Understanding implementation of quality improvement initiatives for maternal and newborn health: exploring maternal and perinatal death audit

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MSc

A thesis submitted in fulfilment of the requirements for the degree of Doctor of Philosophy in the School of Public Health, Faculty of Community and Health Sciences, University of the Western Cape

October 2022

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KEYWORDS

Implementation science

Implementation theory

Accountability

Quality improvement

Maternal and Perinatal Death Surveillance and Response

Maternal death audit

Maternal death review

Perinatal death audit

Perinatal review

Maternal and newborn health

Stillbirth

ABSTRACT

Introduction

Poor quality of health services contributes to high maternal and perinatal mortality, particularly in regions with the greatest burden of deaths, such as sub-Saharan Africa. Maternal and perinatal death surveillance and response (MPDSR), or any related maternal and perinatal death audit processes, is a quality improvement process aiming to end preventable deaths and strengthen health systems. It does so by applying a continuous cycle of identification, notification, and review of maternal and perinatal deaths to determine avoidable causes followed by actions to improve care and prevent future deaths. With the expansion of MPDSR in low and middle-income countries over the past two decades, a better description, understanding, and explanation of how and why implementation occurs including enabling and inhibiting factors, can help institutionalise and strengthen the process. This doctoral thesis aims to examine and explore the implementation of MPDSR through a review of the literature and primary research in different African contexts.

Methods

The thesis considers MPSDR and related implementation factors through a range of research activities with fit for purpose application of varied theory-based implementation science approaches. It applies different lenses through which to understand and measure health system drivers of women's and children's health (service delivery, societal and systems), as well as consideration of implementation at different levels in the health system. To map and synthesise available literature assessing MPDSR and related factors influencing implementation, a scoping review was conducted applying a determinants framework. To measure the extent of MPDSR implementation and further examine implementation factors at sub-national and facility levels, a mixed-methods assessment applied a process model in a purposeful sample of facilities across five African countries (Nigeria, Rwanda, South Africa, Tanzania, and Zimbabwe). To explore the contextual interactions that are critical for sustaining MPDSR over time, case study research was conducted in five sub-districts in the Western Cape, South Africa applying implementation theory. Each research activity had oversight from experts engaged with MPDSR and implementation research. Data collection for the case study research was halted due to the COVID-19 pandemic preventing additional data collection and timely validation. The thesis is

presented in the form of six papers (five published and one under review) reporting on the different study components.

Results

The thesis identifies and unpacks tangible factors (service delivery lens) necessary for implementation as well as the more complex aspects that also contribute, such as the attributes of the actors and the context (social and system lenses), whilst considering different health system levels (macro, meso and micro). For the first study component, the thesis develops a conceptual framework to understand factors influencing MPDSR implementation at all levels (Paper 1) and explores how these factors are described in the literature through a scoping review (Paper 2). It also examines in more depth one of the factors identified in the literature, namely blame culture, and presents a framework to promote a positive implementation culture for MPDSR (Paper 3). For the second study component, the thesis applies a process model and linked scoring tool to measure facility-level implementation considering macro and meso levels inputs. Research conducted in 55 facilities across four African countries revealed implementation in 47 facilities and factors enabling and hindering implementation, such as the leadership, teams, frequency of review meetings, and staff skills (Paper 4). Application of the same approach to five sub-districts in the Western Cape, South Africa with institutionalised practice of perinatal audits identified some implementation gaps as well as possible gaps in the tool itself (Paper 5). The thesis shares lessons from the uptake and sustainability of a perinatal audit programme in South Africa showing the value of moving beyond a narrow list of tangible progress markers to include the social processes linked to implementation. For the third study component, the thesis explores why people continue to implement a perinatal audit programme in four of the sub-districts in the Western Cape. Multiple case study research is used, focusing on micro and meso level factors (Paper 6). This approach reveals the complex interplay of actors, their relationships and context, and highlights the importance of integration, team dynamics, facilitation, and the broad social and structural resources required for sustainability.

Conclusion

Taken together, the studies in this thesis demonstrate that in addition to the tangible inputs, which are more often used to measure and monitor progress, societal and health systems implementation factors are core to MPDSR. As a complex social process, MPDSR has a multitude of implementation factors, operating dynamically across health system levels that are

viewed subjectively by those involved with implementation. Theory-based approaches can help further illuminate such complexity. The contributions of this thesis include a synthesis of what is known from the literature, nuanced understanding of factors linked to implementation and institutionalisation of MPDSR in different African contexts, as well as a basis for revisiting how implementation of MPDSR is measured.

DECLARATION

I declare that *Understanding implementation of quality improvement initiatives for maternal and newborn health: exploring maternal and perinatal death audit* is my own work, that it has not been submitted before for any degree or examination in any other university, and that all the sources I have used or quoted have been indicated and acknowledged as complete references.

Mary Virginia Kinney

October 2022

Signed:……

DEDICATION

To the millions women and babies (born still or alive) who died during the course of this doctoral study from complications that occurred during pregnancy, childbirth, or the postnatal period. My heart aches for your families.

To the late Professor Sean Kay for making me excited to learn about the world and patiently teaching me how to write, research, and believe in myself.

To KJ, my rock.

ACKNOWLEDGEMENTS

As the wonderful, late Professor Stephen Lawn said: “Research does not have an ‘I’. It’s WEsearch not rIsearch.” My doctoral journey was truly a beautiful collaborative experience with dedicated, smart, kind, considerate, and humble academics and change-makers. The support and guidance received from them, my friends and family made this doctoral thesis possible.

I am extremely grateful to my supervisor, Prof. Asha George, for her invaluable guidance, patience, and continuous support. She challenged me to think differently about the world and health systems and helped me find language and formats to express complex ideas.

Thank you to all of the extraordinary co-authors who supported on the research and publications. For the scoping review, I thank David Walugembe, Phillip Wanduru and Peter Waiswa for their dedication and partnership. I am also grateful to the Countdown to 2030’s Drivers group and the Global Maternal and Perinatal Death Surveillance and Response Technical Working Group for their engagement, peer feedback on data collection and interpretation, and opportunities to disseminate the findings. I wish to thank members of the sub-group who worked with me on the ‘overcoming blame framework’ with particular gratitude to Louise-Tina Day, Animesh Biswas, Debra Jackson, Allisyn Moran, and Francesca Palestra. For the multi-country assessment, I thank Kusum Thapa, Gbaike Ajayi, Joseph de Graft Johnson, Kathleen Hill, Neena Khada, Alyssa Om’iniabohs and all of the country colleagues for allowing me to join your team, teaching me so much about the intervention, and being incredibly supportive of this PhD journey. For the South Africa research, I thank Anne-Marie Bergh, Robert Pattinson, and Natasha Rhoda for serving on my advisory group, helping to guide the research throughout, and working for decades to establish and advance the intervention. I thank Alison Swartz and Amnesty LeFevre for allowing me to collaborate with them on their digital health solutions project and link parts of my PhD research to their work.

A huge vote of thanks to colleagues at the School of Public Health (SOPH) who supported me on this journey and the other students in my PhD cohort who provided helpful guidance, encouragement and laughter, especially Tanya Jacobs, Fidele Mukinda, Mamothena Mothupi, Ida Okeyo and Jessi Dutton. Thank you to the CHESAI collective for providing a space for me to grow and learn about health policy and systems research. I have had the privileged to be

nurtured by many colleagues over the years who are dedicated to maternal and newborn health. I am particularly grateful to Joy Lawn for her continued friendship, mentorship and investment in me as a researcher and advocate.

My friends and family are amazing. My husband, Johann, and our children, Caleb and Reuben, are my top cheerleaders and were so understanding, supportive and encouraging throughout the journey. I am grateful to my wolf packs and church family, you know who you are. I thank Tanya Doherty for choosing to be my friend first. I wish to thank my Dad and Sherry, my Mom, and my sisters, Amy and Joy, and their families for believing in me and enabling me to pursue my dreams. I am very grateful to my in-laws, Sophia and Johan, for providing tremendous encouragement, kindness, and childcare support throughout.

A special thanks to my dear friend Kate Kerber who brought me into maternal and newborn health and gave me confidence to do the impossible. It is through her that this topic became the focus of my research, and this PhD became a reality. I am in awe of the grace, dedication, and humility she demonstrates as a parent, researcher, and advocate.

I appreciate the financial support provided by the South African Research Chair's Initiative (SARCHI) of the Department of Science and Technology in Health Systems, Complexity and Social Change and the National Research Foundation of South Africa. The Countdown to 2030 project supported parts of the study. The United States Agency for International Development (USAID)'s Maternal and Child Survival Program (MCSP) funded the multi-country study and kindly supported my pursuit of a doctoral degree.

This thesis is rooted in a quest for social justice and a determination to bring change for women and children in Africa. Thank you God for allowing it to be part of my life and may it make a difference. Whatever I have, wherever I am, I can make it through anything in the One who makes me who I am (Philippians 4:13).

ABBREVIATIONS

CD Drivers	Countdown to 2030 Drivers Technical Working Group
eNPT	Extended Normalization Process Theory
KMC	Kangaroo Mother Care
LMIC	Low- and Middle-Income Countries
MCSP	Maternal and Child Survival Program
MDSR	Maternal Death Surveillance and Response
M&E	Monitoring and Evaluation
MNH	Maternal and Newborn Health
M&M	Mortality and Morbidity
MPDSR	Maternal and Perinatal Death Surveillance and Response
NAPEMMCo	National Perinatal Morbidity and Mortality Committee
NPT	Normalization Process Theory
PHC	Primary Health Care
PPIP	Perinatal Problem Identification Programme
TWG	Technical Working Group
UNICEF	United Nations Children's Fund
UNFPA	United Nations Population Fund
USAID	United States Agency for International Development
UWC	University of the Western Cape
WHO	World Health Organization
WHO SEARO	World Health Organization South-East Asia Regional Office

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CHAPTER 1: INTRODUCTION

1.1 Introduction

This introductory chapter locates the research in the broader picture of quality improvement for maternal and newborn health (MNH); reviews the literature about the implementation of the intervention; presents the rationale for the research; summarises the research setting; and provides the aims and objectives and structure of the doctoral thesis.

1.2 Background

For women's and children's health, the greatest burden of deaths takes place during pregnancy, childbirth, and the first week (WHO, 2021e). Sub-Saharan Africa carries the greatest burden of global maternal and newborn deaths and stillbirths. Latest estimates indicate a total of 2.1 million deaths per year in the region, including 200,000 maternal deaths (WHO, 2019) (68% of global total), 856,000 stillbirths (44% of global total), and 1.06 million newborn deaths (45% of global total) (IGME, 2021), with the majority of deaths occurring around the time of childbirth (Oza et al., 2015; Lawn et al., 2016; Chou et al., 2015). Despite increased coverage of facility deliveries and access to health services, mortality has not decreased in many settings. This is primarily as a result of the poor quality of facility-based care for women and babies (Austin et al., 2014; Persson, 2017).

It is widely acknowledged that strengthening access and quality of MNH services will be essential for achieving the health-related Sustainable Development Goals health targets (Every Woman Every Child, 2015; WHO, 2014; WHO, 2015; Kruk et al., 2017b).[1] Modelling efforts show that improving the coverage and quality of known MNH interventions could avert 54% of maternal and newborn deaths and stillbirths in low- and middle-income countries (LMIC) (WHO and UNICEF, 2019). In addition to saving the lives of women and their babies, perinatal mortality,[2] particularly intrapartum stillbirths, can serve

[1] Global targets for ending preventable maternal and newborn mortality and stillbirths by 2030: Maternal: Every country should reduce its maternal mortality ratio by at least two thirds from the 2010 baseline, and no country should have a rate higher than 140 deaths per 100,000 live births – a number twice the global target. Newborn and stillbirth: Every country should have a national neonatal mortality rate of less than 12 per 1000 live births and a stillbirth rate of less than 12 per 1000 total births.

[2] Fetal deaths of at least 28 weeks of gestation and/or 1000 g in weight, and newborn deaths up to seven days after birth

as a sensitive marker of a health system's ability to provide quality care and respond to care delays (Richardus et al., 1998; Mancey-Jones and Brugha, 1997; Lawn et al., 2016). T*he Lancet Global Health Commission on High Quality Health Systems* calls for urgent action to achieve a high quality health system, defined as "…one that optimises health care in a given context by consistently delivering care that improves or maintains health outcomes, by being valued and trusted by all people, and by responding to changing population needs." (Kruk et al., 2018). The World Health Organization (WHO) and partner organizations have responded with multiple efforts to advance quality of care for maternal and newborn health (WHO, 2016b; WHO, 2017b; WHO, 2021d).

1.3 MPDSR: The intervention process under investigation

Maternal and perinatal death surveillance and response (MPDSR) is one intervention process used to improve high quality health systems (Independent Expert Review Group, 2014; Hounton et al., 2013; Every Woman Every Child, 2015). MPDSR applies a continuous cycle of identification, notification, and review of maternal and perinatal deaths to determine avoidable causes followed by actions to improve care and prevent deaths (WHO, 2016a; WHO, 2021d). The goal is to eliminate preventable maternal and perinatal mortality by counting every death, and obtaining and using the information on each death to guide public health actions and monitor their impact at all levels of the health system. The intervention process aims to address health system gaps, health professional behaviour and patient health through a no-blame, interdisciplinary process (Kerber et al., 2015; Ivers et al., 2012). The intervention process has a number of components, and involves multiple actors and functions at all levels of the health system.

MPDSR, as a concept, has evolved over time. The term 'MPDSR' has only been used by WHO officially in recent years (WHO, 2021d; WHO SEARO, 2016). Previously maternal and perinatal death audit guidance documents were separate (WHO, 2016a; WHO, 2013). The WHO released global technical guidelines on maternal death review in 2004 (WHO, 2004) and then expanded the intervention to include surveillance in 2013 (WHO, 2013). WHO released guidelines for perinatal death audits in 2016 (WHO, 2016a) and provided joint operational guidance and tools for MPDSR implementation in 2021 (WHO, 2021d). Box 1 presents different definitions and descriptions of the intervention that have been used in Cochrane Reviews on audit for maternal and perinatal mortality and by WHO, revealing the

ambiguity and complexity of the intervention (WHO, 2021c; Willcox et al., 2020; Pattinson et al., 2005). There are multiple approaches that can be applied for investigating and reporting maternal and perinatal deaths and different contexts require different approaches (WHO, 2021d). As an intervention, MPDSR can be considered an umbrella term, which includes multiple component parts or 'interventions' which are linked but distinct, such as verbal autopsy, notification processes and surveillance systems, maternal and perinatal review meetings at multiple levels of the health system, near-miss reviews, confidential inquiries into maternal death, and quality improvement activities taking forward recommendations (Lewis, 2014b).

Box 1: Definitions and descriptions of the intervention

World Health Organization definitions:

MPDSR

Maternal and perinatal death surveillance and response (MPDSR) is defined as an essential quality improvement intervention which permits the identification, notification, quantification and determination of causes and avoidability of maternal and neonatal deaths and stillbirth with the goal of orienting the measures necessary for their prevention. This definition also includes confidential enquiries, maternal death reviews, perinatal death reviews, maternal and perinatal death reviews and maternal death surveillance and response (WHO, 2021c).

MDSR

Maternal Death Surveillance and Response (MDSR) is a form of continuous surveillance linking the health information system and quality improvement processes from local to national levels which includes the routine identification, notification, quantification and determination of causes and avoidability of all maternal deaths, as well as the use of this information to respond with actions that will prevent future deaths (WHO, 2013).

Perinatal death audit

A mortality audit is the process of capturing information on the number and causes of stillbirths and neonatal deaths, and then identifying specific cases for systematic, critical analysis of the quality of care received, in a no-blame, interdisciplinary setting, with a view to improving the care provided to all mothers and babies. It is an established mechanism to examine the circumstances surrounding each death including any breakdowns in care that may have been preventable. Applying the audit cycle to the circumstances surrounding deaths is an established quality improvement strategy that can highlight breakdowns in clinical care at the local level as well as breakdowns in processes at the district or national level, and ultimately improve the civil registration and vital statistics (CRVS) system and quality of care overall (WHO, 2016a).

Cochrane review definitions of maternal and perinatal mortality audit:

Audit of maternal and perinatal mortality can be performed at a number of different levels. It can take the form of simply recording the number of deaths in an area. Secondly, the causes of death can be categorised. Thirdly, potential avoidable factors or suboptimal care can be recorded. Hence, there are three levels of audit, each adding to the depth of the audit (Pattinson et al., 2005).

'Death audit and review' is a broad term intended to include every different method of reviewing deaths, that not only identifies the medical cause of death, but also attempts to identify avoidable factors that contributed to the death and make recommendations for avoiding such deaths in the future. The principal methods used are community-based audit (verbal and social autopsy), facility based audits such as significant event analysis (SEA) or morbidity and mortality conferences (MMCs), and a combination of both (e.g. through a 'confidential enquiry')(Willcox et al., 2020).

Global and regional bodies have listed MPDSR as an important health intervention for ending preventable maternal and newborn deaths and stillbirths. Global priority for MPDSR has been demonstrated through its inclusion in the UN Secretary-General's Global Strategy for Women's and Children's Health in 2015 (Every Woman Every Child, 2015) and as part of the

accountability milestone of the *Ending Preventable Maternal Mortality (EPMM): A Renewed Focus for Improving Maternal and Newborn Health and Wellbeing* in 2021 (WHO and UNICEF, 2021). In 2020, WHO listed MPDSR among the essential interventions to mitigate the indirect effects of COVID-19 on maternal and perinatal outcomes (WHO, 2020). In Africa, the African Union Commission included MDSR in their action plan towards ending preventable maternal, newborn and child mortality in 2013 (UNFPA, 2013).

If implemented effectively, MPDSR can strengthen health systems, promote quality of care (WHO, 2021b), and reduce maternal and perinatal mortality (Willcox et al., 2020; Pattinson et al., 2009). The potential to save lives, however, only occurs if the audit cycle is completed and implemented over time, triggering iterative cycles of improvement (Kerber et al., 2015; Pattinson et al., 2009; Ivers et al., 2012). Embedding MPDSR as part of a package of complex interventions, such as leadership strengthening and training, also enables mortality reduction (Willcox et al., 2020). Nonetheless, even in high and middle-income countries, the implementation of MPDSR recommendations remains unclear (Allanson and Pattinson, 2015; Gutman et al., 2022), with calls for more operational research (Willcox et al., 2020).

As national MPDSR policies and implementation expand in LMICs (Martin Hilber et al., 2016) and momentum to strengthen MPDSR practice accelerates (Evidence 4 Action, 2017; WHO, 2017a; WHO, 2016c; WHO, 2004), more needs to be understood about MPDSR implementation. Favourable policies are in place in nearly all sub-Saharan African countries; yet few of these countries have bi-annual national MPDSR committee meetings; few develop annual or publicly available reports; and few countries report robust operational systems (Kerber et al., 2015; Bandali et al., 2016; WHO, 2021c).

1.4 Implementation of MPDSR

The available literature on MPDSR shows uneven implementation across and within countries, as well as a variety of methods used to assess implementation (Martin Hilber et al., 2016; Rhoda et al., 2014; Kerber et al., 2015; MCSP, 2018a; MCSP, 2017c; MCSP, 2017b; MCSP, 2017a; Smith et al., 2017c; Belizán et al., 2011; WHO, 2016c). On the surface, there seems to be a lot of knowledge on this topic; yet the enablers and barriers identified are static and similar to many other MNH quality improvement efforts e.g. leadership, teamwork and health worker capacity (Austin et al., 2014). Further understanding of any intervention

process can be enhanced by health systems research approaches that differentiate between 'hardware' (tangible inputs such as financing, medical products, types of human resources, etc.) and 'software' components of the system - "the ideas and interests, values and norms, and affinities and power that guide actions and underpin the relationships among system actors and element" (Sheikh et al., 2011).

To further expand, organizations that successfully and consistently implement quality improvement initiatives, such as MPDSR, have common characteristics, such as leadership at all levels, cultures supportive of learning and innovation, teamwork, and strong information systems (Langley and Denis, 2011; Hulscher et al., 2013; Bhutta et al., 2014). Within these characteristics, there are elements of power, values, trust, and participation at play, or software components (Langley and Denis, 2011). Hardware elements for MPDSR, or tangible indications of implementation, may include availability of notification forms, number of cases reviewed, who attends the meetings, etc. Both hard and soft elements need to be considered when assessing implementation of MPDSR. For example, the establishment of national, sub-national and facility level MPDSR-related committees is an important input, but tracking the existence of a committee does not reflect whether it is functional or not. Understanding implementation requires us to know if the MPDSR committee meetings happen as scheduled, who participates, and the environment of the meeting, such as a culture of blame, all of which impact the quality of the audit meetings (Langley and Denis, 2011).

George and colleagues (2019) acknowledge different framings or lenses through which to understand and measure health system drivers of women's and children's health (service delivery, societal and systems), as well as consideration of different levels in the health system. These three lenses describe both the tangible and intangible health systems drivers (George et al., 2019). For MPDSR, the service delivery lens includes the tangible inputs needed for implementation or hardware elements; a societal lens includes constructs that focus on social understanding and relationships; and a systems lens includes constructs that emphasise change dynamics, which entails adapting learning to contexts in ways that are not always anticipated.

Additionally, multiple levels of the health system also have a role in influencing effective implementation of MPDSR (Lewis, 2014a; George et al., 2019). A supportive policy and

political environment (macro level) needs to be in place to initiate and support implementation. At the meso level, proactive institutional ethos that promotes learning as a critical part of quality improvement and shapes the organizational culture. An environment open to learning also requires individual responsibility and ownership of the process, whereby clinicians want to improve their practice and change their behaviour for the betterment of maternal and perinatal health (Lewis, 2014a). The organizational (meso) and personal (micro) levels are particularly relevant for MPDSR because this is the coalface of implementation. An individual's willingness to 'self-correct' requires commitment of staff towards conducting audit on themselves, to accept open discussion with peers and to take forward the actions recommended (van Hamersveld et al., 2012; Pattinson et al., 2005; Johnston et al., 2000).

Table 1 illustrates some of the health systems drivers of MPDSR through service delivery, societal and systems lenses and across health system levels drawing from the literature (Martin Hilber et al., 2016; Kerber et al., 2015; MCSP, 2017c; MCSP, 2017b; MCSP, 2017a; MCSP, 2018a; Smith et al., 2017c; Belizán et al., 2011; WHO, 2016c). There are knowledge gaps between how to move from policies, law and rhetoric (macro level), to internalised routine practice at the sub-national and facility level (meso level), to individual behaviour change (micro level). The factors at the meso and micro levels relating to context, actors and their interactions are the primary, but not exclusive, focus of this doctoral thesis.

Table 1. Lenses and levels for examining drivers of maternal and perinatal death surveillance and response (MPDSR)

LENSES	HEALTH SYSTEM LEVELS		
	Micro	Meso	Macro
Service delivery			
• Policy mandate • Coordination mechanisms • Service delivery readiness • User capacity	• Competencies of managers, supervisors, providers to analysis and interpret data and information	• Committees formed • Committee composition: profession, gender, seniority	• National MPDSR policy and guideline • Death notification requirements (legal framework for notifying deaths)

		• Meeting frequency • Publication of proceedings • Strategy for staff orientation • to MPDSR • Availability of MPDSR tools • Health worker workload • Functionality of information systems	• Legal mandate to involve communities and other sectors • Human resource shortages across the system but particularly for maternal and child health specialists
Society			
• Macro: Political prioritization • Meso: Accountability ecosystems • Micro: Processes of discrimination	• Confidence of and capability of health workers to complete and analyse deaths • Relationship between committee members • Mentorship, clinical outreach & supervisory activities through district engagement	• Leadership: individuals (champions) & of system (space for teamwork) • Moving away from blame to learning environment/ trust • Credibility of HMIS system • Health worker responses and prioritization	• National prioritisation of preventing maternal and perinatal deaths • Perceived preventability of deaths • Social implications of political party affiliation, gender, class, among committee members, etc. • Community engagement
Systems			
• Dis/ Equilibria • Feedback loops	Examples: • Kenya: MPDSR process/outcomes fail to deliver on actions due to health system barriers which perpetuates a demoralising work		

• Eventuality of change • Emergence	environment and undermines commitment to attending meetings (Smith et al., 2017a). • Nigeria: improved MPDSR led to increased reporting of deaths and therefore an increase in mortality further documenting poor performance. However, responses to insufficient blood supply led to community mobilisation for blood donor club formation. Inclusion of findings in State Medium Term Strategy led to the provision and maintenance of blood banks in State hospitals (Bandali et al., 2016).

Source: George A, et al. BMJ Glob Health 2019;4:i143–i153. doi:10.1136/bmjgh-2018-001316

Changes brought about by quality improvement interventions are complex, and determinants may vary by context, content and application (Dixon-Woods et al., 2012; Coles et al., 2020; Zamboni et al., 2020; Davidoff et al., 2015; Bhutta et al., 2014). Therefore, exploring factors influencing successful implementation of quality improvement practices, such as MPDSR, requires in-depth examination of existing literature as well as additional research to understand the status of implementation along with the context and actors influencing the process (Lewis, 2014a).

1.5 Understanding implementation

Implementation research considers how interventions work in reality and how to improve them for patients, providers, organizations, and policies (Bauer et al., 2015). The term 'implementation' can be defined and framed in multiple ways. For example, May and colleagues define implementation as "any deliberately initiated attempt to introduce new, or modify existing, patterns of action in health care or some other formal organisational setting." (May et al., 2007; May et al., 2016). Others define implementation as a process or multiple processes and as having multiple parts, such as theory, process, strategies, agents and outcomes (Pfadenhauer et al., 2017; Bauer et al., 2015; Damschroder et al., 2009). Implementation interventions, strategies or a set of efforts geared towards facilitating change, such as MPDSR, are another way to view implementation (Bauer et al., 2015).

The different concepts and multiple components comprising implementation reflect the various and often overlapping approaches in implementation science. Within implementation research, one can find a range of epistemologies from more positivist approaches using

service delivery measurements that validate progress or highlight gaps to more constructivist approaches, using social and system lenses allowing for consideration of further nuance, context and varying viewpoints (George et al., 2018; George et al., 2019). Regardless of epistemology, theory-based approaches in implementation science enable the description of constructs (variables), assessment of the relationship between constructs, and exploration for how these constructs may change behaviour or outcomes (Bauer et al., 2015).

Nilsen (2015) presents five categories of theoretical approaches used in implementation science: process models, determinant frameworks, classic theories, implementation theories, and evaluation frameworks. This doctoral study focuses on three theory-based implementation research approaches to describe intervention process and related inputs (process models) and to understand and explain what influences implementation (determinant frameworks and implementation theories). Process models can be used to describe important inputs or aspects that need to be considered in implementation and are often seen as stages or steps that need to be followed in the process of translating research into action. Studies looking at quality improvement interventions have used process models to support managers and planners to monitor and manage implementation (Nilsen, 2015; Meyers et al., 2012). Determinant frameworks can be used to understand and explain what influences the implementation process or outcomes using different domains or concepts. For understanding MPDSR, determinant frameworks allow consideration of different levels, different users and their relationships across and between levels and types of determinants, thus implying a systems approach to implementation (Nilsen, 2015). While process models describe implementation and determinant frameworks consider different components that influence implementation, neither enable deep examination around how the components interact and why they matter for MPDSR. Implementation theory can therefore be used to unpack the factors and underlying mechanisms that might render the intervention to be (or not to be) effective and sustained (Davidoff et al., 2015; Walshe, 2007). Multiple scholars have called for use of implementation theory when investigating quality improvement processes (Akachi and Kruk, 2017; Persson, 2017; Topp, 2017; Kruk et al., 2017a; Hulscher et al., 2013; Davidoff et al., 2015), including audit and feedback (Ivers et al., 2012).

1.6 Rationale for study

The global community together with Ministries of Health in LMICs are scaling up and

promoting facility-based MPDSR; yet there is little known about current practice at facility level or what works regarding MPDSR implementation, for whom and under what conditions. Some knowledge of factors enabling or preventing implementation of MPDSR, or any form of maternal and perinatal audit exists from LMICs but has not yet been systematically or comprehensively examined (Smith et al., 2017b; Martin Hilber et al., 2016; Kerber et al., 2015). Additional research on MPDSR using different implementation science approaches will allow for identification, description, and examination of implementation factors as well as exploration of how these factors interact and relate to their context (Kruk et al., 2017a; Topp, 2017; George et al., 2015). The rationale for this study rests in providing a more systematic understanding of existing literature on MPDSR implementation as well as primary research assessing the extent of MPDSR implementation across diverse African countries and a more in-depth understanding of the contextual interactions that are critical for sustaining MPDSR over time in South Africa.

1.7 Research setting

This doctoral thesis focuses on LMIC settings with primary research in five sub-Saharan African countries: Nigeria, Rwanda, South Africa, Tanzania and Zimbabwe. All of these countries have guidelines in place for MPDSR or related processes, though they have differing histories of implementation, as well as a range of mortality rates and differing health systems. For example, Nigeria adopted a national policy on MPDSR in 2015 (Federal Ministry of Health, 2015), whereas South Africa has been implementing a perinatal audit programme since the 1990s (Allanson and Pattinson, 2015; Rhoda et al., 2014). Exploring MPDSR in these different contexts using multiple implementation science approaches will enable comparison of the implementation processes from pre-implementation to institutionalisation, as well as investigation of influencing factors.

1.8 Aim of the study

Overall aim

The overall aim of this doctoral thesis is to examine implementation of MPDSR. The thesis assesses what is known in the literature about factors influencing MPDSR implementation in LMIC. It further seeks to understand how MPDSR is implemented at facility level across different contexts in Africa (Nigeria, Rwanda, Tanzania, South Africa and Zimbabwe) and

what factors influence implementation and why. By applying different approaches to measure implementation, the study unpacks tangible factors (service delivery lens) necessary as well as the more complex aspects that contribute to implementation, such as the attributes of the actors and the context (social and system lenses). Together, the different research activities provide a comprehensive approach towards identifying, understanding and exploring factors influencing the MPDSR implementation process, whether through existing literature or across different African contexts.

Study objectives

1) To map and synthesise available literature assessing implementation of MPDSR and factors influencing implementation using implementation research theory based on a determinants framework;
2) To examine the extent of implementation and institutionalisation of facility-based MPDSR and to describe the barriers and enablers of implementation using a process model; and
3) To replicate Objective 2 in a setting with sustained practice; and to undertake an in-depth analysis of the implementation process of MPDSR by examining factors that enable sustained, routine implementation using implementation theory.

1.9 Overview of thesis

This doctoral thesis is presented by publication. The research was conducted through three complementary yet distinct activities: 1) a scoping review; 2) a cross-sectional facility assessment; and 3) case study research. Six papers (five published and one under review) are listed below. Table 2 shows where each paper lies in relation to the objectives and study components:

1. Kinney MV, Walugembe DR, Wanduru P, Waiswa P, George AS. Implementation of maternal and perinatal death reviews: a scoping review protocol. BMJ Open. 2019 Nov 27;9(11):e031328. doi: 10.1136/bmjopen-2019-031328. PMID: 31780590; PMCID: PMC6886965.
2. Kinney MV, Walugembe DR, Wanduru P, Waiswa P, George A. Maternal and perinatal death surveillance and response in low- and middle-income countries: a

scoping review of implementation factors. Health Policy Plan. 2021 Jun 25;36(6):955-973. doi: 10.1093/heapol/czab011. PMID: 33712840; PMCID: PMC8227470.

3. Kinney MV, Day LT, Palestra F, Biswas A, Jackson D, Roos N, de Jonge A, Doherty P, Manu A, Moran, AC, George AS. Overcoming blame culture: Key strategies to catalyze Maternal and Perinatal Death Surveillance and Response. BJOG. 2022 May;129(6):839-844. doi: 10.1111/1471-0528.
4. Kinney MV, Ajayi G, de Graft-Johnson J, Hill K, Khadka N, Om'Iniabohs A, Mukora-Mutseyekwa F, Tayebwa E, Shittu O, Lipingu C, Kerber K, Nyakina JD, Ibekwe PC, Sayinzoga F, Madzima B, George AS, Thapa K. "It might be a statistic to me, but every death matters.": An assessment of facility-level maternal and perinatal death surveillance and response systems in four sub-Saharan African countries. PLoS One. 2020 Dec 18;15(12):e0243722. doi: 10.1371/journal.pone.0243722. PMID: 33338039; PMCID: PMC7748147.
5. Kinney, MV, George AS, Rhoda N, Pattinson R, Bergh AM. From pre-implementation to institutionalisation: Lessons from sustaining perinatal audit in South Africa. Submitted to Global Health: Science and Practice in May 2022. Under review.
6. Kinney, MV, Bergh AM, Rhoda N, Pattinson R, George AS. Exploring the sustainability of perinatal audit in four district hospitals in the Western Cape, South Africa: a multiple case study approach. BMJ Global Health. 2022;7:e009242. doi:10.1136/bmjgh-2022-009242.

Table 2: Mapping of papers to study objectives and components

	Objective 1	Objective 2	Objective 3
Component 1 – scoping review	Papers 1, 2 & 3		
Component 2 – cross-sectional facility assessment		Papers 4 & 6	
Component 3 – case study research			Paper 5 & 6

The remaining sections of the thesis are:

Chapter 2: Methods – States the positionality of the candidate, presents the conceptual framework for the study, and provides an overview of each research activity and ethical considerations.

Chapter 3: Findings – Presents the six included papers, their respective contribution to the thesis and the contribution of the candidate to each paper. The findings are presented by objective and each paper is inserted following its introduction.

Chapter 4: Discussion, conclusion and recommendations - Summarises the contribution of the thesis to knowledge on MPDSR implementation including the identification of key influencing factors. It also reflects on applying different implementation science approaches to examine the complexity of the intervention process. The chapter discusses the limitations of the thesis and concludes by making recommendations for future research, monitoring and measurement of MPDSR implementation.

CHAPTER 2: METHODS

2.1 Introduction

This chapter presents an overview of the methods employed in this doctoral study. It starts with my positionality linked to how this doctoral study emerged and how I addressed reflexivity and rigour. The conceptual framework for the study is then presented followed by an overview for each activity of the study summarizing the study designs, study populations and sampling techniques, data collection and management, and data analysis, which are described in more detail in each paper. The chapter then discusses the steps involved in ensuring rigour in the research and concludes with some comments on ethical considerations.

2.2 Background, positionality, reflexivity and rigour

I will start by stating my positionality, and how this doctoral study came about. This background is important because it influenced my decision for topic, approach to research and methods, and selection of supervisors and doctoral programmes.

My previous work experiences have required me to apply, understand and interpret both quantitative and qualitative approaches applied in research. My interest in public health started with my Masters, where I focused on understanding the impact of HIV governance and foreign aid flow on HIV outcomes and ART coverage, using quantitative research. I then worked for Save the Children's Saving Newborn Lives Programme supporting countries in Africa and South-East Asia to advance the newborn health agenda. With later training, I realized that the work that I did and enjoyed most for Save the Children was actually applied health policy and systems research, e.g. stakeholder mapping, developing frameworks to support implementation and policy analysis. It also helped me better understand that the research that I was involved with at Save the Children was more positivist, whereby implementation factors were often shown as long lists of known barriers and enablers, and progress assessed as checklists of tangible markers (measurable indicators). Yet, I applied more interpretivist social science-based methods regularly to inform our advocacy, navigating and managing inputs from complex and diverse teams.

My philosophical stance, or world view, tends to be pragmatic in nature. I can see that multiple realities exist and respect that people have different world views. On paper, much of

my research has been more positivist, including numbers and static lists of interventions or health system components (e.g. human resources, information systems). In practice, much of my work around advocacy required thinking about behaviours and the sense-making of people's thoughts and actions, which are socially constructed. Therefore, I believe that both qualitative and quantitative research methodologies are necessary to gain a greater understanding of people and their reality in order to make inquiry into a more complex phenomenon (Feilzer, 2010; Creswell, 2009).

The idea for the topic of this doctoral study came from my interest in expanding my own understanding of applying different research philosophies through health policy and systems research. Throughout the research process, I was aware of my positionality (Bourke, 2014). As a researcher and advocate for women and their babies and families, as a social scientist, and as a person of privilege, I had to be mindful to promote objectivity and intentional to put mechanisms in place to ensure reflexivity and rigour throughout the research process. My passion for MNH may have influenced my research process as both a feminist and a mother (Frost and Holt, 2014; Kinney, 2020). While I tend to be generally optimistic that MPDSR can improve the health system and saving lives, I am also skeptical given the implementation challenges. To understand and learn from different perspectives, multiple implementation research approaches were applied adapting from existing process models, frameworks and theories. I kept a dedicated journal throughout the process to reflect on my position and perspectives as well as to document decisions.

The thesis is embedded within larger collaborations. My previous work at Save the Children enabled me to combine my doctoral research with my role as a Co-Principal Investigator of a research project for the US Agency for International Development's Maternal and Child Survival Program (MCSP) on MPDSR implementation. Through this work, I was member of the WHO's MDSPR Technical Working Group (TWG), which allowed me to link parts of the study to their workplan, supported peer-feedback, and provided dissemination channels to key audiences. Likewise, I was a member of the Countdown to 2030 Drivers group (CD Drivers) through my work at the University of the Western Cape, and included some of the work for this doctoral thesis into their workplan. Given these links, I feel extremely privileged to have had inputs from many colleagues throughout the process who have worked on implementation of health interventions in LMIC settings. I acknowledge that these

relationships (both informally to individuals and formally to individuals and these technical working groups) may have influenced my decisions and the direction of the research process and outputs.

In addition, I am mindful of my position as a person who identifies as female, white, American, working and living in Cape Town, South Africa. I will always feel like an 'outsider' and carry the privilege of my background even after marrying locally and living in sub-Saharan Africa since 2003. The decolonisation movement overall, and particularly in public health, has made extraordinary strides in the past couple of years with a long journey ahead (Abimbola and Pai, 2020); and my awareness of the movement and my interface with it increased though the Doctoral thesis process. My foreign and privileged background may have influenced the perceptions of my research respondents and some of our interactions. Intentional efforts across each activity were undertaken to address my positionality.

For *Study component 1: Scoping Review*, we partnered with colleagues at Makerere University in Uganda to ensure the perspectives of health policy and systems researchers from a contrasting health system context in Africa were represented and could meaningfully contribute throughout the process (two of these colleagues were also doing Doctoral research related to MPDSR). Though I led all components of the research, the team had regular remote meetings and two in-person workshops to discuss the adaptation of the conceptual framework and ensure consistency in data extraction and analysis approaches. We engaged key stakeholders throughout the process, including the WHO's MPDSR TWG and the CD Drivers group, to identify any additional literature, to input on the implementation framework and to review the findings to support interpretation. Additional meetings were set up with targeted experts to receive further inputs.

For *Study component 2: Cross-sectional facility assessment*, we collected data through MCSP coordination in four countries. I was engaged in data collection in Tanzania and worked with a team of individuals from the country who were familiar to facility staff through the MCSP programme. For all four countries, data collectors were trained using a standard approach, and at least one of the principle investigators participated in each country assessment. The assessment teams comprised of different members from MCSP home office, country offices and in-country partners. The data collection tools were slightly adapted for each country to

accommodate the different contexts, but were consistent in terms of main content. The quantitative data was collected directly at the facilities assessed and informed by both the semi-structured interviews as well as observations, thus ensuring reliability of the data. During the process of examining the cumulative implementation progress scores and aggregated data analysis, we checked the validity of the data by investigating any deviant cases to explain data variation. Qualitative data were analysed using thematic content analysis by three researchers (myself included) who independently coded responses, consulted, and reached consensus on data interpretation. We mapped national guidelines and tools using a content analysis and verified data with national stakeholders. As the lead author on the paper, I was able to direct the focus of the article to align with the objectives of this doctoral study. In addition to the paper included in this thesis, MCSP published a report for each country and a summary of the multi-country findings (MCSP, 2017c; MCSP, 2017b; MCSP, 2017a; MCSP, 2018a; MCSP, 2018b), and produced an internal multi-country report (Thapa et al., 2019). Colleagues in Rwanda also published a paper about their specific findings (Tayebwa et al., 2020).

For *Study component 3: Case study research*, I conducted data collection in the Western Cape, South Africa. Unlike the key stakeholders interviewed, I do not have a clinical background or experience working for the Department of Health. Additionally, for many of the research participants, their first language was Afrikaans, the language of my partner, but not a language I speak fluently. Therefore upon introduction, I would introduce myself in Afrikaans, indicate that I am married to an Afrikaans person and apologise for not speaking their language well. This approach seemed to make the participants more approving of me as a local researcher and accepting of the interview in English. To ensure rigour of the case-study approach, I followed the four criteria of trustworthiness: confirmability, dependability, credibility and transferability (Yin, 2014; Gilson, 2012). For credibility of the study, I engaged with sub-district health managers as well as sub-national and national stakeholders and the context prior to data collection. I triangulated different data sources to verify and validate information, including field notes, observations and follow up interviews with specific people in order to identify patterns in data and across cases (pattern matching). A short report was provided to sub-district and district managers summarizing the findings of the sub-district research. Verbal feedback was presented in one sub-district (the COVID-19 pandemic hindered timely and further feedback session). For transferability and

dependability, a case-study protocol and database was developed and shared for others to review. An advisory group was established to oversee and engage in the research; this group included experts from South Africa who have a long history of both implementation of perinatal death audit as well as researching its implementation. I provided a short case study report to the advisory group within one week of each of the field visits and had regular meetings with them to review the data collection and analysis process. An audit trail with clear mapping and documentation of the research process was kept. For confirmability, the research proposal was presented to the Provincial Perinatal Mortality Committee and results presented at a related national conference (Conference of Perinatal Priorities in South Africa in March 2022). Supervisor feedback as well as feedback from the advisory group guided every step of the process. Participation of respondents was voluntary and interviews conducted privately, unless the respondent had the preference of being interviewed openly e.g. on the ward. Permission to take photographs of documents and training materials was sought in advance from facility administrators, with commitment to not include sensitive information and identifiers. There was possible interpretive bias of the lead researcher due to issues of reflexivity and specific interests. However, the interviews were conducted using a semi-structured interview guide and data was analysed using an implementation theory and adapted analysis coding framework. The quantitative data was collected directly at the facilities assessed and informed by the questionnaire, individual interviews as well as observations, thus ensuring reliability of the data.

2.3 Conceptual Framework

This study takes a pragmatic philosophical stance, in which both qualitative and quantitative research methodologies can be used to gain a greater understanding of people and their reality in order to support inquiry into complex phenomena (Feilzer, 2010; Creswell, 2009). The thesis considers factors that influence the implementation process of MPDSR using multiple methods including a review of existing literature and primary research. Figure 1 presents the study conceptual framework showing the different theoretical approaches applied to understanding MPDSR implementation. The components of this framework are described by study objective in this section. The study conceptual framework shows that MPDSR leads to identification of modifiable factors and health outcomes; this thesis does not however look at identifying modifiable factors resulting from audit or impact of the intervention.

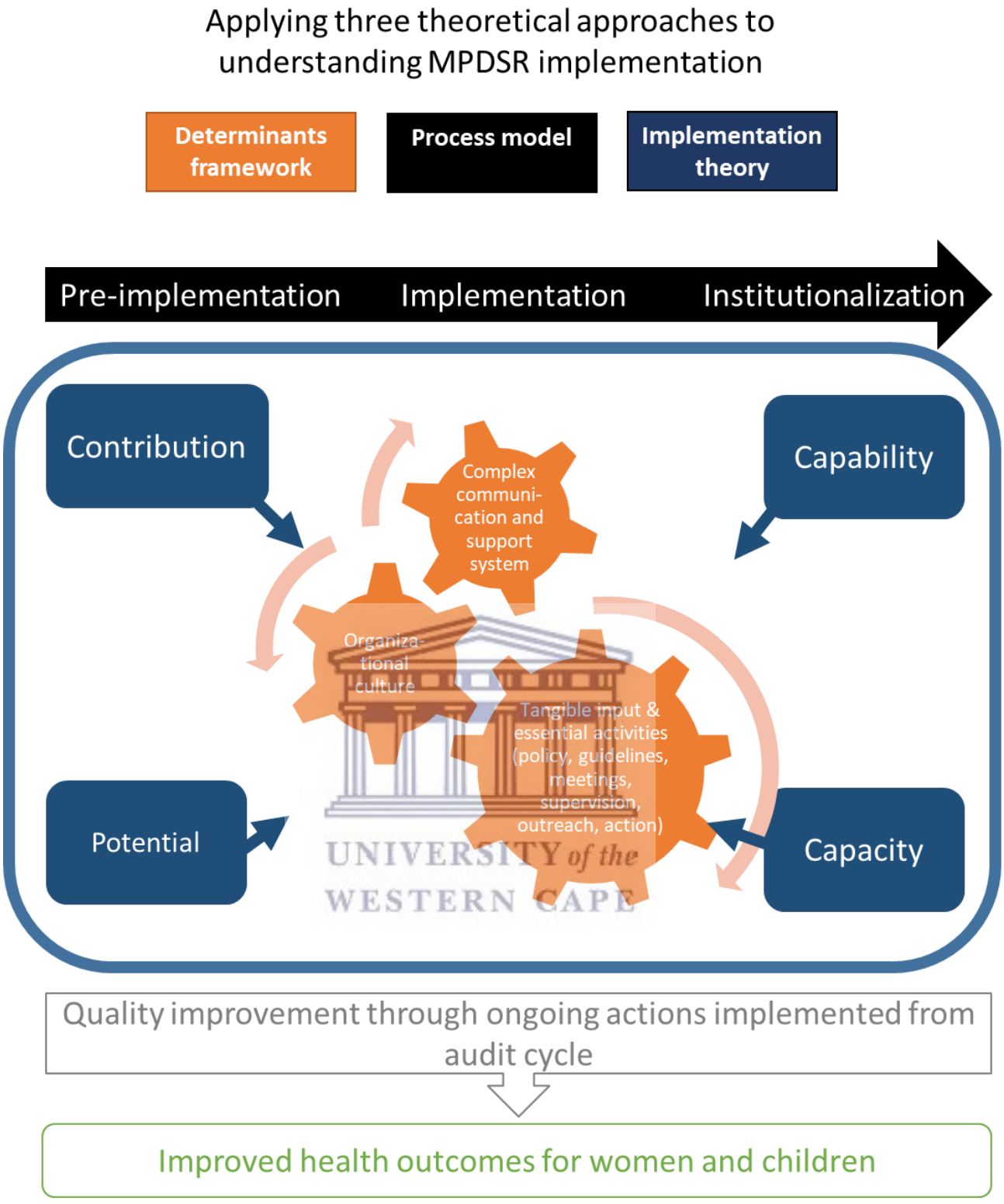

Figure 1: Study conceptual framework

Objective 1: To map and synthesise available literature assessing implementation of MPDSR and factors influencing implementation using implementation research theory based on a

determinants framework.

In the center of the study conceptual framework, there are gears showing different implementation factors. These factors are illustrative, drawing primarily from a South African study that identified factors influencing the success of implementing and sustaining perinatal mortality audit in South Africa (Belizán et al., 2011). Since the thesis sets out to apply, adapt or develop a determinants framework for MDSPR, no specific framework is presented, although multiple determinant frameworks could apply to MPDSR implementation. For example, macro-level determinants frameworks, such as the Health Governance Framework (Brinkerhoff and Bossert, 2014), would allow for unpacking influences across different levels – state, providers, and citizens. Meso-level determinant frameworks would describe general types of determinants that influence implementation outcomes including context and other implementation factors such as Promoting Action on Research Implementation in Health Services (Kitson et al., 2008), Dynamic Sustainability Framework (Chambers et al., 2013) and a Consolidated Framework for Advancing Implementation (Damschroder et al., 2009). Multilevel determinant frameworks would serve to conceptualise, describe and understand the multiple influences on implementation outcomes whilst considering context, setting and implementation aspects, such as the Context and Implementation of Complex Intervention (Pfadenhauer et al., 2017).

Objective 2: To examine the extent of implementation and institutionalisation of facility-based MPDSR and to describe the barriers and enablers of implementation using a *process model.*

At the top of the study conceptual framework, three phases of implementation are shown and can be considered when measuring and describing MPDSR implementation. This process model approach is adapted from one originally designed to measure the progress of Kangaroo Mother Care (KMC) implementation, called a ‘progress-monitoring model’ (Bergh et al., 2005; Bergh and Pattinson, 2003) and later applied to understand the extent of a perinatal audit programme, called the Perinatal Problem Identification Programme (PPIP) in South Africa (Belizán et al., 2011). The adapted progress-monitoring model for perinatal audit includes three phases (Bergh et al., 2011; Belizán et al., 2011):

- pre-implementation, which refers to the ways in which health professionals begin to

realise the benefits of an audit programme to monitor quality of care and become aware of programmes, such as PPIP;

- implementation, which refers to the ways in which the intervention is implemented e.g. execution of activities including completion of the audit cycle; and
- institutionalisation, which refers to the integration of the process into routine practice whereby the intervention has been sustained over a period of time (Bergh et al., 2011).

For each phase, there are stages or conditions that likely need to be achieved before moving to the next stage of implementation, but the process is not always linear. While the progress-monitoring model for KMC has been used to conduct facility assessments (Bergh et al., 2014; Bergh et al., 2012), the study on perinatal audit in South Africa applied the model retrospectively to qualitative research rather than from facility assessments (Belizán et al., 2011). Nonetheless, one can use the adapted progress-monitoring model to assess facility-level implementation that can determine whether people who are at the coalface of implementation are aware of the intervention and commit to implement (pre-implementation), prepare to implement and then implement (implementation), or integrate the intervention into routine practice and sustain the practice (institutionalization).

Objective 3: To replicate Objective 2 in a setting with sustained practice; and to undertake an in-depth analysis of the implementation process of MPDSR by examining factors that enable sustained, routine implementation using *implementation theory*.

The four components in the corners of the box comprise the dimensions of the extended Normalization Process Theory (NPT) (May et al., 2007; May et al., 2009), which provides a useful approach to understanding complex interactions influencing the process of MPDSR (Trietsch, 2016; May et al., 2018). Using implementation theory such as NPT allows for exploration of issues such as trust, credibility and hierarchies shaped by the power relations between MPDSR stakeholders. The social processes that link actors and context are central to understanding embedded, sustained implementation because people are at the heart of the implementation process e.g. their ‘actions shape, and are shaped by, the mechanisms at work in these systems’ (May et al., 2016). Context comprises dynamic elements that influence the impact and effectiveness of an intervention or process (Pfadenhauer et al., 2017), and

considers characteristics, roles, and interactions (May et al., 2016). MPDSR is itself a complex implementation process which 'depends on interactions and negotiations between their participants and contexts' and feedback loops (May et al., 2016).

The original NPT considers the interpersonal relationships within groups and teams, as well as their trust and collective understanding in relation to the sustained implementation of an intervention (McEvoy et al., 2014). The theory itself has evolved and been adapted over time (May et al., 2007; May et al., 2018; May et al., 2016; May et al., 2009; May, 2013). The extended NPT approach broadens the framework beyond contextual and relational integration (e.g. to look at work the actors do when they realise and execute interventions) to include consideration of context including social structural resources as well as social cognitive resources (May, 2013), whilst also considering these elements to be adaptive (May et al., 2016). The four dimensions in the extended NPT include:

- Contribution: What agents do to implement a complex intervention,
- Capability: Possibilities presented by the complex intervention,
- Capacity: Social-structural resources available to agents, and
- Potential: Social-cognitive resources available to agents (May, 2013).

The use of extended NPT can guide the understanding of how an intervention embeds within the fabric of the health system by unpacking the motivations of people implementing it as well as the evolution of the process.

2.4 Study design and overview of methods

This doctoral thesis presents the three study components undertaken to address the descriptive and explanatory aims of the research (Table 3 and Figure 2). Objective 1 uses a scoping review to explore existing knowledge on factors influencing implementation of MPDSR in LMICs. Objective 2 uses a cross-sectional facility assessment to describe the extent of MPDSR implementation across facilities in Nigeria, Rwanda, Tanzania, and Zimbabwe. This objective also identifies factors influencing implementation of MPDSR at a macro and meso level. Objective 3 applies the same cross-sectional facility assessment to sub-districts in the Western Cape, South Africa, as well as case study research to further examine mechanisms that promote the implementation process of perinatal death audit at a meso and micro level. The case study research focuses on the interpersonal relationships

within the team, their trust, and collective understanding in relation to the sustained implementation of perinatal audit. Methods for each study are provided below with additional information in each of the papers (Chapter 3). Additional information on the methods for each component are also available in the individual papers and their supplementary files (Appendix 1).

The timeline of the study components was not sequential by objective. Table 3 includes the timeframes for data collection, analysis and publication of the related studies. The overall study started with Objective 2, the facility assessment, as the doctoral candidate was already involved in this research through MCSP. The idea to further explore the MPDSR implementation literature and to go deeper into understanding implementation using other epistemologies, such as case study research, grew from the development and application of the progress-monitoring model adapted for perinatal audit in objective 2. The scoping review, objective 1, took place following the facility assessment in order to inform the case study research, objective 3.

