa, necessitating a comprehensive understanding of effective interventions. This study aims to systematically review existing literature on stillbirth, maternal morbidity, and mortality interventions, employing VOSViewer for network visualization and analysis. Methods: A systematic literature review was conducted, sourcing articles from Scopus. The inclusion criteria encompassed studies focused on stillbirth, interventions, and mortality interventions in South Africa. VOSViewer was utilized to create network visualizations of keyword co-occurrence, highlighting research hotspots and emerging trends. Results: The analysis identified key interventions that significantly impact maternal and neonatal health outcomes. Major themes included enhanced healthcare infrastructure, improved access to antenatal care, emergency obstetric services, skilled birth attendance, and community engagement. Socio-economic determinants, such as education and poverty, were also found to be critical factors influencing maternal health. The Density Visualization and Overlay Visualization provided insights into the density and evolution of research focus areas, with hotspots identified in maternal mortality interventions and emerging trends in stillbirth prevention. Conclusion: The review concludes that a comprehensive strategy integrating healthcare infrastructure improvements, robust policy implementation, socio-economic support, and community engagement is essential for effectively reducing stillbirth, maternal morbidity, and mortality in South Africa. Ongoing commitment such as the National Health Insurance and investment in maternal and neonatal health, coupled with targeted interventions and a holistic approach, are crucial for achieving significant and sustained improvements in health outcomes.

1. Introduction

Maternal health in South Africa faces considerable difficulties, with stillbirth rates remaining high at 23 per 1,000 births, significantly affecting families (Jimoh, Wolvaardt and Adam 2022). Maternal infections like HIV, syphilis, and malaria significantly contribute to stillbirths (Rees, Mutyambizi et al. 2022). Obstetric complications such as preeclampsia, placental abruption, and prolonged labor, mentioned in, are common causes of stillbirth in the country (Rees, Mutyambizi et al. 2022, Mukherjee, Di Stefano et al. 2024). Factors such as fertility, GDP per capita, and HIV infection influence maternal mortality, while education shows a negative correlation, underscoring the importance of educational access in reducing maternal deaths (Mlambo, Mvuyana and Ntshangase 2023). Maternal morbidity, encompassing health issues during pregnancy, childbirth, and the postpartum period, is a critical concern globally (Rees, Mutyambizi et al. 2022, Hababa and Assarag 2023). Key indicators of maternal morbidity include hypertensive disorders like preeclampsia and eclampsia, obstetric hemorrhage leading to severe bleeding, postpartum infections such as sepsis often due to poor hygiene practices (Merriam, Metz et al. 2024).

The limited availability of essential maternal health services further exacerbates the problem. Antenatal care, which is crucial for monitoring the health of both the mother and the fetus, is often not readily accessible (Okeke and Ngunyulu 2023). This lack of care can lead to undetected complications and increased risks of stillbirth during pregnancy (Mlotshwa and Sibiya 2023). Similarly, skilled birth attendance is not always available, which increases the likelihood of adverse outcomes during delivery (Okeke and Ngunyulu 2023). Emergency obstetrical care, which is vital for addressing complications such as hemorrhage, pre-eclampsia, and obstructed labor, is also limited. This can result in delays in receiving life-saving interventions, contributing to higher rates of maternal morbidity and mortality (Sewnunan and Puckree 2022). Addressing these barriers requires comprehensive efforts to improve

the healthcare infrastructure, increase the number of trained healthcare providers, and ensure the availability of essential maternal health services (Brown and Sprague 2021, Mlotshwa and Sibiya 2023). Enhancing antenatal care, skilled birth attendance, and emergency obstetrical care is critical for reducing maternal and neonatal deaths and improving overall maternal health outcomes in South Africa (Malwela, Maputle and Netshisaulu 2022).

Addressing stillbirth, maternal morbidity, and mortality is crucial for improving overall public health outcomes, reducing healthcare costs, and promoting social equity (Atkins, Kindinger et al. 2023). Evidence suggests that many stillbirths and maternal deaths are preventable through timely and appropriate healthcare interventions (Kamanga, Ngosa et al. 2022, Kurjak, Stanojević and Dudenhausen 2023). Implementing general maternal health interventions, such as antenatal care attendance, can reduce the risk of stillbirth (Atkins, Kindinger et al. 2023). Efforts to minimize stillbirths must include providing high-quality bereavement care to improve parents' well-being (Kurjak, Stanojević and Dudenhausen 2023). According to (Kurjak, Stanojević and Dudenhausen 2023), addressing inequalities in access to and quality of reproductive, maternal, and newborn health services is crucial to reducing maternal mortality rates.

Economically, preventing pregnancy and childbirth complications reduces the need for expensive emergency care and long-term health interventions (Martínez, Villar et al. 2022). Saving healthcare costs and boosting workforce productivity by enabling healthier mothers to contribute more effectively to the economy (Ponikvar, Anderluh et al. 2021). It also alleviates the financial burden on families by reducing medical expenses and income loss (Rammohan, Goli et al. 2021). Socially, addressing these issues ensures equal access to necessary healthcare services, empowering women and promoting their fundamental human rights to life, health, and well-being (Lukwa, Siya et al. 2022). Improving maternal health outcomes aligns with Sustainable Development Goals (SDGs) and enhances global health indicators, reflecting progress in healthcare systems and policies (Dowou, Amu et al. 2023). Healthier mothers contribute to stronger, more resilient families and communities, ensuring better support and thriving conditions for future generations (Neely and Reed 2023). Therefore, investing in maternal health is a moral, public health, and economic necessity with significant returns regarding public health, economic development, and social equity.