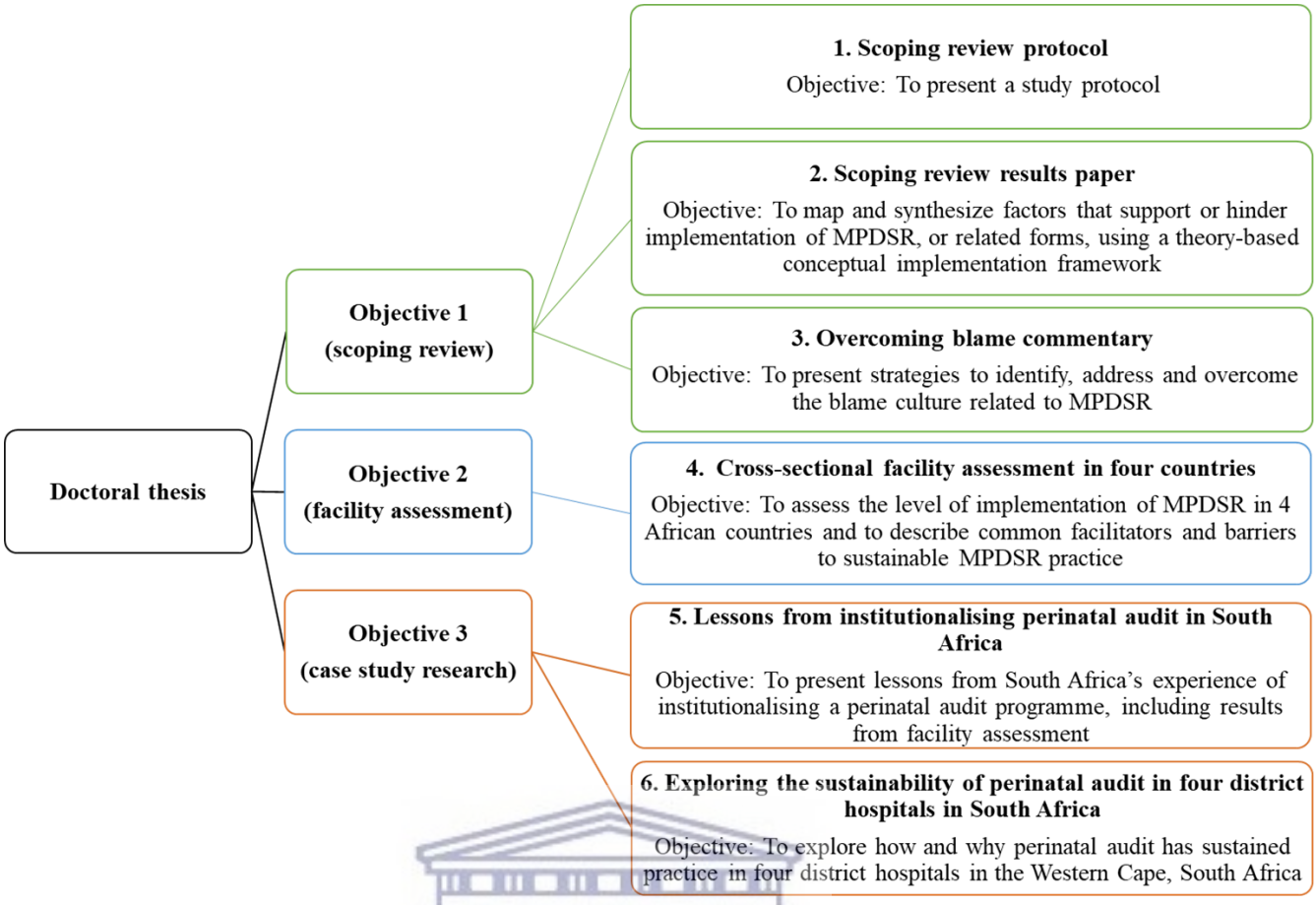

Figure 2: Overview of doctoral thesis and related objectives

Table 3: Overview of doctoral thesis and related study components

	Study component 1			Study component 2	Study component 3	
Paper	Paper 1	Paper 2	Paper 3	Paper 4	Paper 5	Paper 6
Design	Scoping Review			Cross-sectional facility assessment	Multiple case study Cross-sectional facility assessment	Multiple case study
Population/ sample/ components	Context component: LMIC (according to World Bank classification in 2018), English and published between 2004 and July 2018 Concept component: All forms of maternal and perinatal death review (see paper for details); identifies factors that influence the implementation process			Purposeful 55 facilities across 4 countries: Nigeria (10), Rwanda (13), Tanzania (26), Zimbabwe (16)	Purposeful 5 sub-districts; 56 interviews; 9 meetings observed	Purposeful 4 sub-districts; 41 interviews; 7 meetings observed
Data collection	1009 records identified by systematic search 429 records screened by abstract 18 records identified through consultation and references 134 records screened by full text review. 72 records met inclusion criteria (58 primary studies; 6 reviews; 8 commentaries)			Desk review, semi-structured interviews, observations of facility and documentation	Key informant interviews, non-participant observation, Desk review, semi-structured interviews, observations of facility and documentation	

Data collection timeframe	July 2018 to July 2020			October 2016 to May 2017	October 2019 to July 2020	October 2019 to July 2020
Analysis	Iterative data charting process Qualitative thematic and content analysis using conceptual framework			Policy mapping, quantitative tabulation of scores, qualitative using thematic content analysis		Inductive and deductive qualitative analysis using an adapted implementation theory
Data analysis / writing results timeframe	May 2020 to April 2021			May 2017 to Deecember 2019	August 2020 to March 2022	August 2020 to March 2022
Paper originally submitted	April 2019	September 2020	August 2021	January 2020	May 2022	April 2022
Paper published	October 2019	January 2021	October 2021	December 2020	In review	May 2022

Study component 1 – scoping review

Objective 1: To map and synthesise available literature assessing implementation of MPDSR and factors influencing implementation.

Study design

A scoping review was selected since 1) there was limited literature on factors influencing MPDSR in LMIC; 2) we wanted the flexibility to explore different types of studies; and 3) it facilitated the synthesis of what is already known as well as identified knowledge gaps and opportunities for future research (Tricco et al., 2016). The scoping review followed six stages: (1) identify the research question; (2) identify relevant studies; (3) study selection; (4) data collection; (5) data summary and synthesis of results; and (6) consultation (Arksey and O'Malley, 2005; Levac et al., 2010). For the protocol paper, we described the intervention process and applied an adapted conceptual framework after mapping the intervention to

different determinants frameworks.

Review parameters

The study considered all literature that reports on implementation of maternal and/or perinatal death audit published between 2004 and July 2018 from LMIC settings in English. Combined search terms focused on maternal mortality, perinatal mortality, audit/review systems, and attributes of audit/review systems. Only publications that describe the implementation process of M/PDSR were included. The search was performed using the following electronic databases: PubMed, CINAHL, SCOPUS, Web of Science, JSTOR, LILACS, the WHO Library, Maternal Death Surveillance and Response Action Network, and Google.

Data extraction

Reviewers initially screened 20 titles together to ensure consistency in approach. Two reviewers then independently screened the titles, abstracts and full text. In the cases where abstracts were not available, the full text was screened. A third party resolved all discrepancies between reviewers independently. The reviewers met on a weekly basis during the screening process to discuss any issues arising from the process and revolved disagreements by consensus. We developed a data charting tool according to the Joanna Briggs Institute results extraction instrument to record the information from the articles (Peters et al., 2020).

Data Analysis

The review decision process used an adapted Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram. Data analysis involved qualitative thematic and content analysis linked to the theoretical framework. Both content and thematic analyses explored large amounts of textual information (either transcripts or documents) systemically searching for patterns and themes. Content analysis considers trends and patterns of words used, including their frequency, in order to assess the data; whereas thematic analysis identifies themes based on the data themselves rather than on quantifiable measures (Vaismoradi et al., 2013).

Limitation and assumptions

The literature on MPDSR is vast and complex with different terminologies used to describe

the intervention. At the time of the review, there was no standard definition or reporting global guidelines on how to describe MPDSR. We used the WHO definitions and guidelines for maternal death review, maternal death surveillance and response, and perinatal death audit (WHO, 2016a; WHO, 2013; WHO, 2004). Despite our attempt to capture related processes, referred to as obstetric audits, clinical audits, or facility-based maternal and perinatal morbidity and mortality audits, some relevant literature may have been missed in the search. The inclusion criteria excluded confidential inquiries, maternal near-miss reviews, verbal autopsies or social autopsies (Lewis, 2014a); though we recognise that many of the elements central to this review may be considered and measured in this literature. Much of the MPDSR-related literature looked at outcomes of the intervention, such as causes of death, modifiable factors, and recommendations, and therefore it took time to identify articles that document the actual implementation process as some studies included this information but it was not a main objective of the study. The scoping review is limited by language and time span but it is comprehensive in the inclusion of grey literature through consultation with experts in the field. While we presented quantifications to characterise the literature, e.g. number of pilot studies, the decision-making, abstraction and interpretation of findings is subjective. In addition, the development and application of the implementation framework required continuous discussion and revisions by the team. The team had regular meetings to discuss our understanding of the concepts and documented our decisions.

Study component 2 – cross-sectional facility assessment (four countries)

Objective 2: (i) To examine the extent of implementation and institutionalisation of facility-based MPDSR and (ii) to describe the barriers and enablers of implementation in four African countries.

Study design

A cross-sectional mixed methods approach was used to understand MPDSR facility-level implementation in four countries. To examine the extent of implementation, an adapted process model with a standard implementation score was developed to determine the implementation status of MPDSR. Enablers and barriers were determined through stakeholder and facility based interviews as well as assessor observations.

Study sites

In collaboration with Ministries of Health for each country, 55 health facilities were selected in Nigeria, Rwanda, Zimbabwe and Tanzania (Table 4). Factors that influenced the selection of the four countries included:

(1) existence of national guidelines for MPDSR (or any form of maternal and/or perinatal death audit policy);

(2) country government interest and approval;

(3) in-country presence of MCSP (or affiliated organization) to support the assessment;

(4) presence of other in-country partners supporting maternal and/or perinatal death review and response.

Data collection

Trained data collectors conducted semi-structured interviews with 41 key informants (national and sub-national, including policymakers and regional/district managers) and conducted 55 facility visits that included semi-structured interviews with facility managers and providers as well as a review of facility MPDSR documents. Information from the interviews and document review was entered into a standard questionnaire for each facility. Data collection tools and the implementation-scoring tool were uniquely developed for this study (Appendix 2) adapting from the tools developed by Bergh and colleagues for KMC (Bergh et al., 2005; Bergh et al., 2014; Belizán et al., 2011).

Table 4: Summary of facility and stakeholder samples in four African countries

	Nigeria	Rwanda	Tanzania	Zimbabwe	Total
Total number of facilities assessed	10	13	26	16	55
Facility Type					
Number of health centres	4	3	7	0	14
Number of hospitals	6	10	9	16	41
Total Number of Stakeholders Interviewed*	7	0	17	17	41
Stakeholder Type					
National	0	0	1	3	4
Subnational province/state/region	2	0	2	5	9

Subnational district/local government area	4	0	14	8	26
Other	1	0	0	1	2
Geography Covered	2 states	National	2 regions	National	
Estimated population in 2016	Ebonyi: 2,880,000 Kogi: 4,473,000	National: 11,669,000	Kagera: 2,790,000 Mara: 1,924,000	National: 14,030,000	

*Key informant stakeholders were primarily subnational (regional/district) government health officials involved with supporting MPDSR at subnational level.

Population data sources: The World Bank Group, Tanzania National Statistics Bureau, Nigeria National Statistics Bureau (World Bank, 2019; Tanzania National Bureau of Statistics, 2019; Nigeria National Bureau of Statistics, 2019)

Data Analysis

Quantitative data analysis included calculation of the cumulative implementation progress score for each facility by using the progress-monitoring model as well as tabulation of the descriptive means and frequencies of explanatory variables. For the qualitative analysis, responses to the open ended questions from the semi-structured interviews were analysed using thematic content analysis, which identifies the themes derived from the data as well as considering their frequency (Fereday and Muir-Cochrane, 2006).

Limitation and assumptions

This facilities included were not a representative sample. Data collection relied on the self-reporting by respondents and may be limited to some extent by who was available to interview at the facility on the particular day of the visit. Some of the views expressed may not necessarily reflect those of other health care staff, particularly more junior staff who may be subject to more blame or scrutiny during mortality audit meetings.

Study component 3 – case study (South Africa)

Objective 3: (i) To replicate the facility assessment and (ii) undertake an in-depth analysis of the implementation process of MPDSR by examining factors that enable sustained, routine implementation in the Western Cape, South Africa.

Study design

This study applied case study methodology to allow for in-depth investigation of MPDSR implementation through multiple methods of data collection (key informant interviews and observation) (Yin, 2014). Case study methodology was applied to multiple facilities to understand the 'how' or 'why' of implementation. The study used a multiple holistic design whereby the sub-district was considered as a unitary whole allowing for comparison and contrasting across case studies to gain insights on factors influencing routine, sustained implementation of perinatal death audit. The logic behind comparing across multiple cases was to determine if there are similar results (a literal replication) across facilities demonstrating what enables routine, sustained implementation of perinatal death audit (Yin, 2014). The study also applied the same cross-sectional facility assessment used in Objective 2 to facilities in the Western Cape, South Africa to understand application of tool in settings with sustained implementation of MPDSR.

Study population and sampling

The PPIP reporting structure in the Western Cape comprises five PPIP regions. PPIP regions align to the regional hospitals, and each region has a designated regional PPIP coordinator who oversees implementation. The district level-one hospitals manage all of the deliveries in a sub-district, unless referral is required. Antenatal and postnatal care services take place at the primary health care level (PHCs). Perinatal death audit considers the full continuum of care and engages both hospital and PHC staff; therefore, each case is defined as a 'sub-district' with the district hospital as the host of the process. Criteria for sub-district selection included:

1) currently conducting perinatal review meetings;
2) contributing to PPIP for over 10 years;
3) district hospital outside of Cape Town Metro, which has a unique system;
4) demonstrating at least two identified characteristics of successful audit: drivers or agents of change and team work, clinical outreach visits and supervisory activities, perinatal review and feedback meetings, and communication and networking between actors and levels (Belizán et al., 2011).

Based on these criteria and stakeholder inputs, two PPIP regions were selected and then at least two sub-districts identified within each: Case A and B in Region 1; and Case C, D and E

in Region 2 (Table 5). Demographics were similar across three case studies (A, C, D); Case B had about half the population and annual births compared to the others; case D had a much smaller population and did not meet the criteria of district hospital (all deliveries were referred to another district hospital) although they continue to report to PPIP and conduct perinatal review meetings.

Table 5. Description of the setting in five sub-districts in Western, Cape South Africa

	Case A	Case B	Case C	Case D	Case E
Catchment area population	~95,000	~37,50	~95,000	~93,200	~14,400
Annual births (2019)	1741	506	1360	1751	89
Perinatal mortality rate (per 1000 live births) (2019)	11.6	6,0	14,8	17,0	0
Facilities in sub-district (2019)	District Hospital, five PHC clinics	District Hospital, five PHC clinics	District Hospital, three PHC clinics	District Hospital, five PHC clinics	Community Day Hospital, two clinics
PPIP region	Region 1	Region 1	Region 2	Region 2	Region 2

Source: Population data from district reports; births and perinatal mortality rate from PPIP databased (accessed 4 March 2022)

Key: PPIP, Perinatal Problem Identification Programme; PHC, primary health care

Key informants were purposefully sampled based on their involvement with perinatal death audit and included the two regional PPIP coordinators, sub-district health managers, and clinical staff. Interviews were conducted with at least 10 staff per facility or until saturation had been reached, with the exception of Case D where only five staff were available for interviews. In total, 56 key informants were included, mostly at the sub-district and hospital level, comprising a range of health care managers and cadres.

Data collection

Fieldwork and data collection took place from October 2019 to March 2020 ranging from half a day to five days per site. Data collection involved multiple methods including a facility questionnaire, individual interviews with sub-national key informants using an interview guide applying the NPT concepts, individual interviews with facility staff using an interview guide applying the NPT concepts, document observations of PPIP or review meeting materials (to be documented with photos or field notes) as well as non-participant observation at related meetings (observation and discussion were recorded in field notes). Data collection tools are available in Appendix 2. Key informant interviews were in English and ranged from 20 minutes to one hour. All interviews were conducted individually in a private location or space where the participant felt comfortable in (e.g. shared office) with the exception of the interviews at Case D, which were done in two groups in the sub-district manager's office. Non-participant observations occurred at ten meetings: two provincial PPIP meeting, four sub-district perinatal review meetings (referred to as M&M meetings – Mortality and Morbidity), two monitoring and evaluation (M&E) meeting, and one other staff meeting.

Data management and analysis

Quantitative analysis was used to measure the cumulative implementation progress score for each facility by using the progress-monitoring model (Objective 2). Thematic analysis was applied for the qualitative component (Fereday and Muir-Cochrane, 2006), including familiarization with the content of the transcripts and generation of initial codes based on identified themes. The emerging themes were considered in relation to the NPT constructs and their respective sub-constructs. An adapted analysis framework was developed based upon the extended Normalization Process Theory (May, 2013). An initial framework was pilot tested, refined and applied to data from one case study. The framework uses general implementation theory and considers the broader social systems in which interventions are implemented with consideration of context and expressions of agency. The adapted framework includes four main dimensions – capability, contribution, potential and capacity. Interviews were recorded and transcribed. The doctoral candidate compiled transcripts, my observation and reflection notes and analysed the documents using Atlas.ti (v9). Using thematic analysis and an iterative process, the emerging themes were considered in relation to the analysis framework to inform the findings of the research. A report was developed for each case study.

Limitation and assumptions

This research collected information on implementation of perinatal mortality audit, which is a sensitive topic given that it explores adverse incidents by reporting data on deaths as well as reviewing the situation surrounding the death. Participants may not have shared their actual understanding of the process or experience or may have changed their behaviour during the observed review meeting. Through individual interviews, this study included the perspectives of frontline health workers working in the maternity ward and the management of the sub-district health office and regional actors involved in the PPIP process. District management staff were not available for interviews (as a result of scheduling conflicts), and not all of the maternity ward staff and managers at the sub-district level were included. Data collection stopped at the end of March 2020 due to the COVID-19 pandemic and related restrictions. This unfortunately prevented further data collection, including observation of related meetings, and timely validation meetings with the sub-districts.

2.5 Ethics approval

The ethics approval for the overall doctoral study was given from the Higher Degrees Committee of the University of the Western Cape on 09 November 2018. For study component 2, country study protocols and tools received approval from the in-country ethics committees including the Rwanda National Ethics Committee, Tanzania's National Institute for Medical Research, the Medical Research Council of Zimbabwe and Nigeria's National Health Research Ethics Committee. The study also received a 'Non-Human Subjects Research Determination' by the Johns Hopkins Bloomberg School of Public Health Institutional Review Board. Official permission has been sought from USAID's Maternal Child Survival Program to use this research as an output of the doctoral study. For study component 3, approval was received from the Western Cape Provincial Department of Health in July 2019 (NHRD Number: WC_201906_006). This process included the Provincial Department of Health seeking permission from the relevant Department of Health sub-structures. Participation of all key informants taking part in interviews was voluntary and those who agreed to participate signed a consent form. No personal or private information about informants was collected. Appendix 3 contains all ethics and approval-related documentation.

CHAPTER 3: FINDINGS

3.1 Study component 1 – scoping review

Paper 1

Kinney MV, Walugembe DR, Wanduru P, Waiswa P, George AS. Implementation of maternal and perinatal death reviews: a scoping review protocol. BMJ Open. 2019 Nov 27;9(11):e031328. doi: 10.1136/bmjopen-2019-031328.

Paper summary

This paper, published in *BMJ Open*, presents a conceptual framework and protocol for the scoping review. It describes the rationale for a scoping review on MPSDR implementation in LMIC as well as the intervention process, including the different steps and health system levels, based on the literature. For this paper, existing determinant frameworks to the intervention were mapped, and an adapted theory-based conceptual framework for MPSDR implementation developed, drawing from the Consolidated Framework for Implementation Research (Damschroder et al., 2009). The paper outlines the planned methodology for the scoping review, which was guided by an adapted Arksey and O'Malley approach (Arksey and O'Malley, 2005), including the search concepts and components, plan for analysis and plan for consultation.

Contribution to the thesis

This paper contributes to the first objective of the thesis: To explore the existing knowledge on factors influencing implementation of MPDSR in LMICs through a scoping review. The paper contributes to the thesis by applying implementation theory to unpack the complexity of the intervention process, including the different levels and components of implementation. As a protocol paper, it provides guidance for conducting the scoping review process to ensure transparency.

Contribution of candidate

The candidate and her supervisor conceived the idea of this scoping review and identified other researchers who would be able to support the study. The candidate led the team to conceptualise the scoping review. The candidate pilot tested the search terms to determine best fit for the concept. The candidate did the first mapping of the determinant frameworks

and consolidated feedback from the other authors. The candidate wrote the first draft of the paper and incorporated critical inputs from all co-authors on the different drafts. The candidate led the submission process and revisions based on the comments from the journal peer review. As this work was part of the CD Drivers workplan and the MPDSR TWG workplan, the candidate regularly updated these working groups during their regular meetings and managed their inputs and feedback. The comments from the peer review process are available in Appendix 4.

BMJ Open

Implementation of maternal and perinatal death reviews: a scoping review protocol

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To cite: Kinney MV, Walugembe DR, Wanduru P, *et al*. Implementation of maternal and perinatal death reviews: a scoping review protocol. *BMJ Open* 2019;**9**:e031328. doi:10.1136/bmjopen-2019-031328

► Prepublication history and additional material for this paper are available online. To view these files, please visit the journal online (http://dx.doi.org/10.1136/bmjopen-2019-031328).

Received 28 April 2019
Revised 09 October 2019
Accepted 28 October 2019

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ABSTRACT

Introduction Maternal and perinatal death surveillance and response (MPDSR), or any related form of audit, is a systematic process used to prevent future maternal and perinatal deaths. While the existence of MPDSR policies is routinely measured, measurement and understanding of policy implementation has lagged behind. In this paper, we present a theory-based conceptual framework for understanding MPDSR implementation as well as a scoping review protocol to understand factors influencing MPDSR implementation in low/ middle-income countries (LMIC).

Methods and analysis The Consolidated Framework for Implementation Research will inform the development of a theory-based conceptual framework for MPDSR implementation. The methodology for the scoping review will be guided by an adapted Arksey and O'Malley approach. Documents will include published and grey literature sourced from electronic databases (PubMed, CINAHL, SCOPUS, Web of Science, JSTOR, LILACS), the WHO Library, Maternal Death Surveillance and Response Action Network, Google, the reference lists of key studies and key experts. Two reviewers will independently screen titles, abstracts and full studies for inclusion. All discrepancies will be resolved by an independent third party. We will include studies published in English from 2004 to July 2018 that present results on factors influencing implementation of MPDSR, or any related form. Qualitative content and thematic analysis will be applied to extracted data according to the theory-based conceptual framework. Stakeholders will be consulted at various stages of the process.

Ethics and dissemination The scoping review will synthesise implementation factors relating to MPDSR in LMIC as described in the literature. This review will contribute to the work of the Countdown to 2030 Drivers Group, which seeks to explore key contextual drivers for equitable and effective coverage of maternal and child health interventions. Ethics approval is not required. The results will be disseminated through various channels, including a peer-reviewed publication.

Strengths and limitations of this study

- To our best knowledge, this protocol describes the first scoping review to identify and describe implementation factors relating to maternal and perinatal death surveillance and response (MPDSR) in low-income and middle-income countries.
- The search strategy includes six electronic databases with peer-reviewed literature as well as three online search engines to identify published and grey literature including academic research articles, commentaries, other related reviews and reports.
- Qualitative thematic and content analysis will be used to analyse the data linked to an adapted theory-based conceptual framework for MPDSR implementation.
- Key stakeholders will be consulted and engaged throughout the study review process, including the World Health Organization's MPDSR Technical Working Group as well as the Countdown to 2030 Drivers Technical Working Group.
- Limitations relate to the search criteria, notably around language (English only) and time span (from 2004-July 2018) as well as the search process (eg, not all grey literature can be identified).

INTRODUCTION

Most deliveries in developing countries now happen in hospitals and clinics making facility-based maternal and newborn care a global health imperative for achieving the sustainable development goal for health.[1 2] Maternal death surveillance and response (MDSR), perinatal death audit or a joint maternal and perinatal death surveillance and response (MPDSR) is one process used to prevent maternal and perinatal deaths.[3–5] Maternal and/or perinatal death surveillance and response (M/PDSR) is an established mechanism to examine the circumstances surrounding each death to prevent future deaths.[6] It requires continuous application of monitoring–review–act cycles[7] to capture information on the number and causes of deaths, with systematic, critical analysis of the care received for a sample of or for all cases, in a no-blame, interdisciplinary setting, with a view to improving the care provided to all mothers and babies.[8] The potential for MPDSR to improve mortality

outcomes only occurs if the audit cycle is completed and implemented overtime triggering iterative cycles of improvement.[9–11]

In the past 15 years, there has been momentum to strengthen clinical audit practice for maternal and perinatal deaths,[12–15] including the development of global technical guidelines.[8 16] Many low/middle-income countries (LMIC) have adopted national guidelines, however, few have robust MPDSR systems.[9] A growing number of studies have investigated the implementation of M/PDSR in selected countries, and some reviews have explored implementation factors for maternal death reviews or perinatal death audits, separately. For example, a structured literature review of accountability mechanisms for maternal and newborn health in sub-Saharan Africa found MDSR the most common mechanism for performance accountability.[17] A systematic review of facility-based perinatal mortality audit in LMIC in 2009 identified 10 low-quality evaluations with mortality outcome data.[10] A literature review conducted in 2015 on facility-based perinatal audits explored enablers and barriers according to the health system building blocks.[9]

While there are valuable contributions to the literature, these previous reviews did not consider implementation theory to assess implementation of M/PDSR nor of the full range of types of maternal and/or perinatal death reviews.[9 17 18] Implementation theory allows for more complex interventions to be unpacked and examined.[19–24] This approach enables exploration of issues, such as trust, credibility, relationships and hierarchies to understand factors that support or hinder implementation.[25] Interventions seeking to improve facility-based care are often ongoing processes that are complex, fluid and context specific.[7 19 24 26] A variety of factors,[19–24 27] including context,[28] can influence implementation of these types of interventions. With rising attention on facility-based maternal and newborn healthcare,[5 29–31] more needs to be understood about the implementation of M/PDSR.

Study rationale

Global agencies, such as the WHO, have created guidelines for M/PDSR and are encouraging LMIC to move forward with implementation.[8 14] Further understanding of the enablers and barriers of implementation in LMIC is needed to support roll out of this intervention across and within countries. A rigorous, scoping review has not yet been undertaken to map publications in LMIC on factors influencing implementation of M/PDSR in ways that are inclusive of either maternal and/or perinatal death audits.

Study objectives

To map and synthesise the available literature on the factors that support or hinder M/PDSR implementation using a theory-based conceptual implementation framework. We will also explore common, if any, implementation factors among MDSR, PDSR or MPDSR.

METHODS AND ANALYSIS

Conceptual model

This section of the protocol presents a proposed theory-based conceptual framework, which will be pilot tested and adapted for the data extraction and analysis. To develop the framework, we considered conceptualisation of the M/PDSR as an intervention process and reviewed various theory-based implementation frameworks.

Conceptualising M/PDSR

M/PDSR is a continuous action cycle for quality improvement that links maternal and perinatal mortality data from the local to the national level. M/PDSR can be considered as an intervention as well as an implementation process since it is a set of efforts geared towards facilitating change.[25] At all levels, the process relies on the effective reporting and assigning causes to deaths, on identifying actions that may contribute to the prevention of further deaths, assigning those actions to particular groups or individuals within a specified timeframe and following up to ensure that those actions have been implemented. At the facility level, a six-step cycle of auditing deaths is recommended whereby: (1) cases for review are identified; (2) information on these cases is collected; (3) the information is analysed and discussed by the MPDSR committee; (4) solutions are recommended based on the findings of the analysis; (5) solutions are implemented and (6) feedback or reflection on if solutions were implemented and what worked or did not in order to inform the process moving forward.[8]

In a well-functioning health system, the information from the facility-level audits feeds up into a sub-national level process whereby information about maternal and perinatal deaths is received, compiled, reviewed for completeness and any relevant actions at that level or above. The information is further analysed and then disseminated to appropriate stakeholders, including other sub-national entities who would have their own processes (eg, district to province). Information from the sub-national level is compiled and sent to national level whereby further synthesis and analyses are conducted. This often leads to a national annual report that is then disseminated back to sub-national and facility levels.

As a concept, M/PDSR functions at multiple levels of the health system—national, sub-national and facility (and for some countries community level components are included in the process). The communication system and inter-connectedness between the different levels are an important component of M/PDSR since the process is a reporting mechanism moving continuously from bottom up—facility to national—and also from top down—national to facility. For example, recommendations to the national Ministry of Health could be identified during a facility-level audit process. This information should be fed up through the system to reach the national level decision makers. Likewise, the national level needs information from the facility level and sub-national level in order to assess the situation of maternal and perinatal

Box 1 Conceptual implementation framework for M/PDSR

Domain 1: Intervention/MPDSR
SERVICE DELIVERY LENS (tangible inputs)
Executing audit: steps of cycle implemented
Cost and funding for the audit process including collecting data, meeting related costs including transport, specific training, running secretariat, time
SOCIETAL LENS (social understanding and relationships)
Intervention source: legitimacy depending on whether intervention is externally or internally developed
Evidence strength and quality: evidence supporting the belief that the intervention will have desired outcomes (reduced mortality; changes undertaken to improve quality of care/'response')
Relative advantage: perception of the advantage of implementing the intervention versus an alternative solution
SYSTEMS LENS (change dynamics)
Trialability: ability to test/pilot the intervention on a small scale, learn and revise if warranted
Reflectivity: feedback about the progress and quality of implementation accompanied with regular personal and team debriefing about progress and experience
Adaptability: degree to which an intervention can be tailored to meet the needs of an organisation (core vs peripheral elements)
Complexity: perceived difficulty of implementation by the implementers (extent of disruption, number of elements/steps, extent of discretion, health system levels, actors)

Domain 2: Outer setting/broader context
SERVICE DELIVERY LENS (tangible inputs)
Policy and planning: MPDSR policy and guidelines, death notification requirements (legal framework for notifying deaths), legal mandate, litigation/legal protection
Resource flows: any mention of funding support or resources for MPDSR (eg, sponsors, related costs being funded/budgeted)
SOCIETAL LENS (social understanding and relationships)
Linkages to other actors: local party, union affiliations, professional associations, community organisations
Pressure: to implement from actors and other implementers
Community links: awareness of MPDSR in the community (grassroots); community or CHW engagement and participation in MPDSR
SYSTEMS LENS (change dynamics)
Cosmopolitanism: level of connectedness and networks with other health system levels, organisations and therefore openness or resistance to change

Domain 3: Inner setting
SERVICE DELIVERY LENS (tangible inputs)
Readiness to implement: committees formed, training, focal point identified, availability of tools, leadership engagement and management capacity, HRH workload, access to resources
Structural characteristics of social architecture (characteristics of the team, for example, size, interdisciplinary nature, membership regulation)
Incentives/rewards (disincentives/sanctions): extrinsic incentives such as goal-sharing awards, performance reviews/promotions, training, tea or the consequences
SOCIETAL LENS (social understanding and relationships)
Networks and communication: nature and quality of communication within audit team (including hierarchies, mentorship, teamwork)
Culture: norms and values, organisational assumptions (blame culture vs trust)
SYSTEMS LENS (change dynamics)

Continued

Box 1 Continued

Implementation climate: explanation of environment, for example, learning climate, relative priority, if there are things mentioned that are tensions/triggers for change
Agents of change: individuals who have formal or informal influence on the attitudes and beliefs of their colleagues with respect to implementing the intervention or on the implementation process overall

Domain 4: Individuals
SERVICE DELIVERY LENS (tangible inputs)
Technical skills and knowledge: individual staff knowledge and competencies
SOCIETAL LENS (social understanding and relationships)
Individual motivation, self-efficacy: an individual's confidence in their capabilities to execute the implementation; individuals who are motivated
Individual commitment/ownership to team and organisation: individuals' perception of their commitment to the organisation and their relationship
Individual commitment/ownership of intervention: individuals' perception of their commitment to the intervention
Individual orientation: personal traits such as tolerance of ambiguity, team player, flexibility, problem solving, critical thinking
SYSTEMS LENS (change dynamics)
Individual state of change: phase an individual is in as he or she progresses toward skilled, enthusiastic and sustained use of the intervention

mortality in the country in order to make recommendations at sub-national and facility levels.

Theory-based implementation framework

We reviewed theories, models and frameworks consolidated by others as well as M/PDSR specific literature to determine a list of possible frameworks to consider.[6 27 32 33]

Lewis' commentary on MDSR argues the importance of considering different 'cultural factors' relating to M/PDSR including factors at the individual, institutional and policy levels.[6] For example, at a micro level, an individual's willingness to 'self-correct' requires commitment of staff towards conducting audit themselves, to accept open discussion with peers and to take forward the actions recommended. At a meso level, proactive institutional ethos that promotes learning as a critical part of quality improvement shapes the organisational culture. An environment open to learning also requires individual responsibility and ownership of the process, whereby clinicians need to improve their practice and change their behaviour for the betterment of maternal and perinatal health. A supportive policy and political environment (macro level) would need to be in place to initiate and support implementation.[6]

With the understanding that M/PDSR is an intervention process functioning at multiple levels of the health system, we identified five implementation frameworks for in-depth review and mapped their components with each other and in relation to M/PDSR (online supplementary file 1).[34–38] Our mapping process found that both the

Context and Implementation of Complex Intervention Framework[36] and the Dynamic Sustainability Framework[38] did not provide enough consideration to the implementation process of the intervention. The Promoting Action on Research Implementation in Health Services Framework[34] and the Normalisation Process Theory[39] had strengths especially at the meso and micro levels for understanding implementation processes; however, there was not enough overlap with the concepts identified for M/PDSR implementation. The Consolidated Framework for Implementation Research (CFIR) was found to be the most relevant foundation for developing an MPDSR implementation framework because it enables understanding of different levels and different factors that influence implementation including the intervention outcome as well as the implementation process.[35] Since not all constructs are applicable to M/PDSR implementation and some elements missing, we further built on CFIR drawing on the other frameworks and our experience of M/PDSR to develop the theory-based conceptual framework.

Box 1 presents the conceptual framework for this scoping review. It includes four domains: intervention (M/PDSR), outer setting, inner setting and individual. The first domain is related to the characteristics of the intervention being implemented into a particular setting. The complexity of M/PDSR as a process intervention with multi-faceted components and steps meant that we did not think two separate domains for intervention and process were needed and thus were combined. As with most interventions, there will be some adaptability at each level of M/PDSR as it is implemented in different settings and at different levels. Factors within the intervention domain for M/PDSR may include the steps of the audit cycle, cost and funding for the process, perceived legitimacy of the process as resulting in change and the perceived ability to test, adapt and implement it. The next two domains, the inner and outer setting, continuously interface and influence each other; thus the line between them is not always clear. The outer setting includes factors external to the organisation that influence implementation of M/PDSR; whereas the inner setting includes factors internal to the organisation. As outer setting factors influence implementation, change occurs in the inner setting. For M/PDSR implementation, the outer setting factors include policy and planning, linkages to other actors (such as professional association), pressures to implement, community links and communication channels. For the inner setting, implementation factors include readiness to implement, the structural characteristics of the organisation implementing M/PDSR, the organisational culture, the quality of communication and relationships and engagement of agents of change (also called champions in some settings). The last domain considers the characteristics of the individuals involved in implementation. Factors include their individual capacity and knowledge, their motivations and commitments to the implement M/PDSR, as well as their commitment to the team or organisation, and their willingness towards adapting to the intervention. The specific factors considered within each domain also vary depending on the level of implementation and on the context of the implementation effort.

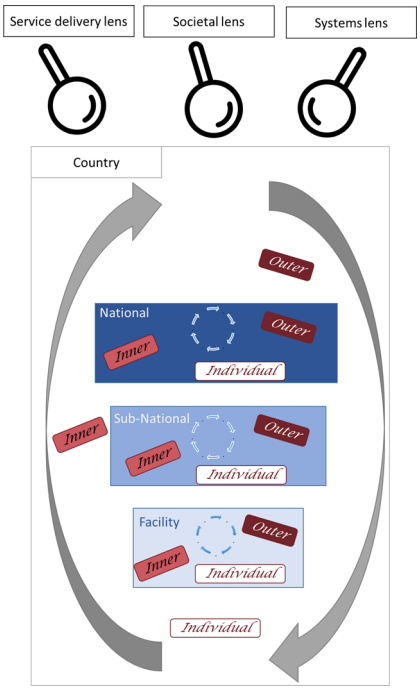

Figure 1 Conceptual framework for implementation of M/PDSR. M/PDSR, maternal and/or perinatal death surveillance and response.

The final component of the theoretical conceptual framework considers three different framings or lenses through which to understand and measure health system drivers of women's and children's health.[40] A service delivery lens includes the tangible inputs needed for M/PDSR implementation; a societal lens includes constructs that focus on social understanding and relationships; and a systems lens includes constructs that emphasise change dynamics which entails adaptive learning to contexts in ways that are not always anticipated. These three lenses have been presented by George *et al* as a way to describe both the tangible and intangible health systems drivers.[40] For each domain, we have categorised the constructs by these lenses.

We will test the framework on up to five different types of papers identified during the screening process and consider if any revisions need to be made. We will also undertake a consultation with experts in M/PDSR and implementation research to acquire their feedback and consider their recommendations for inclusion.

Figure 1 visualises application of the proposed conceptual framework to the concept of M/PDSR. As an intervention, M/PDSR is presented by the grey arrows encompassing various health systems levels and implementation factors that interact dynamically. Within a country, we acknowledge the multiple health system levels—national, sub-national, facility—through which

M/PDSR is operating. Within each level, there is a process for assessing the information relating to maternal and perinatal deaths (shown by the continuous circle). At each health systems level, there are different types of factors influencing implementation—outer, inner or individual. Finally, there are multiple lenses from which to understand and assess implementation (service delivery, societal and systems). For the scoping review, we will extract data with consideration of these multiple levels and factors.

Scoping review protocol design

A scoping review was selected given the need for flexibility to explore different types of studies; and because it will facilitate a mapping and synthesis of available literature assessing implementation of M/PDSR and factors influencing implementation.[41]

The design will be guided by methods developed by Arksey and O'Malley[42] and expanded by Lavac *et al*[43] with guidance from the Joanna Briggs Institute (JBI) on conducting scoping reviews.[44] Details for the proposed six stages of a scoping review are described.

Stage 1: identifying the research question

Our main research question is: 'What do we know about implementation of maternal death audit, perinatal death audit or combined audit approaches and the factors that either support or hinder the implementation process?' We also seek to answer: 'How can a theory-based conceptual implementation framework help to explain the various influencing implementation factors and their interactions?'

Stage 2: identify relevant studies

Process of search strategy

The study will consider all literature that reports on implementation of maternal and/or perinatal death audit published in English between 2004 and July 2018 from LMIC. The start year is selected to coincide with the first WHO maternal death review guideline.[15]

We will include both quantitative and qualitative research studies. Peer-review publications will be primary sources but other published and unpublished (grey) literature such as reviews, reports and commentaries will also be taken into consideration.

An initial limited search of three online databases, which are relevant to our topic, will be undertaken using Google Scholar and PubMed to pilot the search strategy terms. Medical subject heading terms from PubMed will be used at the start to determine the words used to search in PubMed. We will combine search terms focussed on maternal mortality, perinatal mortality, audit/review systems and attributes of audit/review systems (search strategy found in online supplementary file 2).

After the initial search, we will analyse the text words contained in the title and abstract of retrieved articles, and of the index terms used to describe the articles. Revisions of our search strategy will be considered based on the findings of the initial search and incorporate additional keywords, sources and search terms as appropriate. A second search using all the identified keywords and the index terms specific to each database will be undertaken across accessible databases and websites. The search will then be performed using the following additional electronic databases and online search engines: PubMed, CINAHL, SCOPUS, Web of Science, JSTOR, LILACS, the WHO Library, Maternal Death Surveillance and Response Action Network and Google.

The reference lists of all identified reports and articles will be searched for additional studies. All identified studies will be added into EndNote software and duplicate citations will be removed. We may contact the authors of primary studies or reviews for further information if necessary to provide clarity or to access additional information.

Finally, we will consult with experts in the field, including members of the WHO's MPDSR Technical Working Group, to ensure we have identified all relevant literature (published and grey).

Table 1 Inclusion criteria for the scoping review

Components	Application to this scoping review
Concept component	► All forms of maternal and perinatal death review including obstetric audit, MPDSR, MDSR, MDR. ► Limited to studies or perspectives that identify factors that influence the implementation process.
Context component	► Limited to low-income and middle-income countries listed by the World Bank in 2018.

MDR, maternal death review; MDSR, maternal death surveillance and response; MPDSR, maternal and perinatal death surveillance and response.

Characteristics of criteria

Table 1 provides the inclusion criteria for this scoping review. For the concept component, we will only include literature that focusses on maternal or perinatal death reviews; thus excluding verbal autopsy or community death reviews, near-miss reviews, or confidential enquiries into maternal deaths. We also will exclude literature that does not specifically describe influencers of M/PDSR implementation. For example, some studies focus on the results of the audit data such as assessing cases of pre-eclampsia. If the article does not include factors exploring the implementation process, it will not be included.

Stage 3: study selection

Process of screening and data extraction

Two reviewers will independently screen titles and then abstracts to check for relevance to the review. The reviewers will regularly meet during the screening process to discuss their selection of articles and to refine screening, if needed. In the cases where abstracts are not

available, the full text will be screened. All discrepancies between reviewers will be resolved by a third party.

Using the same process, the same reviewers will subsequently screen remaining full texts. All discrepancies between reviewers will be resolved by an independent third party.

Stage 4: data collection

A data collection instrument will be developed by the research team according to the JBI guidance. The extracted data will include study characteristics (eg, type of reference such as article, report, study population, setting, study time period, study objective, study design). We will also consider the level or cultural factors addressed that is, policies, law and rhetoric (macro level), internalised routine practice at the sub-national and facility levels (meso level) and individual behaviour change (micro level).[6]

For describing implementation of M/PDSR, extracted data will be based on the constructs identified in the conceptual framework. The draft data extraction components are provided in online supplementary file 3. We will pilot test the data extraction tool during a workshop and agree on any revisions. The same team members who will undertake the screening process will extract data from the selected articles. The team will engage in weekly meetings to discuss any issues or questions relating to the extraction process; decisions on extraction process will be documented. The charting table may be updated if other additional unforeseen data are identified as extraction moves forward.

Stage 5: data summary and synthesis of results

The review decision process will be reported using an adapted 'Preferred Reporting Items for Systematic Reviews and Meta-Analyses' extension for scoping reviews flow diagram.[45] Data analysis will involve qualitative content and thematic analysis linked to the conceptual framework.[46]

Stage 6: consultation

Stakeholders will be engaged throughout the scoping review from helping to identify literature, to providing input on the conceptual framework and reviewing the findings to support interpretation. Consultations will be targeted at experts serving on the WHO's MPDSR Technical Working Group, as well as the Countdown to 2030 Drivers Technical Working Group. Other experts will be identified through a snowballing approach.

Patient and public involvement

Given this is a protocol for a scoping review, patients and public were not involved in the design or research of the study.

Proposed timeline

The process for conceptualising the scoping review, including the framework, began in April 2018. From September 2018 to March 2019, we began the consultation process with key stakeholders as well as the screening process. Data collection began in April 2019. We expect the scoping review will be completed in the first quarter of 2020.

ETHICS AND DISSEMINATION

This study will contribute to the work of the Countdown to 2030 Drivers Group, which explores key contextual drivers for equitable and effective coverage of maternal and child health interventions as well as the MPDSR Technical Working Group co-led by the United Nations Population Fund (UNFPA), UNICEF and the WHO, which is tasked with advancing implementation of the intervention. This scoping review seeks to contribute specifically to the understanding how implementation of M/PDSR can drive quality improvements in service delivery responses to women and children's health. Limitations of the study include the parameters of the search criteria, notably around language (English only) and time span (from 2004 to July 2018) and search process (eg, not all grey literature will be identified). Because of these limitations, some literature or components of the identified literature may not be included in the results of this scoping review. Ethics approval is not required since the scoping review methodology consists of reviewing and collecting data from publicly available sources. We plan to publish the results of the scoping review in an academic journal as well as present to key stakeholders through various forum (ie, webinars, conferences, meetings). Consultation with key stakeholder groups will further guide dissemination efforts.

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Contributors MVK conceived of the idea, developed the research question and study methods and contributed meaningfully to the drafting and editing; she also approved the final manuscript. ASG, DRW, PW and PW aided in developing the research question and study methods, contributed meaningfully to the drafting and editing, and approved the final manuscript.

Funding ASG and MVK are supported by the South African Research Chair's Initiative of the Department of Science and Technology and National Research Foundation of South Africa (Grant No 82769), the South African Medical Research Council and the Countdown 2030 project funded by the Bill and Melinda Gates Foundation. Any opinion, finding and conclusion or recommendation expressed in this material is that of the author and funders do not accept any liability in this regard.

Competing interests None declared.

Patient consent for publication Not required.

Provenance and peer review Not commissioned; externally peer reviewed.

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Paper 2

Kinney MV, Walugembe DR, Wanduru P, Waiswa P, George A. Maternal and perinatal death surveillance and response in low- and middle-income countries: a scoping review of implementation factors. Health Policy Plan. 2021 Jun 25;36(6):955-973. doi: 10.1093/heapol/czab011.

Paper summary

This paper, published in *Health Policy and Planning*, provides the results of the scoping review. A revised conceptual framework for understanding implementation of MPDSR is presented, slightly modified during the data extraction and analysis process. The paper describes the systematic process of the review and the characteristics of the identified records. The review identifies and focuses on 58 studies from 24 countries, primarily in Africa. Most studies describe tangible inputs addressed by the service delivery lens, though these were often measured inadequately or in incomparable ways. Some literature documents the individual belief that MPDSR leads to change; but little evidence is presented on 'closing the loop' e.g. the response/action. People and their relationships, motivations, implementation climate and ability to communicate influenced implementation processes; yet individual subjective experiences and relationships were inadequately explored in the literature. This paper shows that MPDSR implementation contributes to accountability and benefits from a culture of learning; few studies examined the complex interplay and change dynamics involved.

Contribution to the thesis

This paper contributes to the first objective of the thesis: To explore the existing knowledge on factors influencing implementation of MPDSR in LMICs through a scoping review. The paper presents the results of the scoping review and shows that M/PDSR is a complex intervention process. By applying an adapted determinant framework tailored to the intervention, the various components needed for implementation could be described and unpacked, to further understand the complex interplay and change dynamics of the intervention process. The adapted framework includes the concept of lenses and levels (George et al., 2019), which help to frame results and ensure they are linked specifically to the doctoral thesis. The paper also identifies many research gaps, such as the need for more learning from the perspectives of individuals and sub-national level engagement.

Contribution of candidate

The candidate led and managed the data collection and analysis process. Three co-authors, including the candidate, initially screened 20 titles together to ensure consistency in approach. These same co-authors independently screened the titles, abstracts and full text and met on a weekly basis during the screening and data extraction processes to discuss any issues arising and resolve disagreements by consensus. The candidate organised two in-person workshops with the co-authors in order to agree on the review process, develop the framework and review results. The candidate wrote the first draft of the paper and incorporated critical inputs from all co-authors on the different drafts. The candidate led the submission process and revisions based on the comments from the journal peer review. As this work was part of the CD Drivers workplan and the MPDSR TWG workplan, the candidate regularly updated these working groups during their meetings and managed their inputs and feedback (comments from the peer review process are available in Appendix 4). The candidate prepared and presented a poster at the XXIII FIGO World Congress of Gynecology and Obstetrics held online in October 2021. The candidate prepared and presented an oral presentation at the AlignMNH Virtual Forum in April 2021. Available at https://alignmnh.org/of-mpdsr-country-level/

Health Policy and Planning, 2021, 1–19
doi: 10.1093/heapol/czab011
Review

Maternal and perinatal death surveillance and response in low- and middle-income countries: a scoping review of implementation factors

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Accepted on 25 January 2021

Abstract

Maternal and perinatal death surveillance and response (MPDSR), or any form of maternal and/or perinatal death review or audit, aims to improve health services and pre-empt future maternal and perinatal deaths. With expansion of MPDSR across low- and middle-income countries (LMIC), we conducted a scoping review to identify and describe implementation factors and their interactions. The review adapted an implementation framework with four domains (intervention, individual, inner and outer settings) and three cross-cutting health systems lenses (service delivery, societal and systems). Literature was sourced from six electronic databases, online searches and key experts. Selection criteria included studies from LMIC published in English from 2004 to July 2018 detailing factors influencing implementation of MPDSR, or any related form of MPDSR. After a systematic screening process, data for identified records were extracted and analysed through content and thematic analysis. Of 1027 studies screened, the review focuses on 58 studies from 24 countries, primarily in Africa, that are mainly qualitative or mixed methods. The literature mostly examines implementation factors related to MPDSR as an intervention, and to its inner and outer setting, with less attention to the individuals involved. From a health systems perspective, almost half the literature focuses on the tangible inputs addressed by the service delivery lens, though these are often measured inadequately or through incomparable ways. Though less studied, the societal and health system factors show that people and their relationships, motivations, implementation climate and ability to communicate influence implementation processes; yet their subjective experiences and relationships are inadequately explored. MPDSR implementation contributes to accountability and benefits from a culture of learning, continuous improvement and accountability, but few have studied the complex interplay and change dynamics involved. Better understanding MPDSR will require more research using health policy and systems approaches, including the use of implementation frameworks.

Keywords: maternal health, maternal and child health, implementation, audit, surveillance, health systems, health systems research

KEY MESSAGES

- Using an implementation framework allows for deeper understanding of factors influencing implementation of maternal and perinatal death surveillance and response (MPDSR), which is a complex intervention process aimed at preventing maternal and perinatal deaths.
- The literature on MPDSR implementation primarily focuses on tangible inputs from a service delivery lens, though few of these inputs were adequately documented or measured.
- Studies show that people, their relationships and communication channels are at the heart of the implementation process; yet their subjective experiences and relationships are inadequately focused on in the current literature.
- Understanding the complex interplay and change dynamics of MPDSR implementation requires health policy and systems approaches, which includes but is broader than the current programmatic focus of MPDSR evidence.

Box 1 Overview of the conceptual implementation framework for MPDSR

The theoretical conceptual framework developed for this review is adapted from the Consolidated Framework for Implementation Research (Damschroder et al. 2009), and well described in the protocol paper (Kinney et al. 2019).

The visual of the framework (Figure 1) shows that MPDSR functions at multiple levels of the health system—national, subnational, facility (and for some countries community level components are included in the process). The communication system and interconnectedness between the different levels is an important component of M/PDSR since the process is a reporting mechanism moving continuously from bottom up—facility to national—and also from top down—national to facility. It also shows that there is MDPSR in theory, e.g. how it should work based on guidelines, and that there is MPDSR in practice, e.g. how it actually works.

The framework includes three different lenses through which to understand and measure health system drivers of women's and children's health (George et al. 2019). A service delivery lens includes the tangible inputs needed for MPDSR implementation; a societal lens includes constructs that focus on social understanding and relationships; and a systems lens includes constructs that emphasis change dynamics, which includes adaptive learning to contexts in ways that are not always anticipated. The factors within each domain are categories by lens, which are denoted by grey-shading in the figure.

The framework considers four domains with 24 constructs in total:

- Intervention: The first domain is MPDSR or any related form of maternal and/or perinatal death review or audit. Factors within this domain for MPDSR include the components of the audit cycle and costs relating to the audit process from a service delivery lens, framing of the intervention source, evidence strength and quality and relative advantage from a societal lens, and the perceived ability to test and adapt it from a systems lens.
- Individual: The next domain considers the characteristics of the individuals involved in implementation. From a service delivery lens, factors include their technical skills and knowledge; from a societal lens, factors include their self-efficacy, motivations and identification with the intervention; and from a systems lens, factors include their ability to move from orientation to collaboration.
- Inner setting: The third domain considers factors internal to the organization. From a service delivery lens, this includes the readiness to implement, team composition and characteristics, and incentives to implement; from a societal lens, this includes team relationships; and from a systems lens, this includes the organizational culture and implementation climate, and engagement of leaders (often called 'champions').
- Outer setting: The final domain considers factors external to the organization that influence implementation of MPDSR. These factors include policy and planning and resource support or funding for MPDSR from a service delivery lens; the role of external actors (such as professional association) and political prioritization from a societal lens; and from the pressures to implement and the linkages and networks between levels from a systems lens.

Supplementary 2 further describes the framework and includes an overview of how the framework was adapted and evolved during the data extraction and analysis process of the scoping review.