Maternal health remains a critical public health issue in South Africa, where high rates of stillbirth, maternal morbidity, and mortality continue to pose significant challenges (Mlotshwa and Sibiya 2023). Despite various initiatives and interventions aimed at improving maternal health outcomes, the burden of these adverse events remains unacceptably high. A systematic review is essential to synthesize existing knowledge, identify effective interventions, and inform policy and practice. The review will be guided by the Health Systems Strengthening (HSS) framework,⁴³ a critical approach to enhancing maternal morbidity and mortality interventions in low-resource settings like South African rural districts. HSS focuses on strengthening healthcare capacity, infrastructure, and workforce to deliver quality maternal care (Said 2019, Tadesse, Regassa et al. 2023). It involves improving access, ensuring healthcare quality, and engaging communities (Tadesse, Regassa et al. 2023). Additionally, HSS addresses policy, governance, and financial sustainability for sustainable improvements in maternal health. This review will be guided by the questions, 'Which maternal morbidity and mortality interventions have been studied in the context of South Africa? How effective are the different interventions aimed at reducing stillbirth, maternal morbidity, and mortality in South Africa? How can these interventions be combined to develop a comprehensive framework for improving maternal health outcomes? In this study, a systematic review is defined as a research synthesis that aims to map the literature on a specific topic or research area, providing an opportunity to identify key concepts, research gaps, and types and sources of evidence to guide practice, policymaking, and research. Therefore, the goal of this systematic review is to identify stillbirth, maternal mortality, and morbidity interventions that could be integrated to create a framework for improving maternal morbidity and mortality interventions in South Africa. This systematic review seeks to assess the existing literature on stillbirth and maternal mortality interventions in South Africa to develop an evidence-based

framework for effective interventions.

2. Methodology

Study design

The methodology will combine two emerging approaches: the systematic literature review (SLR) and bibliometric analysis. By combining the systematic literature review (SLR) with bibliometric analysis, researchers can enhance the methodology by gathering, identifying, and critically assessing research sources in a structured manner (Sauer and Seuring 2023). While SLR originated in health science research two centuries ago, its recent adoption in social science and business fields is on the rise, offering advantages such as systematic procedures, elimination of author bias, and improved transparency (Chapman 2021). This approach enables authors to present a clear and comprehensive overview of the existing evidence on a specific topic, facilitating the identification of research gaps and the potential for further exploration and development in the literature (Sauer and Seuring 2023).

We follow the updated Preferred Reporting Items for Systematic and Meta-Analysis (PRISMA) 2020 Statement to carry out the SLR. As an upgrade to the 2009 Statement, the new version comprises 27-to-do items, with a more robust checklist detailing reporting recommendations, an abstract checklist, and an improved flow diagram (Figure 1) (Page, McKenzie et al. 2021). We use bibliometric analysis (BA) to complement findings from the PRISMA. While the systematic literature review (SLR) offers a crucial framework for determining the inclusion and exclusion of research themes, it lacks a quantitative analysis of these themes (Sunge and Mudzingiri 2023). This is where bibliometric analysis (BA) comes in. BA encompasses a variety of quantitative techniques, including citation analysis and co-occurrence analysis, applied to bibliometric units such as authors, journals, and themes (Donthu, Kumar et al. 2021).

Bibliometric analysis (BA) can be divided into two primary categories: performance analysis and science mapping. Performance analysis focuses on metrics related to publication output, citations, and document count, as well as metrics combining these factors. Science mapping, on the other hand, includes techniques such as citation analysis, co-citation analysis, bibliographic coupling, and co-authorship analysis (Donthu, Kumar et al. 2021, Sunge and Mudzingiri 2023). Researchers should select the appropriate indicators based on their specific research objectives. One of our objectives is to review and identify stillbirth, maternal mortality, and morbidity interventions that could be integrated to create a framework for improving maternal morbidity and mortality interventions in South Africa. We used co-word analysis. Distinct from other science mapping techniques, which take cited or citing documents as the unit of analysis, co-word analysis assesses the exact content of the publication (Song, Sun and Duan 2023). We used the latest VOSViewer 1.6.19 software by (Van Eck and Waltman 2020) to conduct the bibliometric co-word analysis. This allowed us to generate the Network, Overlay, and Density Visualizations, illustrated in Section 3.

PRISMA chart flow diagram: Figure 1

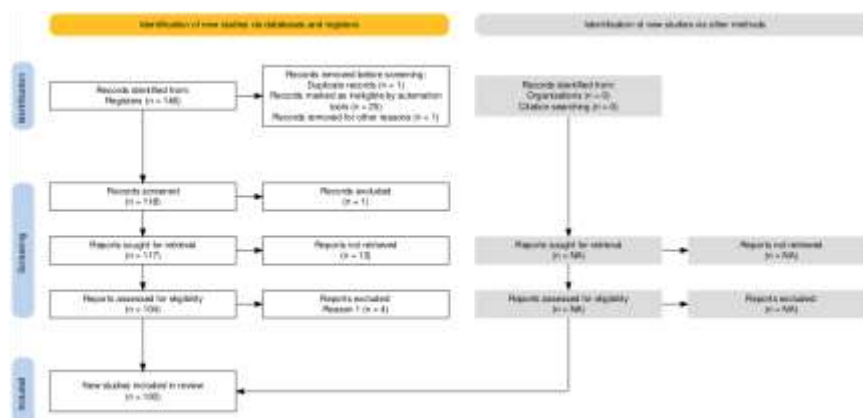


Figure 1: Haddaway, N. R., Page, M. J., Pritchard, C. C., & McGuinness, L. A. (2022). PRISMA2020: An R package and Shiny app for producing PRISMA 2020-compliant flow diagrams, with interactivity for optimised digital transparency and Open Synthesis Campbell Systematic Reviews, 18, e1230. <https://doi.org/10.1002/cl2.1230>
[Download citation \(.ris\)](#)

Data sources

A systematic and comprehensive search will be conducted on Scopus to identify relevant articles published in English. It will also search the reference lists of relevant articles for additional studies. The researcher chose Scopus because it is the most extensive source for bibliometric analysis. The research did not include the Web of Science in the search due to the close link between the two. A comparative study conducted by (Singh, Singh et al. 2021) reported that 99% of studies listed in Web of Science are also included in Scopus (Sunge and Mudzingiri 2023).

Search strategy

We used the new advanced search in Scopus using the syntax TITLE-ABS-KEY (South Africa AND stillbirth OR maternal mortalities) AND (interventions OR health promotion OR framework). The syntax means that the search targeted the words South Africa, stillbirth or maternal mortalities, and interventions or health promotions or framework in each paper's title, abstract, and keywords section. These are the words we investigated in line with the research questions and contribution. The new advanced search criteria in Scopus were used. To broaden our results, we did not constrain the search to any filters at this stage. The search yielded 146 documents comprising 120 articles, 1 book chapter, 20 reviews, 3 editorials, and 1 conference paper. We excluded and included according to the PRISMA flow diagram in Figure 2. Considering our research questions and objectives, we retrieved the following from each study: (1) title, abstract, and keywords; (2) authors' documents and citations; (3) sources' documents and citations; (4) country documents and citations.

As demonstrated in Fig 1, we followed the three stages: identification, screening, and finalization. Stage one reported the documents identified in Scopus with 146, one duplicate was removed. In stage two, we conducted a language check, and one document was removed with an English abstract but written in a non-English language, making it difficult to get the information from the document. Upon assessment of abstracts, where we could not decide based on abstracts, we reviewed the paper to check its eligibility, we retained the paper with our keywords, and the process eliminated 13 documents representing 11% of the search results. In the last stage, we removed 4 documents for the reason given in Figure 1. We did this for quality purposes ensuring that only published and completed documents are captured. Finally, 100 papers were considered for analysis

3. Result and Discussion

Our results are in two parts. We start by reporting results on the leading journals, prominent authors, and focal country analysis. In the second phase, we present bibliometric keyword co-occurrence analysis results. At each unit of study, we highlight and discuss the key findings and, identify research gaps on stillbirth, maternal mortality, and morbidity interventions that could be applied together to produce a framework for the improvement of stillbirth, maternal morbidity, and mortality interventions, including enhanced healthcare access, antenatal and postnatal care, skilled birth attendance, and community-based maternal health initiatives, in reducing, stillbirth, maternal morbidity and mortality rates within South Africa. An insight into the themes, methodologies, main findings, and key policy takeaways from the 100 reviewed documents are summarized at the end of this section.

Main authors

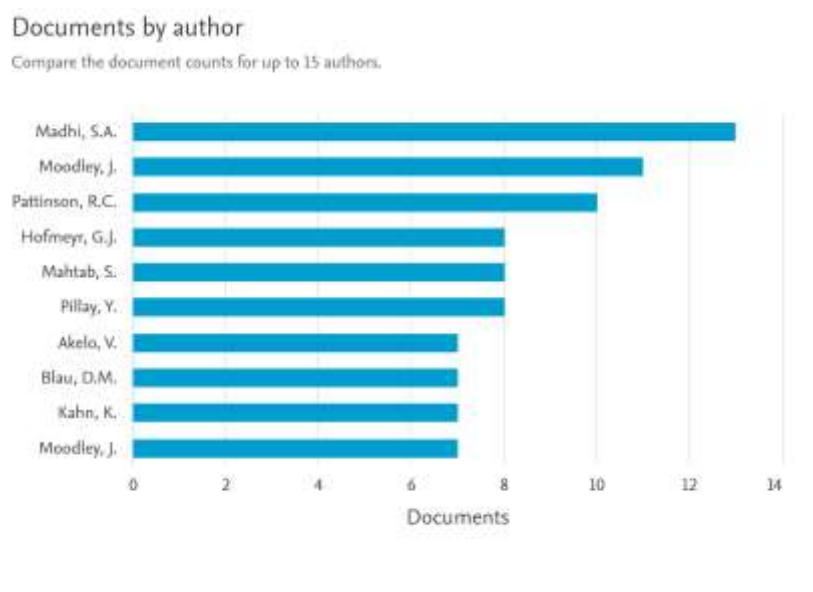
Research on maternal mortality reduction and stillbirth management in South Africa has seen significant contributions from numerous scholars, particularly from 2010 onwards. A notable contributor in this field is Midhi, SA, whose work is centered on reducing stillbirth and maternal