Introduction

Maternal and perinatal death surveillance and response (MPDSR), or any form of maternal and/or perinatal death review or audit, is a process used to improve health services and pre-empt future avoidable deaths (Hounton et al. 2013; Independent Expert Review Group 2014; Every Woman Every Child 2015). As an intervention, it is a continuous cycle of identification, notification and review of maternal and/or perinatal deaths followed by actions to address identified contributing factors and to prevent future deaths through acting on gaps identified in the audit (Kinney et al. 2019). With an aim to influence health professional behavior, health system functioning and patient health as well as improve maternal and perinatal

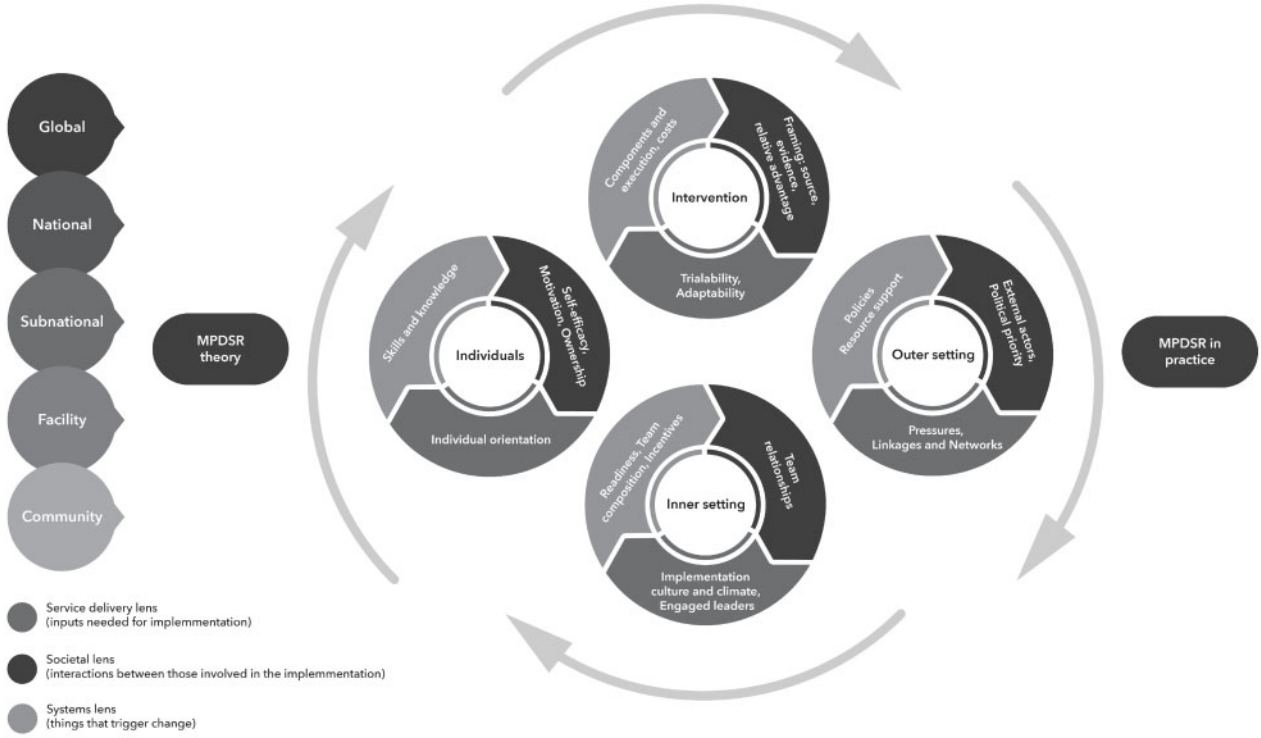

Figure 1 Theoretical framework for studying MPDSR implementation—around here.

health outcomes, MPDSR functions at multiple levels of the health system to capture information on the number and causes of deaths and to undertake systematic, critical analysis of the care received (Ivers et al. 2012; Kerber et al. 2015; WHO 2016a).

In the past 15 years, there has been growing momentum to strengthen and expand the intervention (WHO 2004; WHO 2016c; E4A 2017; WHO 2017), culminating in World Health Organization (WHO) global technical guidelines (WHO 2013a; WHO 2016a; Supplementary File 1). As a result, many low- and middle-income countries (LMIC) have adopted national guidelines, however, few have robust MPDSR systems (Kerber et al. 2015). A growing number of studies have investigated the implementation of MPDSR in selected countries, and some reviews have explored implementation factors separately for maternal death reviews or perinatal death audits (Pattinson et al. 2009; Kerber et al. 2015; Martin et al. 2016; Lusambili et al. 2019). While valuable contributions to the literature, these previous reviews do not consider implementation theory to assess factors influencing MPDSR implementation nor do they consider the full range of types of maternal and/or perinatal death reviews (Kerber et al. 2015; Martin et al. 2016; Smith et al. 2017c). Investigation of quality improvement processes, including audit and feedback (Ivers et al. 2012), benefits from the use of implementation theory and frameworks to understand and explain factors that influence implementation outcomes (Hulscher et al. 2013; Davidoff et al. 2015; Nilsen 2015; Akachi and Kruk 2017; Kruk et al. 2017; Persson 2017; Topp 2017).

The aim of this scoping review is to map and synthesize factors that support or hinder implementation of MPDSR, or related forms, using a theory-based conceptual implementation framework. It also explores common, if any, implementation factors between the types of maternal and/or perinatal death reviews. For MPDSR to function, as intended, the process needs to link across health system levels, adapt to context, enable a learning climate that supports individuals to critically think and collaborate, so that agents can initiate and sustain change. In order to understand the implementation factors identified in the current literature, we developed a theory-based conceptual framework (Kinney et al. 2019), described in Box 1 and visualized in Figure 1, to unpack the different levels and different factors that influence implementation of this complexity intervention process. The framework includes 24 constructs within the four domains (intervention, individual, inner and outer settings) as well as three cross-cutting lenses within each domain that are used to understand and measure health system drivers of women's and children's health (George et al. 2019).

Methods

Protocol

The protocol for this scoping review presents the methods (Kinney et al. 2019), which were guided by an adapted Arksey and O'Malley approach (Arksey and O'Malley 2005; Levac et al. 2010; Peters et al. 2017) and applied the Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist by Tricco et al. (2018; Supplementary 3, Table S3.1). The scoping review followed six stages: (1) identify the research question; (2) identify relevant studies; (3) study selection; (4) data collection; (5) data summary and synthesis of results; and (6) consultation.

The research questions included: first 'What do we know about implementation of maternal death audit, perinatal death audit or combined audit approaches and the factors that either support or hinder the implementation process?'; and second, 'How can an implementation framework help to explain the implementation factors and their interactions?'

Table 1 Overview of search strategy components

Summary of search terms	• ('maternal mortality' OR 'perinatal death' OR 'maternal death' OR 'perinatal mortality' OR 'fetal mortality' OR 'stillbirth') AND ('audit' OR 'surveillance and response').
Concept component	• All forms of maternal and perinatal death review including obstetric audit, MPDSR, maternal death surveillance and response (MDSR), maternal death review (MDR) • Limited to studies or perspectives that identify factors that influence the implementation process • Excluded near miss audits as well as other forms of maternal and perinatal death surveillance, e.g. confidential inquiries, social autopsy and verbal autopsy.[a]
Context component	• Limited to LMICs listed by the World Bank in 2018.

[a]For definitions of these terms, please see Lewis (2014a).

Eligibility, information sources and search

We included all literature that reports on the implementation of maternal and/or perinatal death surveillance and responses or maternal and/or perinatal death audit published in English between 2004 and July 2018 from LMICs. The start year was selected to coincide with the first WHO maternal death review guideline (WHO 2004). The literature included peer-reviewed publications as well as published and unpublished (grey) literature, such as reports. We also considered reviews and commentaries in the screening process.

We piloted and determined the search terms using PubMed (Supplementary 3, Table S3.2). In August 2018, literature was drawn from academic databases and online search engines (PubMed, CINAHL, SCOPUS, Web of Science, JSTOR, LILACS, the WHO Library, Maternal Death Surveillance and Response Action Network, and Google) using specific search terms (Table 1). From August 2018 to January 2019, we also identified literature through expert consultation, including members of the WHO's MPDSR Technical Working Group. Finally, we searched the reference lists of all identified records for any additional records, not previously identified.

Selection of sources of evidence (screening)

Reviewers (M.V.K., D.R.W., P.Wanduru) initially screened 20 titles together to ensure consistency in approach. Then two reviewers independently screened the titles, abstracts and full text. In the cases where abstracts were not available, the full text was screened. A third party resolved all discrepancies between reviewers independently; the third party for the full text screening was conducted by A.S.G and P.Waiswa. The reviewers met on a weekly basis during the screening process to discuss any issues arising from the process and revolved disagreements by consensus.

Data charting process

A data-charting tool was conceptualized by the research team collectively, developed in Microsoft Excel and piloted during a workshop in August 2018 (Supplementary 3, Table S3.3). The three reviewers (M.V.K, D.R.W., P.Wanduru) independently extracted data from three studies, and the results were discussed with the full team. This piloting process led to revisions to the tool as well as cohesion in the team around the data extraction process. The three reviewers then independently charted the data; discussed issues in weekly meetings; and continuously updated the data-charting form in an iterative process. A record of changes was documented in the Excel file.

Data items

Data extracted included key reference characteristics, e.g. type of record (i.e. document type, methods, level of study), background to the record (i.e. country, type of organization) and content of record (i.e. focus of intervention, history, scale of study—cross-country national, subnational, facility; the full tool is available in Supplementary 3, Table S3.3). The components of the framework were organized by domain and entered in as 'not described' or 'described'. A short explanation on how it was described was then entered in, when applicable.

Synthesis of results

We grouped the records by studies (including academic journal articles and reports), academic reviews and academic commentaries. We then analyzed the reference characteristics and framework components by group. Data analysis of the framework components involved qualitative thematic and content analysis (Vaismoradi et al. 2013).

Consultation

We engaged key stakeholders throughout the process, including the WHO's MPDSR Technical Working Group and the Countdown to 2030 Drivers Technical Working Group, to identify any additional literature, to input on the implementation framework and to review the findings to support interpretation (Supplementary 3, Table S3.4). Additional meetings were set up with targeted experts to receive further inputs.

Results

Selection of records

Figure 2 shows the flow diagram documenting the screening process; Table 2 provides the results of the search process by source. The systematic database and online search yielded 2104 records. After removing duplicates, 1009 records were screened by title followed by 429 records screened by abstract. Consultation and checking the references of identified papers resulted in 18 additional records screened (totaling 1027 records screened between the online systematic process and the consultation process). A total of 134 records underwent full text review. Of the 72 records meeting inclusion criteria, 58 were studies (either academic journal articles or reports), 6 were academic reviews and eight were academic commentaries.

Characteristics of sources of evidence

Supplementary 4, Table S4.1 provides an overview of the record characteristics. Among the 58 studies, 24 LMICs are represented including six from Tanzania, four from Malawi and three each from Ethiopia, Nigeria, South Africa, Uganda and Zimbabwe. Two-thirds of the studies are from the sub-Saharan African region (66%); 12% from South Asia region, 3% from East Asia and the Pacific

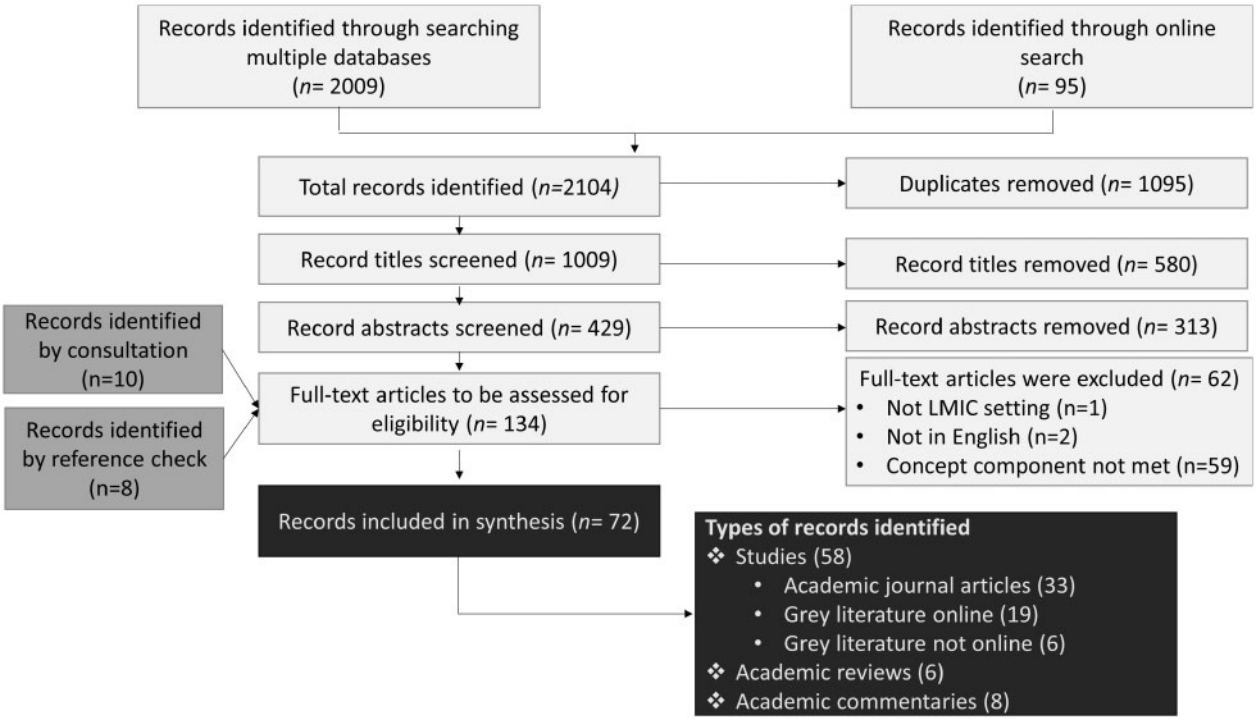

Figure 2 Flow diagram—around here.

Table 2 Results of search by source

Database	Number of articles
PubMed	434
CINAHL	264
SCOPUS	658
Web of Science	432
JSTOR	214
LILACS	7
Database search	2009
MDSR Network	16
WHO IRIS	50
Google	29
Online search	95
Consultation	8
Reference list	10
Additional search	18
Total identified	2122
Duplicates	1095
Total screened	1027

region, 3% from the Middle East and North Africa region, and 12% described as international. The level of study varies greatly with 33% being a combination of geographic levels, 26% at national level, 24% from selected facilities, 9% at subnational level and 7% at global or multicountry level. We found 10 studies published from 2004 to 2010 and 48 studies from 2011 to July 2018.

Half of the studies (53%) focus on maternal death audit processes with 20 and 11 studies concentrating on maternal death review and MDSR, respectively. Combined maternal and perinatal death reviews have 12 studies (21%), and there are 7 studies specific to MPDSR (12%). Five studies focus on perinatal death audit (9%) and another four studies on other related forms of audit (e.g. obstetric audit). The studies mostly consider a combination of macro, meso and micro levels (64%); although 11 studies focus specifically at the macro level, eight studies at the meso level and two studies at the micro level. The majority of the studies were qualitative (45%) or mixed methods (28%) with only 5% using quantitative approaches and 22% of studies not indicating research methods.

Nearly half of the studies do not specify funding support (41%); of those that do, 24% report bilateral support, 12% report funding from nongovernmental or academic organizations and 10% report funding from foundations. Half of the author teams include a mixture of organizations including national governments (52%); academics comprise a quarter of the studies (26%) and the reminder of the studies include authors from government (2%), nongovernment (7%), a mix of organizations not including government (7%), or independent or other (6%). Over half of the first author affiliation comes from LMIC (69%), although the top two countries of author affiliation are the UK (21%) and USA (9%).

Understanding MPDSR

Using the constructs from the implementation framework, 601 data points from the 58 primary studies were extracted (e.g. construct was described) and analysed. The outer setting, intervention and inner setting domains have the greatest number of data points (27, 29 and 30% respectively). In contrast, the individual domain has the fewest data points (13%; Supplementary 4, Table S4.2). Nearly half of the data points are from constructs considered in the service delivery lens (44%); the societal lens comprises 30% of the studies, and the system lens comprises 26% (Supplementary 4, Table S4.3). We present a summary of the results by domain and construct below (Table 3). Supplementary 4 provides specific details on the results with references to the identified studies (Supplementary Table S4.4).

Domain 1: Intervention

The first domain features the intervention characteristics and process. Many studies describe the intervention components, including

Table 3 Synthesis of results by theoretical conceptual framework

Domain	Construct	# Records described[a]	Summary of results
Domain 1: Intervention/MPDSR	Components and execution: steps of the audit cycle described and reported on by level (a descriptive analysis)	34	• Three-fourths of papers described the audit cycle (43/58); but only 17 studies described all steps of the audit cycle; half of the papers reported data collection, the review process and implementation of the recommendations (52, 53 and 52%, respectively); notification and evaluation received the least amount of attention (39% each) • Literature reflects evolution of intervention over time, i.e. clinical audits to maternal and/or perinatal death reviews to MDSR to MPDSR.
	Cost relating to the audit process including collecting data, meeting related costs such as transport, specific training, running secretariat, time	34	• Described as funds for training, transport and dissemination of results; human resources such as staff workload, staff shortages, staff turnover and staff skills • Few studies reported on budgets and actual costs; where studied, no standard costing approach used • Barrier identified as limited financial resources (without quantification)
	Framing—intervention source: ownership of implementation guideline and stakeholder perceptions on whether the intervention is externally or internally developed	41	• Described as government initiated, externally driven by partners or embedded in the system • One study reported as 'top down' approach being problematic • Reported that countries adapt from the global WHO guidelines applying and adapting the recommendations to their context, but not explored • Stakeholder perceptions of legitimacy not explored
	Framing—evidence strength and quality: Evidence supporting the belief that the intervention will have desired outcomes (reduced mortality; changes undertaken to improve quality of care/'response')	31	• Described from the perspective of stakeholders that MPDSR resolves critical gaps in quality of care but little documentation of actual changes made
	Framing—relative advantage: Perception of the advantage of implementing the intervention versus an alternative solution	0	• Not described
	Trialability: Ability to test/pilot the intervention on a small scale, learn and revise if warranted	22	• Described a phased approach, but little documentation of learning from the phasing • Identified nine pilot studies, most conducted at facility level (only one was at subnational level); no reporting of modifications or expansion after these pilots • Enablers included local leadership and initial external support • Barriers included sustained implementation beyond projects
	Adaptability: Degree to which an intervention can be tailored to meet the needs of an organization (core vs. peripheral elements)	15	• Described as MPDSR processes adapting and changing over time but no evidence to show which factors were essential vs. peripheral to change • Variations in implementation observed across facilities in same country, subnational levels and countries with different drivers of the process or frequency of review meetings
Domain 2: Individual	Technical skills and knowledge: Individual staff knowledge and competencies including skills for data collection and data use	31	• Described as important to complete MPDSR process, with most studies making broad based statements about skills.

(continued)

Table 3 (continued)

Domain	Construct	# Records described[a]	Summary of results
			• Barriers included record keeping, data entry, identification and reporting of deaths, use of data for routine analysis, and familiarity with audit process • Level of knowledge assessed in four studies
	Self-efficacy: Individual belief in their own capabilities to execute courses of action to achieve implementation goals.	8	• Described with mixed results on individual confidence to implement MPDSR (e.g. confident or not). • Enablers included supportive supervision, appropriate tools and oversight from management or health specialists.
	Individual motivation: A broad construct related to factors that motivate individuals to implement both extrinsic and intrinsic	23	• Described extrinsic motivation as measures to improve quality of care, adhering to expectation from subnational teams, gaining skills or knowledge and incentives • Described intrinsic motivation as consciousness for self-improvement linked to the underlying value of life • Demotivating factors included lack of resources to support M/PDSR processes, lack of implementation of MPDSR-related recommendations, hierarchical nature of meetings, the process perceived as time consuming and arduous
	Individual identification with intervention: A broad construct related to how individuals perceive the intervention, and their relationship and degree of commitment to the sustained use of the intervention.	18	• Described as important but not explored adequately • Enablers included link between individual commitment to jobs and general quality improvement as well as individuals seeing the benefit of process improving quality over time • Barrier included 'passing the buck' to other staff
	Individual orientation to collaboration: Personal traits such as tolerance of ambiguity, team player, flexibility, problem solving, critical thinking	0	• Not described
Domain 3: Inner setting	Readiness for implementation: Tangible and immediate indicators of organizational commitment to its decision to implement an intervention	48	• Enablers described as formation and or existence of MPDSR committees, a designated focal person, regularly scheduled meetings, available tools and appropriate forms for MPDSR, and 'audit charters', training • Barriers described as shortage and capacity of health workers and disengaged leadership and inadequate management capacity
	Team composition and characteristics including who comprises the team, e.g. size, interdisciplinary nature, membership regulation	36	• Described as multidisciplinary, though some studies noted low participation of nurses. • Barriers identified included high staff turnover, competing priorities, lack of interest by staff and hierarchical nature of meetings.
	Organizational incentives and rewards (or disincentives/sanctions) such as goal-sharing awards, performance reviews/promotions, training, tea or the consequences	11	• Enabler described as refreshments, extra training, financial motivation (per diems), and transportation. • Described removal of funding that financed incentives as a demotivating factor • Not adequately investigated for impact
	Team relationship: nature and quality of communication within audit team (including hierarchies, mentorship, teamwork and management)	19	• Described as both positively and negatively affected by the nature of communication, collaboration, management and networking within and across teams and among

(continued)

Table 3 (continued)

Domain	Construct	# Records described[a]	Summary of results
			stakeholders involved in the implementation process • Enablers included continuous engagement, a teamwork approach, support from hospital management, invested deliberate efforts and strategies such as mentorship, as well as upholding certain norms and values to nurture a conducive atmosphere • Teamwork approach involving consensus building, inclusiveness, delegation of responsibility and continuity of MPDSR as important factors • Hierarchies within teams can both positively and negatively influence relationships.
	Implementation culture and climate: explanation of environment including organizational culture, learning climate, if there are things mentioned that are tensions/triggers for change	47	• Enabler described as an implementation culture of accountability, learning and improvement; effective strategies included the mandatory attendance of audit meetings as well as codes of conduct or 'audit charters' • Barriers described as a blame culture and punitive measures against frontline health providers • Blame culture explored at individual level, as well as between levels of the health system and between units with mixed observations around blame-free and blame culture.
	Engaged leaders: Individuals who have formal or informal influence on the attitudes and beliefs of their colleagues with respect to implementing the intervention or on the implementation process overall, e.g. 'champions' or 'agents of change'	21	• Described as a critical factor for successful implementation • Strong leaders are described as highly motivated individuals who can facilitate the process well • Individual traits and motivations not investigated
Domain 4: Outer setting	Policy and planning: MPDSR policy and guidelines, death notification requirements, Legal mandate, litigation/legal protection	41	• Described as the type of policy or guideline in place, i.e. integrated, standalone and M/PDSR related guidelines; few studies reported on the presence of a legal framework or protocol around death notification • Descried as implementation factor the uptake of national policies and technical guidance and the presence of legal framework or protocol around death notification, but not explored
	Resource support: funding or resource support for MPDSR (e.g. sponsors, budgets)	29	• Described as funding source, e.g. government budget line, government commitment, development partner support • Barrier to implementation included lack of a budget • Budgets linked to spending explored in some studies with mixed findings
	External actors: The role of external actors on the process (e.g. Local party, Union affiliations, Professional associations, Community organisations) as well as community or CHW engagement and participation in MPDSR	31	• Described as the roles of key external actors, including national government, international development partners, professional associations and civil society, having influence at a subnational or facility level from strong national or subnational actors and influence at a national level from externally partners, e.g. WHO, UNFPA and donor agencies • Supportive supervision reported as an implementation factor

(continued)

Table 3 (continued)

Domain	Construct	# Records described[a]	Summary of results
			• Barrier identified as absence of external actor engagement • The role of development partners (UN agencies and NGOs) and professional associations at all levels described and explored, e.g. developing guidelines, training facility staff and mobilizing resources as well as pressuring governments (mostly at national level) to implement • Engagements with private sector, communities, civil society and local authorities described but not explored adequately
	Political prioritization: national mobilization and awareness of issue	10	• Described as pressure to implement MPDSR but not explored adequately
	Pressure: to implement from actors and other implementers	17	• Described as peer pressure for system wide uptake especially from subnational structures to facility level • Barrier identified as lack of national and subnational pressure to implement • Perceptions around pressure to implement explored by only one study
	Linkages and networks between levels: Level of connectedness and networks with other health system levels, organizations and therefore openness or resistance to change	34	• Described as the level of connectedness and networks between health system levels, different sites and different role players influences implementation • Enablers identified as existing strong communication channels between and within levels; well-defined pathways around the flow of data and information relating to MPDSR; and well implemented supportive supervision • Barrier identified as lack of an adequate and coherent guidance or framework to channel communication of MPDSR recommendations across levels

[a]See Supplementary 3, Table S3.4 for references to records by construct.

some elements relating to the cost of implementation, but there is no consistency in reporting all elements of the intervention process or comparable costing methods. The framing of the intervention is described as primarily externally driven; however, stakeholders view that the intervention does address critical gaps in the quality of care. While some studies report on pilots or phased implementation, few report on what has been learned from the phased approach. The breadth of the studies reflect investigations are taking place across levels and components of the intervention, with little evidence showing which factors are essential for implementation. Table 3 provides high-level findings for each construct and below details by construct.

Components and execution. Most studies explain the intervention process, or audit cycle in theory (74%); yet there is uneven reporting between the different components. Only 29% report on all components of the audit cycle according to the six-step audit cycle of (1) identifying cases; (2) collecting information; (3) analysing information; (4) recommending solutions; (5) implementing solutions; and (6) evaluating and refining (Kerber et al. 2015; Supplementary 4, Table S4.5). A mapping of the audit cycle steps found that over half of the studies describe the data collection process (52%), the review process (53%) and the recommendation process (52%). Fewer records report on the notification process and the evaluation of the process (or feedback loop; 40% for both).

The literature demonstrates the evolution of the intervention process over time from clinical obstetric audits to maternal and/or perinatal death reviews to MDSR to MPDSR. The studies prior to 2011 focus on maternal and/or perinatal death reviews. A WHO regional report in 2011 is the first to expand maternal death review to include surveillance (WHO 2011); another WHO regional report in 2016 is the first to present information on 'MPDSR' (WHO 2016b). From January 2016 until July 2018, 7 of 21 studies use the term MPDSR, though most note that the perinatal component is aspirational (WHO 2016b; Koblinsky et al. 2017; MCSP 2017c; MCSP 2017b; 2017a; Karamagi et al. 2018; MCSP 2018). Four studies, during this time period, still focus on maternal death review (without surveillance; WHO 2014a; Congo et al. 2017; de Kok et al. 2017; Du Châtelet et al. 2019). We did not find any differences in implementation factors between the different types of reviews, e.g. maternal death review, perinatal death audit, maternal death surveillance and response, or MPDSR.

Cost. Resources for MPDSR is recognized as an important facilitator for implementation (Kerber et al. 2015; WHO 2016b; Smith et al. 2017c); yet the literature shows mixed findings on whether specifically allocated resources are needed for MPDSR and if so, how much and how it is budgeted (Supplementary Table S4.4). Costs relating to the audit and reporting process, such as collecting data, meeting related costs (i.e. transport, specific training, running secretariat, time), information systems, etc., are often described as a barrier (Supplementary Table S4.4). Several studies specifically mention the challenge of not having funds to implement recommendations from the audit process.

Few studies report on costs, as found previously (Kerber et al. 2015), and those that do report on costs use different approaches (Pattinson et al. 2009; De Brouwere et al. 2014; Tapesana et al. 2017). The initial costs of starting MPDSR are reportedly higher than the running costs because starting requires setting up new systems and training whereas continuous costs would be nominal, such as transport to regional meetings (Grellier and Shome 2011; Nam 2011; De Brouwere et al. 2014; Biswas 2017; MCSP 2017c). The different study designs and varied contexts of the studies prevent comparability in terms of input requirements and related costs (Supplementary Table S4.4).

Framing. From a societal lens, implementation research theory suggests that the framing of an intervention, particularly as externally or internally developed, is critical (Damschroder et al. 2009). A study from South Africa reveals that the implementation of perinatal death audits was perceived as 'top down' without ownership at the facility level (Belizan et al. 2011; Bergh et al. 2011); as found in another study from Sudan (Balogun and Musoke 2014). Beyond these studies, stakeholder perceptions of legitimacy around the intervention are not explored specifically. The framing of the intervention is described in a number of studies as government initiated, externally driven by partners, or legitimate due to the embedded nature of the intervention (Supplementary Table S4.4). Some report applying and adapting national approaches from the global WHO guidelines, with two studies recognizing the importance of global guidelines in standardizing national practice (Scott and Danel 2016; Smith et al. 2017b). One study shows initiation from within a facility without influence from external partners (including Ministry of Health; Nyamtema et al. 2011).

Another framing of the intervention comes from the belief that the intervention will have the desired outcome (Damschroder et al. 2009). While studies report that MPDSR resolved critical gaps in quality of care, few document these changes with evidence beyond perceptions of those interviewed or the authors (Supplementary Table S4.4). Two studies from Ethiopia observe that once MDSR started, the level of documentation improved resulting in better communication and organized care, ultimately leading to more buy-in by stakeholders in the process (Ethiopia Federal Ministry of Health et al. 2016; Abebe et al. 2017). The final framing of the intervention considers the relative advantage of MPDSR over another process. We did not find any studies that explored perceptions of MPDSR versus other quality improvement activities.

Trialability. From a systems lens, the ability to test or adapt the intervention process warrants consideration. The literature reflects implementation through a phased approach, as recommended by WHO, with many studies reporting on small-scale implementation efforts (Supplementary Table S4.4). Of the nine pilot studies identified, implementation approaches and results vary (Day 2006; Dumont et al. 2009; Richard et al. 2009; Nam 2011; Nyamtema et al. 2011; Hofman and Mohammed 2014; Bayley et al. 2015; Biswas et al. 2015; Bandali et al. 2016); although local leadership and initial external support are common facilitators. Two pilots demonstrate that the death audit process can be destabilizing or even threatening, especially in settings where staff are not used to self-evaluation and critical review (Dumont et al. 2009; Richard et al. 2009). The challenge of sustained implementation beyond projects is recognized in several studies, not just the pilots (Muffler et al. 2007; Grellier and Shome 2011; Nam 2011; Hofman and Mohammed 2014; WHO 2014c).

The literature does not provide any evidence that a phased approach led to application of learning. Even when pilot experiences are very well-documented with clear lessons learned, such as FIGO LOGIC (Richard et al. 2009; Lewis 2014b; 2014a), we did not find direct application of these lessons recorded in identified studies later on. Additionally, the lessons from studies published pre-2011 (Pearson et al. 2009; Richard et al. 2009) demonstrate similar lessons learned and recommendations from studies published in the past 5 years (Scott and Danel 2016; Koblinsky 2017; MCSP 2017b; 2017a; 2017c; 2018; Du Châtelet et al. 2019).

Adaptability. Studies that reflect adaptability around implementation of MPDSR recognize the notion of 'different sites, different modalities' (Belizan et al. 2011) whereby MPDSR processes vary between facilities, subnational and national levels (Supplementary Table S4.4). Documentation of change overtime is documented in some studies, such as a shift in culture from a blame to a learning environment due to continuous and improved practice of audits overtime (Bakker et al. 2011). Observed variations include different drivers of the process (e.g. facility manager, head of department, midwife, clinical outreach person, etc.), the nature of review meetings (e.g. frequency, standalone vs. integrated, format), and composition of participants. A South African study reports that facilities determine the key role players or drivers (Belizan et al. 2011; Bergh et al. 2011). A study from Nigeria compares different MDR facility-level meetings showing that the process and approach can slightly vary due to different role players (de Kok et al. 2017). Implementation processes also vary at the national and subnational levels, including oversight and surveillance as well as national variations in processes. A study from Burkina Faso reports that the presentation of findings varied across the district level audit meetings (Congo et al. 2017). A study from South Sudan finds that the lack of the overall system being able to adapt to the local needs identified through the review process prevented uptake of MDR (Balogun and Musoke 2014). While variability between processes across facilities assumes local adaption of the intervention, we did not find any studies that identify which elements are core verses peripheral to change.

Domain 2: Individual characteristics

The second domain considers the characteristics of the individuals involved in implementation. Studies describe the individual's role as important for implementation and include broad statements about the skills needed; yet few actually assess the level of knowledge required or investigate individual confidence to implement. Half of the studies consider individual motivation and identified factors that reflect both extrinsic and intrinsic motivation with some important demotivating factors identified such as hierarchy, lack of resources, lack of follow through to implement recommendations and capacity. Individual traits required for implementation are not investigated. Details by construct are below.

Technical skills and knowledge. Many studies acknowledge the importance of individual technical skills and knowledge to complete MPDSR processes (Supplementary Table S4.4). For the most part, these studies make broad-based statements around lack of skills as a barrier to implementation. Only four studies actually assess the level of knowledge, and their findings vary greatly as they use different methods and questions to assess technical skills and knowledge of individuals (Day 2006; Richard et al. 2009; van Hamersveld et al. 2012; Tapesana et al. 2017). Nonetheless, the literature shows that skills development takes time and goes beyond one training session. One study from South Africa reports:

> *It took one day of training but on average 3–6 months before management understood the value of PPIP and up to 3 years before staff members fully appreciated the full benefit that PPIP provided to a facility* (Rhoda et al. 2014).

Self-efficacy. Individual confidence to implement MPDSR has mixed results depending on the study (Supplementary Table S4.4). Four studies find that staff are confident to implement with oversight (Muffler et al. 2007; Richard et al. 2009; Belizan et al. 2011; Armstrong et al. 2014); whereas other studies show mixed levels of confidence among study participants (Abebe et al. 2017; Tapesana et al. 2017) and the lack of confidence (van Hamersveld et al. 2012; Balogun and Musoke 2014). Identified enablers supporting self-efficacy include supportive supervision, appropriate tools and oversight from management or health specialists.

Individual motivation.

> *The success of audit largely depends on the motivation of the healthcare providers themselves. If they are able to evaluate the care they are giving, and willing and able to give praise where this is due, as well as make amendments where needed, then this should lead to improved motivation, ownership and sense of responsibility for delivering good quality care* (Kongnyuy and van den Broek 2009).

Studies that examine individual motivation mostly identify extrinsic factors, such as measures to improve quality of care, adhering to expectations from subnational teams, gaining skills or knowledge, or incentives (Supplementary Table S4.4). Positive outcomes from the MPDSR process also motivate health workers. The lack of resources to support MPDSR processes as well as the non-implementation of MPDSR-related recommendations is specifically cited as a demotivating factor for staff. The hierarchical nature of meetings may demotivate personnel from participating in the process in some contexts. The literature also reveals that some perceive the process as time consuming and arduous, resulting in inefficiencies in the process and lack of commitment to implement.

Intrinsic motivation described suggests that individuals find MPDSR helpful, especially for learning (Supplementary Table S4.4). Some studies reveal individual appreciation of the intervention for enabling self-reflection and self-improvement. Some argue that MPDSR is linked to professionalism of maternity care itself (Richard et al. 2009; Belizan et al. 2011; Bergh et al. 2011; de Kok et al. 2017). A study from Bangladesh demonstrates the underlying value of life as a motivator, reporting that they observe 'one minute [of] silence for dead babies and mothers in [a] meeting' (Day 2006). Only a few studies link individual motivation and ownership of MPDSR to inner setting elements, such as culture (de Kok et al. 2017) and team structures (Dumont et al. 2009; Kerber et al. 2015).

Individual identification with intervention.. While the importance of ownership and commitment to the intervention is described, few studies explore the reasons behind individual identification with the intervention (Supplementary Table S4.4). Health workers who are committed to their jobs and to quality improvement are more willing to identify with and accept MPDSR. A multi-country report from the South-East Asia Region states: '*The commitment of physicians and supervisors is found to be a strength of the system; they have been encouraged by the fact that recommendations made at the audit meeting have been used as inputs for district planning, and have resulted in tangible improvements in the health system (WHO 2014c).*'

Ownership of the intervention can evolve over time as people see the benefits of change. One study from Ethiopia mentions a shift in individual willingness to complete case notes accurately since it was seen as having a useful purpose for MDSR rather than being an additional burden (Abebe et al. 2017). The literature supports the notion that the lack of ownership prevents effective implementation (Supplementary Table S4.4). For example, a study from Nigeria found that the lack of personal accountability for an honest process resulted in shifting responsibility or 'passing the buck' to other staff (de Kok et al. 2017).

Individual orientation to collaboration. We did not find any literature about how individual traits and critical thinking or problem solving skills support or hinder MPDSR implementation (although some aspects are described under the leadership construct).

Domain 3: Inner setting

The inner setting focuses on implementation factors internal to the organization. Many studies report the tangible factors required for implementation including organizational commitments and team compositions and characteristics. Organizational incentives are less reported or investigated. The nature and quality of communication within audit teams as well as the implementation climate and organization culture are identified as key implementation factors and are both positively and negatively described. Leadership is described as a critical factor for successful implementation; though individual traits and motivations are less investigated. Details by construct are below.

Readiness for implementation. Tangible inputs that facilitate MPDSR implementation include formation and or existence of MPDSR committees, a designated focal person, regularly scheduled meetings, available tools and appropriate forms for MPDSR, and 'audit charters' (Supplementary Table S4.4). The importance of training on MPDSR processes at national, subnational and facility levels is highlighted as another facilitating input in the literature.

Factors that hinder effective implementation include challenges of human resource and health management, including shortage and capacity of health workers, disengaged leadership, and inadequate management capacity. Some have argued that a minimum level of human and material resources is required before the system implements MPDSR (Muffler et al. 2007; Richard et al. 2009; Koblinsky 2017), but we did not find an agreed standard of minimum requirements in the review.

Team composition and characteristics. The composition and characteristics of MPDSR committees that facilitated implementation of MPDSR are described as multidisciplinary, comprising of various cadres of health workers at facility level and external stakeholders

from ministries of health and MPDSR implementing partners at subnational and national levels (Supplementary Table S4.4). Restricted participation is reported as a barrier in some studies, especially when there is low participation of nurses, support staff and management. One pilot study started implementation only with the midwives and auxiliary midwives in order to establish a culture of evaluation in a blame-free setting and only broadened membership after they were comfortable with the practice (Richard et al. 2009).

Organizational incentives and rewards. Provision of organizational incentives, such as refreshments, extra training, financial motivations, is described mostly as an enabler although no study systematically examines the impact of such incentives. Yet still, organizational incentives are often included as recommendations for strengthening implementation, even just the provision of food or tea (Agaro et al. 2016; MCSP 2017c). Some studies recognize the negative consequences of incentives when projects are terminated, resulting in demotivation (van Hamersveld et al. 2012; Agaro et al. 2016). We did not find any studies that examined the use of sanctions for lack of implementation.

Team relationship. MPDSR implementation positively and negatively affects and is affected by the nature of communication, collaboration, management and networking within and across teams and among stakeholders involved in the implementation process. Many studies describe the team relationships among health facility staff and surrounding clinics (Supplementary Table S4.4). Identified approaches that nurture team relationships include continuous engagement, a teamwork approach, support from hospital management, deliberate efforts and strategies, such as mentorship, as well as upholding certain norms and values to create a conducive atmosphere. Two studies report that the MPDSR process itself nurtured team spirit and collaboration (Purandare et al. 2014; WHO 2014b). For example, 'sharing regular updates on the program's progress ensured timely help and kept the team motivated to deliver high-level performance (Purandare et al. 2014)'. In contexts where a teamwork approach to implementing MPDSR was adopted, studies report that there was consensus, inclusiveness, monitoring of staff performance, delegation of responsibility and continuity of the MPDSR implementation processes. Strong communication, involvement and support from hospital management are also found to strengthen team relationships for MPDSR.

Studies also report that the lack of management, communication and coordination across teams, including poorly functioning teams are formidable barriers (Supplementary Table S4.4). Three studies report that the existence of hierarchies within teams and across various contexts have positively influenced team relationships through provision of leadership and mentorship (Dumont et al. 2009; Bakker et al. 2011; de Kok et al. 2017). However, more records show the negative influence of professional hierarchies between health cadres, notably the silencing of the more junior staff and nurses in the process (Supplementary Table S4.4). Structural hierarchies may also constrain the performance of teams in cases where the senior members are absent or unable to perform their duties. Not many studies examine the effect of hierarchies and teamwork on implementation of MPDSR beyond the health facility level. The few that do, only describe the institutional reporting structures rather than the inner team dynamics (MCSP 2017b; 2017a; 2017c; 2018).

Implementation culture and climate. Some studies demonstrate how MPDSR functions well in settings with a culture of accountability, learning and improvement (Supplementary Table S4.4). A culture of trust is nurtured by strong leadership and continuous reassurance of a 'blame-free culture' (Belizan et al. 2011; Grellier and Shome 2011; Kerber et al. 2015; Du Châtelet et al. 2019). Open and enabling environments, which encourage active participation of all participants during meetings, are reported to improve implementation (Dartey 2012; MCSP 2017a). Some studies provide useful resources and tips on how to promote positive culture for MPDSR implementation (Dumont et al. 2009; Richard et al. 2009; Lewis 2014b).

On the opposite spectrum, a blame culture and punitive measures against frontline health providers are widely recognized as barriers to the implementation of the MPDSR (Supplementary Table S4.4). The most common reasons cited are feeling threatened during the review meetings and fearing legal action or punitive repercussions; although some records note a general culture of blame around MDPSR (Koblinsky et al. 2017; MCSP 2017a). The continued prevalence of the blame culture may partially be attributed to lack of clarity around the process when first implemented (van Hamersveld et al. 2012; Agaro et al. 2016; Du Châtelet et al. 2019). In some cases, there are mixed results whereby different individuals report different experiences, with some reporting a blame-free culture and others not. A few studies report shifts in culture from a blame to a learning environment due to continuous and improved practice of audits overtime (Bakker et al. 2011; Belizan et al. 2011; Bergh et al. 2011). The blame culture is reported mostly at the facility level with a focus on individuals or teams e.g. different health cadres or units (obstetrics vs. pediatrics). Only one study reported on blame culture across districts (Congo et al. 2017); blame culture and its effect at the subnational and national levels is not adequately studied (de Kok et al. 2017). At the facility level, identified strategies to minimizing acrimony, avoiding blame and recriminations include the mandatory attendance of audit meetings as well as codes of conduct or 'audit charters' (Dartey 2012; MCSP 2017a; 2017b; Richard et al. 2009; Dumont et al. 2009; Lewis 2014b).

Another factor identified as contributing to the fear among health workers is the absence of a strong MPDSR legal framework across all levels (WHO 2014c; Agaro et al. 2016; Koblinsky et al. 2017), although the explicit aspects of fear about litigation are not described or explored. Amidst this however, studies also describe fear for litigation as having a positive effect on the implementation climate as a form of accountability (Bakker et al. 2011; Abebe et al. 2017; MCSP 2017c).

Engaged leaders. Strong leadership is described as a critical factor for successful implementation of MPDSR, with some studies showing positive influence while others note the lack of leadership as a barrier (Supplementary Table S4.4). The importance of leadership as an implementation factor cross cuts the levels of the health system. At a national level, change agents may include individuals within the Ministries of Health, professional associations and partners such as UNFPA, WHO. At a subnational level, the buy in and dedication to MPDSR by district managers can support or hinder implementation. At facility level, change agents include individual health workers or teams; who have additional responsibilities, such as being in-charges of department/units.

A few studies describe the attributes of strong leadership, their critical tasks and/or the perceived quality of leaders for MPDSR (Bakker et al. 2011; Belizan et al. 2011; Bergh et al. 2011; Lewis 2014b; Rhoda et al. 2014; WHO 2014a; 2014c). Champions or engaged leaders are described as highly motivated individuals (Supplementary Table S4.4) but no study specifically explores their

motivations. Five studies highlight the important role of facilitation in terms of having a good chairperson or a person who is able to steer the conversation to be blame-free and productive (Dumont et al. 2009; Richard et al. 2009; Bakker et al. 2011; Hofman and Mohammed 2014; de Kok et al. 2017). As noted in one study, '"true leaders" of the audit session . . . usually are the first to ask questions and start discussions (Bakker et al. 2011).'

Domain 4: Outer setting

The outer setting includes factors external to the organization that influence implementation of MPDSR. The tangible inputs, such as policies and legal frameworks or resource support, are mentioned in a number of studies but their actual impact is not explored. Many studies reveal the influence of external actors on implementation at multiple levels, and this also links to the pressure to implement, though perceptions around external pressure is rarely reported. The response component of MPDSR, a key purpose to the intervention, requires linkages and communication across and between levels of the health system; therefore, this is a key area described in the literature with enablers and barriers identified for improving implementation.

Policy and planning. Policy and planning for MPDSR include related guidelines, national plans, death notification requirements and legal protection. Studies report various approaches, such as integrated policies or standalone national policies on maternal and/or perinatal deaths notification or national MPDSR related guidelines, with lack of national guidelines hindering implementation (Supplementary Table S4.4). There has been an increase in the number of countries with policies overtime, yet the limitations of the global tracking process is recognized as not sufficient for measuring implementation of MPDSR (Bandali et al. 2016; Kerber et al. 2015; Magoma et al. 2015; Smith et al. 2017b; Muffler et al. 2007; Pearson et al. 2009). Specific benefits of having a national guidelines identified in the literature include unifying fragmented MPDSR-related processes, institutionalizing practice and informing the implementation process, e.g. how to set up a committee.

Some studies describe the presence of a legal framework or protocol around maternal and perinatal death notification, which obligates clinicians and managers to report on the deaths to a central system (Supplementary Table S4.4). Obligatory notification may demonstrate maternal mortality as a government priority adding additional pressure on practitioners (Scott and Danel 2016; Mutsigiri-Murewanhema et al. 2017). Legal measures linked to the MPDSR process, particularly around liability and punitive measures, may also hinder implementation (see inner setting; Lewis 2014a; Hadush et al. 2016; Koblinsky 2017). Only one study discusses the types of legal frameworks or safeguards required for MPDSR (Smith et al. 2017c); a brief by E4A further describes types of legal frameworks (E4A 2012).

Resource support. We consider the source of funding as an external influence on implementation; whereas the actual costs are described under the intervention domain. Settings with established MPDSR related processes report government financial support, such as in Malaysia and South Africa (Pearson et al. 2009; Bandali et al. 2016; Koblinsky et al. 2017; Smith et al. 2017c). A national budget line for MPDSR also shows promise in studies from Burkina Faso, South Africa, Sri Lanka and Indonesia (Belizan et al. 2011; Bergh et al. 2011; Rhoda et al. 2014; WHO 2014b; Bandali et al. 2016; Congo et al. 2017; Koblinsky et al. 2017). Though the lack of budgets for MPDSR at various levels is described generally as a barrier; national or regional budgets specific to MPDSR do not necessarily increase spending for MPDSR as found in studies from Nigeria, Tanzania and Indonesia (Magoma et al. 2015; Koblinsky et al. 2017; MCSP 2017b). The link between levels of funding and political commitment as well as buy-in from government to maternal and newborn health is acknowledged (Pearson et al. 2009; Abebe et al. 2017; Smith et al. 2017c), but not studied. One study finds MPDSR itself is used to mobilize resources for the process (Hofman and Mohammed 2014). The literature recognizes the importance of international mobilization of resources for MPDSR, and that dependence on development partners cannot sustain practice, as reflected in this quote:

> *Without government commitment and funds to scale-up, countries are unable to continue strengthening capacity of staff at all levels to conduct MDR – i.e. training on the MDR method in all facilities, and training for assessors on completing MDR forms, maternal death classification (using ICDMM) and formulating recommendations* (Smith et al. 2017c).

External actors. From a societal lens, the influence of external actors on the implementation of MPDSR are widely discussed or observed in the literature with varying findings by study including scope and level of engagement (see mapping in Supplementary File 4, Table S4.4). At a subnational or facility level, strong national actors influence implementation through ministries of health, often with a strong national committee. At a national level, there is a critical role of WHO, UNFPA and donor agencies. At all levels, many studies report that development partners (UN agencies and NGOs) and professional associations play a role in both supporting implementation processes, e.g. developing guidelines, training facility staff and mobilizing resources as well as pressuring governments (mostly at national level) to implement. The absence of external actor engagement may also imped implementation. Though not investigated in the studies identified in this review, arguments are made for benefiting from engagement with private sector, community, professional associations and others (Pearson et al. 2009; Bayley et al. 2015; Kerber et al. 2015; Hadush et al. 2016; Du Châtelet et al. 2019) as well as cautioning against expanding external engagement (Bandali et al. 2016; Ministry of Health and Sanitation [Sierra Leone] 2017), such as to private sector (Balogun and Musoke 2014), communities, civil society and local authorities (Tapesana et al. 2017), partially due to legal risks (WHO 2014c; Du Châtelet et al. 2019).

Different types of community links to facility-based MPDSR are mentioned but not studied. Low levels of community engagement or participation in the MPDSR process are proposed barriers of implementation, with specific challenges noted around data collection of deaths in the community (Supplementary Table S4.4).

Political prioritization. National political commitment and government leadership are possible pressures on the health system to implement MPDSR. Gaps relating to actual political prioritization of MPDSR remain glaring for some in terms of inadequate funding for MPDSR across all health system levels (Agaro et al. 2016; Du Châtelet et al. 2019). While global commitments to development goals or regional commitments may have led to additional pressure on national governments to implement (WHO 2013b; Kerber et al. 2015; Bandali et al. 2016), this is not systematically assessed in the literature.

Pressures to implement. From a systems lens, few studies specifically look at perceptions around pressure to implement. Regular reporting to WHO and other agencies on policy uptake could be seen as a form of pressure or accountability, but this is not studied. At the facility level, peer pressure for system wide uptake came in the form of outreach visits from regional specialists and reporting requirements by subnational structures. It can also be from within the team (Supplementary Table S4.4). The lack of national and subnational pressure to implement is recognized as barrier to implementation (Nam 2011; Balogun and Musoke 2014).

Linkages and networks between levels. The level of connectedness and networks between health system levels, different sites and different role players influences implementation. Overall, the literature describes communication across levels, e.g. notification forms shared, dissemination of findings and actions, data and information shared through clear communication channels (Supplementary Table S4.4). When functional, MDPSR processes appear to strengthen communication across the levels of the health system and between stakeholders. Supportive supervision serves as a link between levels, but its influence depends on the actors, approach and context. Existing strong communication channels and well-defined pathways around the flow of data and information relating to MPDSR support implementation. A study from Ethiopia shows that better data and reporting improves communication across the health system as well as between team members (Abebe et al. 2017). Effective dissemination of the benefits that MPDSR implementation achieves can be a trigger for change (Lewis 2014b), but further research is needed (Dumont et al. 2009).

Some studies find that the absence of an adequate and coherent framework to guide both local and national communication and dissemination of MPDSR recommendations can be a barrier to implementation. As a result, there exists lack of clarity of roles and duplication of activities among stakeholders at the subnational and national levels in some settings (WHO 2014c; MCSP 2018; Du Châtelet et al. 2019). The lack of connectivity is also identified as a barrier to implementation in other studies, even when systems and guidelines were in place.

The linkage to existing health system structures may also influence implementation, such as integrating surveillance into other health programming or integrating activities into other maternal and newborn health programmes (Pearson et al. 2009; Bandali et al. 2016; Abebe et al. 2017). Vertically designed programmes prevent uptake and sustainability, as demonstrated in a study from Sudan (Balogun and Musoke 2014).

Discussion

This scoping review reveals the complexity of MPDSR as an intervention process requiring many steps, engagement of multiple individuals with differing roles, and information sharing across levels of the health system. The review also shows that research on MPDSR implementation is growing in LMIC settings, especially in Africa. Many of the studies describe the 'hardware' or tangible inputs to MPDSR implementation, which have been previously recognized (Pattinson et al. 2005; Pattinson et al. 2009; De Brouwere et al. 2014; Lewis 2014a; Hussein et al. 2016; Martin et al. 2016; Scott and Danel 2016; Biswas 2017). Among the fewer studies that explore the 'software' elements in the health system, such as the power dynamics, ideas, values and norms (Sheikh et al. 2011), it is clear that people, their relationships and communication channels are at the heart of the implementation process; yet their subjective experiences and relationships are inadequately focused on in the literature. The complex interplay and change dynamics of MPDSR implementation, such as the pressures or underlying motivations behind why people implement or not, require further research. In an effort to unpack the complexities of the MPDSR implementation process, we discuss the findings according to each lens: service delivery, societal and systems (Figure 1; George et al. 2019).

Service delivery lens: inputs that are needed for implementation

Tangible inputs required for implementation include skills and knowledge of the individuals involved, policies and guidelines, system inputs, trainings and consideration of its costs and resource support. The review confirms the importance of staffs' technical knowledge around how to implement MPDSR (Kongnyuy and van den Broek 2009; Raven et al. 2011; Hussein et al. 2016; Biswas 2017), but we did not find a list of required competencies needed at technical and management levels for implementation or many investigations into individual competencies.

The review also validates the already identified system inputs e.g. focal person, committees, multidisciplinary teams, regularly scheduled meetings, available tools, audit charters, training, human resource (Pattinson et al. 2005; Pattinson et al. 2009; De Brouwere et al. 2014; Hussein et al. 2016; Martin et al. 2016; Biswas 2017). Organizational incentives require further investigation to look at impact (positive/negative) in different contexts. Securing funds for the implementation of MPDSR as a process as well as to finance the response activities is needed to sustain implementation (Kerber et al. 2015); yet there is no standard approach to costing the intervention. Gaps in knowledge still exist on the actual cost of audit teams meeting, the opportunity cost to people involved in an audit, the cost of collecting data, data analysis, conducting MPDSR training and running a secretariat. South Africa is the only country with literature on the cost of the national perinatal death audit programme, as well as guidance on how to allocate resources for the implementation process to function (Pattinson et al. 2009; Baleta 2011).

The tracking of policies and guidelines, including legal frameworks and protocols around death notification may be helpful (Martin et al. 2016), but policy analyses are also needed to strengthen implementation efforts and address gaps. The global WHO guidelines and related support mechanisms, such as the regional technical meetings, may also influence standardizing and improving national MPDSR process, but these have not been studied for impact on implementation. The literature also does not systematically report on all steps of the audit cycle, with most studies focusing on different components of the intervention and only a few studies attempting to verify and measure the full intervention process. If the audit cycle must be completed and effectively implemented overtime in order to trigger iterative cycles of improvement and improve outcomes (Pattinson et al. 2009; Kerber et al. 2015), then further study of the complete audit cycle will be required to identify implementation factors for the overall process and measure impact. Implementation of the ideal format, as promoted by WHO and national guidelines, is not adequately documented or reported on in the studies, though the review confirms that countries not implementing according to the WHO or national guidelines (Martin et al. 2016; Lusambili et al. 2019). Part of the challenge perhaps is that the MPDSR process varies by level, by intervention step, by time point in the evolution process (Lewis 2014a; Koblinsky 2017), making it difficult to measure. The continuous adaptation to the

intervention itself, evolving from facility death review, MDSR, MPDSR is also recognized (Lewis 2014a; Biswas 2017; Koblinsky 2017), but not been studied. For example, perinatal death audits and notification seem to have taken on a similar shape as MDSR, where reported, but actual implementation of 'MPDSR' (with demonstration of the perinatal and surveillance components) appears nascent in the identified studies. The central question of what are core elements of MPDSR versus the adaptable periphery is not answered by any of the literature.

Societal lens: the interactions between those involved in the implementation

The review shows the important role of external actors at all levels, especially in terms of developing guidelines and implementation support and funding (Pattinson et al. 2009; De Brouwere et al. 2014; Lewis 2014a; Martin et al. 2016; Biswas 2017; Koblinsky 2017). External influence, either from development partners or through the health system (e.g. national influence on subnational implementation), has previously been linked to the legitimacy of MPDSR (Pattinson et al. 2009; De Brouwere et al. 2014; Lewis 2014a; Hussein et al. 2016; Scott and Danel 2016; Biswas 2017; Koblinsky 2017; Smith et al. 2017a); yet these links and the nature of external actor involvement require more systematic investigation and likely depend on context. For example, a country with greater political prioritization of maternal and perinatal health may lead to more external pressure on those who are implementing MPDSR, as demonstrated by a recent study from Ethiopia (Melberg et al. 2019).

Successful implementation of MPDSR requires an individual's willingness to 'self-correct' (Pattinson 2005), and commitment of staff to conducting audit themselves, to accept open discussion with peers and to take forward the actions recommended (Johnston et al. 2000; Pattinson et al. 2005; van Hamersveld et al. 2012). The literature reflects the importance of individual perspectives, values, experiences and motivation as implementation factors. We found that the outcome of MPDSR influences perception about the intervention, including buy-in to the belief that the intervention will make a difference. Previous reviews and commentaries have also described evidence of the impact of MPDSR as an implementation factor (Pattinson et al. 2005; Kongnyuy and van den Broek 2009; Pattinson et al. 2009; Raven et al. 2011; Buchmann 2014; De Brouwere et al. 2014; Lewis 2014a; Hussein et al. 2016; Biswas 2017; Smith et al. 2017a). Likewise, self-efficacy is a critical component in most individual behavior change theories (Damschroder et al. 2009), but it is understudied for MPDSR.

Lewis (2014a) argues that an environment open to learning requires individual responsibility and ownership of the process, whereby clinicians need to want to improve their practice and change their behaviour for the betterment of maternal and perinatal health. Our review shows that individuals found the MPDSR process to be helpful, especially for learning, a first step towards individual change. Factors that build individual confidence to implement MPDSR align with other quality improvement efforts for maternal and newborn health, such as supportive supervision, appropriate tools and oversight from subnational management or health specialists (Raven et al. 2011; Kerber et al. 2015; Zamboni et al. 2019).

Kongnyuy and van den Broek (2008) claim 'the success of audit largely depends on the motivation of the healthcare providers themselves.' The review supports this theory. Extrinsic motivation, such as expectations from subnational teams, skills or knowledge and incentives, improved quality as well as intrinsic motivation, such as consciousness for self-improvement and value of life, play a role. Individual motivation and buy-in also relates to ownership of the implementation as individuals see the benefits of change overtime (Baleta 2011; Lewis 2014a; Koblinsky 2017). Beyond users, maintaining stakeholder confidence and commitment has been recommended for implementation (Hadush et al. 2016), but this has not been studied for MPDSR, specifically.

MPDSR is often included as part of a package of interventions implemented for testing or strengthening quality improvement efforts, as in the QUARITE Trial identified in this review (Dumont et al. 2013). Since MPDSR, or any form of maternal and perinatal death review or audit, often falls under clinical governance (McSherry and Pearce 2011), audit becomes one of the multiple tools and practices used as a measure for and means to improve quality of health care (Amelia et al. 2015). It acts as a trigger to facilitate behaviour change at the provider level (Bauer et al. 2015). Therefore, the presumption that MPDSR should be implemented along with other clinical governance practices is supported (Pattinson et al. 2005; Kongnyuy and van den Broek 2009; Pattinson et al. 2009; Raven et al. 2011), even though relative advantage has not been established. However, there is very little research or documentation of how MPDSR relates to ongoing quality improvement processes and what health workers see as the relative advantage (Mukinda et al. 2020a; 2020b).

The nature and quality of communication within teams, such as hierarchies, mentorship, teamwork, and management, also reveal to be an important determinant of implementation (Raven et al. 2011; Hussein et al. 2016; Koblinsky 2017). The effects of these components vary across different contexts within communities as well as across different levels of the health system. For example, the review found that there are both positive and negative influences of hierarchies on MPDSR implementation, even if not investigated in depth. Hierarchies relate to leadership approaches, and optimal teamwork relies on effective leadership approaches that create an enabling environment (Cornthwaite et al. 2013; Gilson 2016).

Systems lens: things that trigger change

Proven quality improvement interventions depend on an enabling environment at the national, subnational, and facility-levels with consideration of both everyday culture and broader healthcare improvements (Mensah Abrampah et al. 2018; Zamboni et al. 2019). MPDSR is considered an accountability mechanism (Martin et al. 2016) as well as a pathway towards individual and collective accountability (Johnston et al. 2000; Pattinson et al. 2005; O'Hagan and Persaud 2009; van Hamersveld et al. 2012). Even though fear of blame is a widely recognized barrier to implementation (Kongnyuy and van den Broek 2009; Raven et al. 2011; Lewis 2014a; Scott and Danel 2016), our review exposes the complexity of blame, including different explanatory reasons for it and different types. Future research needs to go beyond identifying blame as a barrier to understanding how to create a culture of accountability, learning and improvement through strengthening leadership, improving teamwork and communication, driving motivation while considering context (Khatri et al. 2009). More focus on investing in and researching the software elements of the health system may support an effort towards a no-blame, no-shame implementation environment (Sheikh et al. 2011; Lusambili et al. 2019). Using theory allows for exploration of issues, such as trust, credibility and hierarchies shaped by the power relations between MPDSR stakeholders, and have been used by others when investigating quality improvement processes (Hulscher et al. 2013; Davidoff et al. 2015; Akachi and

Kruk 2017; Kruk et al. 2017; Persson 2017; Topp 2017), including audit and feedback (Ivers et al. 2012).

Often described as the most influential factor in shaping organizational culture, effective leadership is critical at all levels (Mathole et al. 2018). Though engaged leaders are widely recognized as an enabler, we did not find much literature specifically looking at the necessary individual leadership traits and critical thinking or problem solving skills needed for MPDSR. Skills in facilitation are one trait identified but not specifically investigated. For successful MPDSR implementation, more needs to be understood on what motivates these leaders, what skills are needed, how to grow new champions. There is a wealth of knowledge already about leadership in health (Gilson 2016; Mathole et al. 2018), which may be applicable to MPDSR.

The complex interplay of connectedness and networks between health system levels, different sites and different role players influences MPDSR implementation (Raven et al. 2011; Lewis 2014a). Connected systems with clear channels of communication, a clear pathway of information flow, as well as accountability mechanisms, such as supportive supervision, enable completion of the audit cycle. Not only is this important for implementation of MPDSR, but operational feedback loops also encourage individual commitment to the process as more stakeholders come to see the benefits of MPDSR. The review finds that subnational structures play a vital role in implementation for accountability and quality control (e.g. supportive supervision; clear pathway of information flow); yet few studies investigate their role and influence. A governance perspective more broadly for maternal and newborn health, especially at the meso-level of the health system, may be useful in helping to strengthen implementation (George et al. 2019; Mukinda et al. 2020b; Schneider et al. 2020). Especially as one must also take into account that MPDSR is among many other accountability or quality improvement initiatives being implemented (Mukinda et al. 2020a). MPDSR cannot be a short-term investment or a vertical intervention to promote. Successful implementation of this complex intervention process is linked to other health system strengthening efforts (Dumont et al. 2013) but these linkages appear to be understudied.

WHO guidelines encourage learning from past and current experiences to inform the future of MPDSR implementation (WHO 2016c; Koblinsky 2017). While a phased approach is widely promoted (Kongnyuy and van den Broek 2009; Pattinson et al. 2009; De Brouwere et al. 2014; Lewis 2014a; Hussein et al. 2016; Biswas 2017; Koblinsky 2017), the lack of literature on how learning from pilots or a phased implementation approach leads to improved implementation efforts is of concern, especially given the findings around the influence of external actors. Future implementation and research on MPDSR may also benefit from considering the vast literature more broadly on adaptability and sustainability in development (Bopp et al. 2013; Spicer et al. 2018; Zamboni et al. 2019).

Applying an implementation framework

The Consolidated Framework for Implementation Research served as a useful framework to understand the complex nature of MPDSR by allowing us to consider the different levels and different factors that influence implementation (Kinney et al. 2019). By collapsing the intervention and the process together as one domain, we were able to reduce some of the overlap in concepts applicable to MDPSR. Incorporating the three lenses—service delivery, societal and systems—furthered our ability to understand the different approaches and measurement of implementation factors from a health systems perspective. The review found that implementation frameworks and health systems thinking are rarely used in the original studies and reports, therefore our application of the framework required significant interpretation by the study team and continuous reflection and discussion. Using frameworks from implementation and health systems research in understanding complex health intervention processes, such as MPDSR, will create much more room for growth in future studies, as flagged by the numerous gaps found by applying such frameworks.

Limitations

The literature on MPDSR is vast and complex with different terminologies used to describe the intervention. At the time of the review, there was no standard definition or reporting global guidelines on how to describe MPDSR, we use the WHO definitions and guidelines for maternal death review, maternal death surveillance and response, and perinatal death audit (WHO 2004; WHO 2013a; WHO 2016a). Despite our attempt to capture related processes, referred to as obstetric audits, clinical audits or facility-based maternal and perinatal morbidity and mortality audits, some relevant literature may have been missed in the search. The inclusion criteria excluded confidential inquires, maternal near-miss reviews, verbal autopsies and social autopsies (Lewis 2014a); and we recognize that many of the elements central to this review may also be relevant to this literature. Much of the MPDSR-related literature looked at outcomes of the intervention, such as causes of death, modifiable factors and recommendations, and therefore, it took time to identify articles that document the actual implementation process as some studies included this information but it was not a main objective of the study. The scoping review is limited by language and time span but it is comprehensive in the inclusion of grey literature through consultation with experts in the field. While we present quantifications to characterize the literature, e.g. number of pilot studies, the decision-making, abstraction and interpretation of findings is subjective. In addition, the development and application of the implementation framework required continuous discussion and revisions by the team. The team had regular meetings to discuss our understanding of the concepts and documented our decisions.

Conclusion

This scoping review identifies and describes implementation factors relating to MPDSR in LMIC settings applying an implementation framework and health systems thinking, allowing for deeper understanding of implementation. The literature mostly identifies factors influencing implementation related to MPDSR as an intervention and its inner and outer setting, with less attention to the individuals involved. Much attention is paid to implementation factor involving tangible inputs from the service delivery lens; however, we found no agreed minimum requirements or standard approach to measuring implementation of these components. Though less studied, the societal and health systems implementation factors show that people (external actors, leaders and team members), their relationships, their motivations, their implementation climate and their ability to communicate influence implementation processes; yet their subjective experiences and relationships are inadequately focused on in the current literature. MPDSR implementation benefits from a culture of accountability, learning and continuous improvement as well as contributes to accountability at all levels; but few have studied the complex interplay and change dynamics of implementation in relation to other quality improvement and accountability mechanisms.

Understanding of MPDSR will require more research using health policy and systems approaches, including the use of implementation frameworks.

Supplementary data

Supplementary data are available at *Health Policy and Planning* online

Acknowledgements

We would like to thank the members of the MPDSR Technical Working Group and the Countdown to 2030 Drivers Working Group for their engagement in the consultation process. We also appreciate the contributions of grey literature by experts.

Authors' Contributors

M.V.K. conceived of the idea, developed the research question and study methods, contributed to the screening, data extraction and analysis, wrote the first draft of the manuscript, contributed meaningfully to the drafting and editing, and approved the final manuscript. A.G., D.R.W., P.Waiswa and P.Wanduru aided in developing the research question and study methods, contributed to the screening, data extraction and analysis, contributed meaningfully to the drafting and editing and approved the final manuscript.

Funding

A.G. and M.V.K. are supported by the South African Research Chair's Initiative of the Department of Science and Technology and National Research Foundation of South Africa (Grant No 82769), the South African Medical Research Council and the Countdown 2030 project funded by the Bill and Melinda Gates Foundation. Any opinion, finding and conclusion or recommendation expressed in this material is that of the author and funders do not accept any liability in this regard.

Ethical approval

Ethical approval for this type of study is not required by our institute.

Conflict of interest statement. None declared.

Data availability

The data underlying this article will be shared on reasonable request to the corresponding author.

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Paper 3

Kinney MV, Day LT, Palestra F, Biswas A, Jackson D, Roos N, de Jonge A, Doherty P, Manu AA, Moran AC, George AS; MPDSR Technical Working Group. Overcoming blame culture: key strategies to catalyse maternal and perinatal death surveillance and response. BJOG. 2022 May;129(6):839-844. doi: 10.1111/1471-0528.

Paper summary

This paper, published in the *BJOG: An International Journal of Obstetrics & Gynaecology*, is a commentary focused on overcoming the blame culture related to MPDSR. An adapted framework to promote a positive implementation culture for MPDSR is presented and comprises ten related strategies to identify, address and overcome the blame culture.

Contribution to the thesis

This paper contributes to the first objective of the thesis: To explore the existing knowledge on factors influencing implementation of MPDSR in LMICs through a scoping review. The commentary contributes to the thesis by demonstrating how one factor relating to MPDSR implementation relates to other factors. It also reinforces the use of frameworks to examine implementation factors of this complex intervention process. The ten strategies integrate micro, meso and macro levels of the health system in order to link to the Doctoral Thesis. The commentary is an outcome of the candidate's engagement with the MPDSR TWG. The content was developed first as a module for WHO materials to support MPDSR implementation (WHO, 2021d) and then adapted as a commentary, considering the additional burden that the COVID-19 pandemic has had on maternal newborn health. The framework and strategies are based on the literature and experiential learning shared through consultation with members of the MPDSR TWG and a meeting with MPDSR-related national and sub-national stakeholders in Nigeria.

Contribution of candidate

The candidate participated in a MPDSR TWG sub-group focused on blame and community engagement, which was established in 2018. She led the work plan activity to develop a module on overcoming blame, intending to draw on the scoping review. The candidate conceptualised the framework, based on the literature, and presented it to the sub-group and later the wider MPDSR TWG for feedback. She wrote the first draft of the module, which

included the draft framework, and incorporated feedback. The candidate wrote the first draft of the commentary and incorporated critical inputs from all co-authors on the different drafts. The candidate led the submission process and revisions based on the comments from the journal peer review (Comments from the peer review process are available in Appendix 4). The candidate presented the commentary on a Webinar hosted by the WHO's Network for Improving the Quality of Maternal, Newborn and Child Health on 8 February 2022. https://www.qualityofcarenetwork.org/updates/webinar-overcoming-blame-culture-mpdsr The candidate presented an oral presentation on this paper at the Conference of Perinatal Priorities in Southern Africa in March 2022.

BJOG An International Journal of Obstetrics and Gynaecology

Royal College of Obstetricians & Gynaecologists

DOI: 10.1111/1471-0528.16989
www.bjog.org

Commentary

Overcoming blame culture: key strategies to catalyse maternal and perinatal death surveillance and response

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Accepted 17 October 2021.

Please cite this paper as: Kinney MV, Day LT, Palestra F, Biswas A, Jackson D, Roos N, de Jonge A, Doherty P, Manu AA, Moran AC, George AS, on behalf of the MPDSR Technical Working Group. Overcoming blame culture: key strategies to catalyse maternal and perinatal death surveillance and response. BJOG 2021; https://doi.org/10.1111/1471-0528.16989.

Introduction

Maternal and perinatal death surveillance and response (MPDSR) is a health systems process entailing the continuous cycle of identification, notification and review of maternal and perinatal deaths (Surveillance), followed by actions to improve service delivery and quality of care (Response).[1] Before the coronavirus disease 2019 (COVID-19) pandemic, there were an estimated 4.6 million maternal and neonatal deaths and stillbirths each year.[2] During the pandemic, maternal and perinatal health outcomes have worsened, especially in low- and middle-income countries,[3] highlighting the urgent need to galvanise MPDSR to end preventable mortality and strengthen health systems.

The World Health Organization (WHO) has released global technical guidelines on MPDSR with operational guidance and tools,[4] and has listed it among the essential interventions to mitigate the indirect effects of COVID-19 on maternal and perinatal outcomes.[5] As countries adapt and apply these guidance, implementation gaps and challenges remain preventing successful MPDSR uptake.[1] The organisational climate and culture relating to MPDSR, including elements of blame, have been identified as key factors requiring further attention.[1,6–8] This commentary presents strategies to identify, address and overcome the blame culture relating to MPDSR. It builds from Lewis's 2014 framework on the cultural environment of maternal death and near-miss reviews published in the *BJOG* 2014 supplement on quality of care.[8]

The importance of a blame-free, confidential climate

MPDSR implementation is affected by factors at multiple health system levels[8]:

1 *Individual responsibility for, and ownership of, the MPDSR process (micro level)* whereby health workers embrace positive attitudes of life-long learning for behaviour change to improve maternal and perinatal health.[8] MPDSR implementation relies on health workers' commitment to lead in the process and participate in peer-discussion to identify modifiable factors, and for individuals and teams to be willing to change and implement solutions.[7]
2 *Organisational culture (meso level)* whereby the health facility's work environment influences implementation.[8] MPDSR succeeds when there is an organisational culture of learning as a critical part of quality improvement.[1]

3 *Policy and political supportive environment (macro level)* whereby national policies initiate and support MPDSR implementation, including guidelines, and legal and other protective frameworks. Implementation is facilitated by political priority for maternal and neonatal health with corresponding investment to deliver quality services.[1,9]

Across all three levels, successful implementation of MPDSR requires a 'No Name, No Blame and No Shame' environment, which is grounded in three ethical principles: confidentiality, anonymity and respect. The concept of blame relating to MPDSR is complex; taking different forms, arising for different reasons and with varying perspectives between settings.[1] 'No blame' is integral to 'No name' and 'No shame' in MPDSR and if a blame culture persists, MPDSR efforts will fail.

'Blame culture' linked to MPDSR widely exists at the micro and meso levels.[1] Individuals can feel threatened during MPDSR review meetings – fearing punitive repercussions and legal action.[1] Health-worker emotional fatigue and burnout with high workloads, exacerbated by the pandemic, can further exacerbate the culture of blame. The negative influence of professional hierarchies between health cadres can silence nurse-midwives and junior medical staff,[6] and may even demotivate personnel from participating in MPDSR. Other contributing factors include a lack of clarity around the 'no name, no blame, no shame' principle, defensiveness regarding poor quality record-keeping, poor facilitation of review meetings and lack of staff time to participate.[1] Ineffective management, communication and coordination across teams may also constrain the MPDSR process, when management or senior team members do not buy into or engage in the process. Finally, without national political commitment, government and clinical setting ownership and clear guidelines, MPDSR implementation will face many challenges.[9]

A framework for promoting a positive implementation culture of MPDSR

Despite the identification of some strategies to overcome the blame culture previously,[8] blame remains a major barrier to effective implementation.[1] To support frontline health workers, managers and planners at all levels to overcome this challenge, we present ten strategies using an adapted framework to promote a positive implementation culture of MPDSR (Figure 1). Adapted from Lewis,[8] further investigated[1] and vetted by the MPDSR Global Technical Working Group, the ten strategies integrate micro, meso and macro levels of the health system to reduce blame culture. This framework has also been included in the new WHO materials to support MPDSR implementation.[10]

Strategies to minimise the blame culture

This section explains the ten strategies, with further information in Table S1. Boxes 1–3 provide country case studies of these strategies in practice, revealing how they are also interlinked.[11,12]

1 *Ensure MPDSR policy and planning* including national guidelines that clearly explain the purpose, process and how to conduct blame-free MPDSR with implementation tools available at all levels of the health system. Policies for death notification requirements and legal protection for individual staff and health departments linked to MPDSR need careful consideration. Fear of litigation has been reported as potentially helpful for positive accountability, as well as a negative influence.[1]
2 *Ensure national prioritisation* of ending preventable maternal and neonatal deaths and stillbirths, leading to positive promotion and use of MPDSR. Prioritisation is especially critical during the COVID-19 pandemic to assure that team's monitor and mitigate potential health system challenges. Although political commitment can result in increased MPDSR implementation,[6] it may also lead to additional pressure on over-burdened health workers compromising MPDSR accurate reporting and participation.[1] Therefore, dual national prioritisation on the value of systems learning and quality improvement that MPDSR encompasses needs to be matched with political priority for health system investment to implement *response*, deliver improved health outcomes and reduce the number of preventable deaths.
3 *Harmonise MPDSR with routine monitoring systems* to support process standardisation and strengthen accountability. Integrating elements of MPDSR within routine monitoring systems, e.g. data collection, aims to increase efficiency and sustainability by reducing duplicative data capture and workload. Enabling real-time regular data use may ultimately result in less blame as MPDSR becomes normalised as part of routine data systems, and can serve as a means of verifying data across systems.
4 *Create and advocate for an enabling environment* that supports MPDSR implementation with an organisational culture of learning, accountability and transparency. Enabling environment means that health system building blocks are functioning, i.e. adequate human and physical resources, along with other elements, such as coordinating mechanisms, supportive relationships and quality improvement strategies. During the pandemic, advocacy for the continued need for MPDSR systems to operate with adequate resourcing and staffing is essential to allow health systems to

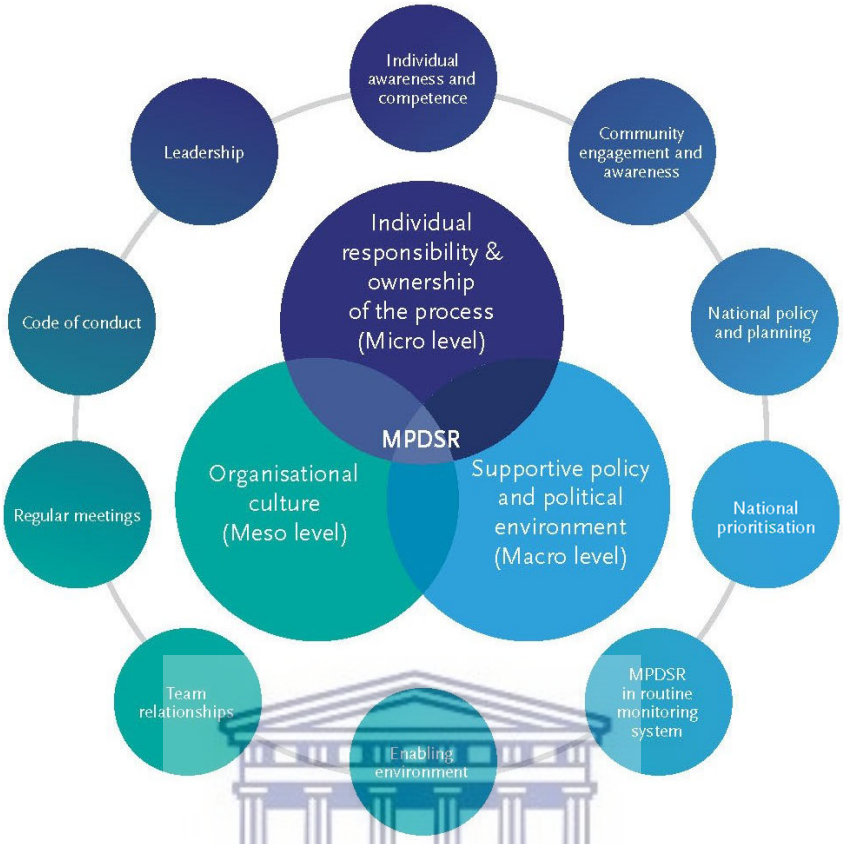

Figure 1. Framework for overcoming blame culture to promote a positive implementation culture for MPDSR.
Source: WHO Maternal and Perinatal Death Surveillance and Response: Materials to Support Implementation. Working document August 2021.[10]

Box 1. Multidisciplinary participation in Zimbabwe

Multidisciplinary participation can reduce blame because more people are engaged in the discussion and can share their perspectives. An assessment of MPDSR implementation in 16 facilities across Zimbabwe found evidence of multidisciplinary participation in death audit meetings with clinical staff from different units (obstetrics, paediatrics, unit in charge) as well as hospital administration, such as information officers, hospital and district management and community liaisons. The interdisciplinary nature of audit meetings demonstrated buy-in and ownership in the process by all staff and reflected strong facility leadership. The assessment also found that there was little fear or blame associated with death review meetings reported. Only six facilities reported a connection to professional disciplinary action and the MPDSR system. In order to ensure separation between these systems, adopting a mortality audit meeting code of conduct that clearly differentiates between mortality audit and professional disciplinary or legal processes can help to give staff greater confidence to share openly with less fear of punishment or blame, as displayed in the below quotes.

'Everyone attends our maternal and perinatal meetings, all the way to the driver, because when we have a case to transfer, he knows why we need to move now.' – Facility interview, Zimbabwe.

We make sure we don't say the names of those who attended the patient. No one says, "I am the one." Just "doctor" or "nurse." — Facility interview, Zimbabwe.

Source: Kinney et al.[11]

respond to their current context, including identification of service delivery disruption and worsening of COVID-19 in specific geographical areas. Advocating for an enabling environment that supports continued implementation during pandemics and in routine contexts protects staff from burn out and blame. Specific to the review process, promoting a learning focus and anonymity mitigates blame.[1] Reviewing cases of newborn survival and near-miss maternal deaths can change the review meeting's atmosphere to further

Box 2. Code of conduct and staff protection in Tanzania

The National MPDSR guideline in Tanzania stipulates that a facility should have a code of conduct for MPDSR. In an assessment of MPDSR implementation across 16 facilities in Tanzania, respondents reported that they adhere to the code of conduct. However, the document review and interviews found inconsistency and poor documentation of an actual code of conduct in all but three facilities. Two of these facilities reported that the MPDSR meeting chairperson reads the code before starting the meeting, which was validated through document review. At the third facility, the code of conduct was embedded in the letter to staff inviting them to join the MPDSR committee members (see extract from letter below). These three facilities demonstrated leadership by hospital management to promote an organisational culture of participation. Although the other facilities in the assessment could not show the use of codes of conduct in their meetings, three-quarters of health facilities had measures to ensure staff confidentiality and did not include names in the review notes.

Extract from the letter inviting staff to join the MPDSR committee:

'The main objective of the committee is to discuss all maternal and perinatal death, which will happen to occur in our hospital and to make action plan for better improvement of maternal and perinatal care at our hospital as well as at the district level. This team will seat for discussion within seven days after occurrence of maternal or perinatal death.

The rule of the Team is

- *To arrive on time for the review session.*
- *To respect the statements and ideas of everyone.*
- *To respect the confidentiality of the team discussions and information and problems raised during the review must not be communicated outside the team.*
- *To participate actively in the discussion.*
- *To accept discussion and debate among participants without verbal violence.*
- *To refrain from hiding or falsifying information that could be useful in understanding the case being reviewed.*
- *To accept that our own action/decision may be questioned."*

(Health facility document review, Tanzania, data collected in May 2017)

Source: Kinney et al.[11]

Box 3. The importance of community engagement to reduce blame

In settings where many births occur outside the health facility, it is difficult to get accurate reporting of maternal and perinatal deaths. Issues around fear of blame often prevent reporting of deaths by family members, health workers or traditional birth attendants who were involved in treating the woman or newborn. Community engagement in MPDSR, when facilitated well, can help minimise blame by involving various members of the community and emphasising the need to address systemic issues rather than individual fault.

The Government of Bangladesh introduced social autopsy in 2010 to engage the communities in examining the social determinants of a maternal death, neonatal death or stillbirth through a guided, structured, standardised analysis. After a decade of implementation, social autopsy has enabled stronger data collection of social causes behind deaths, as well as empowered communities to identify their own problems, identify solutions and take appropriate action. Ensuring a blame-free environment has led to successful implementation through open discussions about cases. In order to foster a blame-free environment, the following steps have been taken in Bangladesh when implementing social autopsy:

- The facilitator of the meeting receives adequate training on social autopsy, including facilitation skills to avoid blame in the meeting.
- The facilitator is someone who is familiar to the community, ideally someone who works in the area where the death occurred, which allows participants to feel confident and comfortable discussing these issues in front of government health workers.
- Prior to the social autopsy session, the bereaved family and other participants are briefed on the process, and consent is requested.
- Before starting the session, the facilitator describes the objectives and expected outcome of the social autopsy.
- Throughout the session, the facilitator steers the discussion to avoid any blame on any person, provider or institution.

Source: Mahato et al.[12]

alleviate blame tendencies while celebrating team success. Provision of incentives, such as refreshments and continuous capacity building, may strengthen overall implementation efforts.

5 *Strengthen leadership* within professional cadres participating in MPDSR at all levels. A culture of trust is nurtured by strong inter-professional leadership and continuous modelling of a 'blame-free culture'.[6] It is critical that MPDSR focal persons have high technical competence, and that the chairperson of the review meeting is an experienced facilitator to model blame-free and educational approaches. MPDSR champions or engaged leaders are often highly motivated senior staff who already serve as mentors and in supportive supervisory roles.

6 *Nurture team relationships* among MPDSR participants. Teams with healthy relationships take collective responsibility and support one another. A teamwork approach to MPDSR facilitates consensus around decision-making, inclusiveness, strong supportive supervision and

delegation of responsibility to implement solutions.[1] Health facility management plays a strong role in strengthening team relationships for MPDSR through clear communication and their involvement and support in MPDSR. Specific attention is needed to strengthen team relationships during the pandemic as the additional strain on the health workforce can lead to emotional exhaustion and possibly a lack of empathy of healthcare workers towards mothers and each other, which could contribute to the blame culture.

7 *Ensure that regular multidisciplinary review meetings take place* to embed MPDSR in routine practice. Continuous engagement and frequent positive experiences of MPDSR review meetings can reinforce the 'no blame' culture (Box 1, Panel S1). Participation of all health-worker cadres caring for women and newborns, including junior and senior team members, creates ownership, enhances the discussion, strengthens the response and reinforces non-blame teamwork. Active participation of all cadres can reinforce the centrality of inter-professional teamwork across hierarchies.[10]

8 *Establish a code of conduct or 'audit charter'* for review meetings to ensure clear understanding about the purpose of the meeting, expected behaviour ('no name, no blame, no shame') and confidentiality. Codes of conduct may minimise acrimony and prevent (or reduce) blame.[1] In some settings, a code of conduct would be a signed or verbally agreed non-disclosure confidentiality agreement (Box 2, Panel S2).

9 Promote *individual awareness* of everyone's role, responsibility and competence to ensure a 'No Name, No Blame and No Shame' process. Every participant engaged in MPDSR needs to understand the MPDSR purpose and process, and to take ownership and responsibility for jointly implementing solutions identified to avert future deaths. Individual awareness can be improved through ongoing engagement in the process as on-the-job capacity development.

10 *Engage communities in awareness* reporting and participation in MPDSR cycles, where appropriate. Community awareness and engagement may strengthen collective ownership and responsibility, and ultimately improve quality of care.[9] Regular feedback of results to communities may also ensure accountability and promotes sustainability.[1,6] Building community awareness and sensitisation around the MPDSR process, for example through social autopsies, may create an enabling environment for implementation at community level. Critical here will be emphasising the 'No Name, No Blame and No Shame' approach so that family, community members and health workers are able to discuss openly and constructively how similar deaths can be prevented in the future (Box 3, Panel S3).

Conclusion

The COVID-19 pandemic highlights the urgent need to further strengthen MPDSR as part of the effort to reach the Sustainable Development Goals to end preventable maternal and neonatal deaths and stillbirths and improve health service delivery. Overcoming the blame culture that currently impedes MPDSR implementation requires action at all levels of the health system. Targeted strategies across the health system will create a healthier culture and environment for implementing MPDSR. Future research needs to go beyond identifying blame as a barrier, to understanding how effectively these strategies can change the blame culture across diverse contexts to scale-up MPDSR, strengthen health systems and ultimately save lives and prevent suffering.

Disclosure of interests

None declared. Completed disclosure of interests form available to view online as supporting information.

Contribution of authorship

This commentary was prepared by the MPDSR Technical Working Group's subgroup assigned to further understand the blame culture. MVK, LTD, FP, DJ and AM conceptualised the idea. MVK wrote the first draft with inputs from LTD and DJ. All authors reviewed and provided edits to the manuscript. FP, AM and ASG supervised the process. All authors reviewed and approved the final version.

Details of ethics approval

This work is a commentary based on the literature and is not a scientific study in itself. Institutional Review Board approval was not required from any of the authors' institutions.

Funding

Asha George and Mary Kinney are supported by the South African Research Chair's Initiative of the Department of Science and Technology and National Research Foundation of South Africa (Grant No. 82769), the South African Medical Research Council and the Countdown 2030 project funded by the Bill and Melinda Gates Foundation. Any opinion, finding and conclusion or recommendation expressed in this material is that of the authors and funders do not accept any liability in this regard. The authors alone are responsible for the views expressed in this article and they do not necessarily represent the views, decisions or policies of the institutions with which they are affiliated.

Acknowledgements

We thank the Global MPDSR Technical Working Group for their review and comments. We thank the authors of the scoping review of MPDSR implementation factors in low- and middle-income countries, which identified 42 studies that described the implementation climate and culture of MPDSR, including aspects of blame, as we drew from this manuscript for evidence (https://doi.org/10.1093/heapol/czab011).

Data availability statement

Data sharing not applicable to this article as no data sets were generated or analysed during the current study.

Supporting Information

Additional supporting information may be found online in the Supporting Information section at the end of the article.

Table S1. Ten strategies for promoting a 'No Name, No Blame and No Shame' culture and key resources with more information.

Panel S1. Example of principles of facility-based case review meetings to ensure no blame.

Panel S2. Examples of audit charter or non-disclosure agreements.

Panel S3. Engaging the community to prevent blame. ■

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3.2 Study component 2 – cross-sectional facility assessment

Paper 4

Kinney MV, Ajayi G, de Graft-Johnson J, Hill K, Khadka N, Om'Iniabohs A, Mukora-Mutseyekwa F, Tayebwa E, Shittu O, Lipingu C, Kerber K, Nyakina JD, Ibekwe PC, Sayinzoga F, Madzima B, George AS, Thapa K. "It might be a statistic to me, but every death matters.": An assessment of facility-level maternal and perinatal death surveillance and response systems in four sub-Saharan African countries. PLoS One. 2020 Dec 18;15(12):e0243722. doi: 10.1371/journal.pone.0243722.

Paper summary

This paper, published in *PLoS One*, presents a cross-sectional, mixed-methods study used to assess MPDSR implementation across 55 purposefully selected facilities in four African countries (Nigeria, Rwanda, Tanzania, and Zimbabwe). This study is the first to apply an adapted standardised scoring methodology to assess the stage of MPDSR implementation at sub-national and facility-level. Structures and processes for implementing MPDSR existed in all four countries with the majority of facilities demonstrating evidence of MPDSR practice. Identified factors enabling and hindering implementation include the policy and political environment, leadership, teamwork, organizational culture, frequency of review meetings, and staff motivation, confidence and capacity.

Contribution to the thesis

This paper contributes to the second objective of the thesis: (i) To examine the extent of implementation and institutionalisation of facility-based MPDSR and (ii) to describe the barriers and enablers of implementation using a process model. The paper contributes to the thesis by adapting and applying a process model to understand implementation of MPDSR. The tool itself was developed based on the literature. The progress markers in the tool measure the current status of implementation, considering tangible and immediate indicators of organizational commitment to implement MPDSR processes, taking a service delivery approach. The tool was not designed to measure the quality of the MPDSR related activities (e.g. how well data was collected) nor the complex realities of the implementation process (e.g. how people interact and their motivations; how information flows).

Contribution of candidate

The research project was already mid-way when the doctoral candidate registered. It was a large research project involving research teams in the four countries and at the headquarter offices of Save the Children and Jpheigo in Washington DC. When the candidate joined the MCSP research team as a co-Principal Investigator in February 2017, the data collection tools had been developed; ethics approvals received; and data collection completed in two countries. The candidate co-led data collection in Tanzania with another co-Principal Investigator in May 2017. The candidate led the data analysis and country report for Tanzania (MCSP, 2018a), led the revision process with additional data analyses for two other country reports (Nigeria and Zimbabwe) (MCSP, 2017c; MCSP, 2017a), and co-led the analysis and writing of the multi-country report (Thapa et al., 2019). The co-authors and research teams provided inputs on drafts. The candidate wrote the first draft of the paper and incorporated critical inputs from all co-authors on the different drafts. The candidate led the submission process and revisions back on the comments from the journal peer review (comments from the peer review process are available in Appendix 4). The candidate prepared and presented a poster at the Health Systems Global Symposium held in Liverpool, United Kingdom, in 2018. The candidate also prepared and presented an oral presentation at the Conference for Perinatal Priorities in South Africa in 2018.

PLOS ONE

RESEARCH ARTICLE

"It might be a statistic to me, but every death matters.": An assessment of facility-level maternal and perinatal death surveillance and response systems in four sub-Saharan African countries

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OPEN ACCESS

Citation: Kinney MV, Ajayi G, de Graft-Johnson J, Hill K, Khadka N, Om'Iniabohs A, et al. (2020) *"It might be a statistic to me, but every death matters."*: An assessment of facility-level maternal and perinatal death surveillance and response systems in four sub-Saharan African countries. PLoS ONE 15(12): e0243722. https://doi.org/10.1371/journal.pone.0243722

Editor: Jennifer Yourkavitch, University of North Carolina at Greensboro, UNITED STATES

Received: January 7, 2020

Accepted: November 29, 2020

Published: December 18, 2020

Peer Review History: PLOS recognizes the benefits of transparency in the peer review process; therefore, we enable the publication of all of the content of peer review and author responses alongside final, published articles. The editorial history of this article is available here: https://doi.org/10.1371/journal.pone.0243722

Abstract

Background

Maternal and perinatal death surveillance and response (MPDSR) systems aim to understand and address key contributors to maternal and perinatal deaths to prevent future deaths. From 2016–2017, the US Agency for International Development's Maternal and Child Survival Program conducted an assessment of MPDSR implementation in Nigeria, Rwanda, Tanzania, and Zimbabwe.

Methods

A cross-sectional, mixed-methods research design was used to assess MPDSR implementation. The study included a desk review, policy mapping, semistructured interviews with 41 subnational stakeholders, observations, and interviews with key informants at 55 purposefully selected facilities. Using a standardised tool with progress markers defined for six stages of implementation, each facility was assigned a score from 0–30. Quantitative and qualitative data were analysed from the 47 facilities with a score above 10 ('evidence of MPDSR practice').

Results

The mean calculated MPDSR implementation progress score across 47 facilities was 18.98 out of 30 (range: 11.75–27.38). The team observed variation across the national MPDSR

Data Availability Statement: All relevant data are within the manuscript and its Supporting information files.

Funding: This study was made possible by the generous support of the American people through the US Agency for International Development (USAID) under the terms of the Cooperative Agreement AID-OAA-A-14-00028 (www.usaid.gov). The contents are the responsibility of the authors and do not necessarily reflect the views of USAID or the United States Government. AG is supported by the South African Research Chair's Initiative of the Department of Science and Technology and National Research Foundation of South Africa (Grant No. 82769) (www.nrf.ac.za/tags/dst), and the South African Medical Research Council (www.mrc.ac.za). Any opinion, finding, and conclusion or recommendation expressed in this material is that of the author, and the National Research Foundation of South Africa does not accept any liability in this regard.

Competing interests: The authors declare that they have no competing interests.

guidelines and tools, and inconsistent implementation of MPDSR at subnational and facility levels. Nearly all facilities had a designated MPDSR coordinator, but varied in their availability and use of standardised forms and the frequency of mortality audit meetings. Few facilities (9%) had mechanisms in place to promote a no-blame environment. Some facilities (44%) could demonstrate evidence that a change occurred due to MPDSR. Factors enabling implementation included clear support from leadership, commitment from staff, and regular occurrence of meetings. Barriers included lack of health worker capacity, limited staff time, and limited staff motivation.

Conclusion

This study was the first to apply a standardised scoring methodology to assess subnational- and facility-level MPDSR implementation progress. Structures and processes for implementing MPDSR existed in all four countries. Many implementation gaps were identified that can inform priorities and future research for strengthening MPDSR in low-capacity settings.

Introduction

Despite gradual progress, women and their babies continue to die of complications of gravidity and childbirth or complications in the first month after birth; an estimated 303,000 global maternal deaths, 2.6 million stillbirths, and 2.5 million newborn deaths occur per year [1,2]. Over 40% of these deaths occur in sub-Saharan Africa, and one-half occur in the perinatal period [3–5]. Many of these deaths are preventable through timely access to high-quality, safe care that delivers evidence-based interventions and avoids harmful practices for women and newborns during gravidity, childbirth, and the postnatal period [5]. To achieve the Sustainable Development Goal targets to end preventable maternal and newborn deaths by 2030, there has been a renewed focus on improving quality of care [6,7], as reflected in multiple global and country efforts [8–14]. Concurrently, there has been momentum to strengthen maternal and perinatal death surveillance and response (MPDSR) as one mechanism to help address quality of care deficits and other important contributors to preventable maternal and newborn deaths [15–18].

MPDSR is a systematic process used to understand the medical causes and the modifiable factors that contribute to maternal and perinatal deaths to identify actions to prevent future deaths [18]. MPDSR operates at all levels of the health system. Its aims are to ensure accurate documentation and reporting of deaths, identify modifiable systemic and social factors at various levels (e.g., delays in care seeking, lack of access to care, quality of care gaps), and link recommendations and accountability for follow-up actions [19–21].

The World Health Organization (WHO) has distinct guidelines for maternal death surveillance and response and for perinatal death audit [19,20]. WHO promotes an integrated approach when appropriate, and many countries have adopted integrated national MPDSR guidelines and policies in recent years [17,21]. A number of studies and reviews have explored facilitators and inhibitors of implementation or sustainability of maternal and perinatal mortality audit systems [17,21–24]. Challenges to effective implementation of MPDSR have been identified, including not having a national MPDSR policy, weak information and surveillance systems (e.g., lack of vital registration systems and lack of primary data on cause of death), lack of diagnostic capacity for accurate classification of cause of death, and gaps in identifying and

documenting maternal and perinatal deaths. Even when data do exist and deaths are reviewed, identified modifiable factors may not be addressed, undermining the "response" component of MPDSR [21,25].

Despite some knowledge of the high-level factors enabling or preventing implementation, there is limited understanding of subnational and facility-based MPDSR activities in sub-Saharan African countries. Better understanding of MPDSR implementation status at subnational and facility levels, including enablers and barriers, can help countries to strengthen MPDSR systems as an important element of their efforts to reduce preventable deaths.

Methodology

Aim and design

The aim of this study was to systematically assess the level of implementation of MPDSR in four sub-Saharan African countries, applying a standardised scoring methodology, and to describe common facilitators and barriers to sustainable MPDSR practice. A cross-sectional, mixed-methods research design was used to assess MPDSR implementation at subnational and facility levels. Qualitative and quantitative data collection methods were employed, including observations (e.g., onsite review of facility documents) and semistructured key informant interviews with subnational and facility managers and staff. The US Agency for International Development (USAID)'s Maternal and Child Survival Program (MCSP) led the study with support from ministries of health. Country visits took place between October 2016 and May 2017. Country study protocols and tools were approved by in-country ethics committees, including the Rwanda National Ethics Committee, Tanzania's National Institute for Medical Research, the Medical Research Council of Zimbabwe, and Nigeria's National Health Research Ethics Committee. The study received a nonhuman subjects research determination by the Johns Hopkins Bloomberg School of Public Health Institutional Review Board. The data collected in this assessment did not include any personal identifiers from respondents. Before review of facility documents and before every key informant interview, the interviewer read an oral consent script and asked the participant to respond "yes" or "no". Oral consent was obtained in Nigeria, Rwanda, and Zimbabwe and written consent obtained in Tanzania, in accordance with ethics committee approvals in each local setting.

Sampling

Four countries—Nigeria, Rwanda, Tanzania, and Zimbabwe—were purposively selected as countries from which a more detailed picture of district- and facility-based MPDSR activities could be gathered. Factors that influenced the selection of the four countries included: (1) having existing national guidelines for MPDSR (or any form of maternal and/or perinatal death audit policy), (2) country government interest and approval, (3) in-country presence of MCSP (or affiliated organization) to support the assessment, and (4) presence of other in-country partners supporting maternal and/or perinatal death review and response. Table 1 presents selected statistics for the four countries, demonstrating the range of maternal and perinatal death rates and ratios, and institutional birth coverage across the four countries.

National and subnational stakeholders were identified for interview by MCSP in-country staff and/or the ministry of health. A total of 41 stakeholders were interviewed, including four national stakeholders in Zimbabwe and Tanzania, and 37 regional and district government health officials supporting MPDSR in Zimbabwe, Tanzania, and Nigeria. No stakeholder interviews were conducted in Rwanda due to the unavailability of identified interviewees, who were all engaged in a national meeting at the time of the assessment. Selection of facilities was purposeful and done in collaboration with the ministries of health and included the following

Table 1. Selection of maternal and newborn health information for the four countries.

Indicator	Nigeria	Rwanda	Tanzania	Zimbabwe
Total live births (2015)	7132700	362600	2064400	538600
Maternal mortality ratio, deaths per 100,000 live births (2015)	814	290	398	443
Neonatal mortality rate, deaths per 1,000 live births (2015)	34	17	22	23
Stillbirth rate per 1,000 total births (2015)	42.9	17.3	22.4	20.6
Institutional delivery (2010–2015)	36%	91%	80%	50%
Total fertility rate (2015)	5.6	3.8	5.1	3.9
History of MPDSR	Different pilot programmes initiated before 2016; national MPDSR guidelines adopted in 2015.	Maternal mortality audits started at some hospitals in 2009; neonatal audits started in 2010, and stillbirth audits started in 2015.	Some facilities have a long history of maternal death audits. Wide-scale maternal and perinatal death audits started in 2006; national MPDSR guidelines adopted in 2015.	Maternal and perinatal death audits started in central hospitals 30 years ago; national MPDSR guidelines adopted in 2013.

Source: Data extracted from Healthy Newborn Network [26].

https://doi.org/10.1371/journal.pone.0243722.t001

criteria: provision of childbirth services and current or previous experience conducting maternal and/or perinatal death audits. Facilities were based on a convenience sample rather than a true probability sample and differed between countries with respect to geographic spread and levels of care. For example, two regions (states) were targeted in Nigeria and Tanzania due to MCSP presence in these areas at the time of the assessment, whereas facilities in all major geographic areas were targeted in Rwanda and Zimbabwe. In total, 55 health facilities (41 hospitals and 14 health centres) received onsite visits. Table 2 summarises the geographic distribution and types of facilities and subnational stakeholders selected in each country.

Table 2. Summary of facility and stakeholder samples.

	Nigeria	Rwanda	Tanzania	Zimbabwe	TOTAL
Total Number of Facilities Assessed	10	13	26	16	55
Facility Type					
Number of health centres	4	3	7	0	14
Number of hospitals	6	10	9	16	41
Total Number of Stakeholders Interviewed*	7	0	17	17	41
Stakeholder Type					
National	0	0	1	3	4
Subnational province/state/region	2	0	2	5	9
Subnational district/local government area	4	0	14	8	26
Other	1	0	0	1	2
Geography Covered	2 states	national	2 regions	national	
Estimated population in 2016	Ebonyi: 2880000 Kogi: 4473000	National: 11669000	Kagara: 2790000 Mara: 1924000	National: 14030000	

*Key informant stakeholders were primarily subnational (regional/district) government health officials involved with supporting MPDSR at subnational level.

Population data sources: The World Bank Group, Tanzania National Statistics Bureau, Nigeria National Statistics Bureau [27–29].

https://doi.org/10.1371/journal.pone.0243722.t002

Data collection

Data collectors included MCSP technical staff and in-country staff from MCSP partner organisations (Save the Children and Jhpiego), national and subnational ministry of health representatives, professional association members (in Nigeria only), and local consultants as needed. The size of the assessment teams for each facility varied from two to five people. Each country's data collection team received standardised training on completion of the data collection tools and assessment methodology. Data collection tools included a semistructured questionnaire for subnational managers and stakeholders (S1 Table) to explore district and regional MPDSR activities, and subnational support of facility-level MPDSR implementation. The facility assessments included two types of data collection: 1) administration of a standardised, semistructured questionnaire to facility health workers supporting MPDSR-related activities who were present on the day of the visit, and 2) observations by assessors of MPDSR-related documents and activities in the facility (e.g., review of MPDSR meeting notes). Generally, facility-level interviews were conducted with health workers as a team, with individual staff selected by the facility manager.

An implementation tool was developed specifically for this study, adapted from the work by Bergh and colleagues for understanding facility-based kangaroo mother care implementation status [30,31]. The tool designed for this study was developed by grounding the constructs in the literature on the topic, engaging experts in the development of the criteria and consulting global guidelines (Table 3). It was also informed by a set of potential questions and progress markers proposed for measuring the status of perinatal death audit implementation [24].

Data analysis

To understand the context and history of implementation, a desk review of related national MPDSR guidelines and literature on implementation of MPDSR in these countries was conducted. A linked policy mapping set out to determine the content of each national guideline in relation to instructions that have been provided to subnational and facility levels regarding implementation.

To derive a cumulative implementation progress score for each facility, the quantitative data were analysed using the adapted implementation progress monitoring model. An implementation progress score was calculated for each facility across six stages of implementation, with each stage having a weighted score based on specific points (Fig 1). For each stage, the assessors considered all relevant collected data to assign stage-specific points, contributing to a possible total score of 30 (see Table 3). Any discrepancies between the data collectors' score assignment and progress marker results were resolved through discussion and consensus, with the final score determined by the lead investigators (KK for Zimbabwe, KK and OS for Nigeria, KT and GA for Rwanda, and KT and MK for Tanzania). The lead investigators also met with in-country ministry of health and partner stakeholders before and after assessments to present the study design and discuss interpretation of the findings before scores were finalised. Facilities that scored greater than or equal to 10 met at least the fourth stage of 'evidence of practice'. Eight facilities were excluded from the qualitative and quantitative analyses because they did not meet the facility inclusion criteria of 'evidence of practice' (seven in Nigeria and one in Tanzania).

Data from the facility and subnational key informant questionnaires were extracted into a database to tabulate descriptive means and frequencies of explanatory variables and progress markers (S1 Data). Qualitative data were analysed using thematic content analysis. Team members (KT, MK, and JJ) independently coded qualitative responses, consulted, and reached consensus on data interpretation. The team mapped national guidelines and tools using a

Table 3. Progress markers and rationale for assessing.

Stage of implementation	Progress markers and instrument items	Rationale for instrument items based on the literature and global guidelines
1. Creating awareness **(2 points)**	Number and type of (senior) managers involved in implementation process (in relation to size of facility) • Special person(s) who take specific effort in promoting death reviews, including management, professionals, driving forces (contact person, meeting coordinator, other champion) • Clear leader(s) are involved in establishing and championing death reviews (past or future).	Successful implementation of MPDSR requires leaders to champion the process and access change agents at other levels to address larger, systemic concerns identified through MPDSR [21–24,32].
2. Adopting the concept **(2 points)**	Decision to implement MPDSR • Knowledge of the original decision to implement death reviews. If death reviews have not yet been implemented, has a formal decision been made?	A formal decision by facility leadership and subnational actors supports uptake of implementation after the intervention has been introduced and leadership identified [21,33].
	Steering committee • A death review leadership team or steering committee is established.	A steering committee ensures the overall responsibility for operationalising the audit policy, provides technical assistance for the implementation of audit systems, and monitors recommendations and follow-through [19]. Supervision and teamwork within a supportive environment are essential components to setting the foundation for a functioning MPDSR process [21,24].
3. Taking ownership **(6 points)**	Tools available • A data collection form is available. • Tools include cause of death. • Tools include modifiable factors. • Tools include a place to follow up on actions taken.	National guidelines with clearly defined roles and responsibilities, tools, and familiarity and confidence in the reporting process enable implementation [21–23].
	Meeting process established • Informants' ability to describe or show documentation of meeting process • A staff meeting conduct agreement is available.	Part of taking ownership involves having team members engaged in the process. This can be undermined if staff feel that MPDSR discussions are not protected, confidential spaces. Specific actions can be taken to create no-blame environment, such as having a code of conduct members agree to adhere to during a review [19]. The lack of trust between health professionals and service administrators, issues around the culture of blame and fear of potential legal ramifications, and lack of ownership in a process prevent successful implementation [21,22].
	Resources allocated • Allocations from the hospital budget or support from other partners to establish death reviews	MPDSR requires staff time and skills, meeting space, and stationery [21–23]. Reliance on external funds and/or goodwill of professional organisations to support the process can be an inhibitor of implementation [23].
4. Evidence of practice **(7 points)**	Evidence of MPDSR meetings • Meeting minutes are available. • Meeting minutes include action items. • Meeting minutes include follow-up from previous meetings. • Meeting notes respect confidentiality of staff and patients.	Documentation of meeting provides evidence that regular meetings take place and enables reflection on the quality of the meetings [21].
	Orientation for new staff • Face-to-face or written orientation on death reviews is available for new staff.	Face-to-face or written orientation of new staff about the death review process supports implementation efforts, since everyone is onboarded to the process [21].
	MPDSR data use • Data trends are displayed or shared.	Data collection and use are foundations of MPDSR. A number of informative quantitative analyses and outcomes can be tallied by the MPDSR committee or designated staff and presented at scheduled review meetings, as well as posted publically within the ward or unit. Looking at data trends over time, such as numbers of admissions, births, and deaths, as well as trends in causes of death and types of modifiable factors are important components of MPDSR tracking. Improved confidence in data capture, use, and reliability enables implementation [21,23,32].