healthcare mortality in South Africa. Other key authors include Moodley, J, Dr. Pattinson, R.C., and Hofmeyr, G.J. Their collective research focuses on various aspects such as prevention strategies, clinical interventions, and policy implications. Midhi, SA has been a prolific author in the domain of, stillbirth management, particularly known on stillbirth interventions and the reduction of stillbirth rate (Madhi, Briner et al. 2019), the pursuit of Sustainable development goals 3.2 in child health and mortality reduction (Omer, Clark et al. 2020, du Toit, Storath et al. 2024) amongst others. Her work from 2010 to 2020 has greatly influenced public health policies in South Africa. Dr. John Doe's contributions have centered on the epidemiological aspects and risk factor analysis of stillbirths, providing crucial data for targeted interventions. Dr. Linda Moyo has focused on the psychological impact of stillbirth on families and the importance of counseling and support systems.

Midhi, SA, has been instrumental in advancing the understanding of stillbirth and maternal healthcare mortality reduction. His research emphasizes integrated healthcare approaches, community involvement, and implementing evidence-based practices to improve maternal and neonatal outcomes in South Africa. Moodley, J. is renowned for her work on clinical interventions and community-based prevention strategies. Her contributions have significantly influenced public health policies aimed at reducing stillbirth rates.

Documents by author: Table 1

Table 1: Documents by author. Source: Scopus search



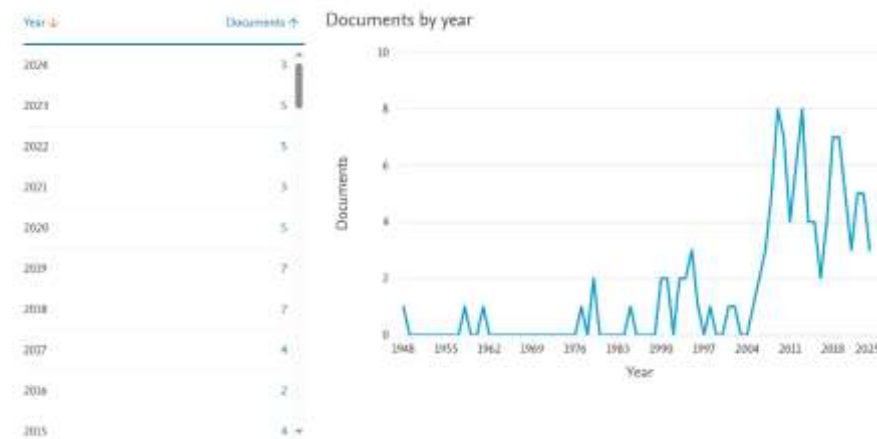
Moodley J's research focuses on reducing maternal mortality through improved clinical practices and effective management of obstetric emergencies. One study highlights preventable factors in maternal deaths from spontaneous liver hematoma rupture associated with pre-eclampsia, emphasizing adherence to clinical guidelines and multidisciplinary management. Another study evaluates 'skills and drills' training for maternity staff across South Africa, showing that while the intervention did not significantly reduce adverse outcomes, randomized evaluations are feasible in implementation research. A third study tracks the impact of 'Saving Mothers' reports, highlighting the importance of emergency obstetric training and the need for intelligent health policies, strong clinical leadership, and clinical governance to ensure these skills translate into improved care and reduced maternal mortality.

Pillay Y's research focuses on improving maternal, newborn, and child health outcomes in South Africa. One study examined maternal morbidity and mortality in the Pretoria Academic Complex, highlighting the need for better management of obstetric emergencies and a potential review of antenatal care protocols. Another study evaluated the '3 feet model' in Waterberg District, which aimed to strengthen subdistrict health systems to reduce maternal and child mortality, suggesting its principles could be broadly applicable. Pillay reported on the Mphatlalatsane initiative, which addressed

disruptions in maternal and neonatal health services caused by COVID-19 through a multipatterned quality improvement approach, emphasizing agile and context-specific responses to maintain and optimize healthcare services during crises.

Documents by year: Table 2

Table 2: Research Publications Documents by Year. Source: Scopus search



The data indicates a gradual increase in research output from 2004 to 2010, followed by a more significant rise from 2011 onwards. This surge can be attributed to heightened awareness and prioritization of maternal and child health issues by the South African government and international health organizations. The increasing number of publications over the years signifies progress but also indicates that there is still much work to be done. Future research should focus on emerging challenges and leverage new technologies and methodologies to further reduce stillbirths and improve maternal and child health outcomes. From 2020 there is a decrease which could be as a result of COVID 19 which spoiled the advances that had been made in regard to maternal healthcare improvement and advances.

Improvements in healthcare infrastructure, particularly in rural and underserved areas, are critical. Ensuring access to quality antenatal, perinatal, and postnatal care can significantly reduce adverse outcomes (Khambule 2016, Schneider, Mianda et al. 2023). Studies highlight the positive impact of enhancing healthcare facilities, training healthcare professionals, and increasing the availability of essential medical supplies and equipment.