(*Continued*)

Table 3. (Continued)

Stage of implementation	Progress markers and instrument items	Rationale for instrument items based on the literature and global guidelines
5. Evidence of routine integration **(7 points)**	Further evidence of practice • There is evidence of change based on recommendations that arise from death review findings.	Implementation is encouraged by evidence of the MPDSR process, leading to change or having improved health services as a results of the process [23]. When problems identified during review meetings are not followed up on and addressed, staff are not motivated and/or lose motivation to participate in MPDSR activities [22,34].
	Evidence of routine MPDSR practice • Death review meetings are held at stated interval (e.g., weekly, monthly).	Holding regular meetings is an important element of integrating MPDSR into routine practice. Most national policies stipulate that MPDSR committees meet regularly [21,24].
	Multidisciplinary meetings • Death review meetings include staff from different disciplines and management.	Participation of all health worker cadres involved in the process of caring for women and newborns enhances the analysis of death information and the identification and implementation of follow-up actions to address modifiable factors [19,24].
	Community linkages • There is evidence of reporting findings and progress to the community.	Regular feedback of results to communities and to subnational level ensures accountability and promotes sustainability [21]. Institutionalising MPDSR supported by communities strengthens collective ownership, responsibility, and quality of care [22].
6. Evidence of sustainable practice **(6 points)**	Documented results • Facility records show ongoing death review meetings for at least 1 year.	Regular audit meetings practised over a long time reflect sustained practice; staff have an expectation that meetings will occur [21,24].
	Evidence of staff development • There is a plan in place to ensure all staff receive MPDSR training. • There is evidence that staff have received MPDSR training in the past year.	Depending on the role and level of implementation of the audit system, district health staff, administrative staff, health workers, and other relevant stakeholders require initial and/or regular training specific to their role in the audit process [19,21,24].
	Score on the first five stages (divided by 12)	Sustainable practice is influenced by the level of implementation of elements in the first five stages.

*MPDSR = maternal and perinatal death surveillance and response.

https://doi.org/10.1371/journal.pone.0243722.t003

content analysis and verified data with national stakeholders (S2 Table). To determine the leading facility-reported barriers and enablers to MPDSR implementation, the team analysed the frequency of qualitative responses from facility interviews based on the thematic content analysis and considered the frequency of relevant progress markers (S3 Table).

Results

National and subnational enabling structures

The history of introducing and implementing maternal and perinatal death audits or reviews varied among the four countries (S1 File). National MPDSR guidelines, tools, and forms varied in content across the four countries, including guidance on methods to classify deaths and timeline for death notification (S2 Table). Paper-based systems were used in all four countries. In addition, Rwanda used electronic tools for documenting and reporting maternal deaths, and one province in Zimbabwe was piloting an electronic data system for both maternal and neonatal data. Subnational managers interviewed in Tanzania, Nigeria, and Zimbabwe expressed concerns about the quality of data in facility MPDSR reports in their district or region. All countries had active national MPDSR committees, but subnational support structures varied among countries.

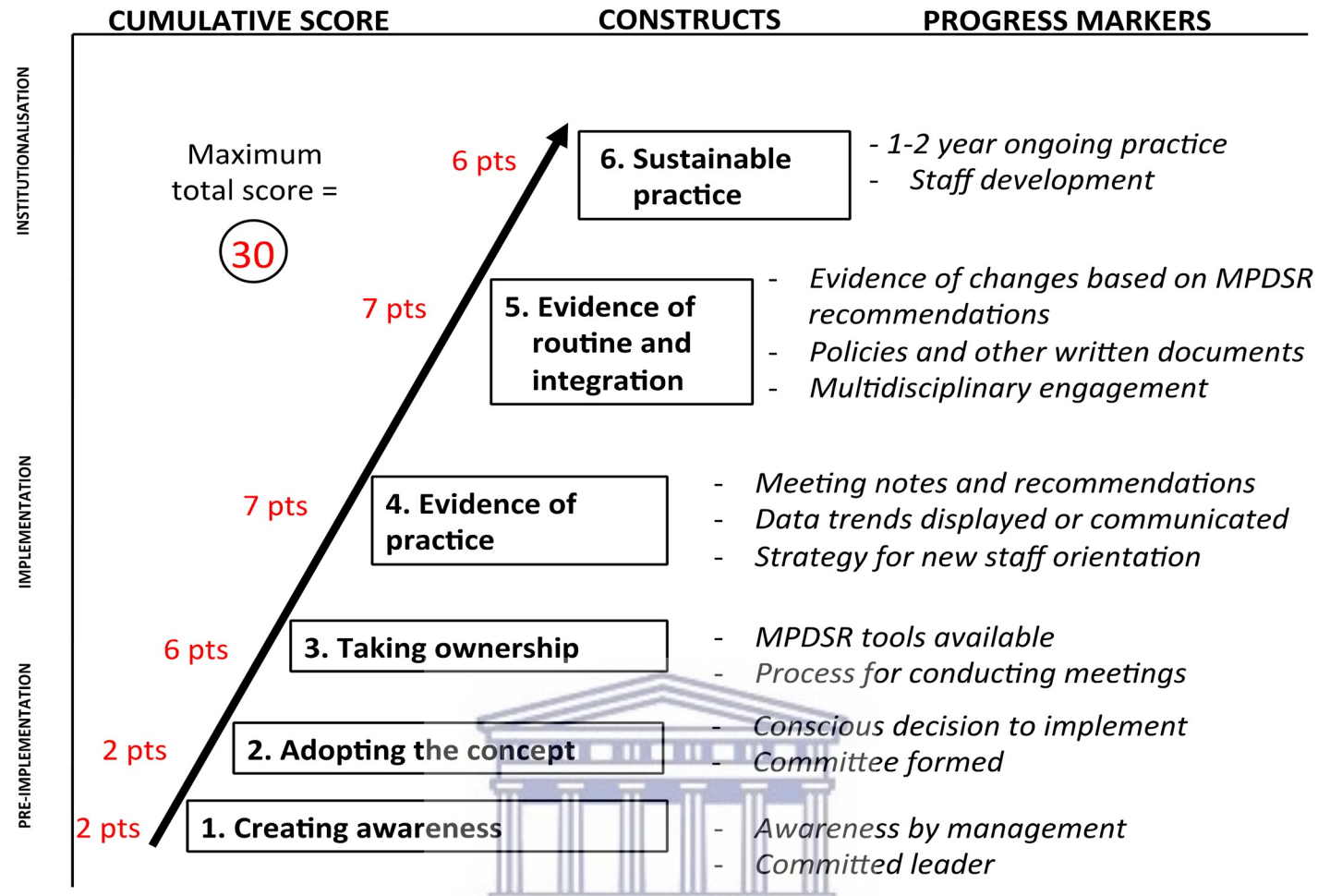

Fig 1. Implementation progress scoring schematic.

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Facility-based implementation of MPDSR

Across those facilities with evidence of practice, the stage of facility-based MPDSR implementation varied within and across countries (Fig 2). The mean implementation progress score across the 47 facilities was 18.98 (evidence of practice, Stage 4), with a range from 11.75–27.38. One-third of facilities (34%) had reached the evidence of practice stage (Stage 4); over half of facilities (55%) were assessed to be at the stage of routine and integrated practice (Stage 5); and 11% demonstrated implementation at the level of sustainable practice (Stage 6). Overall, hospitals scored higher on average (19.68) than health centres (16.01).

Results by stage of facility-based MPDSR implementation

Results are reported for both specific progress markers and questionnaire items across stages that represent a linked implementation progression. Table 4 presents the results for all progress markers by individual country and cumulatively across the four countries. S4 Table provides the ranking of the progress markers by frequency overall. Progress markers for earlier stages (Stages 1–3) were mostly achieved by all facilities, which was consistent with facility selection criteria. Fewer facilities met the progress markers for higher stages of implementation

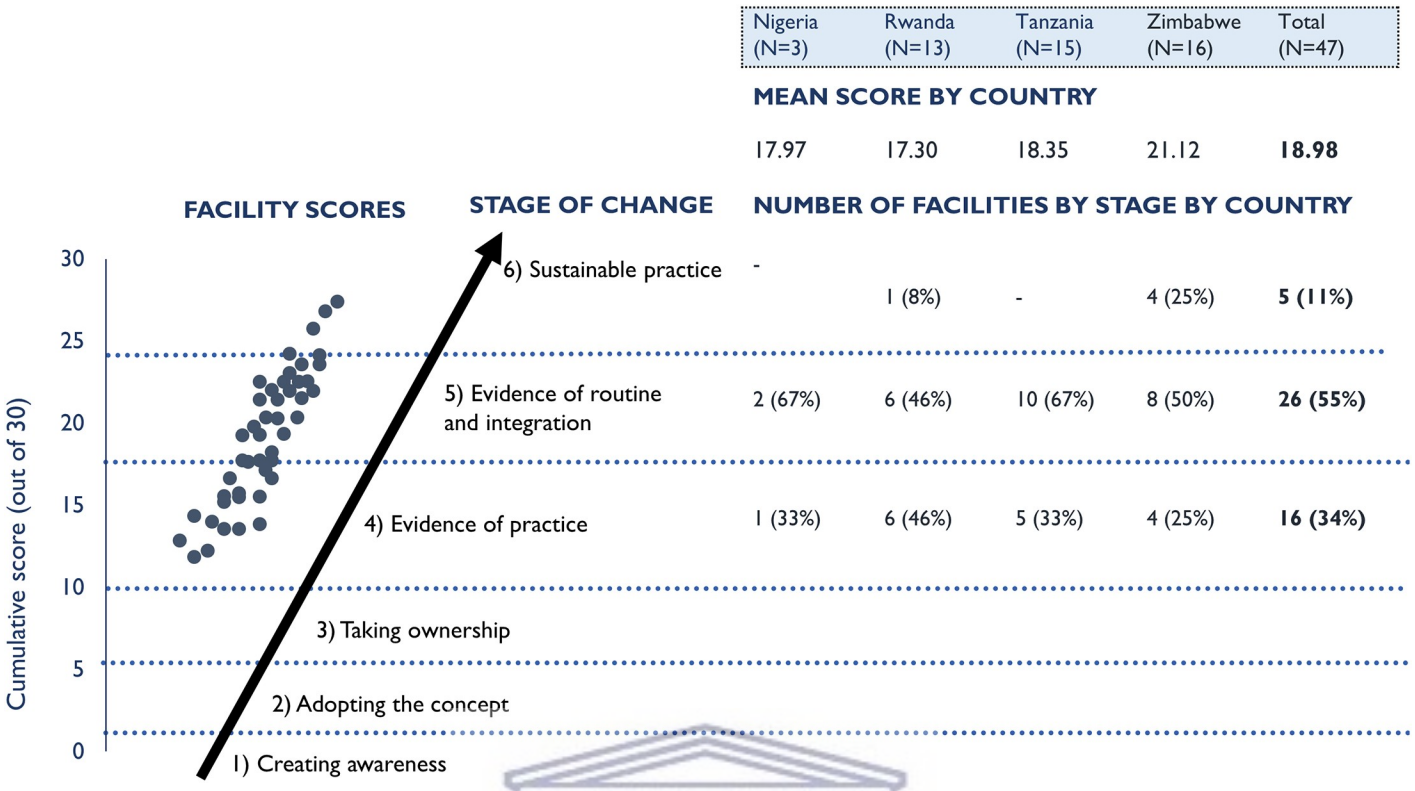

Fig 2. Implementation progress score and distribution of facilities by country.

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(Stages 5 and 6), and wide variation was observed for some progress markers in the higher stages across countries (e.g., plans to ensure training). This section summarises results for each of the six stages of facility-based MPDSR implementation.

Stage 1—Creating awareness. The two progress markers for this stage were mostly achieved (by at least 68% of facilities). In most facilities (89%), leaders were fully involved in championing death audits, and nearly all facilities (98%) had a focal person responsible for conducting death audits. The individual assigned as the MPDSR coordinator varied by facility level. The facility in-charge was cited most commonly as the MPDSR coordinator in health centres and in small hospitals; the regional/district health officer for provincial, regional, and district hospitals; and the head of the obstetrics and gynaecology, paediatric, or neonatology department for tertiary and private hospitals. Introduction of MPDSR to facility staff varied by country and facility except in Rwanda, where respondents all reported a similar orientation process.

Stage 2—Adopting the concept. The two progress markers for this stage were mostly achieved. A 'formal decision to implement MPDSR' was recalled by facility staff in Nigeria, Rwanda, and Tanzania. However, some facility respondents in Zimbabwe could not recall the decision to begin implementing MPDSR. All facilities in Rwanda and Tanzania had established MPDSR steering committees, whereas only two of three facilities in Nigeria and 13 of 16 facilities in Zimbabwe had established committees.

Stage 3—Taking ownership. Among the seven progress markers in this stage, four were mostly achieved, one was moderately achieved (34–67% of facilities), and two were rarely achieved (< 33% of facilities), though findings varied among and within countries. Nearly all

Table 4. Proportion of facilities meeting the progress markers for each stage of implementation (n = 47).

	Stage of implementation	Progress markers	Nigeria (n = 3)	Rwanda (n = 13)	Tanzania (n = 15)	Zimbabwe (n = 16)	Cumulative (n = 47)
Pre-Implementation	1. Creating awareness (2 points)	Awareness by management	100%[c]	100% [c]	100% [c]	94% [c]	98% [c]
		Committed leader	100% [c]	69% [c]	100% [c]	94% [c]	89% [c]
	2. Adopting the concept (2 points)	Conscious decision to implement	100% [c]	100% [c]	97% [c]	84% [c]	94% [c]
		Committee formed	67%[b]	100% [c]	100% [c]	81% [c]	91% [c]
Implementation	3. Taking ownership (6 points)	Tools available	17%[a]	100% [c]	100% [c]	69% [c]	84% [c]
		Tools include cause of death	33%[a]	100% [c]	100% [c]	63%[b]	83% [c]
		Tools include modifiable factors	33%[a]	100% [c]	93% [c]	72% [c]	84% [c]
		Tools include place to follow up on actions taken	17%[a]	100% [c]	0%[a]	59%[b]	49%[b]
		Understanding of process for conducting meetings	100% [c]	85% [c]	93% [c]	100% [c]	94% [c]
		Staff meeting conduct agreement available	0%[a]	8%[a]	20%[a]	0%[a]	9%[a]
		Budget or support to conduct death reviews	100% [c]	4%[a]	10%[a]	63%[b]	32%[a]
	4. Evidence of practice (7 points)	Meeting minutes available	50%[b]	38%[b]	87% [c]	100% [c]	74% [c]
		Meeting minutes include action items	17%[a]	31%[a]	100% [c]	81% [c]	68% [c]
		Meeting minutes include follow-up from previous meetings	17%[a]	23%[a]	20%[a]	50%[b]	30%[b]
		Meeting notes respect confidentiality of staff and patients	33%[a]	31%[a]	80% [c]	97% [c]	68% [c]
		Face-to-face or written orientation to death reviews	100% [c]	92% [c]	70% [c]	53%[b]	71% [c]
		Data trends displayed or shared	33%[a]	50%[b]	10%[a]	41%[b]	33%[a]
Institutionalisation	5. Evidence of routine integration (7 points)	Evidence of change based on recommendation	61% [b]	10%[a]	44% [b]	71% [b]	44% [b]
		Death review meetings are held at stated interval (e.g. weekly, monthly)	67% [b]	73% [b]	47% [b]	44% [b]	53% [b]
		Multidisciplinary engagement	100% [c]	85% [c]	87% [c]	91% [c]	86% [c]
		Evidence of reporting findings and progress to community	17%[a]	19%[a]	37% [b]	50% [b]	34% [b]
	6. Evidence of sustainable practice (6 points)	Over 1–2 years of ongoing practice	75% [c]	85% [c]	77% [c]	95% [c]	83% [c]
		Plan in place to ensure all staff receive MPDSR training	100% [c]	0%[a]	0%[a]	53% [b]	24%[a]
		Evidence that staff have received MPDSR training in the past year	67% [b]	15%[a]	63% [b]	50% [b]	45% [b]

Note: The percentage provided signifies the number of facilities demonstrating the progress marker out of the total number with evidence of MPDSR practice.

[a] signifies "rarely achieved" and indicates less than 33% of facilities,

[b] signifies "moderately achieved" and indicates 34–67% of facilities, and

[c] signifies "mostly achieved" and indicates above 68% of facilities.

https://doi.org/10.1371/journal.pone.0243722.t004

facilities (94%) could describe or show documentation of MPDSR processes. Standard MPDSR data collection forms were available in 84% of health facilities. Most facilities reported having a policy, guideline, or protocol available at the facility, which was shown to assessors, and for the most part, it was the national guideline. Nigeria was the exception, as facilities reported no written MPDSR policy, guidelines, or tools available in the facility. MPDSR tools included cause of death and modifiable factors in facilities in Rwanda, Tanzania, and Zimbabwe. Most facility tools across the four countries lacked a designated place to document

follow-up on actions taken (i.e., response), except for in Rwanda, where the standard MPDSR form includes a place to document follow-up of actions. There was strong awareness of national MPDSR guidelines among facility interviewees in Rwanda and Zimbabwe. Few of the facilities in Nigeria were aware of the national guidelines. In Tanzania, all facilities were aware of the national guideline, but five hospitals demonstrated gaps in adhering with the national guideline, notably around information flow to other levels and community follow-up. Respondents at both the facility and subnational levels described how they valued the process of reviewing cases:

'*Providing information about preventable factors that contribute to maternal death and using information to guide actions is key for preventing similar death in the future*'.

–Facility interview, Rwanda

'*We may think it's too much to review every death, but each one death is crucial to someone. It might be a statistic to me, but every death matters*'.

–Stakeholder interview, Zimbabwe

Few facilities had agreements or procedures in place regarding the conduct of MPDSR meetings (9%). Nearly one-quarter of facilities (23%) reported a connection between professional disciplinary actions and MPDSR activities, including one facility in Rwanda, three in Tanzania, two in Nigeria, and six in Zimbabwe. In Nigeria, only one of three facilities reported a nonpunitive, no-blame environment. Respondents described different approaches to assigning blame within MPDSR activities:

'*Review meetings are where people learn to "stick to the rules". . . . Some staff are reprimanded verbally and [receive] other punishments*'.

–Facility interview, Nigeria

'*The health worker involved is requested to provide a statement of how the incident happened and may be given a verbal warning or a written one. . . and in one incident, the responsible person did not work for 1 month*'.

–Facility interview, Tanzania

One-third of all facilities reported financial or in-kind support from the hospital budget or partner allocations to establish or support MPDSR activities. Hospital or district budget support to establish MPDSR processes varied starkly across facilities, ranging from 15% of facilities in Rwanda, to 33% of facilities in Nigeria and Tanzania, to 69% of facilities in Zimbabwe.

Stage 4—Evidence of practice. Four of the six progress markers were mostly achieved in this stage. Minutes of MPDSR meetings were observed in 74% of facilities; meeting minutes included action items and respected the confidentiality of staff and patients in two-thirds (68%) of facilities. One-third of facilities (30%) presented meeting minutes with documented follow-up of prioritised actions from previous meetings. Qualitative interviews emphasised the importance of meeting minutes and written recommendations:

'*We need to document the meetings better with minutes and give the designated actions to the responsible persons in writing*'.

–Facility interview, Tanzania

'*One of the most challenging parts of the review process is the formulation of appropriate recommendations, but this step is critical to successful MPDSR*'.

–Facility interview, Rwanda

Overall, 71% of facilities provided some sort of orientation on MPDSR to facility staff members, ranging from 53% of facilities in Zimbabwe to 100% in Nigeria. The assessment did not explore who attended orientations, how an orientation was conducted, or why one was not conducted.

Only one-third of facilities demonstrated the display or sharing of data trends (e.g., run charts with key statistics posted on a wall). The most commonly mentioned sources of data on death were the labour and delivery registers, followed by the postnatal register. At facilities responsible for capturing information on maternal and perinatal deaths in the community (four of six health centres in Tanzania, nine of 16 facilities in Zimbabwe, and three of 13 facilities in Rwanda), assessors observed gaps in the information provided in the case files. Data sources for compiling case reports in advance of death audit meetings included patient clinical records, registers, transfer/referral forms, and ambulance records. Guidance on methods to classify deaths varied from an optional checklist approach, to open-ended questions on apparent causes of death, to ICD-10 classification (The 10th revision of the *International Statistical Classification of Diseases and Related Health Problems* [ICD-10]). Less than one-half of the facility respondents (47%) reported that the medical records and registers captured the information necessary to determine cause of death and identify contributing factors (ranging from 27% of facilities in Tanzania to 75% of facilities in Zimbabwe). Cause of death classification systems varied among and within countries. Two-thirds of facility respondents reported using some form of standard coding system aligned with the national guideline on the mortality audit forms (66%). For modifiable factors, almost all facilities reported classifying deaths as avoidable, possibly avoidable, or not avoidable, and/or used the three delays model or a root cause analysis [35]. Facility respondents expressed varying perceptions of the accuracy of data:

'*One cannot vouch for the accuracy of data being collected because staff are not motivated. They do not know what it will be used for*'.

–Facility interview, Nigeria

'*I strongly believe the forms provide adequate information, but the big challenge here resides in providers who do not fill in the necessary information. In general, information is not filled in the forms*'.

–Stakeholder interview, Zimbabwe

'*We always need to reconcile the cause of death data from the MPDSR form and register to avoid discrepancies of deaths in facilities*'.

–Facility interview, Tanzania

Stage 5—Evidence of routine and integrated practice. Only one of the four progress markers in this stage (multidisciplinary engagement) was mostly achieved in at least two-thirds of facilities, while the other three progress markers were only moderately achieved. Most facilities reported that they assigned specific follow-up actions to individuals with timelines (79%). Less than one-half of the facilities (44%) could actually demonstrate or show any evidence of

change(s) made based on recommendations from death reviews (Fig 3). Examples of changes described by facility respondents included improved clinical practices, referrals, documentation, and procurement of essential commodities (e.g., blood). The quote below by a facility respondent provides an example of a successful local response:

'*Now that the perinatal death is audited, they have started resuscitation of babies who are not crying or breathing. Also, proper use of partographs is now in place*'.

–Facility interview, Tanzania

Though national guidelines included schematics on the reporting structure, including how responses should be tracked, less than one-third (28%) of facilities reported a formal written documentation system for tracking follow-up of recommended actions. Only one facility each in Zimbabwe and Tanzania and three in Rwanda demonstrated a formal process for follow-up of recommendations, apart from reviewing minutes at the next mortality audit meeting. None of the facilities in Nigeria had a systematic process for following up on recommendations.

One-half of facilities held meetings on a predetermined schedule (53%), ranging from 47% in Zimbabwe to 73% in Rwanda. Other facilities held meetings only after a death occurred or on an ad hoc basis. The reporting of regular MPDSR meetings by facility respondents was generally greater than observable evidence of regular meetings (e.g., through review of meeting minutes).

Most facilities demonstrated evidence of multidisciplinary participation in death audit meetings (86%) with representation of a range of health workers from different units,

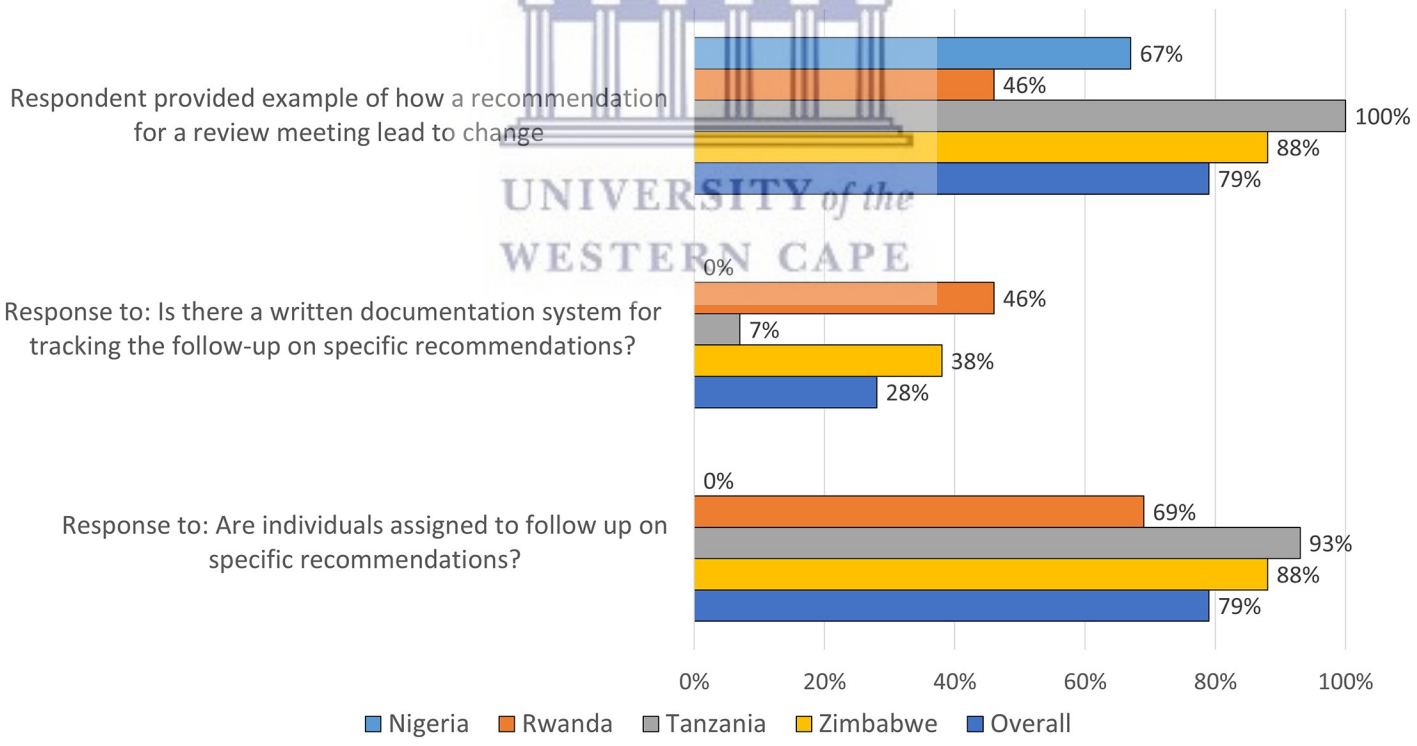

Fig 3. Proportion of facilities reporting follow-up of recommended actions from death reviews (N = 47 facilities).

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especially in larger facilities. Respondents explained the value of the multidisciplinary nature of the meetings and some of the challenges posed around attendance given staff shortages.

'*Everyone attends our maternal and perinatal meetings, all the way to the driver, because when we have a case to transfer, he knows why we need to move now*'.

–Facility interview, Zimbabwe

'*It's helping [the MPDSR process]. One person wouldn't have noted these gaps alone. But together, we are improving the quality of services*'.

–Facility interview, Zimbabwe

'*There are not enough staff to attend meeting as well as tend to patients*'.

–Facility interview, Tanzania

'*We have difficulty finding an opportunity to gather everyone due to busy schedules*'.

–Facility interview, Nigeria

Three-quarters of health facilities reported regularly linking MPDSR to other quality improvement activities at their facilities (74%). However, none of the national guidelines included clear guidance on linking MPDSR to quality improvement activities, and the team did not systematically assess the linkages.

One-third of the facilities reported sharing death audit findings, recommendations, and progress with the community (34%), including four facilities in Rwanda, seven in Zimbabwe, and two in Tanzania (none in Nigeria). The reported channels of communication varied among and within countries. Audit recommendations were typically shared with community health workers to disseminate to the community in Rwanda, whereas in Zimbabwe, some facilities reported that a facility staff member was designated as a community liaison and was responsible for sharing recommendations with the community. One facility respondent in Tanzania reflected the desire to provide feedback but did not have a mechanism to do so, a sentiment echoed by other facilities:

'*We wish that there was a specific mechanism to ensure that MPDSR feedback is shared with the community*'.

–Facility interview, Tanzania

Stage 6—Evidence of sustained practice. The three progress markers in this stage ranged from rarely achieved to mostly achieved. Most facilities assessed (83%) achieved the progress marker for demonstrating occurrence of death audit meetings for at least 1 year (irrespective of regularity). Evidence of staff development to sustain MPDSR practice was partially achieved, with only 45% of facilities reporting that staff had received MPDSR training in the past year. A plan in place to ensure all staff receive MPDSR training was rarely achieved by the assessed facilities (24%), with no future plans observed at the facilities in Rwanda and Tanzania. The qualitative responses supported these findings:

'*By policy, the ward in-charge is supposed to be trained in MPDSR, but she has not had any training, even though she is preparing the case summary*'.

–Facility interview, Tanzania

Enablers and barriers to MPDSR

Table 5 summarises the top three barriers and enablers of MPDSR implementation as observed by the assessors and as reported by facility informants. The top three enablers observed by the assessors included leadership, regular meeting conducted with participation from a multidisciplinary team, and availability and use of the MPDSR-related guidelines and tools. The top three barriers observed by the assessors included lack of health worker capacity to capture and use data analytically to inform the review process, limited plans for training health workers on the MPDSR process, and limited accountability for the follow-up actions identified during the review process. S3 Table provides detailed results of the identified MPDSR implementation enablers and barriers analyses by country.

The most commonly described enabling factors by informants across countries included teamwork, communication between staff, staff commitment, and multidisciplinary participation during meetings. Other reported enablers across the countries included national and subnational support through MPDSR training support and evidence of MPDSR process leading to change or having improved health services. Additional cited enablers included availability of MPDSR guidelines and tools, facility leadership for MPDSR, observed positive effect of MPDSR process on reducing deaths, and staff motivation to support MPDSR due to concern about high number of deaths. The most commonly cited barriers to implementing MPDSR processes described by facility staff included limited staff time, heavy workloads preventing participation in meetings, general staff shortages, and high staff turnover. Other reported barriers included lack of motivation due to absence of incentives for participation in meetings (e.g., travel support) or perceived lack of effect of death audit meetings (e.g., audit recommendations not implemented, health services unchanged.) The most commonly cited changes to improve the utility of MPDSR included actions to motivate staff, such as providing incentives for participation in MPDSR processes, increasing facility staff numbers, increasing MPDSR capacity and skills through additional training and mentorship, more funding and specific resources to facilitate meeting and data collection processes, stronger facility leadership of MPDSR, more regular death review meetings, multidisciplinary participation, and reducing the blame environment.

Table 5. Top enablers and barriers to MPDSR implementation.

Top three enablers	Top three barriers
Based on observations	
Leadership by individual(s) in promoting death reviews including management, professionals, driving forces	Lack of health worker capacity to capture and use data analytically to inform the review process
Regular meeting conducted with participation from a multidisciplinary team	Limited plans for training health workers on the MPDSR process
Availability and use of the MPDSR-related guidelines and tools	Limited accountability for the follow-up actions identified during the review process
Based on response from the facility informants	
Interdisciplinary teamwork with good communication amongst staff and staff participation in meetings	Health worker capacity issues, such as limited staff time and work overload, preventing meeting attendance
Support from national and/or subnational levels, including through training, capacity-building, and administrative support	Human resource shortage issues, such as high staff turnover and general staff shortage
Evidence of MPDSR process leading to change or having improved health services	Demotivation due to recommendations at various levels not being implemented

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Discussion

This assessment of MPDSR implementation aimed to characterise the stages of MPDSR implementation progress across several countries using a standardised scoring methodology. The assessment results reinforce previous findings [17,21–23] and highlight important implementation gaps and priority areas to strengthen MPDSR systems in low-capacity settings.

Implementation factors

A supportive policy and political environment for MPDSR facilitates implementation but does not guarantee translation into practice [22,23,32,33]. Components in national guidelines that are more straightforward to implement, such as establishment of a steering committee or assigning an MDSR or perinatal death surveillance and response coordinator, generally had greater uptake in facilities. Components of the national guidelines with fewer details (e.g., cause of death classification, or follow-up on action plans or community linkage) demonstrated more variable practice across facilities. Ensuring onsite availability of practical guidance and tools is a critical component at the pre-implementation phase [21]. The history of MPDSR introduction and implementation also matters for sustaining and institutionalising MPDSR practice [24,36], as demonstrated by Zimbabwe, which had the highest overall score (27.38) and has a long history of practising MPDSR in central-level hospitals. While the national guidelines could be strengthened in some areas, such as not having clear instructions on how to follow up on the recommendations, they were mostly aligned with the WHO global guidelines and all had useful tools for implementation, which would enable a supportive policy and political environment to initiate and support implementation [33]. The primary challenge of implementation appears to be at the organizational and individual levels, which are the coalface of implementation [33].

This study confirmed previously reported common facilitators of MPDSR, including the importance of strong leadership and effective teamwork [21–24,37–41]. Engagement of subnational managers promotes accountability and supports MPDSR practice at facility level through cross-facility/-district learning, capacity-building, and mentorship [24,33,40]. Multifaceted efforts to improve quality of care, including MPDSR, emphasise leadership and teamwork, understanding of the root causes of local quality of care gaps, and the systematic implementation of changes to close gaps [23,32,33,42]. There are many opportunities to strengthen alignment of broader quality improvement and MPDSR processes. For example, MPDSR generates essential information about the local causes of maternal and perinatal deaths and the key contributors to these deaths, which is important for designing robust quality improvement efforts that are responsive to local needs. Quality improvement efforts typically include a systematic change management and monitoring strategy. They can help bolster the systematic follow-up and measurement of the effect of death audit recommendations, an area of weakness identified in this assessment.

Linked to teamwork, the organisational culture around the death audit process can either facilitate or inhibit implementation of MPDSR. Previous studies have found that a lack of trust between health professionals and service administrators, a culture of blame and fear of potential legal ramifications, and the lack of ownership of a process prevent successful implementation [22,32,43]. Failure to comply with principles of confidentiality and anonymity can inhibit implementation practice [22,23,32,41,43–46]. A culture of safety in which staff feel protected from disciplinary action and in which death audit data are de-identified and/or kept confidential is a WHO-recommended practice [19,20]. If staff fear repercussions, they are unlikely to support MPDSR or engage fully and productively in an audit process. Elements of individual-level fault-finding and/or disciplinary processes were reported in one-quarter of the facilities

in this study, though comments made by respondents during the interview process suggested blame and disciplinary action occurred more than was reported. A study in Nigeria found that the interactional processes among those involved in audit meetings affect the meaningfulness of the death review and may inhibit their impact [34]. Deeper investigation is needed to better characterise and understand the impact that a 'blame culture' has on the effectiveness of the MPDSR process. Strategies, such as official audit charters or codes of conduct that are mentioned in the national guidelines, may minimize acrimony and prevent (or reduce) blame and recriminations [47,48]. Few facilities in this assessment had formal agreements or procedures in place regarding the conduct of MPDSR meetings despite facility staff undergoing some type of training or having access to guidelines, which made this recommendation.

Poor staff motivation, limited time and capacity, poorly functioning health systems, and general human resource challenges have also been shown to undermine MPDSR efforts [25,36,37,44,49,50]. Success of MPDSR relies on an individual's and team's willingness to 'self-correct'; commit to honest, open discussions with peers about a traumatic event; and implement recommended actions [33]. When problems identified during review meetings are not followed up on and addressed, staff lose motivation to participate in MPDSR activities [22,34,51,52]. At the facility level, this assessment demonstrated a lack of consistent follow-up of recommended actions and infrequent sharing of success stories arising from the audit process. Further investigation is needed to determine how this affects the motivation of facility staff.

Prior studies demonstrate that the confidence and capability of health workers to complete the review process and analyse death audit data strongly influence implementation of effective MPDSR processes [21,23,24,32,36,41,49,52,53]. Low confidence of managers and health workers to assess causes of deaths and modifiable factors documented in this assessment confirm the findings of prior studies and illustrate the importance of strengthening health worker confidence, skills, and information systems to support MPDSR. Several studies have shown that stronger health information systems, including improved data capture, use, and reliability, can facilitate MPDSR processes [23,32,36–38,40,45,47,52]. The common lack of mortality and patient care data in routine health information systems in low-resource settings (e.g., patient records/case notes, facility registers) hinders robust MPDSR implementation, including accurate assignment of cause of death and identification of critical gaps in quality of care [42]. In this assessment, subnational managers expressed concern about the quality of data in facility MPDSR reports, and less than one-half of facility respondents reported that the health information available in their facility was sufficient to classify cause of death and analyse contributing factors. None of the national guidelines in the four assessment countries explicitly aligned with the WHO ICD-10 maternal mortality guidelines [54], published before the most recently updated guidelines in each country, nor the WHO ICD-10 perinatal mortality guidelines, published at the time of the assessment [55]. There is a need to strengthen health information systems and assignment of cause of death guidance in both policy and practice.

Reliance on external funds and/or goodwill of professional organisations to support administration, training, and implementation of MPDSR processes have previously been identified as a barrier to sustainable practice [23,47,56,57]. It is unclear whether designated funding (e.g., a budget line item) is important for effective MPDSR implementation. This assessment did not demonstrate a close relationship between reported budgetary or in-kind support and facility conduct of death audits. Presence of donor support in some areas may have boosted findings of sustainable practice but this would need to be investigated further.

Community engagement may strengthen collective ownership, responsibility (e.g., for referral), and quality of maternal and perinatal care, and may contribute to more robust implementation of MPDSR processes [21,22,32,44,57,58]. The small proportion of facilities

reporting sharing death audit recommendations with the community in all four countries deserves greater exploration. Learning from studies of facilities undertaking intentional efforts to engage communities should be further explored to determine how such community engagement might influence the accountability mechanism of death audits and how this may influence community behaviours [22,59].

Measuring implementation

This assessment was the first to our knownledge to apply a standardised implementation progress scoring model to assess MPDSR implementation. The related tool developed for the assessment sought to classify progress markers of MPDSR processes derived from the literature. Its sensitivity in being able to correctly identify a facility's ability to demonstrate specific implementation markers could not be formally assessed in comparison to alternative tools for MPDSR since it was the first of its kind. The progress markers measure the current status of implementation, especially in terms of tangible and immediate indicators of organizational commitment to implement MPDSR processes including committees formed, training, focal point identified, and availability of tools. It is important to note, however, that the tool was not designed to assess the quality of specific MPDSR processes (e.g. correct assignment of causes of death; robust identification of modifiable contributors to deaths audited; development and follow up of actionable responses to address identified contributors, ability to correct mismanagement etc. . .). Future applications of this standardised implementation progress scoring model methodology for MPDSR should review the stage-specific progress markers, data collection tools, and process of assigning a standardised implementation score based on learnings from this assessment. Additional progress markers of implementation coverage, such as proportion of deaths reviewed based on national recommendations, should also be considered. Clear operational definitions for each marker will strengthen inter-rater reliability and systematic measurement across sites.

Limitations

The assessment was conducted in a relatively small number of nonrandomly selected facilities in only four countries; therefore, it is not possible to generalise the assessment findings at the country subnational or national level or for the continent of Africa. Given the purposeful, nonrepresentative sample of facilities, the team was not able to analyse potential patterns or differences in MPDSR implementation by facility type (e.g., rural versus urban, primary versus secondary). The nature of the study is a source of possible biases [60]. First, the choice of facilities was made on the basis of a specific program favouring MPDSR. Second, interviews were led by people who may have had an interest in presenting the program in a favourable light. Third, the assessors had a background in clinical care for maternal and newborn health and/or worked for non-governmental organizations, professional associations, or Ministry of Health bringing their own professional background, experiences and prior assumptions. Power dynamics between assessors and those interviewed may have impacted on participants' willingness to talk openly about experiences. Despite efforts to standardise data collection across countries, the variation in individual assessors and the modest adaptation of data collection tools in each country may have also contributed to some variation in the scoring approach in individual facilities and countries. Data were collected from health workers present at the facility on the specific day of the facility visit; thus, the views and MPDSR activities reported by facility respondents may not capture all facility-specific MPDSR activities or reflect the views of all health care staff, including junior staff, who may be subject to more blame or scrutiny during mortality audit meetings and who may have been absent on the day of the assessment

or more hesitant to share their views during group interviews. The non-availablity of subnational stakeholders in Rwanda at the time of the assessment is another limitation to note.

For the most part, this assessment did not differentiate between maternal and perinatal death audit processes. Further research is needed to distinguish differences in death audits and responses for maternal and perinatal deaths. The study included both health centres and hospitals but was not designed to investigate differences in implementation between the two different levels. Further research is needed to explore characteristics of implementing MPDSR in a health center versus a hospital setting.

The assessment set out to measure implementation status and did not evaluate the quality of MPDSR processes (e.g., surveillance completeness, accuracy of cause of death assignment, analysis of modifiable factors, development and follow-up of actions).

Conclusion

This assessment is the first attempt, to the authors' knowledge, to assess facility-level MPDSR implementation progress using a standardised scoring methodology in multiple countries. Structures and processes for implementing MPDSR existed in all four countries, with over two-thirds of the assessed facilities reaching at least stage 5 –evidence of routine and integrated practice. Many implementation gaps were identified that can inform priorities for strengthening MPDSR implementation. These gaps include ensuring availability of onsite MPDSR guidelines and forms, developing more explicit guidance on cause of death assignment and follow-up of audit recommendations across system levels as part of national guidelines, instituting regular mechanisms to build manager and health worker confidence and skills to implement MPDSR (e.g., training, supervision), strengthening health information systems to permit accurate classification of cause of death and support robust death reviews, strengthening alignment of MPDSR and broader quality improvement efforts, and increasing linkages across system-level MPDSR activities, from community, to facilities, to regional and district health managers. Further implementation research is needed to assess the quality of MPDSR implementation processes and to identify and test mechanisms to overcome common MPDSR implementation gaps in low-capacity settings.

Supporting information

S1 Table. Data sources and collection methods.
(DOCX)

S2 Table. Mapping content of national MPDSR policy by country.
(DOCX)

S3 Table. Summary of MPDSR implementation enablers and barriers most commonly cited by facility staff in four countries.
(DOCX)

S4 Table. Ranking of progress markers by frequency across 47 facilities.
(DOCX)

S1 File. Brief historical summary of MPDSR processes by country.
(DOCX)

S1 Data. Database for MCSP multicountry assessment of MPDSR implementation.
(DOCX)

Acknowledgments

We would like to thank the ministry of health officials, USAID Missions, professional association members, and health workers from Nigeria, Rwanda, Tanzania, and Zimbabwe for their input and support. A very special thanks to many in-country MCSP staff and technical experts who supported the research implementation process. In addition, we would like to thank, Lara Vaz (Save the Children US), Stella Abwao (MCSP), John Varallo (MCSP), Lisa Noguchi (MCSP), Ayne Worku (MCSP), and Brianne Kallam (MCSP) for their technical input and review of drafts of the individual country and multicountry reports. We appreciate the support from Edward Kenyi (MCSP) on data extraction. We thank Sylvia Alford with USAID for her strong support during all stages of planning and implementing this assessment and analyzing and disseminating assessment results.

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3.3 Study component 3 – case study research

Paper 5

Kinney, MV, George AS, Rhoda N, Pattinson R, Bergh AM. From pre-implementation to institutionalisation: Lessons from sustaining a perinatal audit programme in South Africa. Submitted to Global Health: Science and Practice in May 2022. Under review.

Paper summary

This paper, submitted to *Global Health: Science and Practice*, shares the history and lessons learned from initiating, scaling up and institutionalizing a perinatal audit programme, a form of MPDSR, in South Africa, revealing key factors enabling sustained practice as well as future vulnerabilities. Key influential factors of institutionalisation include integrated policies and guidelines, multiple and evolving national and sub-national structures, continuous efforts to use the data, demonstration of impact and local adaption. Applying the MCSP tool to five sub-districts with sustained practice identified gaps in the perinatal audit process and in the tool itself. The paper shows that the future of the perinatal audit programme in South Africa is vulnerable, given apparent implementation gaps as well as shifts in policy.

Contribution to the thesis

This paper contributes to the second and third objectives of the thesis: (i) to examine the extent of implementation and institutionalisation of facility-based MPDSR, (ii) to describe the barriers and enablers of implementation using a process model; and (iii) to undertake an in-depth analysis of the implementation process of MPDSR by examining factors that enable sustained, routine implementation using implementation theory. The paper applies the same process model used in paper 4, using the same data collections tools, as well as additional research to further understand the history of the programme and implementation factors of perinatal audit in settings with sustained practice. The paper demonstrates the value-add of moving beyond a list of tangible progress markers to measure implementation (service delivery lens approach) to include other implementation science approaches that enable analysis of intangible factors such as the perspectives of the users and observations of practice (societal and system lenses). The additional research reveals the importance of history and local adaption to sustainability and also shows what factors may not be suitable markers of progress.

Contribution of candidate

The candidate set up an advisory group of experts from the country, who are also co-authors on the paper, to inform and oversee the overall research process. The candidate designed the study with her supervisor and with inputs from the advisory group. The candidate conducted a desk review of policies and guidelines, developed the case study research data collection tools, conducted all field work (including key informant interviews, document review, non-participant observation of meetings and activities at district hospitals), and conducted the data analysis, with inputs from co-authors (supervisor and advisory group members). Following data collection, the candidate mapped key milestones and actor engagement. For the national and sub-national key informant interviews, the candidate worked with another research team who were exploring digital health solutions in South Africa, and lessons were triangulated with their results (Swartz et al., 2021). For the facility assessment component, the candidate collected the data and calculated the implementation progress score using the MCSP tool. For the case study research, the candidate wrote a field research report within one week of conducting data collection at each site, which was shared with her supervisor and advisory group. The candidate wrote case study reports for each of the sub-districts and shared these documents with relevant provincial, district and sub-district stakeholders. The candidate wrote the first draft of the paper and incorporated critical inputs from all co-authors on the different drafts. The candidate led the submission process and revisions following editor review and comment. The paper was still in peer-review at the time of submission of this doctoral thesis. The candidate made an oral presentation on part of this paper at the Annual Conference of the Public Health Association of South Africa in September 2019.

Global Health: Science and Practice

From pre-implementation to institutionalization: Lessons from sustaining a perinatal audit program in South Africa

--Manuscript Draft--

Manuscript Number:	GHSP-D-22-00213
Full Title:	From pre-implementation to institutionalization: Lessons from sustaining a perinatal audit program in South Africa
Short Title:	Lessons from sustaining a perinatal audit program in South Africa
Article Type:	Original Article
Manuscript Classifications:	Maternal and neonatal health; Health policy and advocacy; Health systems; Quality of care; Scale up; Africa-Sub-Saharan; Quality/performance improvement
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Question	**Response**
If your manuscript reports results from research or a program experience in a given country, the author team should include authors based in that country. If it does not, please explain the reasons here. If it does, please indicate "Not Applicable" or NA.	NA
Please provide a statement indicating the role each author played in the research or program, and preparation of the manuscript.	MK, AMB and AG conceived the idea for the study drawing from MK's doctoral research. AG served as the doctoral supervisor while AMB, NR, and RP served as an advisory group for the study. All authors inputs throughout the process. MK conducted the data collection and analysis, with oversight from AG and AMB, and wrote the first draft of the paper with inputs from all authors. All authors edited the manuscript and approved the final version.
Please enter the key message. In one or two sentences (no more than 50 words), explain the "single overriding communication objective (SOCO)," or key message, of your manuscript, including the significance for action.	Lessons from South Africa's long history of implementing a perinatal audit program reveal complex enabling factors, such as multiple support structures, incorporation into policy, demonstration of impact, and local adaption. Measuring implementation with an existing tool in five sub-districts identified operational gaps and possible issues with the existing tool.
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acknowledgements. You may cut and paste this from a word processing file but any formatting will be lost. The acknowledgements will not be visible to peer reviewers. Please note that acknowledgements should not be included in the uploaded manuscript file as they may contain information that will identify authors.	Department of Health, Provincial Perinatal and Neonatal Morbidity and Mortality Committee, regional PPIP coordinators, and the managers and staff in the five sub-districts.
All authors must complete the ICMJE Uniform Disclosure Form for Potential Conflicts of Interest which can be downloaded from: www.icmje.org/disclosure-of-interest/. Though each author must complete the form, the forms do not need to be submitted to the GHSP journal. Instead, they should be kept on file by the corresponding author in the event that a question arises regarding the funding or competing interests related to this submission. Please acknowledge compliance with this requirement below.	Yes
Based on the ICMJE Uniform Disclosure Form, please declare any competing interests for the submitted work for you and your coauthors. If there are no competing interests, please indicate "None declared."	None declared
I confirm that the manuscript has been submitted solely to this journal and is not published, in press, or submitted elsewhere.	Yes
I confirm that the research meets all appropriate and applicable ethical guidelines in both the US and the study country(ies).	Yes
I confirm that I have read and understand the author guidelines.	Yes
I agree to the Creative Commons License which says that the authors retain copyright of the work but it can be used without permission by anyone to share, remix or use for commercial purposes as long as they attribute the work to us.	Yes
Please tell us how you heard about GHSP?	Word of mouth
Funding Information:	Bill and Melinda Gates Foundation (INV-007594) — Ms Mary V Kinney

	South African National Research Foundation (82769)	Prof Asha S George
Abstract:	Introduction Maternal and perinatal death surveillance and response (MPDSR), or related forms of maternal and perinatal death audits, has the potential to strengthen health systems. This paper explores the history of initiating, scaling up and institutionalizing a perinatal audit program in South Africa. Methods Data collection involved 56 individual interviews with key stakeholders, administration of a questionnaire, a desk review of related documents, and 10 non-participant observations of meetings related to the perinatal audit program. To describe the history of implementation, thematic content analysis and a progress-monitoring model were applied. A MPDSR progress-monitoring tool was administered to measure sub-district implementation in one province. The historical mapping and lessons were organized using the health policy analysis triangle framework. Results Multiple national and subnational structures evolved and interacted to support implementation and benefited from a continuity of actors, who were able to expand and nurture the network. The perinatal audit program was integrated into national policy and guidelines until recently. Intentional efforts to demonstrate impact and enable local adaption allowed for more ownership and buy-in but could be strengthened further at all levels. Application of the MPDSR progress-monitoring tool identified gaps in the implementation process in five sub-districts, such as incomplete minutes and clear codes of conduct. The tool itself may require revisions to better reflect implementation realities particularly in settings with institutionalized practice, such as orientation, facility budget allocations and report back to community. Discussion This paper provides rich lessons on how to initiate, expand, and strengthen MPDSR. Despite a long history of implementation, the perinatal audit program in South Africa cannot be assumed to be indefinitely sustainable or perfect in its current form. To monitor MPDSR uptake and sustainability, we need research approaches that allow exploration of context, local adaption and underlying issues that support sustainability.
Keywords:	implementation science; Health policy and systems; Accountability; quality improvement; Maternal and Perinatal Death Surveillance and Response; Perinatal audit; Perinatal review; Maternal and newborn health; perinatal; stillbirth
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Manuscript Region of Origin:	SOUTH AFRICA
Order of Authors Secondary Information:	

Concise full title: From pre-implementation to institutionalization: Lessons from sustaining a perinatal audit program in South Africa

Short title: Lessons from sustaining a perinatal audit program in South Africa

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MK, AMB and AG conceived the idea for the study drawing from MK's doctoral research. AG served as the doctoral supervisor while AMB, NR, and RP served as an advisory group for the study. All authors inputs throughout the process. MK conducted the data collection and analysis, with oversight from AG and AMB, and wrote the first draft of the paper with inputs from all authors. All authors edited the manuscript and approved the final version.

Acknowledgements

We are grateful for the support and facilitation received from Western Cape Department of Health, Provincial Perinatal and Neonatal Morbidity and Mortality Committee, regional PPIP coordinators, and the managers and staff in the five sub-districts.

Funding

Asha George and Mary Kinney are supported by the South African Research Chair's Initiative of the Department of Science and Technology and National Research Foundation of South Africa (Grant No. 82769), the South African Medical Research Council and the Countdown 2030 project funded by the Bill and Melinda Gates Foundation. Any opinion, finding and conclusion or recommendation expressed in this material is that of the authors and funders do not accept any liability in this regard. The authors alone are responsible for the views expressed in this article and they do not necessarily represent the views, decisions or policies of the institutions with which they are affiliated.

Competing interests None declared.

Data availability statement
All data relevant to the study are included in the article or uploaded as supplemental information. Patient identifiable data not applicable.

Ethics approval
The ethics approval from the Higher Degrees Committee of the University if the Western Cape was given on 09 November 2018, and approval was received from the Provincial Department of Health in July 2019 (NHRD Number: WC_201906_006). Authorization to conduct the study was granted from the Department of Health of the Western Cape Province.

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Methods

Data collection involved 56 individual interviews with key stakeholders, administration of a questionnaire, a desk review of related documents, and 10 non-participant observations of meetings related to the perinatal audit program. To describe the history of implementation, thematic content analysis and a progress-monitoring model were applied. A MPDSR progress-monitoring tool was administered to measure sub-district implementation in one province. The historical mapping and lessons were organized using the health policy analysis triangle framework.

Results

Multiple national and subnational structures evolved and interacted to support implementation and benefited from a continuity of actors, who were able to expand and nurture the network. The perinatal audit program was integrated into national policy and guidelines until recently. Intentional efforts to demonstrate impact and enable local adaption allowed for more ownership and buy-in but could be strengthened further at all levels. Application of the MPDSR progress-monitoring tool identified gaps in the implementation process in five sub-districts, such as incomplete minutes and clear codes of conduct. The tool itself may require revisions to better reflect implementation realities particularly in settings

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This paper provides rich lessons on how to initiate, expand, and strengthen MPDSR. Despite a long history of implementation, the perinatal audit program in South Africa cannot be assumed to be indefinitely sustainable or perfect in its current form. To monitor MPDSR uptake and sustainability, we need research approaches that allow exploration of context, local adaption and underlying issues that support sustainability.

Key messages

- Understanding the operationalization and institutionalization of Maternal and Perinatal Death Surveillance and Response (MPDSR) is critical for scaling up and strengthening the intervention process.
- This paper shares the history and lessons learned from initiating, scaling up and institutionalizing a perinatal audit program, a form of MPDSR, in South Africa revealing key factors enabling sustained practice as well as future vulnerabilities.
- Applying a progress-monitoring model, developed to measure implementation of Maternal and Perinatal Death Surveillance and Response (MPDSR), to five sub-districts in the Western Cape Province, South Africa identified operational gaps as well as considerations for adapting the existing tool.

Key implications

- Multiple factors influence institutionalization of an audit program, including tangible factors, such as focal points, policies and tools, as well as the societal and systems factors, such as actor interactions and motivations, political priority and adaption.
- The shift in national policy and implementation gaps in the five sub-districts in the Western Cape signal the need to advocate for the continuation of the perinatal audit program and improve the quality of practice.
- Adapting and updating the existing progress-monitoring tool for MPDSR will benefit from more learning of application in other contexts as well as from more implementation research.

Background

Achieving the Sustainable Development Goal for health requires increased attention on high-quality health systems.[1] Perinatal mortality (fetal death of at least 28 weeks of gestation and/or 1000 g in weight and newborn deaths up to seven days after birth) can serve as a sensitive marker of a health system's inability to provide quality care and respond to care delays.[2-4] As such, countries are scaling up maternal and perinatal death surveillance and response (MPDSR), or related forms of maternal and perinatal death audits as a key measure to address maternal and perinatal mortality.[5] MPDSR applies a continuous process to ensure deaths are notified and data around each death are collected, analyzed and reviewed to investigate the cause and circumstances surrounding each death in order to identify actions that may strengthen the health system and prevent future deaths.[6] As national MPDSR policies and implementation expand in low- and middle-income countries (LMICs)[7] and momentum to strengthen practice accelerates,[8-11] there is a need to better understand implementation practice, scale and impact.

Studies exploring MDPSR in LMICs identify elements that enable or inhibit implementation, including service delivery factors (tangible inputs), such as trainings and focal persons, as well as societal and systems factors, such as networks, team dynamics and individual motivation.[12,13] Implementation occurs at all levels of the health system - national, subnational, facility and community.[14] Across all levels, the context of the setting, the system of implementation and the actors engaged are underlying factors that influence the implementation process.[15-17] A scoping review on MPDSR implementation in LMICs revealed many gaps in the literature, particularly around how the implementation process works and why, and found that few countries report robust operational systems at scale.[5,12,18,19] South Africa is one exception.

South Africa established a perinatal audit program, a form of MPDSR, in the early 1990s called the Perinatal Problem Identification Program (PPIP) to capture perinatal mortality, identify modifiable factors and stimulate action as part of a quality-of-care audit cycle.[20] The program includes two primary components implemented at subnational and national levels: 1) the PPIP system and linked tool to help collect and analyze data, and 2) perinatal review meetings (often called mortality and morbidity [M&M] meetings). The perinatal audit program is most valuable when these components are used together and linked to the facility-based clinical audit process, allowing the end users to analysis and use their own data for decision making and promoting accountability.[21] Studies examining this perinatal audit program reveal several implementation factors, such as agents of change, institutional review, feedback, communication, long history, demonstration of practice and user-friendly technology.[22-24] The program has had varying degrees of implementation between provinces and districts.[20,21] Even with some evidence that perinatal audits lead to health system improvements and strengthen accountability mechanisms,[21,24] the impact and sustainability of the program in South Africa remains unclear.[20,23] As other LMICs seek to introduce, scale up and strengthen MPDSR, a comprehensive assessment of factors that have contributed to the institutionalization of the program in South Africa may be helpful.

This paper presents lessons learned from South Africa's experience of scaling and institutionalizing a perinatal audit program at the national level and in five sub-districts in the Western Cape (WC) Province. Applying different theoretical approaches used in implementation research enables description, understanding and explanation on the sustainability of an intervention, such as through process models with standard measurement tools, frameworks and theories.[25] This paper seeks to describe and assess the implementation

process in South Africa drawing from original research based on the first author's doctoral research,[12,26,27] as well as building from other studies about implementation of the perinatal audit program in South Africa.[21-23,28]

Methods

South Africa is a middle-income country with just under a million births a year, and a national perinatal mortality rate of 30.9 deaths per 1000 total deliveries.[29] Perinatal mortality rates, including newborn mortality and stillbirth rates, has experienced stagnation in the past decade after reduction from 1990 to 2012, as reported by multiple data sources.[29-31] The WC Province, in the south-western part of the country, had ~102,000 births and a perinatal mortality rate of 24.8 in 2019 according to routine data.[29] Within the WC, there are six district health services comprising multiple sub-districts each. For maternity services outside of the Cape Town metro, the sub-district health service normally includes primary health care clinics that provide outpatient services, such as antenatal and postnatal care, as well as a district, level one hospital that manage childbirth care. In the WC, there are five PPIP regions, overseen by a designated regional PPIP coordinator who is a specialist based at the regional referral hospital. For the doctoral research, the sub-districts were purposefully selected, situated within two PPIP regions and differing with respect to geographic spread and number of deliveries (Table 1).

Table 1. Description of the setting

	Case A	Case B	Case C	Case D	Case E
Catchment area population	~95,000	~37,500	~95,000	~93,200	~14,400
Annual births (2019)	1741	506	1360	1751	89
Perinatal mortality rate (per 1000 live births) (2019)	11.6	6.0	14.8	17.0	0.0

Facilities in sub-district (2019)	District hospital 5 PHC clinics	District hospital 5 PHC clinics	District hospital 3 PHC clinics	District hospital 5 PHC clinics	Community day hospital 2 clinics
PPIP region	Region 1	Region 1	Region 2	Region 2	Region 2

Source: Population data from district reports; births and perinatal mortality rate from PPIP database (accessed 4 March 2022)
Key: PPIP, Perinatal Problem Identification Program; PHC, primary health care

Data collection included a systematic document review of relevant policies, guidelines and literature from South Africa relating to perinatal audit, 56 individual interviews with key stakeholders, administration of a standardized, semi-structured questionnaire, document reviews of sub-district level documents, and 10 non-participant observations of meetings related to the perinatal audit process. National, provincial, district and sub-district key informants were purposefully sampled based on their involvement with perinatal audits and included participants with different roles in PPIP and the review meetings (Table 2). Fieldwork and data collection took place from September 2019 to March 2020 and time spent at each facility varied from half of a day to five days. Data analysis included application of a MPDSR progress-monitoring tool to measure the phase of implementation,[26] thematic content analysis of transcripts and content analysis of relevant documents identified through the desk review. Panel 1 provides details about the MPDSR progress-monitoring tool.[26] The historical mapping and lessons learned through the analyses were mapped according to the health policy analysis triangle framework.[32,33]

Table 2: Summary of key informants and meeting observations

a) Key informants	**Number**
Total	**56**
Level of health system	
National/Provincial	3
Provincial	3
Regional/District	6
Sub-district	19
Facility	20
Primary health care	5
Case study	
Case A	*10*

Case B	*11*
Case C	*10*
Case D	*5*
Case E	*11*
Other	*9*
b) Meetings observed (as non-participant)	**Number**
Total	**10**
Type of meetings	
PPIP provincial meeting	2
M&M meetings	5
M&E meetings	2
Other meetings	1

PPIP, Perinatal Problem Identification Program; M&M, mortality and morbidity; M&E, monitoring and evaluation

The ethics approval from the Higher Degrees Committee of the University if the Western Cape was given on 09 November 2018, and approval was received from the Western Cape Provincial Department of Health in July 2019 (NHRD Number: WC_201906_006). Additional information on the methods can be found in the Supplementary file 1.

[insert panel 1]

Panel 1: Background and lessons to applying a standard tool to measure MPDSR implementation

Background

The US Agency for International Development's Maternal and Child Survival Program (MCSP) adapted a progress-monitoring model to systematically assess MPDSR implementation.[26] Their adapted model and linked tool were adapted from work done in South Africa, first to support the implementation of kangaroo mother care (KMC)[34-37] and later understand implementation of the Perinatal Problem Identification Program (PPIP). The original KMC progress-monitoring model and tool have been widely used to measure facility and subnational level implementation as well as macro level shifts that influence implementation,[38,39] Belizán and colleagues (2011) did not develop and apply a tool to measure PPIP in South Africa; rather, they applied the progress-monitoring model to

illustrate themes influencing implementation and identify questions to monitor PPIP implementation.[22] MCSP used these questions along with literature to identify pre-determined implementation factors to use in the MPDSR tool.[26] Their adapted model comprises three phases: pre-implementation (create awareness, adapting the concept); implementation (taking ownership, evidence of practice) and institutionalization (evidence of routine integration, evidence of sustainable practice), and the linked tool measures tangible inputs proposed to support implementation. This standard progress-monitoring tool was used to conduct assessments of MPDSR implementation across 55 facilities in four African countries.[26] The same tool has been used by others to measure MPDSR implementation at subnational and facility levels [40,41] and is included in the WHO's Materials to support MPDSR implementation.[6] For this study, we applied the progress-monitoring model to describe implementation at national level and used the MPDSR progress-monitoring tool to measure facility and subnational level implementation in the five sub-districts.[26]

Lessons from applying the tool

We found that most of the factors included as pre-implementation and implementation phase progress markers in the MPDSR progress-monitoring tool were attained across all five sub-districts but fewer progress makers for institutionalization. Some of the gaps, such as budget to support the reviews, reporting to community and orientation and ongoing training, were also found in previous assessments[26] and may indicate the need to reconsider the framing of these progress markers. For example, a budget line for MPDSR may be less important than allocated time of staff or activities in job descriptions. More research around how and what type of reporting should be expected to communities is needed, and at what level (i.e. individual engagement of affected families or higher level feedback on data trends and recommendations/actions). Future measurement may want to consider the integration of

activities related to perinatal audit as part of pre-service and in-service orientation and trainings. Other gaps, such as codes of conduct, meeting minutes including follow up action and data trends displayed or shared, also found in other assessments,[26] may not be necessary for sustained practice but rather measures in the quality of MPDSR practice.

It is important to note that the MPDSR progress-monitoring tool measures the phase of implementation, not the quality of practice.[26] Applying the tool to facilities and subnational structures with long histories of implementation showed that the stages within each phase and the linked pre-determined factors that are in the tool may not suit the context. There are likely different markers for a setting which is just starting a new interventions versus one that has been practicing it for a long time. The original progress-monitoring model designed for KMC sought to monitor implementation after initial introduction of the intervention.[34,35] It may be possible to adapt the MPDSR progress-monitoring tool to adjust progress markers for sustained practice as well as add another component to measure quality. For example, Martin-Hilber and colleagues adapted the KMC progress-monitoring model more broadly to measure accountability initiatives in global health and added in a fourth stage – transformation as well as consideration of context and stakeholders.[42] As more countries apply the MPDSR progress-monitoring tool, further dialogue around the lessons of application will be necessary to strengthen and adapt the tool for future use.

[end panel 1]

Results: Lessons from South Africa's experience of institutionalizing a perinatal audit program

Panel 2 provides a brief overview of the history of the South African perinatal audit program.[43] Four main lessons are presented from initiating, scaling and sustaining the perinatal death audit program after mapping results to the four components of the health

policy analysis triangle (content, actors, process and context). As per the framework, these components are overlapping and interlinked and thus consideration of placement is less important than the lessons shared. For each lesson, we consider national level as well as the learning from the five sub-districts assessed in the WC.

[Panel 2 start]

Panel 2: History of the perinatal audit program in South Africa

History in South Africa

South Africa has a unique and long history of perinatal audit implementation.[23] To describe the history of implementation, we first describe the background to the perinatal audit program and then assess the history using the progress-monitoring model framework and the constructs of the health policy analysis triangle (content, actors, process, context). Prior to the start of the perinatal audit program, different paper-based systems were used by clinicians working in maternity care in order to identify avoidable factors in perinatal deaths and use data to inform their clinical-audit processes. Data from these systems and learning from application were discussed at the annual Conference on Perinatal Priorities (Priorities Conference), established in 1982, in order to improve audit systems. One of these paper-based systems was translated into an electronic tool using Microsoft Disk Operating System, in 1994 becoming Perinatal Problem Identification Program (PPIP), the program under investigation. The tool was refined over the years, using a Windows program in 1999, and lessons and data were shared at the annual Priorities Conferences. The first national meeting on PPIP was held in 2001 to review data from 27 hospitals resulting in the first Saving Babies Report.[44] Thereafter, it grew by word of mouth and from people's interest at the Priorities Conference. By 2010, over 80% of all births in the public sector nationally were being entered into the program. Perinatal reviews became mandatory and in the South African

Strategic Plan for Maternal, Newborn, Child and Women's Health and Nutrition (MNCWH&N) 2012-2016 facilities were encouraged to use PPIP.[45]

In Phase 1 – pre-implementation (1992-2007), policy was introduced ensuring all births and deaths were recorded, including perinatal deaths, and that children had the right to health. During this phase, the PPIP tool was developed, tested, modified and scaled up. In Phase 2 – implementation (2008-2012), demonstration of practice, combined with increased political prioritization of neonatal mortality led to the establishment of a national perinatal review committee and policy change making the perinatal audit program mandatory nationwide. In Phase 3 – institutionalization (2012-2019), the audit program expanded to all facilities with clear instructions in the Guidelines for Maternity Care[46] with widespread implementation of multiple new programs in response to the PPIP findings and recommendations.[21] Further details can be found in Supplementary files 2 and 3.

Phase 1 (1992-2007): The start of the perinatal audit program (pre-implementation)

- *Context*: District Health Information Software introduced and scaled nationally to collect routine data; multiple maternal and newborn health (MNH) programs initiated; PPIP expands from 27 facilities in 2000 to 244 facilities.
- *Content*: Policy to register perinatal deaths (1992); Convention on the Rights of the Child signed (1993); Millennium Development Goal commitment (2000).
- *Actors*: Bottom up approach from committed champions who initiated PPIP and led the roll out; Saving Babies Technical Task Team established; University of Pretoria established Maternal and Infant Health Care Strategies Research Unit (1997) (an extra-mural unit of the South African Medical Research Council).

- *Process*: User friendly software developed and filled a gap in the routine data systems; annual Perinatal Priorities Conferences with learning shared; multiple PPIP workshops along with regularly published Saving Babies reports; Perinatal Education Program (PEP) in South Africa established (1993) to provide continued learning opportunities for clinical staff.[47]

Phase 2 (2008-2012): The scale up of the perinatal audit program (implementation)

- *Context:* Implementation of MNH programs in response to PPIP findings; PPIP expands from 275 facilities to 588 facilities.[30]
- *Content:* The MNCWH&N Strategic Plan 2012–2016 includes indicator making perinatal death reviews mandatory in hospitals; District Clinical Specialist Teams established.
- *Actors*: Formalization of network with ongoing engagement from original champions and expansion of network through establishment of National Perinatal Committee with regular reporting of perinatal mortality to the Minister of Health.
- *Process*: One workshop along with biannual Saving Babies reports; annual Perinatal Priorities Conferences with learning shared; implementation research;[21,22,28] provincial PPIP trainings; PEP develops *Saving Mothers and Babies* curriculum (2008), which includes perinatal death audit.[47,48]

Phase 3 (2013-2019): The sustaining of the perinatal audit program (institutionalization)

- *Context*: Implementation of MNH programs in response to PPIP findings (e.g. Helping Babies Breathe, management of small and sick newborns); over 75% of births recorded through PPIP.[29]

- *Content*: Sustainable Development Goal Commitment; Adaption of Every Newborn Action Plan; 2016 Maternity Guidelines include use of PPIP and provides a "how to guide" for conducting perinatal death review; 2021 Maternal, Perinatal, and Newborn Health Policy does not include PPIP.
- *Actors*: Institutionalization of actors and networks to oversee implementation including new posts in National Department of Health (e.g. neonatal care improvement advisor and Deputy Director for Neonatal Care post) and establishment of National Neonatal Co-ordinating Committee; University of Pretoria Research Centre for Maternal, Fetal, Newborn and Child Health Care Strategies established taking over role of training and technical support (2016).
- *Process*: Reporting and oversight embedded in system demonstrated by biannual Saving Babies report as well as triennial National Perinatal Mortality and Morbidity Committee report; annual Perinatal Priorities Conferences with learning shared.

[end panel 2]

1) Integrating the perinatal audit program in broader policy and guidelines embeds the process within the health system

National

Before PPIP, South Africa had a national policy for capturing data on all births and deaths (including perinatal deaths) and the right to health for all children.[23,49] As PPIP expanded and the review of perinatal deaths became more regular, South Africa incorporated the perinatal audit program into other policy and guidance documents, providing detailed instructions on the perinatal review process and PPIP with related example tools to use (e.g. data capturing forms).[46,50] The incorporation of instructions and explanation of how to use the PPIP tool for reporting deaths and for facility-based clinical audits in broader national strategies embedded the program into the health system structures. However, the new 2021 Maternal, Perinatal

and Neonatal Health (MPNH) Policy sets an objective to develop a sustainable surveillance system for maternal, perinatal and neonatal morbidity and mortality, without mentioning PPIP.[51] Additionally, the section on MPDSR does not link to clinical governance structures, such as perinatal review meetings which enable the response.[52] The new policy claims there is fragmentation of the different MNH related data systems; for example, the PPIP data system is separate to the routine data system (different software and reporting structure).The previous policy recognized the value of the PPIP tool for the clinical audit process, which routine data cannot replace.[46]

Western Cape

In the five-sub-districts assessed, components of the perinatal audit program were embedded and adapted into other guidelines and programs, such as review meetings as requirements of the "Ideal Hospital" initiative.[50] Some participants were aware of National Department of Health (NDOH) and the WC Department of Health (DOH) guidelines for perinatal audit. Two sub-districts reported receiving Standard Operating Procedure (SOP) on how to run M&M meetings from district health services.

2) Multiple structures along with continuity of actors in an expanding network support institutionalization

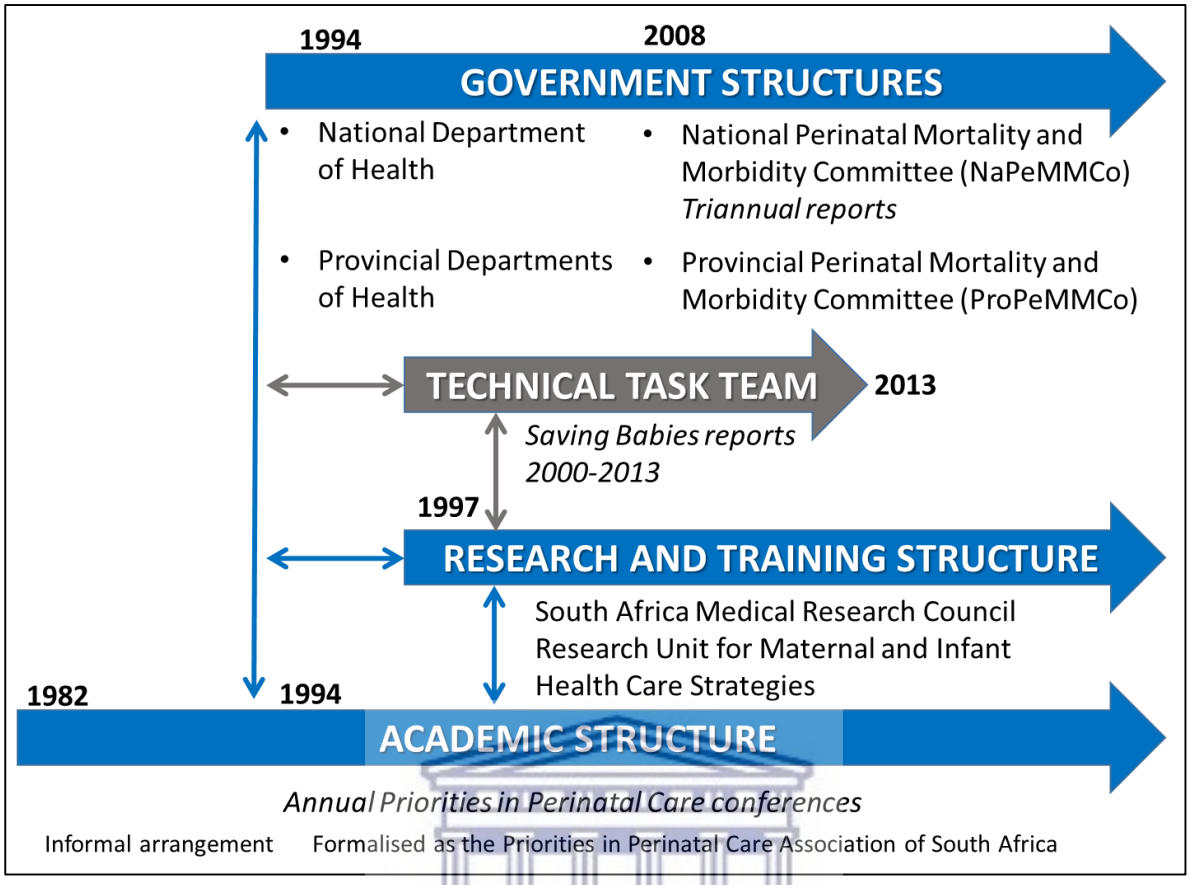
National

Multiple national structures support perinatal audit implementation, and these structures co-exist, interlink and rely on each other to function well. The three categories of structures include academic, research and training, and governance (Figure 1), each becoming more formalized over time as the government took over more ownership of the process. First, the Priorities in Perinatal Care Association of South Africa and their annual conference (Priorities Conference) serves as the academic structure providing a mechanism to share data

and learning from perinatal audit as well as provide capacity building around using and interpreting PPIP and related audit findings.[53] Second, the research and training structure provides continuous oversight and implementation support. Established in 1997, the Maternal and Infant Health Care Strategies Research Unit, oversaw the administrative and technical aspects of PPIP, supporting the NDOH to capture, analyze and summarize the data. Affiliated to the University of Pretoria (UP), this Unit was also an official extramural unit of the South African Medical Research Council (SAMRC) ensuring ownership of NDOH in the process. The Unit evolved over time becoming the UP Research Centre for Maternal, Fetal, Newborn and Child Health Care Strategies and continuing to support these PPIP related activities.

Finally, the governance structures include the NDOH and provincial DOHs and their related perinatal review committees. Initially, a Saving Babies Technical Task Team was established to support implementation of PPIP and included membership from the NDOH, representatives from the different provinces and academic clinicians leading the PPIP process. Initially, the SAMRC/UP unit funded support for this group to meet through research grants. This group became more formalized with the establishment of South Africa's Ministerial National Perinatal Mortality and Morbidity Committee (NaPeMMCo) in 2008. The committee meets on a semi-annual basis, reports to the NDOH annually, and produces a publically available triennial report.[29,30,54,55] NaPeMMCo recommended the establishment of provincial perinatal review committees, with one provincial coordinator for PPIP on the national committee to ensure a coordinated approach of data flow and analysis.[55] The NDOH and Provincial DOH fund related costs for these meetings (e.g. travel).

Figure 1: National structures supporting implementation of the perinatal audit program



These structures are linked by the actors who engage in the processes, with individuals often engaged in more than one structure. A continuity of actors in these structures with a core set of PPIP champions at the helm,[23] as well as the expansion of the network with new actors emerging and taking more leadership roles, promoted institutionalization. Many of the provincial and regional PPIP actors remained in their roles for long periods of time. For example, the provincial and regional PPIP coordinators in the WC interviewed had been in their roles for over 10 years and had established systems to support and use the perinatal audit program to strengthen clinical practice, allowing predictability in communications, engagement and expectations from actors at the sub-district and provincial levels. However, recent transitions of core actors to the perinatal audit program at all levels and within NDOH,

either through new posts or retirement, has raised some concern about the sustainability and quality of the program.

> *I don't think anybody will ever be him. Or be able to replace him. [Others] they're not the same. They just fill in the forms and don't really teach us. With Dr X, you are always learning. – Family physician*

The range of actors has been multi-disciplinary. The Priorities Conference particularly emphasizes and encourages the involvement of a range of health professionals including frontline health workers, managers, academics from different disciplines, national and provincial DOH, and implementing partners. Participants receive continuous professional development points for attendance and primarily receive funding from their workplace or the provincial DOHs to attend. The inclusive nature of this structure was especially important at the start given the political and historical context in the country:

> *It was the only meeting in South Africa where there was no hierarchy - midwives, nurses, doctors, MOs [medical officers], consultants - they were all at one level. And that in the early nineties was a major thing. Because remember it was white - and they were the doctors - and the blacks were the nurses. – Subnational stakeholder*

Western Cape

Bergh and colleagues unpacked the complex web of structures supporting implementation of perinatal audit at subnational level, notably provincial, regional, and sub-district levels (Supplementary file 4).[28] These structures are essential for communication and flow of data and information between and within levels.[21] The case study research confirmed that similar structures existed in the WC Province. The Provincial Perinatal Mortality and Morbidity Committee (ProPeMMCo) meets semi-annually where regional PPIP coordinators present the data from their sub-districts to inform provincial health system planning. The provincial PPIP coordinators are responsible for compiling the data and recommendations for the province and sending the results to national level. Each sub-district has regular perinatal review

meetings, whereby clinical staff, management and other actors working in maternity care meet to review and discuss perinatal deaths. The involvement of both managers and clinical specialists (family physician, obstetrician and/or pediatrician) along with frontline health workers enable accurate analysis of the cases and identification of related and practical recommendations.

The PPIP system (forms, software and reporting system) is used to identify, report and analyze deaths to inform the quality-of-care audit process. The flow of information starts with capturing data in the registers and in a designated data capturing form; the data is then entered into the PPIP electronic system and sent to the regional PPIP coordinator, who then sends the data to the provincial PPIP coordinator as well as presents the data at provincial perinatal review meetings.[21] In some sub-districts, PPIP data is analyzed and presented at the monthly sub-district and quarterly district monitoring and evaluation (M&E) meetings as well as the M&M meetings. Feedback loops are in place to share recommendations and actions to different teams and levels through existing meetings, communication channels and other clinical governance structures.

> *Say we need education or something or training on something and equipment. It will go to the medical managers' meeting from there. So selective things will go through to management meeting and we'll discuss it there and from there on it will be our responsibility. – Clinical manager*

3) Intentional and continuous demonstration of impact as well as local adaption are essential for buy-in and ownership to sustain practice

National

Intentional efforts were made at the start with PPIP to demonstrate impact, engage a diversity of stakeholders and embed the process within NDOH in an effort to get buy-in. The first Saving Babies report (2000) was a product of a workshop held to collate data, identify areas

of concerns, and collectively make recommendations.[44] The first workshop was multidisciplinary and inclusive:

> *"The delegates came from throughout South Africa and for once the meeting was not dominated by academics or administrators, but by the health workers from the coalface." – Saving Babies Report 2000.*[44]

This model of inclusive engagement to develop the *Saving Babies* reports continued as the number of participants and facilities presenting data from PPIP expanded (Panel 2).[56-63] The annual engagement through the Priorities Conferences and other PPIP related workshops ensured buy-in after the initial phase and enabled continued sharing of local adaption and experiences during the implementation and institutionalization phases. Though there has not been a specific workshop since 2009, the *Saving Babies* reports continued until 2016.[30]

Reflecting the response portion of the perinatal audit program at the national level, new initiatives were established and rolled out nationally, such as Helping Babies Breathe (HBB), Management of Sick and Small Newborns (MSSN) and Essential Steps in Managing Obstetric Emergencies (ESMOE).[64] Over the years, these new and existing programs were promoted in the NaPeMMCo reports, discussed and presented at the Perinatal Priorities Conference, and taught as part of training for quality improvement, furthering dissemination and buy-in. Clear messaging on data and actions has been an important contribution:

> *I think there's been a lot that has come out of just the simple clear messages from PIPP through the Saving Babies [reports] … being implemented or at least being taught at academic level and training level. – National stakeholder*

In terms of direct impact on mortality, the evidence is inconclusive.[65-67] The largest study from South Africa investigated perinatal mortality across 163 facilities using the perinatal audit program over five years and found wide variation in mortality changes.[66] Poor quality

of implementation of the program, e.g. not identifying appropriate modifiable factors, may have resulted in the increased mortality rates in some settings; but further research is needed to compare the quality of practice linked to outcomes between facilities in South Africa.

Western Cape

Swartz and colleagues speak to the value proposition of PPIP as a tool to help present data and motivate for change based on the data resulting in high levels of buy-in from health workers and managers.[23] The case study research confirmed that buy-in increases when people see results from the perinatal audit program. At the sub-district level, most participants could give examples of how change occurred due to perinatal audit and believed it helped to improve service delivery, as demonstrated by these quotes:

> *If there's equipment situation, they want to identify it through the PPIP. Or we need more staff. Then they got extra two sisters for labour ward and we got like more CTG machines. – Operational manager of maternity ward*

> *I think it does have an impact… there's been a few M&M's where I've actually written SOP's to change practice and we've implemented it. – Medical officer*

At the same time, not all frontline health workers go to the Priorities Conference or attend M&E meetings where results are presented. Only one person at sub-district level knew about the *Saving Mothers* and *Saving Babies* reports at national level. Therefore, some frontline health workers felt that they were not informed about how the PPIP data was used and what impact the process had, as exemplified in this quote:

> *I think if it was more emphasized on why we are doing it - to see results, to see where we're lacking - I think then people might have more of an input in it. – Primary health care nurse*

Reporting back actions or "the response" during the next perinatal review meeting can help garner buy-in by sharing the benefits of the perinatal audit program. However, some of the sub-districts did not report back or include actions in their minutes (Supplementary file 5). As a result, some actors who work at more administrative levels and may only see the data, not the actions taken forward at sub-district level, questioned the purpose of the process, as these quotes demonstrate:

> *We do all of this work [data collection, analysis, reporting] for nothing; nothing changes. – Outreach specialist*

> *The stuff that they talk about [at M&M meetings] I don't actually know if they implement it because it's more medical related. But from an administrative point of view it hasn't improved. It really hasn't improved. – Sub-district information officer*

Other aspect related to buy-in is local adaption. Rhoda and colleagues chronicled the pre-implementation and implementation phases of two provinces, demonstrating different paths towards scale.[21] Belizán and colleagues also found that "different sites used different modalities to sustain audit – different people, different places, different plans."[22] The case study research further demonstrates the importance of adapting the process to the local context. Table 3 describes the process according to the MPDSR cycle[6,10] with factors supporting sustained practice as well as distinctions between sites especially between the two PPIP regions. Common inputs identified include PPIP focal points, standard reporting forms and regular review meetings, but there are variations in who did what and which forms were used and how often meetings took place (Supplementary file 5).

Table 3: Descriptive factors enabling sustained practice

Dimension / question	Main finding	Common factors across sites	Distinctions between sites (Case)
Identification and reporting *How do people identify and report deaths?*	People identify and report deaths on regular bases because they have a standard reporting system and PPIP regional focal points monitor data inputs.	• Standard reporting forms available. • Standard reporting software/mechanism available (PPIP software). • Follow up by PPIP coordinators at provincial and regional levels to ensure data is collected and submitted.	• Different reporting forms used after a death. • Information officer responsible for PPIP data collection, capturing and reporting working with doctors and operational manager (C, D, E). • PPIP data collection, capturing and reporting rely on clinicians, the nursing manager and operational managers (A, B).
Reviewing deaths *How do people review deaths?*	Review meetings take place regularly as part of national requirements with multi-disciplinary engagement; although the meeting process varied between cases.	• Facilities are required to do a minimum number of review meetings each year (10) and perinatal focused meetings are counted towards this requirement. • Multi-disciplinary engagement. • Outreach specialist (obstetrician or pediatrician) attends review meeting.	• Meetings are scheduled monthly (A, B). • Ad hoc review meetings (C). • Multiple meetings related to review process (D). • Facilitation by hospital staff (C, D, E). • Outreach specialist facilitates meeting (A, B). • Outreach specialist attends and contributes during the meeting (C, D).

Dimension / question	Main finding	Common factors across sites	Distinctions between sites (Case)
Analysis and recommendations *How do people analyze data and make recommendations after perinatal death?*	Data analysis and use for decision making varied between cases but all data is used for planning at provincial level.	• Involvement of managers and clinical specialists (obstetricians, pediatricians and/or family physicians) in review meeting to analyze cases and identify relevant and feasible recommendations. • Regional PPIP focal person conducts analysis of data for the region and makes recommendations to provincial level during biannual meeting.	• Data analysis by information officer (C, D, E). • PPIP data used at M&E sub-district meeting to make recommendations (C). • PPIP data used at the quarterly M&E district meeting for health system planning (C, D, E).
Response and actions *How do people respond to the recommendations and take actions forward after perinatal death?*	Sub-district management teams oversee response and actions. Feedback loops for sharing information are in place.	• Management oversees implementation of actions. • Feedback loop in place to share with different teams and levels.	• No formal follow up (A, B). • Formal follow up by QA manager (C, D). • PPIP data used at the M&E district meeting for health system planning (C, D, E) and M&E sub-district meeting (C).

PPIP, Perinatal Problem Identification Program; M&E, monitoring and evaluation; QA, quality assurance

4) Institutionalization is a continuous process, not a destination

National

The perinatal audit program started nearly three decades ago and has continuously evolved and expanded (Panel 2). The expansion of PPIP from 27 to 244 facilities in Phase 1 took 15 years as the program was entirely voluntary. Once the program became more official with the national committee established, the number of facilities reporting more than doubled to 588 in four years. After PPIP became formally embedded in national policy and guidelines, 75.8% of deliveries recorded through the routine health information system were also reported to PPIP in 2012-2013.[56] There was an increase to 83.9% of deliveries reported in 2014-2016,[30] but a decline to 75.8% of deliveries in 2017-2019,[29] demonstrating widespread practice but not yet complete coverage of the perinatal audit program. The chronology of this national program demonstrates how long it can take for the introduction and scale up of MPDSR. The declining coverage of deliveries reported to PPIP in recent years also signals that backsliding is possible without continuous efforts.

Western Cape

To move beyond coverage as measured by number of deliveries reported to PPIP, we used a proposed MPDSR progress-monitoring scoring tool to further understand coverage of practice using tracer indicators[26] in the five WC sub-districts. These sub-districts all achieved the status of institutionalization, with a median score of 24.21 out of 30 (Table 4; Supplementary file 5). Missing elements that held back a complete score across all cases included budget allocation, reporting findings and progress to community, and MPDSR related training in the past year. Additional progress markers not fulfilled in two or more cases included a code of conduct, follow up actions recorded in minutes, orientation, data trends displayed, and plans for MPDSR related training (Table 4).

The failure to achieve some progress markers may indicate issue with the pre-determined factors in the tool itself, suggesting these components are either not essential for sustained practice or that the framing of these components need reconsideration. For example, participants indicated no direct budget allocation from the hospital to support the perinatal audit program; however, the time of staff to participate in the related activities was recognized as a related cost but people felt it was worth the expense:

> *But you see that's in our daily business… If I must put a resource price on it [M&M meetings], I mean then it's quite expensive... if you think salary wise. – Hospital manager*

Similarly, we found no evidence of reporting the findings to the community. Three of the case studies indicated functional hospital boards in place with representation from community members, but participants recognized there was no report back specifically about the perinatal audit program. Direct involvement of the affected family in the perinatal audit was perceived as highly sensitive. Participants reported that engagement with the families was managed by the clinical managers and matrons. When asked, participants felt the M&M meetings should be for clinical staff only and should not involve members of the community.

> *They [parents] will be kept up to date but we don't invite them to the M&Ms because we don't want to put them in that spot, but the doctor [clinical manager] will give them feedback… So doctor will communicate with them the whole time. – Quality assurance manager*

Gaps in the quality of practice, such as not including actions in meeting minutes, signify the need to ensure staff receive adequate training on the specific tasks required of them for implementation (Supplementary file 5).[27] Even though perinatal audit activities remain despite staff transitions, few participants reported receiving any official training on the

perinatal audit program with most reporting informal and "learn on the job" orientation.[27] Sub-districts in Region 1 did not display data trends during the M&M meeting and only reported verbally on the PPIP statistics from the last month.

Some of the progress markers did not capture the full essence of implementation realities. For example, there was never one "committed champion" (as per the progress marker in the tool) but rather an informal team of actors that implemented perinatal audit at subnational level with different roles in the process (Supplementary file 5). We also found people identified different "champions" because their perspectives of who was leading the process varied based on their engagement in the process. Given the multiple components of the audit process, different actors have different responsibilities. These informal teams demonstrate shared commitment among actors and the importance of multidisciplinary engagement:

> *I think this is a program that you need to drive with a team of different departments. If you have a doctor, you have the operational manager of maternity, we have a sister maybe, we have a clerk. – Information officer*

Table 4: Meeting the progress markers for each stage of implementation

Phase	Stage of implementation	Progress markers	Status of progress markers				
			Case A	Case B	Case C	Case D	Case E
Pre-Implementation	1. Creating awareness (2 points)	Awareness by management	✓	✓	✓	✓	✓
		Committed leader	✓	✓	✓	✓	✓
	2. Adopting the concept (2 points)	Conscious decision to implement	✓	✓	✓	✓	✓
		Committee formed	✓	✓	✓	✓	✓
Implementation	3. Taking ownership (6 points)	Tools available	✓	✓	✓	✓	✓
		Tools include cause of death	✓	✓	✓	✓	✓
		Tools include modifiable factors	✓	✓	✓	✓	✓
		Tools include place to follow up on actions taken	✓	✓	✓	✓	✓
		Understanding of process for conducting meetings	✓	✓	✓	✓	✓
		Staff meeting conduct agreement available	X	X	✓	✓	✓
		Budget or support to conduct death reviews	X	X	X	X	X
	4. Evidence of practice (7 points)	Meeting minutes available	✓	✓	✓	✓	✓
		Meeting minutes include action items	✓	✓	✓	✓	✓
		Meeting minutes include follow-up from previous meetings	X	✓	✓	X	X
		Meeting notes respect confidentiality of staff and patients	✓	✓	✓	✓	✓
		Face-to-face or written orientation to death reviews	✓	X	P	P	X
		Data trends displayed or shared	✓	P	✓	✓	X
Institutionalization	5. Evidence of routine integration (7 points)	Evidence of change based on recommendation	✓	✓	✓	✓	P
		Death review meetings are held at stated interval (e.g. weekly, monthly)	✓	✓	✓	✓	✓
		Multidisciplinary engagement	✓	✓	✓	✓	✓
		Evidence of reporting findings and progress to community	X	X	X	X	X
	6. Evidence of sustainable practice (6 points)	Over 1-2 years of ongoing practice	✓	✓	✓	✓	✓
		Plan in place to ensure all staff receive MPDSR training	✓	X	X	X	X
		Evidence that staff have received MPDSR training in the past year	X	X	X	X	X
		Score on the first 5 constructs (divided by 12)	1.71	1.63	1.79	1.71	1.42
		Total (30 points)	**25.21**	**23.13**	**25.29**	**24.21**	**20.42**

✓ signifies fulfilled, P signifies partially fulfilled, X signifies not fulfilled

Discussion

Lessons from South Africa's experience of implementing a perinatal audit program draw from nearly three decades of implementation revealing enabling factors, such as core structures, as well as vulnerabilities to sustainability. The results show that multiple and evolving national and subnational structures benefited from ongoing intentional efforts to establish and nurture a network of diverse actors. Local adaption and demonstration of impact helped to ensure buy-in and ownership initially although feedback has not been continuous at all levels of the system. The integration of the perinatal audit program activities in national policy and guidelines embedded it within the health system until recently. Finally, applying a standard tool to measure implementation in settings with sustained practice showed gaps in practice as well as flagged concern about components in the current tool.

MPDSR is promoted by WHO and partners as a strategy to end preventable maternal and newborn mortality and stillbirths, and is being expanded in LMIC.[6] The PPIP tool has also been adapted and used in other settings outside of South Africa.[68-70] Panel 3 provides 10 lessons from this research, which may help South Africa and other countries in their efforts to introduce, expand, and sustain MPDSR. Even though there is little evidence that it directly reduces mortality and concerns about the capacity to implementation in LMIC, the general assumption remains that MPDSR is useful and more operation research and learning is needed.[71,72] This reflective policy analysis responds to the call for more operational research about MPDSR in practice. While we have some lessons from studies examining history of implementation some high-income countries, especially for maternal death reviews and Confidential Enquiry into Maternal Deaths,[72,73] but also for perinatal audit,[3,74] more in-depth studies are needed, especially from LMIC.

[insert panel 3]

Panel 3: Ten lessons from sustaining a perinatal audit program in South Africa

1. Integrate MPDSR in broader health policies and related guidelines. For scale up and sustainability in South Africa, it helped to include perinatal death audits and PPIP in the MNCWH&N Strategic Plan 2012–2016 and related initiatives in order to explain value add (e.g. extra data elements not captured in the routine health information system to measure quality of care), support implementation, and track coverage.
2. Set up formal and functional structures at all levels of the health system (facility, subnational, national) that oversee and coordinate implementation of MPDSR. For South Africa, informal structures formalized over time, such as the Saving Babies Technical Task Team becoming a national ministerial committee, with continuous engagement from NDOH to ensure ownership and buy-in.
3. Engage relevant stakeholders at all levels of the health system in the collection, analysis, and reporting of data and recommendations/response. In South Africa, the multidisciplinary engagement was intentional from the start and occurred at multiple levels of the system, i.e. facility perinatal review meetings as well as in subnational/national level for data analysis and development of reports. Stakeholders included those within the formal health service delivery system, e.g. DOH, academics, health workers (all cadres) and not community members. The role of community in MPDSR requires contextual consideration and more research.[12]
4. Enable and encourage local adaption of MPDSR processes across the steps of the audit cycle (e.g. who does what, when meetings occur, how information is shared) in order to support accountability, sustainability and ownership. While the core elements of data capture and reporting and death review meetings took place, the implementation processes varied across the five sub-districts signaling that there is no "one-size-fits-all" model. Common implementation processes were observed between

the sub-districts within the two PPIP regions reflecting the leadership of the regional PPIP coordinators. Provincial and regional oversight of senior health professionals, who were official mandated to improve care at local level, drove accountability at local level.

5. Provide opportunities for users of MDPSR at different levels of the health system to meet on a regular basis to share implementation experiences, e.g. lessons, challenges, innovative solutions, and capacity development. At national level, the annual Perinatal Priorities Conference has provided a platform for users to regularly engage. The perinatal review meetings provide this platform at a sub-district and provincial level.

6. Share the results and impact of MPDSR at all levels of the health system. Nationally, regular demonstration of practice through the Saving Babies reports and workshops encouraged others to engage and buy into the process. Clear messaging around the importance and value of the perinatal audit program has also helped. Subnationally, evidence of change due to the perinatal audit process encouraged participation.[27]

7. Recognize that scale up and institutionalization takes time and plan accordingly. The perinatal audit program in South Africa started nearly three decades ago.

8. Ensure MPDSR remains in policies, programs, and practice through continuous and intentional efforts, through advocacy and trainings. The expansion of the perinatal audit program in the 2000s demonstrates what can be achieved with intentional efforts by champions.[23] Yet, the recent decline in coverage of PPIP usage and exclusion of PPIP from the new maternal and newborn health policy signals the fragility of such programs and the need for continuous efforts to sustain them. The case study research revealed the potential of local data use as a means to sustain the practice, but this may require skills development.

9. Monitor coverage and implementation practice at all levels of the system. South Africa has done well to ensure regular reporting of PPIP data in the national triennial reports, including coverage of deliveries reported through PPIP. The MPDSR progress-monitoring tool is one mechanism to monitor practice at facility level. The tool enables users to conduct a brief assessment of coverage, but potentially missing some elements that may be relevant across contexts (e.g. organizational culture), and some elements that may require more nuanced contextualized understanding (e.g. community engagement).

10. Conduct more research on impact and quality of MPDSR. The studies from South Africa assessing impact on mortality and implementation factors reveal inconclusive and often inconsistent findings.[20-24,28] MPDSR is a complex social process involving many steps and people, engagement at multiple levels, and linkages to other clinical governance and quality improvement activities.[12] More research across diverse epistemologies and at different levels will be needed for better understanding MPDSR implementation across different settings.

[end panel 3]

Factors influencing implementation of MPDSR in LMICs have been identified and examined in the literature[12] including for South Africa.[22-24] This paper adds to that body of literature showing that many factors influencing institutionalization may not be easily quantified or measured as indicators (i.e. networks, team dynamics, and individual motivation).[12,22,27,28] Institutionalization of the perinatal audit program has been supported by mainstreaming it into national policies and guidelines, demonstration of practice, local adaption, and continuity of actors. Academic and technical structures, linked to NDOH, as well as synergies with other quality improvement and clinical governance structures also supported practice.[75]

Subnationally, this paper highlights that different actors took on various roles and tailored the process to their context, reflecting the importance of local adaption, a well-known core element of sustainability.[76-79] Currently, global and regional surveys monitoring MPDSR do not capture all the structures that may be needed to institutionalize practice, such as academic and technical structures, and do not include other factors, such as local adaption.[80]

For South Africa, the future of this perinatal audit program cannot be assumed to be indefinitely sustainable or perfect in its current form despite its legacy and widespread coverage. The new MPNH policy call for the development of a new surveillance system and does not link MPDSR to the audit cycles and clinical governance activities,[51] raising concern about government's understanding, buy-in and ownership of the perinatal audit program. As actors develop new national MPNH guidelines and adapting these for local context, the lessons from South Africa's long history of perinatal audit should be considered. For example, transitioning to new actors may require intentional efforts to ensure buy-in and share lessons learned on practice, as was done for the first 20 years of the program. The Priorities Conference continues as a mechanism to expand the network, advance data use for decision-making, and engage actors in shared learnings about the implementation realities of PPIP.[53]

Another concern for South Africa is that the scale of the perinatal audit program has dipped in coverage, and there are observed quality gaps even amongst facilities with long histories of practice.[24,27] The stagnant perinatal mortality rates combined with reduced PPIP coverage is worrisome, especially in the absence of an alternative tool that can help clinicians and managers assess their maternal and perinatal health outcomes. Audit and feedback aims to improve professional practice through identifying local problems and solutions,[81] and

currently PPIP is the only tool nationally available to help clinicians and managers collect and analyze their maternal and perinatal health data for audit. While there has been some uncertainty about the impact of the current perinatal audit program on mortality reduction in South Africa,[20] this does not necessarily indicate failure of the program, especially when global systematic reviews on the impact of MPDSR identify few studies.[71,74,82] Quality of practice or "functional PPIP" is necessary for health system improvements. This includes high-quality practice of the audit cycle, e.g. correct use of data at local levels for advocacy and regular feedback, sharing information across levels, as well as quality use of the PPIP software and tools.[21] The case study research presented in this paper set out to describe and assess the implementation process at facility and subnational level, and did not measure impact of the perinatal audit program in terms of mortality outcomes or quality of practice. A complementary paper of this research presents evidence that there are other benefits to the perinatal audit program, such as skills development, individual and collective motivation, improved teamwork and dynamics.[27] Users and policy makers need to consider and measure the impact of the whole process rather than only one component of the complex MPDSR process, e.g. data from the PPIP tool, in order to fully assess impact. Tracking other forms of outputs, such as documenting success stories and feedback and demonstrating data use for decision making, may enable managers and policy makers to see the value-add of MPDSR beyond outcomes.[22,24,27] As with any quality improvement intervention, continuous activities and linked improvements are needed to sustain and strengthen practice.[66,71,82,83]

The MPDSR progress-monitoring tool showed gaps in the implementation process as well as gaps in the tool itself (Panel 2). Application of the MPDSR progress-monitoring tool may help researchers and program managers evaluate if MPDSR activities are taking place (coverage); [22] but for the most part it is not able to measure the quality of practice. While

some of the progress markers can be used to assess quality of practice (e.g. components included in the tools and minutes of the meetings), most of the progress makers fail to measure the quality and complexity of MPDSR practice, such as leadership, organizational culture, orientation, and multidisciplinary engagement.[26,41] For example, committees can be in place; but if perinatal review meetings do not have a code of conduct and are not well facilitated, it can lead to a blame culture, which can derail the implementation process.[84] Strategies to implement a positive implementation culture have been identified, and more research on the quality of practice is needed.[84] It was beyond the scope of this study to assess quality of practice across all of the progress markers, though some gaps were identified, such as poor documentation of follow up. Adapting and updating the existing MPDSR progress-monitoring tool will benefit from more learning of application in other contexts as well as from more implementation research.

Understanding sustainability requires qualitative research of the national and subnational structures, their history of origin, ownership, and relationships among actors within and between these structures.[22-24,28] To further advance implementation at all levels, we will need more nuanced health policy and systems investigations about what drives and motivates those who are initiating and overseeing implementation and how to create a culture of adaptive learning through MPDSR that supports trust, communication, and collaboration over time.[85]

Limitations

This study collected information on perinatal audit, which is a sensitive topic given the nature of exploring adverse incidents by reporting data on deaths as well as reviewing the situation surrounding the death. Through individual interviews, this study included perspectives from a wide range of stakeholders, but not all stakeholders were included and the case study research

can only speak to the five sub-districts and may not be generalizable across South Africa or even the WC. Participants may have reserved their true opinions about the process or experience and may have changed their behavior during the observed review meetings. Data collection stopped at the end of March 2020 due to the COVID-19 pandemic and related restrictions. This unfortunately prevented further data collection, including observation of additional meetings, and timely validation meetings with the sub-districts.

To ensure rigour and trustworthiness, triangulation of the different data sources was used to verify and validate information including field notes, observations, and follow up interviews with specific people. There was possible interpretive bias of the doctoral candidate (MK) and other authors given their involvement in the development and adaption of the progress-monitoring tool and involvement in the perinatal audit program. Efforts were undertaken to prevent bias, such as the use of a semi-structured interview guide, a standardized tool, thematic content analysis applying an analysis coding framework and validation with multiple stakeholders and sources.

Conclusion

The institutionalization of the perinatal audit program in South Africa provides some rich lessons that may be helpful as stakeholders in the country and in other countries that seek to expand and strengthen MPDSR. Key factors supporting sustained practice include national and subnational structures that evolve and enable routine flow of information to all levels of the health system and continuously provide formal touch points among actors to share learning and information about practice. Enabling local adaption of the intervention process at subnational levels whilst also having clear national policies and guidelines in place for reporting and tracking progress promotes sustainability; but this requires continuous efforts to

keep the program in policy. The implementation gaps in the five sub-districts in the WC Province signal the need to improve the quality of practice even when there is sustained practice. To monitor the uptake and sustainability of these programs, we need to go beyond tracking measurable or tangible inputs necessary for implementation to include research approaches that allow us to explore the importance of contextual, local adaption and underlying issues that support sustainability.

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Paper 6

Kinney M, Bergh AM, Rhoda N, Pattinson R, George A. Exploring the sustainability of perinatal audit in four district hospitals in the Western Cape, South Africa: a multiple case study approach. BMJ Glob Health. 2022 Jun;7(6):e009242. doi: 10.1136/bmjgh-2022-009242.

Paper summary

The paper, published in *BMJ Global Health*, presents results from a multiple case study of four rural sub-districts (with level 1 district hospitals) of the Western Cape, South Africa with long histories of perinatal audit implementation. It focuses on understanding how and why perinatal death audits have sustained practice from the perspectives of the users. By applying implementation theory, it shows the complex interplay of actors, their relationships and context highlighting the importance of integration, team dynamics, facilitations, and the broad social and structural resources required for sustainability. The explanatory factors for why people continue to implement perinatal death audit in these four sub-districts includes integration of activities into routine tasks (capability), clear value-add (contribution), individual and collective commitment (potential), and an enabling environment to implement (capacity).

Contribution to the thesis

This paper contributes to the third objective of the thesis: To undertake an in-depth analysis of the implementation process of MPDSR by examining factors that enable sustained, routine implementation using implementation theory. The paper explores individuals' experiences, the dynamics of their relationships and non-tangible factors needed to sustain practice of MPDSR. It shows that applying implementation theory to a complex intervention process allows for exploration of underlying issues that support sustainability, such as trust, credibility and hierarchies, even when implementation varies between settings. Focusing on the societal and system lenses at the micro and meso levels, the paper reveals that individuals' experiences, the dynamics of inter-personal and team relationships and non-tangible factors play an important role in the sustained practice of perinatal death audit.

Contribution of candidate

Similarly to paper 5, the candidate designed the study, conducted the data collection and analysis and wrote the first draft of the paper, with inputs from her supervisor and an advisory group of experts from the country. The candidate led the submission process and we are waiting for a response from the journal. The candidate made an oral presentation on this paper at the Conference of Perinatal Priorities in Southern Africa in March 2022.

BMJ Global Health

Exploring the sustainability of perinatal audit in four district hospitals in the Western Cape, South Africa: a multiple case study approach

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To cite: Kinney M, Bergh A-M, Rhoda N, *et al*. Exploring the sustainability of perinatal audit in four district hospitals in the Western Cape, South Africa: a multiple case study approach. *BMJ Global Health* 2022;**7**:e009242. doi:10.1136/bmjgh-2022-009242

Handling editor Seye Abimbola

► Additional supplemental material is published online only. To view, please visit the journal online (http://dx.doi.org/10.1136/bmjgh-2022-009242).

Received 1 April 2022
Accepted 29 May 2022

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ABSTRACT

Introduction Maternal and perinatal death surveillance and response (MPDSR) is an intervention process that uses a continuous cycle of identification, notification and review of deaths to determine avoidable causes followed by actions to improve health services and prevent future deaths. This study set out to understand how and why a perinatal audit programme, a form of MPDSR, has sustained practice in South Africa from the perspectives of those engaged in implementation.

Methods A multiple case study design was carried out in four rural subdistricts of the Western Cape with over 10 years of implementing the programme. Data were collected from October 2019 to March 2020 through non-participant observation of seven meetings and key informant interviews with 41 purposively selected health providers and managers. Thematic analysis was conducted inductively and deductively adapting the extended normalisation process theory to examine the capability, contribution, potential and capacity of the users to implement MPDSR.

Results The perinatal audit programme has sustained practice due to integration of activities into routine tasks (capability), clear value-add (contribution), individual and collective commitment (potential), and an enabling environment to implement (capacity). The complex interplay of actors, their relationships and context revealed the underlying individual-level and organisational-level factors that support sustainability, such as trust, credibility, facilitation and hierarchies. Local adaption and the broad social and structural resources were required for sustainability.

Conclusion This study applied theory to explore factors that promote sustained practice of perinatal audit from the perspectives of the users. Efforts to promote and sustain MPDSR will benefit from overall good health governance, specific skill development, embedded activities, and valuing social processes related to implementation. More research using health policy and system approaches, including use of implementation theory, will further advance our understanding on how to support sustained MPDSR practice in other settings.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Maternal and perinatal death surveillance and response (MPDSR) or any form of maternal and/or perinatal death review or audit is an intervention process that aims to improve health services and pre-empt future maternal and perinatal deaths; few studies have explored individual perspectives and intangible factors needed to sustain practice of MPDSR.