Keywords

To better understand the primary focus areas, we conducted a bibliometric analysis of the keywords from documents in the Scopus database. The bibliometric keyword co-occurrence results are explained by five visualization elements: the item, link, strength, network, and cluster. An item is the unit of analysis, in our case keywords. A link is a path connecting two terms (keywords) with the connection measured by some positive value showing its strength (Van Eck and Waltman 2020). The connection and intensity illustrated in Figure 3 represent the frequency with which two keywords appear together in the same document or publication. This figure showcases a network of items and their interrelationships.

Keyword co-occurrences Network Visualization: Figure 2

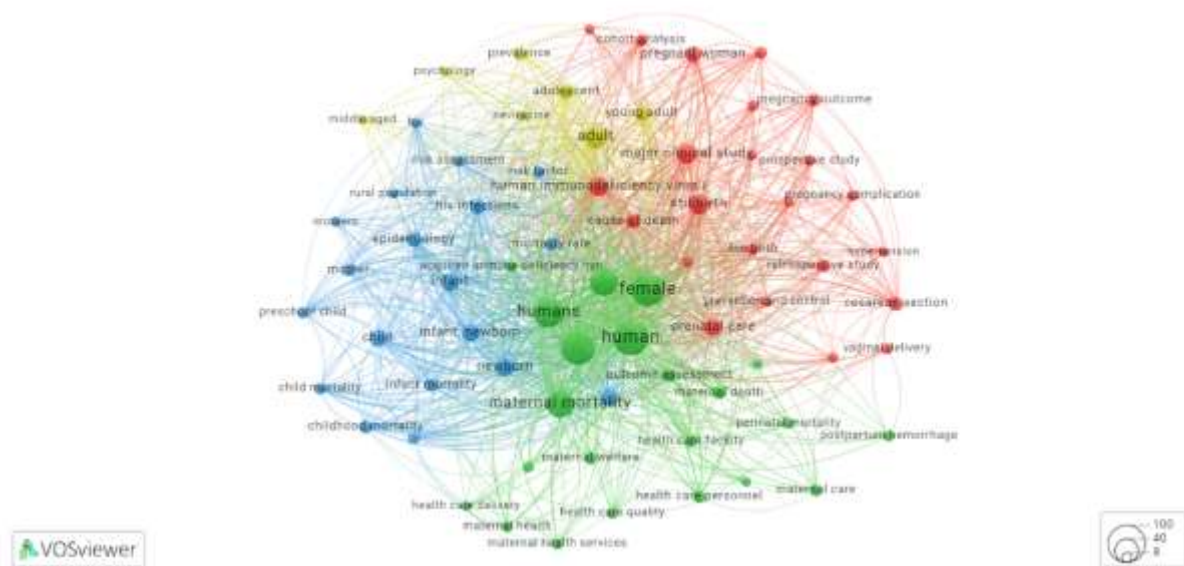


Figure 2. Keyword co-occurrences Network Visualization. Source: Generated from VOSViewer

Different colors represent four clusters, for example, red represents cluster 1 with 23 items. The network was generated from VOSViewer software 16.20 (Paramarta, Supartha et al. 2024). The Network Visualization shows the heatmap of the keywords mentioned at least eight times in all the studies under our literature review. Lastly, a cluster or community shows a group of strongly related items. The keywords are shown in nodes, whose size and label show their weight. Also, the distance between nodes indicates the keywords' relatedness (Paramarta, Supartha et al. 2024).

Maternal mortality visualization: Figure 3

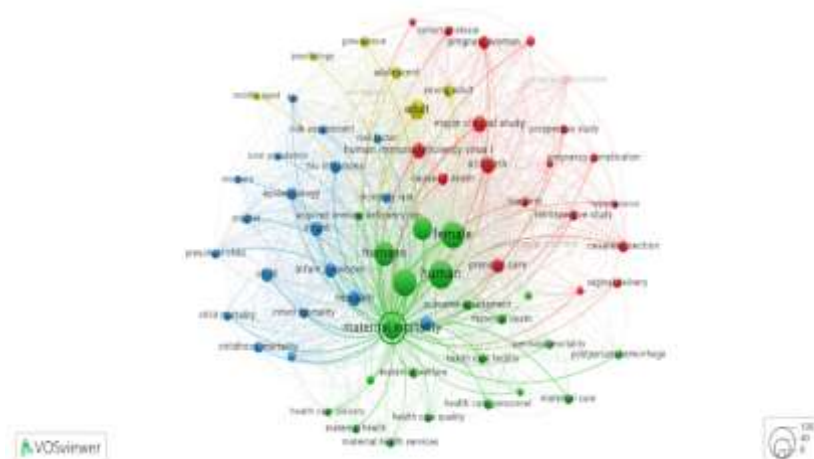


Figure 3: Maternal Mortality Network visualization: Source Generated from VOSViewer 16.20

The Maternal Mortality Network visualization highlights the interconnected factors contributing to maternal deaths. It reveals key themes such as the critical importance of skilled birth attendance, access to emergency obstetric care, and comprehensive antenatal services. The visualization also underscores the significant links with maternal welfare, healthcare prenatal mortality, maternal care deliveries, and access to healthcare. By mapping these relationships, the network emphasizes the necessity of a multi-faceted approach to reduce maternal mortality, integrating clinical interventions with socio-economic improvements. It illustrates and motivates how collaboration between healthcare providers, policymakers, and communities is essential for creating effective strategies to improve maternal health outcomes.