WHAT THIS STUDY ADDS

⇒ The study examines factors that influence the sustained practice of a perinatal audit programme, a type of MPDSR, in four subdistricts in South Africa from the perspective of the users.

⇒ The study shows that sustainability is linked to clear value-add (contribution), integration of activities into routine tasks (capability), individual and collective commitment (potential) and an enabling environment to implement (capacity), which supports contextual and local adaption.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE AND/OR POLICY

⇒ Applying implementation theory through case study research enables greater understanding of MPDSR implementation.

⇒ Implications for practice and policy include investment in good governance, innovation on how we measure successful implementation of MPDSR, improvement of skills building on data use and facilitation, integration of activities into daily practice and data systems, and conduction of more implementation research.

INTRODUCTION

Attaining the sustainable development goal for health will require high-quality health systems that enable access and quality of care to prevent death and disease.[1] Women and children are among the most vulnerable in societies, and their risk of death is greatest during pregnancy, childbirth and the first week after, with an estimated 4.6 million maternal and newborn deaths and stillbirths each year, mostly in low-income and

Box 1 Brief overview of MPDSR broadly and in South Africa

MPDSR seeks to improve health systems, especially for maternal and newborn health, though a continuous cycle of identification, notification and review of maternal and perinatal deaths (surveillance), followed by actions to improve service delivery and quality of care (response).[40] MPDSR tracks the number of maternal and perinatal deaths and identifies the main and underlying causes of death. By systematic analyses of mortality trends and the factors that contribute to each death, health system issues are identified along with solutions to prevent future deaths. The intervention process has a number of components (identify deaths, report deaths, review deaths and respond to recommendations) and involves multiple actors and teams to collect, analyse and apply the information at multiple levels of the health system.[11] If implemented effectively, MPDSR can support the delivery of quality maternal and newborn healthcare.[71] The World Health Organization (WHO) released global technical guidelines on maternal death surveillance and response[3] in 2013 and perinatal audit in 2016.[4] In 2020, WHO listed MPDSR among the essential interventions to mitigate the indirect effects of COVID-19 on maternal and perinatal outcomes.[5] Operational guidance and tools to support MPDSR implementation were released in September 2021.[6]

In South Africa, there are separate but linked processes for MDPSR, which are outlined in the national maternity care guidelines.[72] The National Committee for Confidential Enquiry into Maternal Deaths, established in 1998, oversees the structure of reporting maternal deaths. Every death is reported and discussed within 72 hours at the facility, and there is a confidential enquiry conducted within a month. The National Perinatal and Neonatal Morbidity and Mortality Committee, established in 2008, oversees the structure of reporting perinatal deaths. All perinatal deaths, defined as all dead babies with gestational age of 22 weeks and more (or 500 g and more), are recorded in the Perinatal Problem Identification Programme, a software and process that captures perinatal mortality and notifies deaths.[72] Facilities are required to have regular perinatal review meetings, where deaths and data are discussed.[23 72 73] All of these components aim to improve the quality of perinatal care and outcomes through reporting deaths and determining main causes of deaths, identifying modifiable factors, determining actions and motivating for change. Both national committees meet biannually and produce a publically available triennial report.[74 75]

MPDSR, maternal and perinatal death surveillance and response. WHO, world health organization.

middle-income countries (LMICs).[2] Over half of these deaths (54%) could be averted by expanding coverage and quality of known interventions and innovations before, during and after pregnancy[3]; yet too often these interventions are not provided at scale or with quality in LMICs.[4]

Maternal and perinatal death surveillance and response (MPDSR) is an intervention process aimed at improving health systems for this vulnerable group (box 1). LMICs have adapted MPDSR policies and commenced their implementation,[5 6] yet more attention to understanding and supporting implementation is needed after initial introduction to MPDSR.[6 7] Examination of scale-up and sustainability in health, that is, continued programme activities, or implementation over a long period of time,[8] requires consideration of different types of factors and their interlinkages.[9 10] For example, MPDSR operates at multiple levels of the health system—national, subnational and facility—and is affected by factors at the microlevel (individual behaviour change), mesolevel (organisational culture) and macrolevel (policy and political supportive environments).[11]

To date, the literature on MPDSR mostly examines the tangible inputs required for implementation (availability of tools, focal points and committees established). While it flags the importance of the people and processes involved,[6] few studies have explored individuals' experiences, the dynamics of their relationships and non-tangible factors needed to sustain practice.[6] Quality improvement interventions, including MPDSR, are complex, fluid and context-specific, requiring consideration of relationships and values among those implementing the intervention.[12–15] Applying implementation theory may enable deeper understanding of the health policy and system factors that support the sustainability of MPDSR.[12 15–19] Using theory, this study aimed to understand what factors promote sustained implementation of MPSDR from the perspectives of those engaged in implementation.

South Africa has been implementing perinatal audit, a form of MPDSR, since the late 1990s.[20] Studies in South Africa assessing perinatal audit have mostly looked at the macrolevel and mesolevel and have shown the importance of team drivers or 'champions', institutional review, feedback and communication within the system, long history and user-friendly technology.[20–22] Varying approaches to implementation between provinces and districts have been documented with evidence that perinatal audit can lead to health system improvements and strengthen accountability, such as clinical trainings, equipment provision and maintenance, and collaboration between primary healthcare (PHC) facilities and hospitals.[22 23] Primary activities related to perinatal audit include the perinatal review meetings (referred to as mortality and morbidity (M&M) meetings) and the Perinatal Problem Identification Programme (PPIP) (box 1).

Perinatal audit in South Africa

All public health hospitals conducting deliveries in the Western Cape Province in South Africa have been implementing perinatal audit for over 15 years using the PPIP.[23] Given the long history, hospitals in the Western Cape will be a conducive environment to understanding sustained practice, considering microlevel and mesolevel factors.

METHODS

Study design

A multiple case study design was applied to understand the 'how' or 'why' of sustained implementation.[24] We used a multiple holistic design whereby the subdistrict was considered as a unitary whole, allowing for comparison

across settings to gain insights on factors influencing sustained implementation of perinatal audit.

Sampling

Sampling of subdistricts

The PPIP reporting structure in the Western Cape comprises five PPIP regions (online supplemental file 1) which are aligned to the regional hospitals with a designated regional PPIP coordinator who oversees implementation. The district level 1 hospitals manage all of the deliveries in a subdistrict, unless referral is required. Antenatal and postnatal care services take place at the PHC level. Perinatal audit considers the full continuum of care and engages both hospital and PHC staff; therefore, each case is defined as a 'subdistrict', with the district hospital as the host of the process. Criteria for subdistrict selection included (1) currently conducting perinatal review meetings; (2) contributing to PPIP for over 10 years; (3) a district hospital outside of Cape Town Metro, which has a unique system[23]; and (4) demonstrating at least two characteristics from a previous study on perinatal audit in South Africa: team drivers, institutional review, feedback and communication within the system.[21] The lead author attended a provincial PPIP meeting in April 2019 with the provincial and regional PPIP coordinators to present the idea for this study, including the selection criteria and feasibility of doing this research in the different PPIP regions. Based on the criteria, stakeholder feedback at the meeting about feasibility and criteria, and interest from the regional PPIP coordinators, two PPIP regions were selected, Cape Winelands East and the Overberg (region 1) and Garden Route and Central Karoo (region 2), and then two subdistricts identified within each: cases A and B in region 1 and cases C and D in region 2. Demographics were similar across three case studies; case B had about half the population and annual births compared with the others (table 1). All subdistrict hospitals reported low levels of staff turnover.

Sampling of participants

Key informants were purposefully sampled based on their involvement with perinatal audit. The two regional PPIP coordinators identified key actors involved in the perinatal audit process at the district and subdistrict levels. Additional stakeholders were identified through a snowballing approach based on information provided from those interviews. For each subdistrict, we aimed to interview the medical manager, clinical manager, nursing manager, information manager or officer, manager of the maternity ward and front-line health workers who were involved in the perinatal audit process, including doctors, midwives, nurses and PHC staff. Interviews were conducted with at least 10 staff per case or until saturation had been reached, with the exception of case D, where only five staff were available. In total, 41 key informants were included (table 2 and online supplemental file 2).

Data collection

Data collection tools included a key informant interview guide and a meeting observation guide (online supplemental file 3). The interview guide focused on individual perceptions about the perinatal audit process, factors needed for implementation and team dynamics related to implementation. The meeting observation guide considered who was in attendance, information presented, and behaviours and interactions of participants.[25] Fieldwork and data collection took place from October 2019 to March 2020, ranging from half of a day to 5 days per site. MK conducted the fieldwork and sent a summary report of preliminary findings and reflection to the research team within 1 week of visiting the site. Key informant interviews were in English and ranged from 20 min to 1 hour. All interviews were conducted individually with the exception of case D, which were done in two groups. Non-participant observations occurred at seven meetings: two provincial PPIP meetings, three subdistrict perinatal review meetings (M&M meetings), one monitoring and evaluation (M&E) meeting, and one other staff meeting.

Data management and analysis

Interviews were recorded and transcribed. Transcripts, observation and reflection notes were compiled and analysed using Atlas.ti V.9 by MK with oversight from AG.

Table 1 Key features of each case study

Case study	Case A	Case B	Case C	Case D
PPIP region	**Region 1**	**Region 1**	**Region 2**	**Region 2**
Population (2018/2019)	~95 000	~37 500	~95 000	~93 200
Annual births (2019)	1741	506	1360	1751
Perinatal mortality rate (per 1000 live births) (2019)	11.6	6.0	14.8	17.0
Number of PHC clinics (2018/2019)	5	5	5	5
Number of staff in subdistrict (2018/2019)	~138	~93	~205	~227
Year perinatal audit started	1999	2004	2004	2003

Data source: population, number of PHC clinics and number of staff from District Health Reports 2018/2019,[76–78] annual births and perinatal mortality rate from PPIP database (accessed 4 March 2022), year perinatal audit started from key informant interviews.
PHC, primary healthcare; PPIP, Perinatal Problem Identification Programme.

Table 2 Demographic information about key informants

Demographic characteristics	Key informants (n=41)
Case study	
Case A	10
Case B	11
Case C	10
Case D	5
Other	5
Level of health system	
Provincial, regional, district	5
Subdistrict	16
Facility	16
PHC	4
Cadre of participants	
Provincial actors	2
Other district staff	1
Regional PPIP focal persons	2
Medical manager	3
Nursing manager	4
Clinical manager	2
Information manager	3
Quality assurance manager	1
PHC manager	1
Information officer	2
Family physician	3
Medical officer (including senior and registrar)	4
Operational manager (facility)	1
Operational manager (maternity)	3
Professional nurse	5
PHC clinic manager	2
PHC nurse practitioner	2
Sex	
Female	32
Male	9
Age group	
Below 30	2
30–49	21
Over 50	18

PHC, primary healthcare; PPIP, Perinatal Problem Identification Programme.

Thematic analysis was used applying an analysis framework derived from Carl May's extended normalisation process theory,[26] an implementation theory used to consider broader social systems in which interventions are implemented (online supplemental file 4). Undertaking an iterative process, we developed the coding framework by analysing the data from case A using the dimensions and constructs of the extended normalisation process theory. With these findings, we identified emerging themes and gaps in the analysis framework. The codebook was revised to include descriptive factors as well as tailored to suit the intervention and related results. This revised codebook was tested and refined using the same case study as well as another (case C) before being applied to all of the data. A report was developed for each case study by MK and received inputs from all authors.

Rigour, positionality and ethics

Measures were taken to ensure rigour of the case study approach,[24 27] such as engagement with stakeholders prior to data collection, voluntary participation of participants, seeking peer and expert feedback, audit trail with clear mapping of the research process and triangulation of data sources. A feedback report was shared with subdistrict managers to verify results with the stakeholders. Permission to take photographs of documents and training materials was given from subdistrict health administrators, with commitment not to include sensitive information and identifiers. The lead author did not know any of the participants prior to the study but was able to develop trust with them through stakeholder engagement, including spending a few days in the subdistricts. This engagement helped to contextualise and interpret the data. Though not involved in the data collection process, other authors (A-MB, NR and RP) may have been known or familiar to some of the participants, given their involvement in the national and provincial perinatal audit processes.

Patient and public involvement

Patients or the public were not involved in the design, conduct, reporting or dissemination plans of this study. A short report disseminating the findings was shared with subdistrict managers, district health managers, and regional and provincial stakeholders. An in-person feedback session occurred in one subdistrict with study participants.

RESULTS

The findings are presented according to the dimensions of the extended normalisation process theory—capability, contribution, potential and capacity (table 3).

Capability

May posits that routine implementation depends on its workability and integration into everyday practice.[26] Participants described perinatal audit activities as embedded into everyday workflows. In all subdistricts, the managers viewed data capturing of information about perinatal deaths as part of their routine data collection and reporting system. However, PPIP was more embedded in the information system in region 2 because the responsibility of the data capturing and analysis using the PPIP software was the responsibility of the information officer, not the clinical staff, as in region 1. The information officers reported that they would

Table 3 Explanatory factors enabling sustained practice of perinatal audit

Dimensions/question	Main finding	Factors identified*
Capability: implementation depends on its workability and integration into everyday practice. How do people integrate the work into their daily practice? Or how is it not integrated?	People have the capability to implement because activities related to perinatal audit are integrated and embedded into everyday work.	▶ Activities are part of daily workflow. ▶ Activities are part of job expectations. ▶ Activities are part of formal training for some. ▶ Activities are linked to other meetings and QI processes. ▶ Activities are part of district support/regional outreach. ▶ Related implementation costs are embedded into existing budgets. ▶ Activities are integrated with the data system and process (eg, M&E, information unit) (C and D). ▶ Activities are part of official job descriptions (A). ▶ Activities are part of orientation (A and C).
Contribution: implementation depends on people's contributions to doing the intervention by investing meaning, commitment, effort and appraisal Why do people contribute to implementation of the intervention? Or, why don't people contribute?	People contribute to the intervention because they understand perinatal audit, value it, trust it and use it to help build and nurture relationships.	▶ People have a common understanding of the intervention. ▶ People value it for improving service delivery, helping them learn skills, enabling them to debrief as a team. ▶ People use the review process as an opportunity to navigate professional hierarchies, hold each other accountable, improve communication and build/nurture their relationship with team members. ▶ People trust the process because the meetings are well facilitated and occur in an environment conducive to learning in a safe, non-blame environment. ▶ People also learn over time that the system works.
Potential: implementation depends on people's commitment to operationalising the intervention. Why are people committed to operationalising the intervention? Or, why are people not committed?	People are passionate about their work, committed to improving the quality of service delivery and motivate each other to implement activities relating to perinatal audit.	▶ People are passionate about their work. ▶ People are committed to providing high quality service delivery. ▶ Individual motivation stems from the desire to learn, problem solve and self-improve. ▶ Intangible incentives to attend the M&M meetings, that is, learning, debriefing, communicating. ▶ There is shared commitment to work together and improve the health system because people are invested in the area (eg, come from community or intend to continue working at the hospital for a long time). ▶ Engagement of multiple actors; when some actors are absent from the process, it makes it difficult to implement effectively. ▶ There are tangible incentives to attend the M&M meetings, that is, performance reviews (A and C) and CPD points (C and D).
Capacity: implementation depends on people's capacity to co-operate and co-ordinate their actions. What gives people the capacity to implement the intervention? Or what limits people's capacity?	People have the capacity to implement because they work in an enabling environment that supports the implementation of perinatal audits.	▶ People work in a well-functioning hospital with sufficient and well managed material and human resources. ▶ Low staff turnover. ▶ Strong, predictable and open communication system in place between levels and staff. ▶ Good management enables a healthy organisational culture conducive to learning, innovation and accountability. ▶ Culture of data use for decision making (A, C and D). ▶ Strong social network among the staff (B).

*Factors listed means these were identified across all case studies with the exception of where indicated with A, B, C or D linked to case study assignment. Online supplemental file 7 provides a breakdown by case study.
CPD, continuous professional development; M&E, monitoring and evalutation; M&M, morbidity and mortality; QI, quality improvement.

collect the PPIP data from the maternity ward at the same time as collecting data for the routine information system. Clinical staff regularly attended M&M meetings, and managers expected and monitored their participation. Participants more involved in the process, such as meeting facilitators or data capturers, reported that they had adequate time to complete the related work and considered it part of their jobs.

Perinatal audit activities were linked to ongoing processes, such as quality improvement. For example, managers tailored trainings or quality-related interventions to the identified issues during the M&Ms. Participants agreed that the 'response' component of perinatal audit was taken forward as part of their routine work. Discussion and action points from the M&M meetings were shared at regular management or team (ward or clinical) meetings in order to implement actions:

> We'll go through the old minutes with the next Monday [bimonthly management meeting]. And they'll ask you "Did you sort that out?" and we need to give feedback on that. –Clinical manager

New staff orientations formally and informally integrated perinatal audit. Few participants reported undergoing official training on the components of the intervention, with the exception of those involved with data capture using PPIP, most of whom had received some formal training. The district health team and the regional PPIP coordinators embedded staff capacity development efforts to improve perinatal audit activities (eg, data collection) into ongoing trainings. For the most part, training was unofficial and embedded within general orientation and learning their roles on the job:

> With the new operational manager of the maternity ward, we will like spot teach what M&M is and what you are supposed to record on that M&M [form] but not official training. –Maternity ward operational manager

The integration of perinatal audit into other subnational level mechanisms and activities further supported sustained practice. For example, the regional PPIP coordinators scheduled their monthly clinical outreach visit to the district hospital (to conduct routine specialist procedures) on the same day as the related M&M meeting. District teams provided materials to support implementation, such as the PPIP software and a standard operating procedure (SOP) template for how to conduct M&M meetings. In all subdistricts, the 'ideal hospital initiative' was being implemented, requiring a minimum number of 10 M&M meetings per year, including some perinatal-focused meetings.[28] Costs related to implementation of perinatal audit were integrated into existing budgets. Participants did not view activities for perinatal audit as stand-alone but rather as an integral part of clinical governance.

Contribution

Another dimension of the theory suggests that routine implementation depends on people's contributions through investing meaning, commitment, effort and appraisal.[26] For perinatal audit, participants had a collective understanding of the purpose but not the process and how the different components linked to each other. For example, PHC nurses did not include the surveillance system (PPIP) when asked to describe perinatal audit because they did not engage with that component.

Participants highly valued the intervention for improving service delivery, learning skills and debriefing about cases as a team. For improving service delivery, participants gave examples of change due to perinatal audit, such as additional trainings, human resource changes, the development of SOPs and acquiring additional resources. For example, one hospital permanently assigned a medical officer to the maternity ward in response to issues raised during the audit process. Another subdistrict used the audit process to advocate for additional midwives in the maternity ward. The midwives and nurses indicated that the perinatal audit process improved data capture and collection since they knew that information would be reviewed and discussed at the perinatal review meeting.

> It helps us as a staff - as midwives - to be accurate with the writing of the notes because most of the time when there is an emergency, you are busy. Sometimes you forget to record … So it [perinatal death audit] helps us to improve our skills as well. –Midwife

For learning skills, participants viewed the M&M meetings as an opportunity to gain clinical skills from the referral hospital specialist (eg, obstetrician or paediatrician).

> It's almost like getting a refresher every month of at least one to three topics in obstetrics that he [outreach specialist] does. –Clinical manager

For debriefing, participants reflected that the meetings were an opportunity to collectively and openly debrief about a difficult case. Any death can be traumatic for the staff, and debriefing can help those involved understand what happened.

> You need feedback on what has happened. It doesn't help if you've nursed the patient and baby is gone or mom's gone and you don't have any feedback on what happened. –Midwife

> It is [valuable] because at what other platform are we gonna discuss? One is one death too many you know. –Nursing manager

Though the team dynamics varied between subdistricts, overall participants used the review process as an opportunity to navigate professional hierarchies, hold each other accountable, improve communication, and build and nurture their relationships. An established cohesive team environment led to participants wanting to contribute to the process as part of the camaraderie felt between staff. The team approach to implementation ensured accountability and representation by multiple cadres (doctors, maternity staff, information and subdistrict management):

> It's not only a doctor driven thing. It's a nursing and a doctor driven thing… We as the nursing staff - any category of the nursing staff - can give inputs to it [M&M]. –Nursing manager

> Everybody's got a voice there from the juniors to doctors to the sisters and I think we make everybody's opinion count. –Clinical manager

Participants trusted the process because the review meetings were well facilitated and occurred in a safe, non-blame environment conducive to learning. The M&M meetings did not exceed the scheduled 1 hour, requiring careful preparation of cases and strategic facilitation (box 2). While only one subdistrict presented a code of conduct at the start of the meeting (online supplemental file 5), all participants believed others understood the purpose and rules of the M&M meetings. Some of the nurses and midwives still felt blamed by management and doctors during the review meetings but indicated it gets better over time. When anonymity was not maintained during M&M meetings, it was only because those involved in a case would indicate that it was their case in order to explain better what had happened, signalling they trusted the process and wanted to debrief. Of the meetings observed, the facilitator never first disclosed who was involved in the case.

By seeing how it works over time, participants knew what to expect and did not fear participation. One subdistrict experienced initial resistance to perinatal audit and found the following measures improved the process and led to sustained practice: (1) clear instructions on how

Box 2 The important role of facilitation

Our study found that good facilitation of the perinatal review meetings was an important and common factor of sustained practice across all of the case studies and was related to multiple dimensions of the implementation theory applied. The M&M meeting facilitators enabled learning, promoted humility and inclusivity, kept time and intentionally steered the meeting to be blame-free and focused on purpose. These qualities supported sustained implementation as opposed to the alternatives.[22 34 50 55 79 80] None of the participants reported that they underwent any specific training on management or facilitation of these meetings, with the exception of one family physician.

Effective facilitation of the review meeting can strengthen individual and collective trust in the process. It also can create an environment for learning and debriefing of an adverse outcome in a safe, non-blame environment. Although facilitation of the meetings varied between case studies, there were common factors reported and observed around what traits reflect good facilitation.

The common characteristics and qualities of the facilitators included being

⇒ Straightforward and direct about issues.
⇒ Approachable.
⇒ Well respected clinician.
⇒ Knowledgeable about the clinical protocols.
⇒ Able to draw on personal experience.
⇒ A teacher.
⇒ Humble.
⇒ Academic.

Based on observations and interviews with participants, the following recommendations may be considered to strengthen facilitation:

⇒ Ensure careful preparation of the case before the meeting. Even though the facilitators themselves may not do the case preparation, they need to ensure that whoever is presenting the cases has done a thorough job in preparation in order to allow for a meaningful discussion. Staff involved need to have time allocated for preparation before the meeting.
⇒ Enable local ownership in the process. In all of the case studies, a member of the clinical staff (normally doctors and/or the operational managers of the maternity ward) prepared the cases and presented the cases during the review meetings to ensure ownership.
⇒ Remind participants about the purpose of the meeting at the start. A code of conduct or 'audit charter' is helpful for ensuring a blame-free meeting.[63] In some places, this might only require an informal reminder, whereas in other places, a more formal agreement might be useful.[6]
⇒ Steer the direction of the conversation to focus on the learning of the case. Facilitators can use the meetings as a refresher of the evidence and guidelines, emphasising clinical guidelines, importance of documentation and SOPs. By keeping the meeting focused on learning and adherence to protocols, there is less opportunity for blame.
⇒ Demonstrate empathy. Senior staff should make a concerted effort to listen to staff who were involved in the case, prior to the meeting, and understand the reality of their experience. Facilitators who show empathy for those involved in the case and who humanise the patient by using terms, such as 'She was a fresh stillborn', remind the participants about the purpose of these meetings, to prevent future deaths and not to blame each other.
⇒ Show humility. Facilitators help others learn when they can give examples of their own mistakes or experiences of an adverse outcome with what action was taken to correct it. Sharing your own experience and ability to 'self-correct' or advocate for change encourages others.
⇒ Promote inclusivity. Facilitators should speak to the whole room, making eye contact with everyone rather than one individual, in order to ensure everyone feels that they are part of the team. This promotes team development and underscores the message that everyone is responsible to take forward or support others in implementing the recommendations.
⇒ Encourage and draw on the participation of external factors, such as the clinical specialist, PPIP regional coordinator and/or subnational actors. These actors may be 'content experts', such as obstetricians and paediatricians, and able to bring more detailed clinical knowledge about the case. External participants can also provide an impartial perspective to the discussion.
⇒ Keep to time. If the meeting is scheduled for an hour, guide the discussion to ensure you finish on the agreed time in order to respect everyone's time. Going over time may prevent people from wanting to participate in the future.

M&M, mortality and morbidity. SOP, standard operating procedure. PPIP, Perinatal Problem Identification Programme.

to conduct meetings, (2) local adaption of the process to suit their needs, and (3) improved facilitation of the review meetings to ensure ownership and a blame-free environment by having the clinical manager lead the meeting, along with the doctor who was involved in the case.

Potential

A third dimension of the theory posits that implementation depends on people's commitment to operationalising the intervention. The potential for sustained practice of perinatal audit came from the individual and collective commitment by staff to deliver high-quality maternity care. At an individual level, most of the participants were very dedicated to their jobs and demonstrated pride and confidence in their clinical practice. The maternity ward staff were described as especially passionate about their work and competent:

> The sisters that work in maternity they're excellent with what they do and they're committed. We trust that they know their job. They can manage everything. –Nursing manager

Overall commitment to high-quality service delivery was reflected by individual motivation to achieve good results and the belief that perinatal audit would help. The enthusiasm of a few committed individuals to implement the process drove others to engage and even lifted the level of commitment to perform, especially among the facilitators (box 2). In general, participants felt open to learning and new approaches.

Participants were motivated when they saw that their subdistrict statistics were among the best in the region. Subdistricts in region 2 provided continuous professional development points to doctors who attended the meetings, though this was not an incentive on its own.

Financial incentives were not offered nor did people feel it was necessary (eg, per diems, tea and coffee). Collectively, there was buy-in because people saw that their engagement would yield positive change and was worth their time and their staff's time:

> You only get buy-in if people see why. If people get positive things out of it to see why am I doing this and not feel threatened and can see the learning opportunity… –Medical manager

Low staff turnover also enabled shared commitment to work together and improve the health system collectively. Many of the participants were from the subdistrict or had been there a long time, with no intention of leaving, which facilitated the motivation to improve the health system:

> If your people know that this is now their hospital where they're going to be for a few years. You try to implement things that make your life easier… But if [not], people didn't really care about improving the system because tomorrow they're going. –Family physician

The overall implementation process at subdistrict level was a shared task among multiple players who were committed to their role. These individuals acted as informal teams, each having a different responsibility linked to the audit process and holding each other accountable to ensuring the tasks would get done. The common characteristics of these informal teams included open and constant communication, trust in each other, and dedication to quality improvement and expectation of excellence among actors. The multidisciplinary nature of the process demonstrated shared commitment among all actors engaged. Some key actors were consistently absent from the observed processes, notably emergency medical services (EMS) and district health management. Three of the subdistricts reported that an EMS representative would normally attend the perinatal meeting or would attend if asked, but even in these settings, some participants expressed frustration when they did not attend, given their important role in the referral process. Direct engagement from the district health management team was limited in the perinatal audit process. Subdistricts in region 2 reported that the district comprehensive health manager would sometimes attend; subdistricts in region 1 reported no engagement from the district office. These subdistrict managers indicated that information related to perinatal audit would be reported to them in other meetings as relevant.

Capacity

The final dimension of the theory considers that implementation depends on people's capacity to co-operate and co-ordinate their actions. Across the case studies, participants described working in an environment that supports the implementation of perinatal audit. These subdistricts have well-functioning hospitals with highly competent staff, at the management and clinical levels. Resources were already in place to implement perinatal audit, that is, staff capacity, data capturing forms, computers and available space (meeting room). Some participants reported budget constraints to implement actions identified through the audit process, that is, human resources and equipment procurement. For example, all subdistricts, except for case B, reported not having enough staff in the maternity wards. Subdistrict managers responsible for addressing these challenges considered these challenges as part of the broader budget management and constraints, as demonstrated by this quote:

> Most of the time what comes up in these perinatal reviews is the number of staff. But I must look at the budget… a professional nurse in maternity ward is expensive… My hands are tied because this is like my budget. How am I going to cut it? –Nursing Manager

The subdistricts demonstrated professional work environments with clear and regular communication. Communication channels between the district hospital and the regional referral hospital included a range of mediums, for example, phone, email and WhatsApp. Participants felt there was open communication between team members and health system levels, which made it easier to share information. For example, participants indicated they could call the regional hospital and speak directly to a specialist (eg, obstetrician or neonatologist) and get guidance over the phone about how to manage a case. This type of open communication strengthened trust and joint responsibility between health system levels and contributed to a healthy organisational culture conducive for implementation of perinatal audits.

All case studies demonstrated strong data use for decision making more generally with maternity-related statistics visible in the hospital and regular M&E meetings at subdistrict and district levels to inform health system planning. PPIP data use for decision making varied between the regions. Region 1 did not use the PPIP data for local decision making, whereas region 2 had a strong system of using the data and information from PPIP, as demonstrated by this quote:

> The M&E - where we have all the role players together - it's great because using the [PPIP] data then we can say "this is the issue with the transport from [city]. This is the issue with the CPAP (continuous positive airway pressure) at [case D] hospital" and immediately you can address more things. –Regional PPIP coordinator

The overall management was excellent, as observed and reported. The top-level managers (medical manager, clinical manager and matron) demonstrated strong managerial skills, which fed into good management of others on their team (other managers and operational ward managers). The managers interviewed were supportive and protective of their staff. Managers reported one-on-one meetings with those involved in a perinatal death prior to M&M meetings in order to demonstrate support and identify issues before the group meeting. By working alongside their staff, managers were visible and able to mentor staff, including in perinatal

Box 3 Policy and programme implications and recommendations

1. Invest in overall good governance. This study shows the importance of an overall enabling environment with good leadership, strong management, open communication and data-driven decision making. Perinatal audit has the potential to strengthen individual staff capacity and motivation and even helps to build team relationships. Linking perinatal audit to other accountability mechanisms, such as key performance areas and staff performance assessments, can ensure individuals participate and actions are taken forward. Improving overall health system governance can strengthen MPDSR implementation, just as a functional MPDSR programme can strengthen the health system.
2. Innovate how we measure successful implementation. The benefits of the perinatal audit programme, as perceived by users, go beyond tangible changes to include social and individual processes, such as health worker motivation, mutual accountability, confidence in clinical skills and cohesive team building. These factors are also needed for health systems and can determine the success or failure of quality improvement interventions more generally.[50 61 81 82] So often in the literature and global guidelines, the impact of MPDSR is only measured by considering output and outcome indicators, with little evidence of impact.[30 40 47 73] Redefining implementation success to consider the perceived values of MPDSR programmes, for example, navigating hierarchies, learning and debriefing after an adverse case, may promote sustained practice.
3. Improve skills building on data use and facilitation. Specific skills are needed to implement MDPSR programmes, including preparation and facilitation of perinatal review meetings and data collection and analysis. In this study, most people did not report undergoing specific training on how to facilitate or engage in the perinatal review meetings. Also, there had not been a PPIP training in over 5 years. Materials already exist to support these skills development through the Perinatal Education Programme in South Africa.[36 37 72] Targeted preservice and in-service training and mentorship programmes should incorporate these skills development.
4. Integrate activities related to MPDSR into daily practice and data systems. Our study shows that people had the capability to implement activities related to perinatal audit because it was part of the work they were already doing and were expected to do. Embedding tasks related to MPDSR in job descriptions, orientations and ongoing activities can support sustainability. Additionally, integrating PPIP data use at subnational levels through M&E processes and M&M meetings promotes sustainability. PPIP, as a tool (forms, software and outputs), was more valued and more embedded in region 2, where information officers analysed and presented the PPIP data at subdistrict and district M&E meetings.
5. Implementation research. More research using health policy and systems research approaches will be needed to explore the implementation process in different contexts, over time, and the impact of the COVID-19 pandemic. Since most studies on MPDSR implementation focus on tangible factors,[6] there is a need to expand our knowledge of implementation considering theory-based approaches, allowing further understanding of the complex interplay and change dynamics linked to the success and sustainability of the intervention.

Continued

Box 3 Continued

M&E, monitoring and evaluation; MPDSR, maternal and perinatal death surveillance and response; PPIP, Perinatal Problem Identification Programme.

audit-related activities, such as how to correctly complete the PPIP forms and apply learning from the M&M meetings. The regional PPIP coordinators also had strong management skills and served as mentors to the staff in subdistricts, with an aim to grow champions to strengthen implementation.

> I think it's just lead by example, be open, be a good example why, and just care. Care for your patients, care for your staff. –PHC operational manager

> It's like a tree. So you start with the stem and a couple of branches and you're adding leaves all the time. So - like the other day when I went to [district hospital] when [doctor] presented the PPIP data himself. It's not that the tree is suddenly full of leaves, but it's a slow process of adding people and getting them enthusiastic. –Regional PPIP coordinator

DISCUSSION

This study presents factors that promote sustained practice of perinatal audits from the perspectives of the users in four subdistricts in the Western Cape, South Africa. Using the normalisation process theory, we learn that implementation is supported by integration of activities into routine tasks (capability), clear value-add (contribution), individual and collective commitment (potential), and an enabling environment to implement (capacity). To place these results in relation to the literature, we will apply a conceptual implementation framework developed specifically for MPDSR.[6] The framework includes three cross-cutting health systems lenses: service delivery (tangible inputs), societal (social relationships) and systems (interactions over time and levels).[6 10 11] Box 3 presents implications and recommendations.

Service delivery lens: inputs needed for implementation

Our study validates the need for tangible system inputs, such as focal points and regular meetings,[5 6 29–33] and shows that for sustainability, integrating these into routine practice and systems gives people the capability to sustain implementation. Organisational incentives (refreshments, per diems and continuous professional development points) did not appear to contribute to sustained participation in our study, though incentives have been identified in other settings.[6 34]

Training and supervision can also promote sustainability.[6 7 9 22 35] This study shows that training was mostly informal and integrated, especially after initial introduction. The long history and scale of the Perinatal Education Programme in South Africa, which includes perinatal audit as part of the curriculum, may also have

contributed to sustained practice,[36 37] though it was not specifically identified or explored in this study. Low staff turnover and continuous supervision by the regional PPIP coordinators helped maintain skills and knowledge. As with other studies, participants believed they had the skills needed to fulfil their responsibilities related to perinatal audit.[38 39] Nonetheless, few people had a full a grasp on all of the steps in the audit cycle and how they linked. A clear explanation of the components of MPDSR and a list of competencies required for implementation remains elusive in the global literature.[6 40] The lack of a common understanding of MPDSR implementation, as reflected in global literature and the users of the intervention in this study,[6] may impede our ability to demonstrate effectiveness and sustainability of the intervention process, which is not a problem unique to MPDSR.[41]

While no standard minimum requirements of human and material resources for MPDSR implementation have been identified,[6] sufficient and well-managed human and material resources may contribute to sustainability.[9 34 42 43] In our study, the belief that there were sufficient resources to respond to identified actions may have reflected the Western Cape Province's rich and unique experience of health-system transformation and a relatively well-functioning overall health system.[44] Future research may want to analyse budgets and expenditures relating to perinatal audit to validate these beliefs.

Societal lens: interactions between those involved

External influences can affect the perceived legitimacy of MPDSR.[6] Our study finds that the expectation of reporting and engagement from the regional PPIP coordinators, along with other accountability mechanisms, that is, the 'ideal hospital', gave legitimacy to participate in perinatal audit, as found in other South African studies.[21–23] The clear and intentional linkages to the routine information system in region 2 added another layer of accountability, as shown in studies from India[45] and Malawi.[46] The integration of perinatal audit into other processes embedded activities into the broader frame of clinical governance rather than as a stand-alone activity, further supporting the presumption that MPSDR should be implemented along with other clinical governance practices.[6 7 47]

The belief that the intervention achieves its desired outcome, also called 'value proposition', promotes sustainability.[20 48] While many studies have shown positive outcomes from MPDSR,[6] few have also linked this to buy-in and sustainability.[6 20 49–52] Our study shows that seeing the benefits of engaging over time enabled people to buy in and become more committed to perinatal audit, ultimately improving implementation.[6]

Individual motivation to implement MPDSR is critical for sustained practice.[8 26] Our study confirms what others have found regarding intrinsic motivation related to MPDSR,[6] such as passion for maternity care and commitment to improving the quality of service delivery. Additionally, we learnt that users valued the opportunity to debrief as a team after difficult cases in a safe and trusted space. As for extrinsic motivation, people appreciated the opportunity to learn clinical skills through MPDSR.[6] Individual motivation, buy-in to MPDSR and general commitment to their jobs and quality improvement are linked.[21 51 53] Our study finds that clear tools, supportive supervision and continuous oversight from subnational actors improved individual confidence in implementation, and this aligns with the quality improvement literature.[35]

Sustainability is supported when people have a common understanding about an intervention; they value it, trust it, and use it to help build and nurture relationships.[8 54] The nature and quality of teams, including the hierarchies, mentorship, teamwork, facilitation and management, all played a role in MPDSR implementation.[6] Multidisciplinary team engagement is widely acknowledged as an enabler,[6 22 55] but less studied are the small informal teams that are core to implementation.[6] Our study confirms the importance of such teams for sustainability, especially when they operate in an environment with clear communication channels and mutual respect.[21 56] The importance and value of investing and strengthening these informal teams require more attention for those seeking to strengthen MPDSR implementation.[40]

Systems lens: things that trigger change

Local adaption of an intervention is a core element of sustainability.[39 57–59] The contextual and local adaptation of the MPDSR process has been well documented in South Africa and other LMIC settings,[6 21 60] is promoted by the WHO,[40] and aligns with broader quality improvement approaches.[35 61] Our study shows variability in implementation processes between sites, and that subdistricts continuously tailored the process to the capacity, interests, and needs of the actors involved.

Implementation culture profoundly influences MPDSR and its sustainability,[6 22 55 62 63] and multiple frameworks seek to support how to overcome the blame culture specifically.[51 63] Our study validates elements that prevent blame in MPDSR, such as strong leadership, codes of conduct, participation, openness, professionalism and self-reflection.[7 21 38 51 60 64 65] Strong leaders or 'champions' are a critical factor in MPDSR sustainability,[6 20 21] and our study goes further to identify traits and motivations of these individuals (Box 2), which align with common aspects found in good leaders or managers.[66 67] Strong, predictable and open communication systems, along with effective management, enable a work culture conducive to learning, innovation and accountability linked to perinatal aduit.[8 39 61] The observed positive implementation culture of perinatal audit in this study took time to nurture and also was part of a wider effort to strengthen quality improvement, self-reflection and joint responsibility.[23 44 68] The Western Cape Department of Health's governance approach of collaboration, integration and multisectoral engagement may have influenced the implementation of the perinatal audit programme and enabled it to benefit from and contribute to the broader health system.[44 68 69]

By focusing on explanatory factors, our study provides a deeper understanding into how and why MPDSR routinely works in the Western Cape. While our study confirms findings from other studies in South Africa,[21–23 65] the focus at the mesolevel and microlevel allowed for more understanding on how individuals and teams perceive perinatal audit implementation.

Application of the extended normalisation process theory

The adapted version of the extended normalisation process theory provided a structure to understand and explain an environment with sustained implementation.[26] May argues that his theory is useful for understanding complex implementation processes in the 'real-world' environment where they are implemented. The MPDSR process is complex, with many parts or steps, different actors at multiple levels, and the interaction between people, teams and the health system.[11] By applying a health policy and systems approach, we were able to unpack the contextual factors and underlying mechanisms that might render MPDSR to be sustained.[15 35 70] Using theory, we explored issues such as trust, credibility and hierarchies shaped by the power relations between stakeholders even when the implementation process slightly varied between cases.

For the maternal and child health community, this study demonstrates the value of using theory as a means to understand complex implementation.[12 15–19] Most studies in maternal and child health fall under the service delivery lens, measuring the tangible markers of an intervention.[10] Our study confirms that factors enabling sustained practice of MPDSR require investments in the societal and systems lenses, or intangible elements of the health system, and this will require qualitative research approaches.[6]

Limitations

This study collected information on perinatal mortality audit, which is a sensitive topic, given the nature of exploring adverse incidents by reporting data on deaths as well as reviewing the situation surrounding the death. Participants may not have shared their actual understanding of the process or experience or may have changed their behaviour during the observed review meetings. Through individual interviews, this study included the perspectives of front-line health workers, subdistrict health management and regional actors involved in the PPIP process. District management staff were not available for interviews (scheduling conflicts), and not all of clinical staff and subdistrict managers were included. Data collection stopped at the end of March 2020 due to the COVID-19 pandemic and related restrictions. This unfortunately prevented further data collection, including observation of additional meetings, and timely validation meetings with the subdistricts.

To ensure rigour and trustworthiness, triangulation of the different data sources was used to verify and validate information including field notes, observations and follow-up interviews with specific people. There was possible interpretive bias of the lead researcher (MK) due to issues of reflexivity and specific interests. However, the interviews were conducted using a semistructured interview guide and data were analysed using an implementation theory and adapted analysis coding framework with review from all authors.

CONCLUSIONS

The sustainability of MPDSR relies on societal and health systems elements as well as tangible markers of implementation and their interactions. Through case study research in four subdistricts of the Western Cape, South Africa, this study reveals the importance of contextual and local adaptation. To sustain perinatal audit, related activities were embedded into everyday work (capability), and the users valued and understood the process (contribution). Elements relating to context also played an important role, including the skills and motivations of the individuals involved (potential) as well as an enabling environment with adequate resources, data use, management and communication (capacity). This study applies an adapted implementation theory to understand sustainability highlighting the complex interplay of actors, their relationships and context. More health policy and system research will advance our understanding on how to support sustained practice of quality improvement interventions.

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Acknowledgements We are grateful for the support and facilitation received from Western Cape Department of Health, Provincial Perinatal and Neonatal Morbidity and Mortality Committee, regional Perinatal Problem Identification Programme coordinators, and the managers and staff in the four subdistricts.

Contributors MK and AG conceived and designed the study. A-MB, NR and RP served as an advisory group for the study, providing inputs throughout the process. MK conducted the data collection and analysis, with oversight from AG, and wrote the first draft of the paper with inputs from all authors. All authors edited the manuscript and approved the final version. MK and AG act as guarantor to this article.

Funding AG and MK are supported by the South African Research Chair's Initiative of the Department of Science and Technology and National Research Foundation of South Africa (grant number 82769), the South African Medical Research Council and the Countdown 2030 project funded by the Bill and Melinda Gates Foundation. Any opinion, finding and conclusion or recommendation expressed in this material is that of the authors, and funders do not accept any liability in this regard. The authors alone are responsible for the views expressed in this article and they do not necessarily represent the views, decisions or policies of the institutions with which they are affiliated.

Disclaimer The funders played no role in the design, data collection, analysis, interpretation or writing of this study.

Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, conduct, reporting or dissemination plans of this research.

Patient consent for publication Not applicable.

Ethics approval This study involves human participants and was approved by the higher degrees committee of the University if the Western Cape was given on 9 November 2018, and approval was received from the Provincial Department of Health in July 2019 (NHRD number WC_201906_006). Authorisation to conduct the study was granted from the Department of Health of the Western Cape Province. The participants gave informed consent to participate in the study before taking part.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available upon reasonable request. The data (case study reports and transcripts) are available from the corresponding author on request.

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CHAPTER 4: DISCUSSION, CONCLUSION AND RECOMMENDATIONS

4.1 Introduction

This chapter presents a summary of the findings and reflects on the key contributions of the thesis to the fields of health policy and systems research, specifically implementation research, quality improvement, and maternal, perinatal and newborn health. It also explains the study limitations, conclusions and recommendations.

This doctoral thesis sets out to identify and examine factors that influence sustained, routine practice of MPDSR in LMICs. It does this by presenting the results from three research activities, based on six papers in which the candidate led. Paper 1 develops a theoretical conceptual framework to understand and unpack factors influencing MPDSR implementation. Paper 2 reviews how these factors are described in the literature. Paper 3 develops a framework to overcome the blame culture of MPDSR. Papers 4 and 5 apply a progress-monitoring scoring tool to measure implementation at facility and sub-national levels and identify enablers and barriers of implementation. Paper 5 also identifies lessons from the uptake and sustainability of a perinatal audit programme in South Africa. Paper 6 explores why people implement sustained practice of MPDSR. Overall, the thesis demonstrates, in addition to the tangible inputs which are more often used to measure and monitor progress of MPDSR, that societal and health systems elements are core to the sustainability of MPDSR, thus revealing the complexity of the intervention process itself and the challenges of measuring implementation.

The doctoral thesis applies three theoretically based implementation research approaches to understand and explain how and why implementation sustains (Nilsen, 2015), allowing for examination of the factors influencing the intervention process across epistemologies (lenses) and analytical levels (levels) (George et al., 2019; Lennox et al., 2018). Table 6 provides an overview of these different study components, including the type of implementation science approach applied, the lenses and levels considered and the lessons from applying the approaches. Objective 1 uses a determinants framework to organise the findings from the scoping review to explore existing knowledge of factors influencing implementation of MPDSR, considering all lenses and levels of the health system (Papers 1-3). Objective 2

applies a process model to analyse the findings from a cross-sectional facility assessment in four African countries that describe the extent of MPDSR implementation at macro and meso levels, primarily through a service delivery lens (Paper 4). This same approach is applied to the case study research in South Africa (Paper 5). Objective 3 applies an implementation theory to analyse the findings from case study research in the Western Cape, South Africa that examined implementation factors considering societal and system lenses at the meso and micro levels (Paper 6). The lessons learned from applying the different approaches are incorporated throughout this chapter.

Table 6: Application of different implementation research approaches

Study component	Approach	Lenses considered	Levels considered	Lessons from applying the approach
Scoping review	Determinants framework adapted from CFIR (Damschroder et al., 2009)	All lenses	All levels	• Tailored conceptual framework provides mechanism for understanding MPDSR implementation. • Framework captures both tangible factors as well as contextual factors and their interactions. • Application of lenses and levels concept strengthens evidence synthesis and identifies gaps.
Cross-sectional facility assessment	Process model adapted from KMC progress-monitoring model (Bergh et al., 2005)	Service delivery	Meso, Macro	• Progress-monitoring tool enables a standard way to measure implementation across settings. • The tool is limited to implementation factors included (not comprehensive).
Case study	Theory – implementation theory adapted	Societal and Systems	Micro, Meso	• Implementation theory shows the complex interplay of implementation from the

	from extended NPT (May, 2013)			viewpoint of the different users involved. • Applying theory reveals important implementation factors for sustained practice. • Case study research highlights the importance of contextual and local adaptation.

Key: CFIR, Consolidated Framework for Implementation Research; KMC, Kangaroo Mother Care; NPT, Normalization Process Theory

The contribution of this doctoral thesis to the field will be discussed under three main and overlapping areas of knowledge:

1) Applying different theory-based implementation research approaches to MPDSR;

2) Identifying and describing implementation factors of a complex intervention process; and

3) Expanding our knowledge of factors influencing the sustainability of MPDSR and the measurement of progress.

4.2 Applying different theory-based approaches

For Objective 1, the determinants frameworks used in the scoping review unpack factors that influence implementation at all levels (macro, meso, and micro) and consider their interactions. The application of this conceptual framework for MPDSR implementation ensured the complexity and context of the intervention could be examined (George et al., 2018; Singh et al., 2021). The process of developing this framework (Paper 1) allowed me to learn about the wealth of existing determinants frameworks from implementation research and the range of viewpoints, levels, and components each offer (Lennox et al., 2018). I learned the value of adapting an existing determinants framework specifically to an intervention. By tailoring the framework to MPDSR implementation, our conceptual framework includes tangible (i.e. policy, meetings, skills) and contextual (i.e. organizational culture, leadership, communication) factors that influence MPDSR implementation and demonstrates how these factors interact. By incorporating the lenses and levels concept, this thesis further shows how examination of the different implementation factors may require different epistemologies (George et al., 2019). By building from the literature, developing the

framework iteratively with the research team and vetting it through a consultation process (Paper 2), I also learned that conceptual frameworks are indeed best viewed as 'living tools' which reflect both the final framework, the process and the ability for future revisions (George et al., 2018).

Objective 2 applied a process model to assess implementation by using pre-determined intervention components to determine what level of implementation was occurring at a meso and macro level across different settings. My more positivist research background drew me to this study design due to the familiarity of clear, measureable components. Indeed, this implementation research approach provides a standard way to measure implementation across settings, as well as a guide to support future implementation efforts (Nilsen, 2015), as was the intention of the original progress-monitoring tool for KMC (Bergh et al., 2005). This approach is limited to measuring only the service delivery inputs included in the tool, which is not a comprehensive list of implementation factors. It also does not take into account the quality of these inputs or the software elements, which are particularly important in facilities with sustained practice as shown in Paper 5.

For Objective 3, application of implementation theory using case study research set out to understand how and why implementation occurs at the micro and meso levels, considering the societal and system lenses. As was done with the framework developed for the scoping review, I reviewed several implementation theories and mapped constructs and dimensions to MPDSR implementation to determine best fit. Even after NPT was selected, I had to consider which version of the theory to apply and which elements within that were most relevant for guiding the research. The development of an adapted framework using NPT for MPDSR was an iterative process that required mapping the many characteristics and elements contributing to the intervention process and how these factors interact with each other and within a dynamic and complex health system. My decision to use the expanded NPT version of the theory came after the data collection process, when it was clear that context plays a fundamental role in the implementation process (May, 2013; May et al., 2014; May et al., 2016). By applying the societal and systems lenses, this part of the thesis demonstrates the complex interplay of different factors that enable the normalization of the process into daily practice.

Each study component contributes to addressing different parts of the doctoral thesis – what, how and why. I found it helpful to carefully map existing models, frameworks and theories, identify the best fit for MPDSR, and then adapt each approach to suit the specific intervention and related implementation factors. This process of reflection, application and adaptation is promoted in implementation science (Lennox et al., 2018; Powell et al., 2017) and quality improvement (Dixon-Woods et al., 2012; Zamboni et al., 2019). The iterative process of adapting the framework and theory approach throughout the research process allowed me to become more familiar with the literature as well as consider the data collected; thus reflecting the implementation realities of MPDSR as observed. Additionally, the doctoral thesis demonstrates how these different approaches can represent different lenses and levels in health policy and systems research.

4.3 Implementation factors of a complex intervention process

This doctoral thesis reveals the complexity of MPDSR as an intervention, as well as how it interacts with the health system and those actors working within it. This section of the discussion unpacks the intervention process and related implementation factors in relation to the objectives of this thesis.

Hawe (2015) considers the field of complex interventions and argues that "complexity – resulting from interactions among many component parts – is a property of both the intervention and the context (or system) into which it is placed". Likewise in the literature, quality improvement interventions have also been referred to as "implementation interventions" (Baker et al., 2018) as well as "organizational interventions" (Walshe, 2007), whereby the actors engaged are both recipients and implementers of the interventions. This thesis shows the same for MPDSR, whereby actors both contribute to the intervention process and benefit from it, and this continuous cycle supports sustained practice.

As the introduction section of this thesis highlights, MPDSR is a complex intervention process with multiple steps and different approaches, which operate at multiple levels of the health system with a diverse range of stakeholders. The WHO guidelines relating to MPDSR describe the different parts and required inputs for the intervention to be implemented, and provide sample tools, which can be adapted by countries (WHO, 2021d; WHO, 2016a; WHO, 2013). To track implementation, WHO developed a MPDSR monitoring framework to

provide basic guidance on how MPDSR should be implemented, whilst acknowledging the intervention components may vary depending on context: “the purpose of this Monitoring Framework is to provide a conceptual framework for monitoring MPDSR programmes rather than prescriptive instruction” (WHO, 2021d). The indicators in the framework comprise a checklist of activities that contribute to the intervention, such as recording each maternal and perinatal death as a notifiable event, conducting timely MPDSR steering committee meetings to review the information on the deaths at all levels, making recommendations for interventions to reduce deaths, implement recommendations and monitor progress. Though careful not to seem prescriptive, these indicators clearly promote certain components of the intervention. The literature from quality improvement as well as scale up and sustainability show that blueprints are rarely applicable to all contexts (Coles et al., 2020; Zamboni et al., 2020; George et al., 2018; Hawe, 2015; Spicer et al., 2014; Lennox et al., 2018; Kruk et al., 2018).

This doctoral thesis confirms the complexity and variability in terms of what comprises the intervention itself. For example, the case study research found that the intervention process included M&E meetings in some PPIP regions but not others (Paper 5). Additionally, the thesis shows that the perception of what is included in the intervention varies by actor (Papers 5 and 6), as stakeholders have different understandings of the intervention process and its parts because they have different roles and perspectives about its usefulness. Even where national MPDSR-related guidelines exist, a common understanding of the intervention may be lacking among the users. As also shown by others, guidelines alone are not sufficient to support and sustain implementation (Smith et al., 2017b; Grimshaw et al., 2006; Gagliardi et al., 2011; Martin Hilber et al., 2016; Smith et al., 2017c). Finally, the scoping review showed that less than a third of the identified studies (29%, 17 of 58) described all steps of the audit cycle (Paper 2), signalling that most studies are focusing on specific parts of the intervention rather than looking at how the system comes together more broadly.

For MPDSR, we need to consider that “the whole is more than the sum of its parts” (Upton et al., 2014) because the intervention goes beyond the individual steps of the audit cycle. Collectively, the activities included in MPDSR enable the health system to change through individual and collective behaviour change and through improved synergies between individuals and units working together. This thesis demonstrates that MPDSR is a social

process that evolves and adapts over time “in interaction with dynamic contexts” (George et al., 2018). Focusing on the individual parts of the intervention make it difficult to understand key factors that influence implementation of the whole intervention. It also may prevent our ability to see the intervention as a social system that can respond to the actors involved, their relationships, motivations, and capacity (May et al., 2016).