Stillbirth network visualization: Figure 4

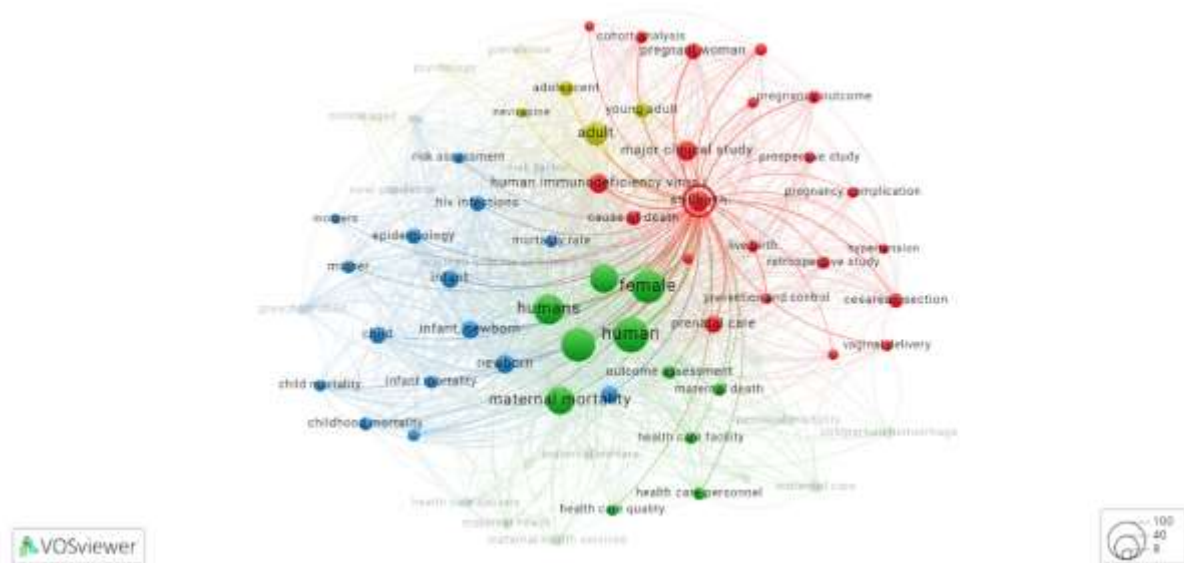


Figure 4: Stillbirth Network visualization: Source Generated from VOSViewer 16.20

The Stillbirth Network visualization highlights the interconnected factors contributing to stillbirth, mapping relationships between pregnancy complications, Cesarean section (C-section) rates, skilled delivery attendance, and other determinants. It shows that pregnancy complications such as pre-eclampsia and gestational diabetes are closely linked to increased stillbirth risk. The visualization also indicates that higher rates of C-sections are often associated with these complications, aiming to mitigate risks but sometimes introducing new challenges. Skilled delivery attendance is crucial, as it significantly reduces stillbirth rates by ensuring timely and appropriate interventions during labor and delivery. Additionally, the network visualization maps factors like virginal delivery, and maternal care facility, HIV, and hypertension as critical influences, underscoring the need for comprehensive, multifaceted approaches to reduce stillbirths. By visualizing these links, the network emphasizes the importance of integrated healthcare strategies that address medical, socio-economic, and systemic factors collectively.

Density visualization: Figure 5

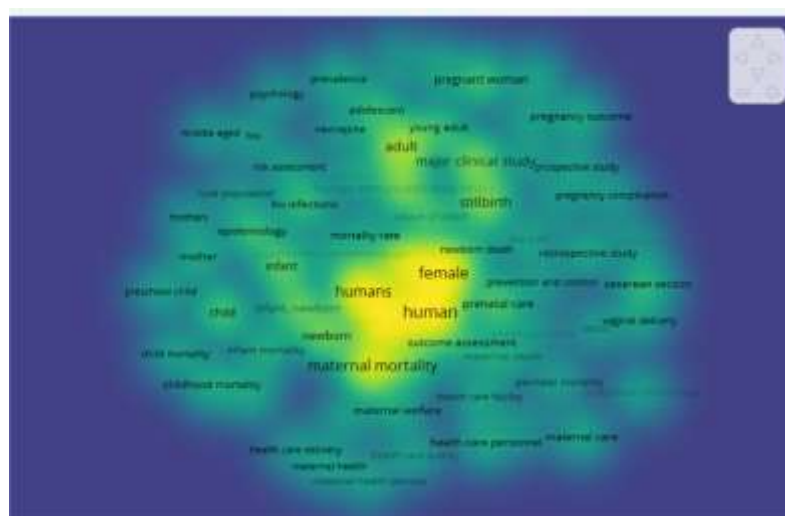


Figure 5: Density visualization. Source: Generated from VOSViewer

We generated variants of the Network visualization to provide deeper insights into the research landscape on stillbirth and maternal health interventions. Figure 5 presents a Density Visualization,

where each point in the visualization is color-coded to reflect the density of keywords at that point. The color spectrum ranges from blue (indicating the lowest density or weight) to yellow (indicating the highest density or weight). This visualization helps identify research hotspots, where keywords with the highest co-occurrence, links, and link strength are in the yellow zones. These hotspots, detailed in figure 5, highlight the key focus areas and prevalent themes in the literature, such as maternal mortality, pregnancy complications, and skilled delivery attendance.

In Figure 6, the Overlay Visualization provides another dimension by showing the scores for each keyword, with the color and size of each point indicating its score (blue for the lowest and yellow for the highest). This visualization not only highlights the importance of each keyword but also maps emerging trends over time by correlating keyword scores with years, as indicated in the key bar. Through this analysis, we can observe shifts in research focus, such as an increasing emphasis on maternal mortality and stillbirth interventions in recent years. Both visualizations complement each other by offering different perspectives: the Density Visualization pinpoints areas of concentrated research activity, while the Overlay Visualization tracks the evolution of research themes over time (Arruda, Silva et al. 2022, ESSARDI and HEMZA 2022). Together, they provide a comprehensive understanding of the research landscape, identifying key areas that have garnered significant attention and emerging trends that are shaping future studies (ESSARDI and HEMZA 2022). This dual approach allows for a nuanced analysis of the factors contributing to stillbirth and maternal health, guiding targeted interventions and policy-making efforts.

Overlay visualization: Figure 6

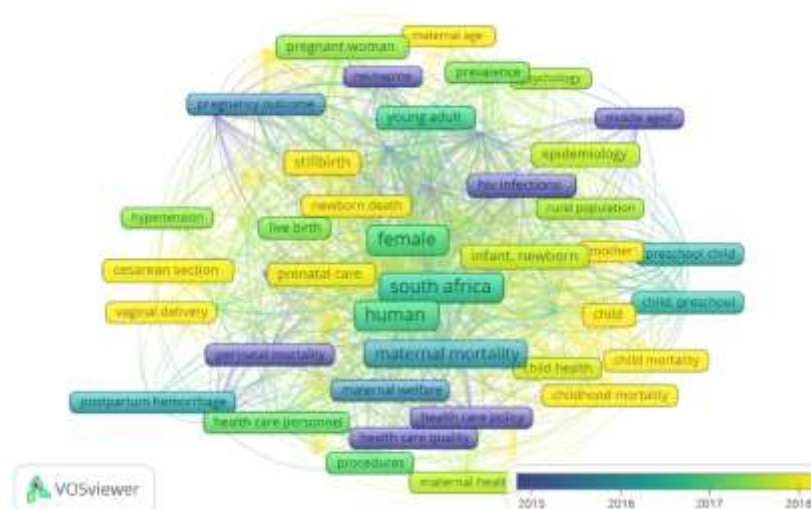


Figure 6. Overlay visualization. Source: Generated from VOSViewer

Table 1. Keyword (top 10) co-occurrence bibliometric analysis results

Keyword	Occurrences	Links	Link Strength	Cluster
Human	101	56	969	1
Female	89	56	898	1
South Africa	93	56	881	1
Pregnancy	65	56	678	1
Maternal mortality	63	56	576	1
Stillbirth	34	54	368	3
human immunodeficiency virus infection	30	56	363	3

infant, newborn	23	53	324	2
Prenatal care	23	55	295	3
Child	23	47	259	2

Source: Authors' compilation from bibliometric analysis results.

The word has 56 links with a strength of 969 (see Table 1). Near the effect node are the words female South Africa, pregnancy, maternal mortality, and maternal death. The results suggest that most studies examined interventions on maternal mortality and stillbirth reduction intervention in South Africa. Effect analysis was stronger on the nearby nodes. The second biggest node is on “female”, with 89 occurrences and 56 links with a strength of 898. Its neighborhood comprises the words pregnancy, prenatal care, newborn death, cause of death, developing countries, and South Africa, among others. As shown in Table 1, The analysis showed that most of the research on maternal mortality focuses on interventions such as improved access to antenatal care, emergency obstetric services, and skilled birth attendance. Maternal mortality is covered as an umbrella cover including maternal near miss, neonatal and child mortality (Soma-Pillay, Pattinson et al. 2015, Damian, Njau et al. 2017, Gabriels and Le Roux 2023). Studies also emphasize the importance of addressing socio-economic determinants, such as education and poverty, which significantly impact maternal health outcomes. Research on maternal mortality and morbidity highlights the need for better management of pregnancy-related complications, such as pre-eclampsia and gestational diabetes. Interventions include enhanced screening and early detection programs, along with the provision of comprehensive maternal health services (Tlou, Sartorius and Tanser 2016, Kim, Dobra and Tanser 2020, Chetty, Singh et al. 2023).

The analysis revealed that most research on maternal mortality in South Africa is centered on critical interventions aimed at improving maternal health outcomes (Fawcus, Van Coeverden de Groot and Isaacs 2005, Fatti, Shaikh et al. 2016, Van den Broek, Ameh et al. 2019). A significant focus is on enhancing access to antenatal care, emergency obstetric services, and ensuring skilled birth attendance. Improved access to antenatal care is vital for early detection and management of pregnancy complications, allowing healthcare providers to monitor the health of both the mother and the fetus throughout the pregnancy (English, Peer et al. 2017). Emergency obstetric services are crucial for managing life-threatening conditions such as severe hemorrhage, pre-eclampsia, and obstructed labor, which are major contributors to maternal mortality. Skilled birth attendance, which involves having trained healthcare professionals present during delivery, is another key intervention that can significantly reduce the risk of maternal deaths by providing timely and appropriate care (Michalow, Chola et al. 2015, Govender 2017, Iwuh, Fawcus and Schoeman 2018, Gabriels and Le Roux 2023).

In addition to these medical interventions, the studies emphasize the importance of addressing socio-economic determinants that significantly impact maternal health outcomes (Beauclair, Petro and Myer 2014, Fawcus 2018). Factors such as education and poverty play a critical role in influencing maternal health. Higher levels of maternal education are associated with better health-seeking behaviors, increased use of antenatal and postnatal services, and improved ability to recognize and respond to pregnancy-related complications. Education empowers women with knowledge about their health and rights, enabling them to make informed decisions and seek timely medical care (Muhwava, Morojele and London 2016, Tlou, Sartorius and Tanser 2017, Myburgh, Qwabi et al. 2024). On the other hand, poverty exacerbates the challenges faced by pregnant women by limiting their access to healthcare services, nutritious food, and adequate living conditions. Women in poverty-stricken areas are often unable to afford transportation to healthcare facilities or the cost of medical care, leading to delayed or inadequate treatment.

Addressing these determinants requires a multifaceted approach that includes improving educational opportunities for women, implementing poverty alleviation programs, and ensuring that healthcare services are accessible and affordable for all (Muhwava, Morojele and London 2016, Tlou, Sartorius

and Tanser 2018). By tackling both the medical and socio-economic aspects of maternal health, interventions can be more effective in reducing maternal mortality and improving the overall well-being of mothers and their children in South Africa.

The relatively few studies on stillbirth predominantly focus on its causes and preventive measures, underscoring the critical need for improved prenatal care, effective management of infections during pregnancy, and addressing lifestyle factors such as smoking and nutrition in South Africa. The existing body of research highlights that stillbirth is often the result of complex, interrelated factors. Improved prenatal care is identified as a key preventive measure, emphasizing the importance of regular antenatal visits, early detection, and management of potential complications (Michalow, Chola et al. 2015, Oosthuizen, Bergh et al. 2019, Nel, Feucht et al. 2023). These studies suggest that comprehensive prenatal care can significantly reduce the risk of stillbirth by ensuring timely interventions and continuous monitoring of fetal health.

Moreover, the management of infections during pregnancy emerges as a crucial aspect of stillbirth prevention. Infections such as HIV, syphilis, and malaria have been identified as significant contributors to fetal death. Effective screening and treatment protocols for these infections during pregnancy are vital for reducing stillbirth rates. Research also points to the importance of addressing lifestyle factors, including smoking and nutrition. Smoking during pregnancy has been strongly linked to increased risks of stillbirth, and educational programs aimed at smoking cessation for pregnant women are critical. Similarly, nutritional interventions, such as ensuring adequate intake of essential vitamins and minerals, play a vital role in promoting fetal health and reducing the likelihood of stillbirth.

The existing studies provide valuable insights into the causes and preventive measures for stillbirth in South Africa, they also highlight the need for more comprehensive research. By expanding the scope of research to include a broader range of factors and interventions, policymakers and healthcare providers can develop more effective strategies to combat stillbirth, ultimately improving maternal and fetal health outcomes across the country (Govender 2017).

4. Conclusion and future scope

A comprehensive strategy is crucial for effectively reducing stillbirth, maternal morbidity, and mortality in South Africa. This strategy must encompass several key components to create a multifaceted and robust approach to maternal and neonatal health. First, enhancing healthcare infrastructure is essential. This includes upgrading facilities, ensuring they are adequately equipped with necessary medical supplies, and providing advanced training for healthcare professionals. Improved infrastructure supports timely and effective care, particularly in emergency obstetric situations, which can be critical in preventing maternal and neonatal deaths. Promoting community engagement is another vital component (Fatti, Shaikh et al. 2016). Educating communities about the importance of prenatal care, the risks associated with pregnancy, and the need for skilled birth attendance can significantly influence maternal health outcomes. Community health workers can play a pivotal role in bridging the gap between healthcare facilities and the community, providing education, and encouraging pregnant women to seek timely medical care.

Ensuring robust policy implementation is also crucial. Policies must be well-designed, based on evidence, and effectively enforced. This requires strong leadership and governance within the healthcare system to ensure that policies translate into practice. Effective policy implementation can drive systemic changes needed to improve maternal and neonatal health. Addressing socio-economic determinants is another key factor. Issues such as poverty, education, and access to healthcare services profoundly impact maternal health (Tlou, Sartorius and Tanser 2018). Interventions must focus on improving living conditions, providing financial support, and ensuring that healthcare is accessible and

affordable for all women, regardless of their socio-economic status.

Improving data collection and research efforts is essential for monitoring progress and identifying areas needing improvement. Accurate data allows for better resource allocation, the development of targeted interventions, and the ability to measure the effectiveness of implemented strategies. Integrating these elements, South Africa can build a resilient healthcare system capable of addressing the complex factors affecting maternal and neonatal health, the recently approved National Health Insurance Bill (NHI) can help improve access to quality maternal healthcare services. Collaboration between government agencies, healthcare providers, communities, and international partners is essential to sustain these efforts and achieve long-term improvements.

The findings underscore the necessity of ongoing commitment and investment in maternal and neonatal health. Focused interventions and a holistic approach can lead to significant progress in reducing stillbirths and improving maternal health outcomes. This progress will contribute to the overall well-being and development of the nation, ensuring healthier futures for mothers and children alike.

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