As a complex social process, there are a multitude of factors that influence implementation of MPDSR. Objective 1 presents the conceptual framework for understanding MPDSR implementation factors, which includes four domains (intervention, individual, inner setting and outer setting) with 24 constructs in total (Paper 2). Within each construct, multiple factors may exist. For example, the construct ‘Readiness for implementation’ includes tangible and immediate indicators of organizational commitment to implement, such as committees, focal persons, regularly scheduled meetings, etc. which are often highlighted in the literature as implementation factors (Papers 1 and 2). By emphasising the importance of the societal and system components required for implementation, the thesis challenges the practice of assessing implementation mainly through the service delivery or tangible inputs. This learning is consistent with the broader quality improvement literature investigating context factors influencing implementation (Coles et al., 2020; Shea et al., 2018; Zamboni et al., 2020). Additionally, this thesis underscores that MPDSR implementation occurs at multiple levels of the health system, demonstrating the need to consider all of these at each level as well as the linkages between them.

Given the importance of context in quality improvement, this thesis intentionally incorporates context throughout but most notably in Objectives 1 and 3. Objective 2 considers context when assessing national and subnational structures. *The Lancet Commission for High Quality Health Systems* emphasises the importance of context including a focus on people, the users of the system, as well as the people working within it who require a supportive organizational culture with opportunities for adaptive learning (Kruk et al., 2018). More learning on how to tailor implementation guidance to contextual needs will be required for sustaining MPDSR and may benefit from drawing on behaviour science approaches (Powell et al., 2017; Zamboni et al., 2020).

Some research gaps identified in Objective 1 are specifically investigated in Objectives 2 and

3 (Papers 4-6), including local adaption of the intervention process, which is a core element of sustainability (Spicer et al., 2018; Hawe, 2015; Zamboni et al., 2019; Chambers et al., 2013). National and sub-national structures are also investigated, including their history of origin, ownership, and the relationships among actors within and between these structures (Swartz et al., 2021; Mukinda et al., 2021; Belizán et al., 2011; Bergh et al., 2011). Objective 3 reveals the importance of micro and meso level factors, which are less studied (paper 2), such as individual motivations, team dynamics through formal and informal processes, and collective ownership and buy-in to the process.

4.4 Measuring implementation

This doctoral thesis originated as a response to the perceived limited knowledge of sub-national and facility-based MPDSR activities in Sub-Saharan Africa. Objective 1 reveals that there is a lot of knowledge about implementation activities, but no standard approach for assessing or measuring implementation across settings. Objectives 2 and 3 set out to test a standardised progress-monitoring tool to measure MPDSR implementation. Three questions around measuring MPDSR with this standard tool and the contributions of the thesis are addressed in this section:

1) Does the current tool, and related progress model, reflect the components required for pre-implementation, implementation and institutionalisation of MPDSR?
2) Is the standard tool sufficient for measuring sustained practice of MPDSR?
3) Can the tool be used to measure quality of MPDSR practice?

First, this doctoral thesis finds that the components used in the MCSP tool for MPDSR require more consideration of the inputs needed for sustained practice. As shown in Papers 4 and 5, there are many progress markers commonly not achieved in settings with sustained practice of MPDSR, either indicating that either these components are not essential, or the framing of these component needs reconsideration. While Paper 4 presents the first application of the tool for MPDSR, it has since been used by others to measure MPDSR implementation at sub-national and facility levels (WHO, 2021a; Kashililika and Moshi, 2021) and is included in the WHO's Materials to support MPDSR implementation (WHO, 2021d). The KMC progress-monitoring tool has also been adapted more broadly to measure accountability initiatives in global health (Martin Hilber et al., 2020). Given the findings from this thesis with regard to uptake of the tool, it will be beneficial to share experience and

learning from applying the MCSP tool in different contexts and to discuss any changes required to strengthen the tool to better reflect implementation inputs.

Second, this doctoral thesis demonstrates the need to go beyond a checklist approach in measuring sustained practice of MPDSR. A standardised progress-monitoring tool may help researchers and programme managers to evaluate whether MPDSR activities are taking place (Belizán et al., 2011); however, it limits measurement to a few service delivery lens components. It therefore does not provide a comprehensive overview of MPDSR practice in the 'real world' or facilitate identification of support needed to improve implementation (Hawe, 2015; May, 2013). As demonstrated in this thesis, we need both a service delivery lens as well as more societal and systems level components to understand implementation (George et al., 2019). Some of these components (i.e. the belief the intervention works and trust among those engaged) may not be easily quantified or measured as indicators. We might need to apply different methods and research approaches in order to inform the effect on people, their ownership and relationships. Exploring these components of implementation can be supported by use of theory and more in-depth studies (Walshe, 2007; Hawe, 2015).

Third, the doctoral thesis focuses on understanding sustained practice (the ability to continue at a particular level for a period of time) rather than quality of practice (ability to achieve a high standard) (Cambridge University Press, 2022); thus the tool developed for Objective 2 was designed to monitor the extent of implementation and not the quality of MPDSR practice. The overlap between these concepts may confuse users when applying the MCSP tool to strengthen implementation efforts (Mortimer et al., 2018). Even though the studies conducted at sub-national and facility levels (Papers 4-6) identified gaps in the quality of practice (e.g. minutes missing critical information and lack of feedback on audit results), the MCSP tool in the current form does not provide a mechanism to measure the quality of the progress markers. Some tangible quality measures of MPDSR implementation are included in WHO's MPDSR monitoring framework, such as percentage of cases reviewed or proportion of facilities with committees (WHO, 2021d). However, these indicators still fall short of understanding how implementation occurs. For example, committees can be in place, but if not well facilitated blame culture can emerge, which can derail the implementation process, as shown in Paper 3. The case study research (Papers 5 and 6) showed that understanding the 'how' part of implementation is fundamental to measuring the success of the intervention

process. This thesis demonstrates that sustained MPDSR components are not implemented in a vacuum but are rather one of many linked quality improvement processes. This is confirmed by WHO (WHO, 2021b) and shown by others in South Africa (Mukinda et al., 2020; Mukinda et al., 2021). This is also a common finding in quality improvement literature (Bakker et al., 2011; Hulscher et al., 2013; Raven et al., 2011).

The lack of a standard approach to measuring the quality of MPDSR and related impact, particularly the 'response' part of MPDSR, was beyond the scope of this thesis. There is a wealth of literature around measuring the success of quality improvement interventions, and there is a link between quality of practice and sustainability in health quality improvement activities (Donabedian, 1966; Kruk et al., 2018; Walshe, 2007; Zamboni et al., 2020). Specific to MPDSR, the evidence of impact on outcomes and health systems remains uncertain (Willcox et al., 2020) in all settings, partly due to variable implementation processes and different approaches to measuring the response (Gutman et al., 2022). This thesis demonstrates that as a social process, measuring success of MPDSR should go beyond measuring outputs and outcomes. The case study research (Papers 5 and 6) reveals other benefits of the perinatal audit programme in South Africa, such as health worker motivation, mutual accountability, clinical skills development, and cohesive team building, which are also needed for sustainability. These components can determine the success or failure of quality improvement interventions (Bakker et al., 2011; Donabedian, 1966; Zamboni et al., 2020; Shea et al., 2018). The lack of a common understanding of 'success' and how to measure it may impede our ability to demonstrate effectiveness of the intervention process, which is not a problem unique to MPDSR (Garcia-Elorrio et al., 2019).

4.5 Limitations

The limitations for each study can be found in their respective papers. My positionality statement in Chapter 2 presents my biases and efforts undertaken to ensure rigour and trustworthiness. Additional and overall limitations of this thesis include:

- Objective 1 was defined by the concept and context components, such as definition of MPDSR, time frame and country selection. The review only considered studies that examined national, sub-national and facility-based maternal and perinatal death audit processes, excluding other related processes e.g. social autopsies or confidential inquiries. The three researchers (myself included) who identified studies, extracted data and

analysed results were all researching MPDSR and had a vested interest in understanding the literature. Intentional efforts were made to minimise our biases and subjectivity by standardizing the process, having regular meetings to discuss the findings and enabling consultation with key stakeholder groups.

- The commentary (Paper 3) was based on work done through WHO's MPDSR TWG. Members of the working group who contributed to the thinking and content had a vested interest in the process and final product. To reduce bias around the topic, Paper 3 drew from evidence presented in the scoping review and underwent consultation with the broader MPDSR TWG and also received feedback from stakeholders working on MPDSR in Nigeria as part of a case study development process.
- For Objectives 2 and 3, the country, region and facility selection process was purposeful and the findings specific to those settings. There was bias in the selection for Objective 2 as it was linked to an ongoing project. The selection process for Objective 3 was also purposeful and was informed by various stakeholders engaged with implementation. Specific inclusion criteria were applied in both studies to minimise bias. Participants in these studies were purposefully selected based on their roles and were limited to those who were available at the time of fieldwork. Some key stakeholders were not included in these studies as they were unavailable during the data collection process, especially sub-national stakeholders.
- For Paper 4, data collection was conducted using standardised tools with different teams of assessors collecting data. As such, there may have been variation in scoring approach and interpretation of findings. Validation exercises were conducted including a presentation of preliminary findings to national level stakeholders involved in MPDSR for inputs and a draft country report shared with these stakeholders for review before finalizing. Two authors (myself included) compiled all scores independently and validated these scores based on the questionnaires and field notes. For Papers 5 and 6, data was collected by only the doctoral candidate using the same standardised tools as Paper 4, with additional tools including a semi-structured interview guide. A field report was sent to an advisory group within one week of data collection and all data triangulated during the analysis process.
- Objective 3 data collection, including the validation of preliminary results, had to be halted due to the COVID-19 pandemic. South Africa's first 'lockdown' started within one

week after completing my first round of fieldwork. Not only did the pandemic prevent additional data collection and timely feedback sessions to validate findings, but my personal experience of lockdown affected my ability to continue the thesis work at the same pace. The delay in conducting data analysis for Objective 3 may have influenced my reflexivity and memory of observations and perspectives experienced during data collection. To minimise the impact of this delay, I re-listened to interviews and my reflection voice notes, and studied my field notes and observation notes. Case study reports were shared electronically with all key stakeholders in the sub-districts, districts and province. I conducted one feedback session at one sub-district two and a half years after data collection. They appreciated the feedback (despite the delay) and validated the findings as well as providing insightful feedback that further informed Papers 5 and 6.

4.6 Conclusion

MPDSR seeks to address the greatest total number of preventable deaths along the continuum of care for women's and children's health: maternal and newborn deaths and stillbirths. Women and their babies will continue to die (currently around 4.6 million annually) from preventable causes or survive with disability unless we think differently and innovatively to implement known clinical interventions. MPDSR is a social and complex intervention process that has the potential to identify local and context specific solutions at all levels of the health system to address preventable causes of death. Attention to understanding and supporting sustained practice of MPSDR in the past decade has been uneven albeit emerging.

This doctoral thesis shows that much is already known about MPDSR implementation in LMIC settings and by applying multiple theoretically-based implementation research approaches, we can better understand and explain how and why implementation is sustained. Using an adapted determinants framework, the thesis identifies implementation factors across three health system lenses (service delivery, societal and systems) and describes them based on the literature. Though most of the literature focuses on tangible inputs (service delivery lens), there remain gaps in adequately documenting, describing and measuring them. Applying a process model using a standardised progress-monitoring scoring tool, the thesis uses pre-determined implementation factors to measure the stage of implementation at facility and sub-national levels in four African countries and five sub-districts in South Africa with long histories of implementation, revealing key components required for implementation

or lack thereof. The South African experience of scaling up and sustaining a perinatal audit programme demonstrates the importance of local adaption, integrated policies and guidelines, multiple and evolving national and subnational structures with an expanding network, and continuous efforts to use the data to demonstrate impact. Applying an adapted implementation theory, the thesis explores underlying issues that support sustainability, such as trust, credibility and hierarchies. Sustainability of a perinatal audit programme in this setting relies on the integration of activities into routine tasks (capability), clear value-add (contribution), individual and collective commitment (potential), and an enabling environment to implement (capacity).

Overall, this thesis presents the benefits of using theory-based research approaches to allow for examination of the factors influencing the intervention process across diverse epistemologies and at different levels. The sustainability of MPDSR requires consideration of societal and health systems elements as well as tangible markers of implementation and the interactions of these factors across health system levels. The global health community working on quality improvement for women's and children's health, including MPDSR, may want to review the standard approaches designed to measure sustained practice, considering the contributions of this thesis, as well as expand the use of theory-based implementation research to monitor progress.

4.7 Recommendations

The policy and programme recommendations in this section build from an original list of recommendations developed for the multi-country report for Objective 2 and submitted to MCSP (Thapa et al., 2019). The recommendations have been updated to reflect the findings from the overall thesis. Future research recommendations in this section draw on the overall findings from the thesis considering all three study components: scoping review, cross-sectional facility assessment and case study research. Some of the specific papers include recommendations specific to the study component:

- Paper 3 in this thesis presents clear recommendations through a framework for promoting a positive implementation culture of MPDSR, which can also be viewed as recommendations for sustained practice.

- Paper 5 includes 10 lessons learned from scaling up and sustain a perinatal audit programme in South Africa.
- Paper 6 includes five policy and programme implications and recommendations based on the case study research in the Western Cape, South Africa.

Overall policy and programme recommendations related to implementing MPDSR

- Leadership and ownership of MPDSR by Ministry of Health
    - Ensure proactive leadership and accountability of the MPDSR process to support implementation at national, sub-national and facility level.
    - Strengthen integration of MPDSR within the broader Ministry of Health reproductive/maternal health programme in the various health system processes, to promote ownership by the government.
    - Leverage and coordinate stakeholders and ensure Ministry of Health ownership of all data, reports and processes.
    - Assess national and sub-national funding gaps for capacity building and mentorship of MPDSR practice and allocate resources appropriate
    - Consider linking MPDSR processes and results with national financing mechanisms, such as universal health coverage schemes
    - Act now to improve MPDSR systems at all level, applying the learnings from this thesis and many resources provided by WHO and partners.
- National guidelines, whether integrated or specific to MPDSR, should clearly:
    - Outline intervention components and how they interact,
    - Embed guidance on how to follow up on the response component of the audit cycle across all levels,
    - Define roles and responsibilities of actors at various levels of the health system,
    - Explain how MPDSR aligns and links to the quality improvement efforts and health policies in the country,
    - Include forms for documenting cases under review with space for identifying action points agreed during review process, which can be adapted to sub-national and facility-level implementation, and
    - Be disseminated with related forms available at all levels of the health system.
- Data and death notification systems and data-use for decision making:

- Provide sensitization on the fact that maternal deaths are reportable events at all levels and encourage reporting even if no deaths have occurred ('zero reporting' for maternal deaths); encourage reporting on all perinatal deaths at facility-level to ensure all are captured into the health information system.
- Ensure every woman, stillborn and newborn has a complete, accurate, standardised medical record during labour, childbirth and the early postnatal period including birth and death registration (WHO, 2017b).
- Strengthen national systems to capture information on all events, i.e. births and deaths, and ensure linkage to national data systems.
- Support regular surveillance of deaths and cause of death in routine HMIS (maternal, stillbirths and neonatal) and link to monitoring of death audit findings.
- Consider linking MPDSR processes to Integrated Disease Surveillance and Response and Civil Registration and Vital Statistics systems, if relevant to context.
- Strengthen use of data for decision-making at all levels through displaying and using up-to-date routine data to inform staff about progress for maternal and newborn health as well as the improvements made by using data from death notification and audit forms.
- Consider testing and applying an electronic version of the surveillance forms for facilities with computer and network access, with support system maintained
- Ensure timely production, dissemination and review of MPDSR reports, particularly at the national and sub-national levels.

- Sub-national and facility level implementation:
  - Invest in overall good governance to support a healthy organizational culture with open and predictable communication changes, strong management and accountability mechanisms.
  - Ensure synergy and alignment of MPDSR with other quality improvement processes at all levels. Linking MPDSR to other quality improvement processes at all levels will ensure the 'response' part of the process can be implemented and will support broader health system strengthening (WHO, 2021b).
  - Integrate MPDSR-related activities into job descriptions and expectations.

- Ensure sub-national and facility level MPDSR-related mechanisms are in place, functioning and able to coordinate flow of data/information and feedback loops through review/response processes.
- Encourage health facilities that provide childbirth care services to conduct death review meetings. Frequency and types of meetings (maternal, perinatal, and near-miss) will vary by context. Regularly scheduled meetings facilitate sustained practice.
- Improve documentation of the 'response' as systematic documentation of the follow up actions can demonstrate effectiveness and encourage participation.
- Build intentional skills to prepare and facilitate death review meetings and build capacity and confidence of providers to correctly assign cause of death using standardised classification aligned with national guidelines; identify key underlying contributors to death; and define and follow-up on actionable recommendations linking MPDSR to quality improvement activities.
- Adopt a meeting code of conduct – preferably displayed – to ensure that staff know that they will not be punished or blamed during an audit meeting.
- Establish clear norms for confidentiality of families and providers and ensure that the norms are respected (e.g. verifying that no individual provider names are included in death reports and audit materials).
- Adapt national guideline into standard operating procedures, job aids and on-the-job training materials to support standardised MPDSR practice in a cost-effective and efficient manner through inclusion in ongoing in service training efforts, including mentoring and supportive supervision.
- Identify MPDSR focal persons at facility and sub-national level to promote death reviews and enable a culture of learning for mentorship of junior staff.
- Support greater engagement of sub-national stakeholders, ideally specialists and management staff, in facility death audit reviews through improved mentorship efforts.

- Community Engagement
  - Conduct more research around how and what type of reporting should be expected to communities, and at what level in different contexts (i.e. individual engagement of affected families or higher level feedback on data trends and recommendations/actions).

- Strengthen community engagement activities in order to address harmful maternal and newborn health practices through various mechanisms, such as community sensitisation, social and behaviour change communication materials and job aids for Community Health Workers.

Future research recommendations

- Conduct more research on MPDSR using health policy and systems research approaches. This should include the use of theory-based approaches, particularly to understand implementation at the micro and meso level, considering the complex interplay and change dynamics of implementation. Notably more learning about the following topics will be useful in different contexts:
  - local adaptation at all levels,
  - how MPDSR contributes to a culture of adaptive learning that supports trust, communication and collaboration over time,
  - perceptions and complexity about the intervention process, and
  - national and sub-national actors and structures at meso and micro levels to understand how these link to other quality improvement and accountability mechanisms.
- Identify and innovate ways to assess and monitor implementation of MPDSR as a whole, rather than only looking at parts of the process. How we measure implementation success needs to be reconsidered to include the perceived values of MPDSR programmes, e.g. navigating hierarchies, learning, and debriefing after an adverse case, may promote sustained practice.
- Investigate and innovate methods of measuring MPDSR implementation, including through:
  - Applying the MCSP tool in different contexts and sharing experiences and learnings from applying the tool to consider any adaptations needed for future use, and
  - Revising or expanding the tool to consider other factors that can monitor successful implementation, or quality of MPDSR practice, and testing the tool in multiple contexts.
- Investigate the impact of the COVID-19 pandemic on sustained practice of MPDSR.

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APPENDICES

Appendix 1: Supporting information for each paper

Paper	Details of supporting information and supplementary files with access weblink
Paper 1	• Supplementary files: - Frameworks considered when developing the conceptual frameworks for the scoping review - Search strategy / Concepts and search terms - Draft data extraction form Available online at https://bmjopen.bmj.com/content/9/11/e031328#DC1
Paper 2	• Supplementary file 1: Maternal and Perinatal Death Surveillance and Response Terminology • Supplementary file 2: Description of changes to the conceptual framework • Supplementary file 3: Methods - Table S3.1: Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist - Determining search terms - Table S3.2: Results from testing search terms in PubMed - Table S3.3: Components of data extraction tool - Table S3.4: Record of consultation process • Supplementary file 4: Results - Table S4.1: Characteristics of included studies (ordered by year) - Table S4.2: Summary of data points by domain, construct and lens - Table S4.3: Summary of data points by domain and lens - Table S4.4: Detailed results by construct - Table S4.5. Components of the audit cycle described Available online at https://academic.oup.com/heapol/article/36/6/955/6169403?login=true
Paper 3	• Supporting information - Table S1. Ten strategies for promoting a "No Name, No Blame and No Shame" culture and key resources with more information

	- Panel S1. Example of principles of facility-based case review meetings to ensure no blame - Panel S2. Examples of audit charter or non-disclosure agreements - Panel S3: Engaging the community to prevent blame Supporting information Available online at https://obgyn.onlinelibrary.wiley.com/action/downloadSupplement?doi=10.1111%2F1471-0528.16989&file=bjo16989-sup-0001-Supinfo.docx
Paper 4	• Supplementary files - S1 Table. Data sources and collection methods - S1 File. Brief historical summary of MPDSR processes by country - S2 Table. Mapping content of national MPDSR policy by country - S3 Table. Summary of MPDSR implementation enablers and barriers most commonly cited by facility staff in four countries - S4 Table. Ranking of progress markers by frequency across facilities - S1 Data: Database for MCSP Multicountry Assessment of MPDSR implementation Available online at https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0243722#sec027 Additional files in Appendix 2
Paper 5	• Supplementary file 1. Methods additional information • Supplementary file 2. Desk review additional information • Supplementary file 3. Policy analysis • Supplementary file 4. Provincial and subnational structures • Supplementary file 5. Case study research additional information Available in Chapter 3, Paper 5
Paper 6	• Supplementary file 1: Description of settings • Supplementary file 2: Distribution of participants and meeting observations • Supplementary file 3: Data collection tools • Supplementary file 4: Analysis framework and constructs

	• Supplementary file 5: Code of conduct example • Supplementary file 6: Example of a well-facilitated perinatal death review meeting • Supplementary file 7: Mapping of specific factors by case study Available in Chapter 3, Paper 6

Appendix 2: Data collection tools

Cross-sectional facility assessment data collection tools

MCSP Tool for Assessing Maternal and Perinatal Death Surveillance Processes in Facilities available online at: https://www.mcsprogram.org/resource/tool-for-assessing-maternal-and-perinatal-death-surveillance-processes-in-facilities/

Table A2:1: Implementation scoring scheme applying the progress-monitoring model

Implementation construct	Progress marker	Instrument items
1. Creating awareness *(2 points maximum)*	Number and type of (senior) managers involved in implementation process (in relation to size of facility)	Special persons who take specific effort in promoting death reviews including management, professionals, driving forces (contact person, meeting coordinator, other champion)
		1 point
		Clear leader(s) involved in establishing and championing death reviews (past or future)
		1 point
2. Adopting the concept *(2 points maximum)*	Decision to implement MPDSR	Knowledge of the original decision to implement death reviews. If death reviews not yet implemented: has a formal decision been taken?
		1 point
	Steering committee	Death review leadership team or steering committee established
		1 point
3. Taking ownership *(6 points maximum)*	Tools available	Data collection form available
		1 point
		Tools include cause of death

		1 point
		Tools include modifiable factors
		1 point
		Tools include place to follow up on actions taken
		1 point
	Meeting process established	Ability to describe or show documentation of meeting process
		0.5 points
		Staff meeting conduct agreement available
		0.5 points
	Resources allocated	Allocations from the hospital budget to establish death reviews
		0.5 points
		Allocations from other partners to establish death reviews
		0.5 points
4. Evidence of practice *(7 points maximum)*	Evidence of MPDSR meetings	Meeting minutes available
		1 point
		Meeting minutes include action items
		1 point
		Meeting minutes include follow up from previous meetings
		1 point
		Meeting notes respect confidentiality of staff and patients
		1 point
	Orientation for new staff	Face-to-face or written orientation to death reviews
		1 point
	MPDSR data use	Data trends displayed or shared

		2 points
5. Evidence of routine integration *(7 points maximum)*	Further evidence of practice	Evidence of change based on recommendation arising from death review findings
		3 points
	Evidence of routine MPDSR practice	Death review meetings are held at stated interval (e.g. weekly, monthly)
		1 point
	Multi-disciplinary meetings	Death review meetings include staff from different disciplines, management
		2 points
	Community linkages	Evidence of reporting findings and progress to community
		1 point
6. Evidence of sustainable practice *(6 points maximum)*	Documented results	Facility records show ongoing death review meetings for at least 1 year
		2 points
	Evidence of staff development	Plan in place to ensure all staff receive MPDSR training
		1 point
		Evidence that staff have received MPDSR training in the past year
		1 point
	Score on the first 5 constructs (divided by 12)	Score on the first 5 constructs will influence sustainability
		2 points
MAXIMUM TOTAL SCORE		*30 points*

Case study research data collection tools

1) Facility level key informant interview guide

BACKGROUND

1. What is your position, how long have you held it and what in summary are your main responsibilities?

PURPOSE OF PERINATAL DEATH REVIEW

2. Can you please describe the perinatal death review process from your perspective?
    a. *Probes:*
        i. *Audit cycle: Data collection, case preparation, M&M meeting, PPIP entry, reports, feedback meetings?*

3. Can you please explain from your perspective the purpose of the perinatal death review process?
    a. *Probe:*
        i. *Why does it exist and what problems does it aim to solve?*
    b. Follow up questions:
        i. Do you think staff agree on the purpose and benefit of using the process to prevent mortality and morbidity?

YOUR ROLE IN THE PERINATAL DEATH REVIEW PROCESS

4. What are your responsibilities relating to the implementation of the perinatal death review process?
    a. *Probe:*
        i. *What are your specific roles: administration of PPIP, preparation for M&M meetings, attending meetings, etc…*
    b. Follow up questions:
        i. How do these responsibilities relate to the rest of your work? Are the responsibilities aligned with your work?
        ii. *Is it part of your official job description?*

PURPOSE, FUNCTIONING AND RESOURCING OF PERINATAL DEATH REVIEW

5. Can you please describe your thoughts on how the process is actually working in this facility?
    a. *Probes:*
        i. *Are the correct people assigned to implement process?*
    b. Follow up questions
        i. How are the results of the perinatal death review process shared internally at facility, between levels of health system? Feedback at meetings, emails, other?

6. To what extent do you think people learn from the perinatal death review process and then modify their work in response to the feedback?
    a. Probes:
        i. Do you have any recommendations for how to improve feedback to you?
        ii. Why do you think it is worth the investment and effort as a team? As an individual?
        iii. Can you describe barriers that have prevented successful implementation? What has been done in the past to overcome some of these barriers?

7. What resources are available to sustain the process of implementing perinatal death reviews in terms of money, strategy and other resources?
    a. Probes:
        i. What funding is available to implement the actual review process? Where is it budgeted? Is this sufficient?
        ii. How do you feel supported by hospital management and district management to implement?
        iii. What training and supportive supervision do and other staff you receive? Is this sufficient?

iv. *Are there additional tools or strategies that have been implemented to achieve successful implementation and sustainability of audit programmes?*

YOUR THOUGHTS ON HOW THE TEAM IMPLEMENTS PERINATAL DEATH REVIEWS

8. Can you describe how the team is organized or works together to implement perinatal death reviews at this facility?
    a. *Probes:*
        i. *How do people on the team support one another? Give example*
        ii. *Do you think people buy into the process of perinatal death reviews - Why?*
        iii. *Are people open to new ways of working together to strengthen implementation of the perinatal death review process? Give example*
        iv. *Are the correct people assigned to the related tasks?*
    b. *Reserve for people with very specific responsibilities, e.g.*
        i. *How does the core PIPP team support each other? [Refer back to responsibilities mentioned and try to link them in probes for 'cross-over' support.]*
        ii. *What kind of support do you get from staff members who are not intensively involved with the PPIP process but who attend meetings? Do you ever need / ask for assistance or information from staff members who are not intensively involved with the PPIP process but who attend meetings? If yes [without elaboration]: ask for examples.*
    c. *For staff not very aware of processes:*
        i. *Does XXX [name of the person in ward / in-charge / nursing manager more intensively involved in PPIP processes] ever ask you for assistance or help with information or performing tasks needed for PPIP? If yes [without elaboration]: Can you describe in more detail? or Can you recall any specific occasions?*

9. Who are the key people who drive the process at this facility and can you describe how they interact with others on the team?
    a. *Probe:*
        i. *How do they manage the process?*
        ii. *How do they get others involved?*
        iii. *What motivates these "drivers" or agents of change to support sustained practice of perinatal death audits?*
        iv. *Ask for examples or specific incidents / occasions the participant can recall where the driver(s) displayed this passion or made specific statements about wanting to ensure health mother/baby outcomes. (Some drivers may have repetitive behaviours, e.g. repetition of phrases that demonstrate these. If I had been a driver, they would have recalled phrases like "If it is not recorded, it has not been done" or "Never give up!")*
        v. *What kind of leadership qualities do you think the PPIP driver(s) have? Look out for examples / events / incidents recalled – could be outside the narrow PPIP focus / more general qualities or events.*

10. I want to better understand the trust you have in yourself and in other's regarding perinatal death review. With that in mind:
    a. Two questions:
        i. How confident are you in your ability to implement your functions relating to the perinatal death review process?
        ii. How confident are you in other team member's ability to implement their responsibilities?
    b. *Probes:*
        i. *Does the process ever threaten trust between staff members? Ask for example*
        ii. *Can you give an example of a time a team member surprised you with their ability to perform or not a responsibility linked to the perinatal death review process?*

YOUR OVERALL REFLECTIONS OF PERINATAL DEATH REVIEWS IN CONTEXT

11. When you reflect about the perinatal death review process, in what ways do you think it evolved or changed over the years?
    a. *Probe:*
        i. *Membership, frequency of meetings, composition of attendees to meetings, upgrades to PPIP, use of DHIS*

12. What would be your recommendations for improving future implementation of perinatal death reviews in your facility?
    a. *Probes:*
        i. *What could be done to further facilitate implementation and sustainability? [Add a few specific more probes around "components" and "actions", e.g. the meetings, the system, the process, the software, people involved, etc]*
        i. *Are there components and/or actions about these audits, e.g. the meetings, the system, the process, the software, people involved, etc, that you would change and why?*

13. In your facility, you have the perinatal death audit, but also other death audits processes (e.g. CHIP), quality improvement processes and accountability mechanisms.
    What are the key processes or mechanisms in place that you think work best for improving the care in your facility and why? Also how does it link, if at all, with perinatal death reviews?
    a. P*robe:*
        i. *Is there value in doing perinatal death reviews in the context of these other efforts?*
        ii. *Can you describe the linkage between the perinatal death audit process and these* other initiatives? *Are there overlaps? Are they repetitive? Reinforcing? Tell me more*

14. Are there any other factors that you think drive how perinatal death reviews functions in your facility that we have not yet discussed?

LAST QUESTION

15. Are there any other issues around PPIP or death audits that you think would be useful for me to know of?

2) Key informant interview coversheet and reflections

COVERSHEET

1. Details of interview	
Unique individual ID	
Date of interview	
Time of interview	
Place of interview	
Interviewer	

2. Level		3. Respondent type	
National/Provincial		*Regional PPIP manager*	
District		*District manager*	
Sub-District		*District MWCH manager*	
Hospital		*District Quality assurance manager*	
Other		*CEO hospital*	
4. Consent to record		*Clinical staff (doctor)*	
Yes – written		*Clinical staff (nurse/midwife)*	
Yes – oral		*Information manager*	
No		*M&M leader*	
N/A		*Other (specify)*	

DEBRIEF

Step 1: Reminder:

- Upload audio into dropbox folder
- Place the consent forms in a safe location
- Complete the reflection notes
- Fill in the data management spreadsheet

Step 2: Complete descriptive field notes

A. Provide physical description of informant

B. Provide physical description of interview location (e.g. Office, skype, telephone, boardroom)

C. Provide overview of interview logistics and feasibility
    a. How feasible was it to find and interview respondents in a private setting?

    b. Were there any issues with the recording quality and notetaking?

    c. Were there any issues with the interview length? If so, what should be considered in the future?

Step 3: Complete reflective field notes

D. Reflective commentary
    a. Overall perceptions of the interviews: did it go well? Instances of excellent probing, active listening, managing time well and keeping the interview on track?

    a. Were any follow ups that the interviewer or respondent agreed to take forward? Did the informant recommend any additional individuals to interview?

b. Content of data

- Impressions regarding the intensity of involvement of informant in perinatal death reviews

- Discuss the key domains, noting *major themes emerging* from today's research and noting whether some of the domains were *skipped or not explored in depth*

E. What was the role or stance of the researcher in relation to the setting and participants?
F. Were there any moments of discomfort or discontinuity? Explain?
G. Were there any ethical dilemmas experienced?
H. Did you experience any methodological challenges and obstacles?

a. Instances of interviewer fatigue or distraction?

b. Issues with asking many yes/no questions without giving the respondents opportunities to speak at length? How could we better elicit long, descriptive, insightful responses?

c. Issues of failing to follow the guide? Going off topic? Skipping around too much rather than moving topic by topic?

I. Did you have any revelations and epiphanies?
J. Other

3) Observation coversheet and reflections

COVERSHEET

1. Details of observation	
Unique observation ID	
Date of observation	
Time of observation (HH:MM to HH:MM)	
Place of observation	
Observer	

2. Level	Name of level	3. Observation type	Name of observation
National/Provincial		*Meeting*	
District		*Facility ward*	
Sub-District		*Data collection*	
Hospital		*Other*	
Other			
4. Consent to observe			
Yes - written			
Yes - oral			
No			
N/A			

WHAT TO OBSERVE DURING THE OBSERVATION

Category	Includes	Researcher should note
Appearance of participants	Clothing, age, gender, physical appearance	Anything that might indicate membership in groups or in sub-populations of interest to the study, such as profession, social status,

		socioeconomic class, religion, or ethnicity
Verbal behavior and interactions	Who speaks to whom and for how long; who initiates interaction; languages or dialects spoken; tone of voice	Gender, age, ethnicity, and profession of speakers; dynamics of interaction
Physical behavior and gestures	What people do, who does what, who interacts with whom, who is not interacting	How people use their bodies and voices to communicate different emotions; what individuals' behaviors indicate about their feelings toward one another, their social rank, or their profession
Personal space	How close people stand to one another	What individuals' preferences concerning personal space suggest about their relationships
Human traffic	People who enter, leave, and spend time at the observation site	Where people enter and exit; how long they stay; who they are (ethnicity, age, gender); whether they are alone or accompanied; number of people
People who stand out or are silent	Identification of people who receive a lot of attention from others OR people who do not receive any attention from others	The characteristics of these individuals; what differentiates them from others; whether people consult them or they approach other people; whether they seem to be

		strangers or well known by others present

TEMPLATE TO USE FOR NOTETAKING DURING OBSERVATION

Category	Notes from observation
List of participants	
Appearance of participants	
Verbal behavior and interactions	
Physical behavior and gestures	
Personal space	
Human traffic	

People who stand out or are silent	

DEBRIEF

Step 1: Reminder:

- Scan or type up handwritten notes and place in dropbox folder
- Place the consent forms, if applicable, in a safe location
- Complete the reflection notes
- Fill in the data management spreadsheet

Step 2: Complete descriptive field notes

A. Provide physical description of the observation location (e.g. Office, skype, telephone, boardroom)
B. Provide overview of observation logistics and feasibility
    d. How feasible was it to observe (eg was there space for you, were you able to find the room/location)?
    e. Were there any issues with the notetaking?
    f. Were there any other issues? If so, what should be considered in the future?

Step 3: Complete reflective field notes

C. Reflective commentary
    a. Overall perceptions of the observation: did it go well?
    b. Were any follow ups from the observation to take forward?
    b. Content of data
        - Impressions regarding the intensity of involvement of participants in the observation item?
        - Discuss the key domains, noting *major themes emerging* from today's research and noting whether some of the domains were *skipped or not explored in depth*

D. What was the role or stance of the researcher in relation to the setting and participants?
E. Were there any moments of discomfort or discontinuity? Explain?
F. Were there any ethical dilemmas experienced?
G. Did you experience any methodological challenges and obstacles?
H. Did you have any revelations and epiphanies?
I. Other

Appendix 3: Approvals and consent forms

Ethics approval from the University of the Western Cape

UNIVERSITY of the WESTERN CAPE

OFFICE OF THE DIRECTOR: RESEARCH
RESEARCH AND INNOVATION DIVISION

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13 March 2020

Ms M Kinney
School of Public Health
Faculty of Community and Health Sciences

Ethics Reference Number:	BM18/9/4
Project Title:	Understanding implementation of quality improvements initiatives from maternal and newborn health: Exploring maternal and perinatal death audit.
Approval Period:	14 February 2020 – 14 February 2023

I hereby certify that the Biomedical Science Research Ethics Committee of the University of the Western Cape approved the scientific methodology and ethics of the above mentioned research project.

Any amendments, extension or other modifications to the protocol must be submitted to the Ethics Committee for approval.

The permission letter to conduct the research must be submitted to BMREC for recordkeeping purposes.

Please remember to submit a progress report by 30 November for the duration of the project.

The Committee must be informed of any serious adverse event and/or termination of the study.

Ms Patricia Josias
Research Ethics Committee Officer
University of the Western Cape

NHREC REGISTRATION NUMBER-130416-050

FROM HOPE TO ACTION THROUGH KNOWLEDGE.

Four country cross-sectional assessment

1) Ethics approvals for each country

The country study protocols and tools received approval from the in-country ethics committees, including the Rwanda National Ethics Committee, Tanzania's National Institute for Medical Research, the Medical Research Council of Zimbabwe, and Nigeria's National Health Research Ethics Committee. The study also received a nonhuman subjects research determination by the Johns Hopkins Bloomberg School of Public Health Institutional Review Board.

National Health Research Ethics Committee of Nigeria (NHREC)
Promoting Highest Ethical and Scientific Standards for Health Research in Nigeria

Federal Ministry of Health

NHREC Protocol Number: NHREC/01/01/2007-19/07/2016
NHREC Approval Number: NHREC/01/01/2007-16/08/2016
Date: 17th August, 2016

RE: ASSESSMENT OF MATERNAL AND PERINATAL DEATH AUDIT SYSTEMS IN HEALTH FACILITIES IN NIGERIA

Health Research Committee assigned number: NHREC/01/01/2007

Name of Principal Investigator: Prof. Oladapo Shittu
Address of Principal Investigator: Department of Obstetrics and Gyneacology
Ahmadu Bello University Teaching Hospital
Shika, Zaria, Kaduna State
Oladapo.shitu@gmail.com

Date of receipt of valid application: 19/07/2016
Date when final determination of research was made: 16/08/2016

Notice of Research Exemption

This is to inform you that the activity described in the submitted protocol/documents have been reviewed and the Health Research Ethics Committee has determined that according to the National Code for Health Research Ethics, the activity described there-in meets the criteria for exemption and is therefore approved as exempt from NHREC oversight.

The National Code for Health Research Ethics requires you to comply with all institutional guidelines, rules and regulations and with the tenets of the Code. The HREC reserves the right to conduct compliance visit your research site without previous notification.
Signed

Clement Adebamowo BMChB Hons (Jos), FWACS, FACS, DSc (Harvard)
Chairman, National Health Research Ethics Committee of Nigeria (NHREC)

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MINISTRY OF HEALTH

National Health Research Committee
Ref: NHRC/2016/PROT/024

To: **Felix Sayinzoga**
Kusum Thapa
Kate Kerber
Principle Investigators

Scientific Review Approval Notice

With reference to your request for approval of the Research Protocol entitled; "**A regional review of facility – level Maternal and Perinatal Death surveillance and Responsive (MPDSR) System in four sub-Saharan African Countries**"; We are pleased to inform you that, following a thorough review and critical analysis of your proposal (**NHRC/2016/PROT/024**), your Research Protocol has been approved by National Health Research Committee.
However,

1) Changes amendments on approach and methodology must be submitted to the NHRC for review and approval to validate the changes.
2) A submission of quarterly progress report is mandatory
3) Submission to NHRC of final results before publication is mandatory
4) Failure to fulfill the above requirements will result in termination of study

Once again National Health Research Committee appreciates your interest in research and requests you to submit this proposal to the National Ethics Committee or IRB and then share a copy of the approval letter from them.

Your final approval reference number is **NHRC/2016/PROT/024**.

Sincerely,

Dr. Parfait UWALIRAYE
Chairperson of NHRC

Date: 26/07/16

REPUBLIC OF RWANDA/REPUBLIQUE DU RWANDA

NATIONAL ETHICS COMMITTEE / COMITE NATIONAL D'ETHIQUE
Telephone: (250) 2 55 10 78 84
E-mail: info@rnecrwanda.org
Web site: www.rnecrwanda.org
Ministry of Health
P.O. Box. 84
Kigali, Rwanda.
FWA Assurance No. 00001973
IRB 00001497 of IORG0001100

November 11, 2016
No.897/RNEC/2016

Co-Principal Investigators:
Felix Sayinzoga, Kusum Thapa and Kate Kerber

Your Project title: **"A regional review of facility-level Maternal and Perinatal Death Surveillance and Response (MPDSR) Systems in four Sub-Saharan African Countries** has been evaluated by the Rwanda National Ethics committee.

Name	Institute	Involved in the decision		
		Yes	No (Reason)	
			Absent	Withdrawn from the proceeding
Dr.Jean-Baptiste MAZARATI	Biomedical Services (BIOS)		X	
Prof. Eugène RUTEMBESA	University of Rwanda	X		
Dr.Laetitia NYIRAZINYOYE		X		
Mrs. Françoise UWINGABIYE	Lawyer at RUSIZI	X		
Dr. Egide KAYITARE	University of Rwanda	X		
Sr.Domitilla MUKANTABANA	Kabgayi Nursing and Midwife school	X		
Dr. David K. TUMUSIIME	University of Rwanda		X	
Dr. Lisine TUYISENGE	Kigali Teaching Hospital	X		
Dr. Claude MUVUNYI	Biomedical Services (BIOS)	X		

After reviewing your protocol during the RNEC meeting of October 08th, 2016 where quorum was met and after revisions made on the advice of the RNEC submitted on 08th November 2016, **Approval letter has been granted to the above mentioned study.**

Please note that approval of the protocol and consent form is valid for **12 months**.
You are responsible for fulfilling the following requirements:

1. Changes, amendments, and addenda to the protocol or consent form must be submitted to the committee for review and approval, prior to activation of the changes.
2. Only approved consent forms are to be used in the enrollment of participants
3. All consent forms signed by subjects should be retained on file. The RNEC may conduct audits of all study records, and consent documentation may be part of such audits.
4. A continuing review application must be submitted to the RNEC in a timely fashion and before expiry of this approval.
5. Failure to submit a continuing review application will result in termination of the study.
6. Notify the Rwanda National Ethics committee once the study is finished.

Date of Approval: November 11, 2016
Expiration date: November 10, 2017

Sincerely,

P.O. Vice-chair
Prof. Eugène RUTEMBESA

Dr. Jean- Baptiste MAZARATI
Chairperson, Rwanda National Ethics Committee.

C.C.
- Hon. Minister of Health
- The Permanent Secretary, Ministry of Health

THE UNITED REPUBLIC OF TANZANIA

National Institute for Medical Research
3 Barack Obama Drive
P.O. Box 965
11101 Dar es Salaam
Tel: 255 22 2121400
Fax: 255 22 2121360
E-mail: ethics@nimr.or.tz

Ministry of Health, Community Development, Gender, Elderly & Children
University of Dodoma, College of Business Studies and Law
Building No 11
P.O. Box 743
40478 Dodoma

NIMR/HQ/R.8c/Vol. I/618

18th October 2018

Dr. Kusum Thapa
C/o Dr. Bruno Fokas Sunguya
Department of Community Health
Muhimbili University of Health and Allied Sciences
P.O. Box 65001
Dar es Salaam

RE: ETHICAL APPROVAL FOR PROTOCOL AMENDMENT

This letter is to confirm that your application for amendment of a protocol on the study entitled: Regional review of facility-level maternal and perinatal death surveillance and response (MPDSR) systems in 4 sub-Saharan African Countries (Thapa K et al) (Version 3.0, dated 29th May 2018) whose local investigator is Dr Bruno Fokas Sunguya of Muhimbili University of Health and Allied Sciences, Dar es Salaam, Tanzania Ref. NIMR/HQ/R.8a/Vol. IX/2421 dated 20th February 2017, has been granted ethical clearance to be conducted in Tanzania.

The approval is for the following amendment:

1. Kate Kerber a Co-PI has left Save the Children to take a new position, and will be replaced with Mary Kinney as a new Co-PI.

Approval is valid until 3rd March 2019.

Name: Prof. Yunus Daud Mgaya

Signature
CHAIRPERSON
MEDICAL RESEARCH
COORDINATING COMMITTEE

Name: Prof. Muhammad Bakari Kambi

Signature
CHIEF MEDICAL OFFICER
MINISTRY OF HEALTH, COMMUNITY DEVELOPMENT, GENDER, ELDERLY & CHILDREN

Telephone: 791792/791193
Telefax: (263) - 4 - 790715
E-mail: mrcz@mrcz.org.zw
Website: http://www.mrcz.org.zw

Medical Research Council of Zimbabwe
Josiah Tongogara / Mazoe Street
P. O. Box CY 573
Causeway
Harare

REF: MRCZ/E/156

21 November 2016

Dr. B. Madzima
Ministry of Health and Child Care
P.O. Box CY 1122
Causeway
Harare

RE: - Regional review of facility level maternal and perinatal death surveillance and response (MPDSR) systems in four sub-Saharan African countries

Thank you for the application for review of Research Activity that you submitted to the Medical Research Council of Zimbabwe (MRCZ). Please be advised that the Medical Research Council of Zimbabwe has **reviewed** and **approved** your application to conduct the above titled study.

This approval is based on the review and approval of the following documents that were submitted to MRCZ for review:-

a) Study proposal

- **APPROVAL NUMBER** **: MRCZ/E/156**
  This number should be used on all correspondence, consent forms and documents as appropriate.
  - **TYPE OF MEETING** **: EXEMPT**
  - **EFFECTIVE APPROVAL DATE** **: 21 November 2016**
  - **EXPIRATION DATE** **: 20 November 2017**

  After this date, this project may only continue upon renewal. For purposes of renewal, a progress report on a standard form obtainable from the MRCZ Offices should be submitted three months before the expiration date for continuing review.
- **SERIOUS ADVERSE EVENT REPORTING**: All serious problems having to do with subject safety must be reported to the Institutional Ethical Review Committee (IERC) as well as the MRCZ within 3 working days using standard forms obtainable from the MRCZ Offices or website.
- **MODIFICATIONS**: Prior MRCZ and IERC approval using standard forms obtainable from the MRCZ Offices is required before implementing any changes in the Protocol (including changes in the consent documents).
- **TERMINATION OF STUDY**: On termination of a study, a report has to be submitted to the MRCZ using standard forms obtainable from the MRCZ Offices or website.
- **QUESTIONS**: Please contact the MRCZ on Telephone No. (04) 791792, 791193 or by e-mail on mrcz@mrcz.org.zw

Other

- Please be reminded to send in copies of your research results for our records as well as for Health Research Database.
- You're also encouraged to submit electronic copies of your publications in peer-reviewed journals that may emanate from this study.
- The study can be conducted with verbal consent.

Yours Faithfully

.....

MRCZ SECRETARIAT
FOR CHAIRPERSON
MEDICAL RESEARCH COUNCIL OF ZIMBABWE

MEDICAL RESEARCH COUNCIL OF ZIMBABWE
2016 NOV 21
APPROVED
P.O. BOX CY 573 CAUSEWAY HARARE

JOHNS HOPKINS
BLOOMBERG SCHOOL
of PUBLIC HEALTH

Institutional Review Board Office

615 N. Wolfe Street / Room E1100
Baltimore, Maryland 21205-2179
Phone: 410-955-3193
Toll Free: 1-888-262-3242
Fax: 410-502-0584
Email: jhsph.irboffice@jhu.edu
Website: www.jhsph.edu/irb

FWA #00000287

NOT HUMAN SUBJECTS RESEARCH DETERMINATION NOTICE

Date: February 29, 2016

To: Kusum Thapa, FRCOG, MPH
Jhpiego: JH Prog for Int'l Educ. in Gyn/Ob

Re: **Project Title**: "Regional review of facility-level maternal and perinatal death surveillance and response"

The JHSPH IRB reviewed your e-mail determination request (received 1/7/16) for the above referenced project on **February 26, 2016**. We have determined that the proposed activity described in your email determination request will involve subjects who are key informants and collects expert opinions and judgments designed to elicit information from them in their professional capacity about the MPDSR system, policies and guidelines. No personal or private information about informants will be collected. Thus, the proposed activity does not qualify as human subjects research as defined by DHHS regulations 45 CFR 46.102, and does not require IRB oversight.

We anticipate that you will follow ethical practices in your interactions with individuals in the community during the course of your study. You are responsible for notifying the JHSPH IRB of any future changes that might involve human subjects and require IRB oversight.

If you have any questions regarding this action, please contact the JHSPH IRB Office at (410) 955-3193 or via email at jhsph.irboffice@jhu.edu.

ES/teb

2) Approval from MCSP to use results of multi-country assessment as part of the Doctoral Thesis

---

From: Kusum Thapa <Kusum.Thapa@jhpiego.org>
Sent: Tuesday, 02 April 2019 07:55
To: Kinney, Mary
Cc: Kathleen Hill; Johnson, Joseph (DC); Asha George
Subject: RE: Request to include MCSP's MPDSR regional assessment in Mary's PhD

Dear Mary,
Hope all is well. Thank you for your mail and mentioning that you would not be undertaking any secondary analysis of the multi-country assessment data.
"I approve you to include the paper documenting the primary outcomes of the MPDSR regional assessment as one of the papers contributing to her PhD research."
Is this ok or do you want me to send a separate mail for this. Let me know.
Best
kusum

From: Kinney, Mary [mailto:MKinney@savechildren.org]
Sent: Monday, April 01, 2019 6:23 PM
To: Kusum Thapa <Kusum.Thapa@jhpiego.org>
Cc: Kathleen Hill <Kathleen.Hill@jhpiego.org>; Joseph de Graft-Johnson <jjohnson@savechildren.org>; Asha George <asgeorge@uwc.ac.za>
Subject: Request to include MCSP's MPDSR regional assessment in Mary's PhD

Dear Kusum

I wanted to follow up on this email to confirm what was requested last year regarding including the MPDSR regional assessment main paper as one of the papers included in my PhD. As the co-PI, the only requirement is that you (the co-PI) grant me permission to include this paper among those contributing to the PhD research. Permission is just an email response eg "I approve Mary Kinney to include the paper documenting the primary outcomes of the MPDSR regional assessment as one of the papers contributing to her PhD research."

Please note that I will not be undertaking any secondary analysis of the multi-country MPDSR assessment data. The approved protocol for the full PhD research is attached which includes this study among others and verifies the paper will be the primary outcomes of the assessment.

Thanks for your continued support. Let me know if you have any questions.

All the best
Mary

3) Consent form used for data collection

USAID FROM THE AMERICAN PEOPLE

Maternal and Child Survival Program

CONSENT FOR KEY INFORMANT

Regional Review of Facility-level Maternal and Perinatal Death Surveillance and Response

Good day. My name is _____. I am representing the Maternal and Child Survival Project (MCSP). We are conducting a study of health facilities which are or previously have implemented maternal and perinatal death reviews with the goal of finding ways to improve services. This facility was selected to participate in this study in consultation with the Ministry of Health, Community Development Gender Elderly and Children.

We are conducting interviews with health facility staff and observing the documentation used for maternal and perinatal death review to learn more about how reviews are done at this facility. We would like to ask you to participate in an interview since you participate in these reviews. Your decision to participate is completely voluntary, and even if you agree to participate, you may withdraw at any time. There will not be any penalty if you decide not to participate or withdraw from this interview.

Information from this interview is confidential. We will not record the names of any patients during this assessment. Your name, and your facility's name, will not be included in the final report. There will be no direct benefit to you from participating in this study but we expect the findings will inform activities to improve services and care for women and babies overall. We are asking for your help to ensure that the information we collect is accurate.

Call Dr. Juma Nyakina or Ruth Lemwayi at **+255-22-277 1346/48** if you have questions or complaints about being in this study. If you have any questions about your rights as a research participant, or if you think you have not been treated fairly, you may call National Health Research Ethics Committee of NIMR IRB at **+255-22-2121400**

Do you have any questions about the study? Do we have your agreement to proceed?

I understand the study aims and objectives, and have decided of my free will to be interviewed.				
Name:				
Signature/Thumb Print:		Day	Month	Year

Case study research approvals

1) Western Cape Provincial Approval Letters

Western Cape Government
Health

Health Impact Assessment
Health Research sub-directorate
Health.Research@westerncape.gov.za
tel: +27 21 483 0866: fax: +27 21 483 9895
5th Floor, Norton Rose House, 8 Riebeek Street, Cape Town, 8001
www.capegateway.gov.za)

REFERENCE: WC_201906_006
ENQUIRIES: Dr Sabela Petros

University of Western Cape

Robert Sobukwe Road

Bellville

Cape Town

7530

For attention: Ms Mary Kinney, Prof Asha George

Re: **Understanding implementation of quality improvement initiatives for maternal and newborn health: exploring maternal and perinatal death audit**

Thank you for submitting your proposal to undertake the above-mentioned study. We are pleased to inform you that the department has granted you approval for your research.

Please contact the following people to assist you with any further enquiries in accessing the following sites:

Prince Albert Hopistal	**Dr Marlese Luttig**	**023 541 1730**
Mossel Bay Hospital	**Dr Paul Ruschenbaum**	**044 604 6101**
Oudtshoorn Hospital	**Dr Charles Dreyer**	**044 203 7204**

Kindly ensure that the following are adhered to:

1. Arrangements can be made with managers, providing that normal activities at requested facilities are not interrupted.
2. By being granted access to provincial health facilities, you are expressing consent to provide the department with an electronic copy of the final feedback (**annexure 9**) within

six months of completion of your project. This can be submitted to the provincial Research Co-ordinator (Health.Research@westerncape.gov.za).

3. In the event where the research project goes beyond the *estimated completion* date which was submitted, researchers are expected to complete and submit a progress report (**Annexure 8**) to the provincial Research Co-ordinator (Health.Research@westerncape.gov.za).

4. The reference number above should be quoted in all future correspondence.

Yours sincerely

Dr Melvin Moodley
Director: Health Impact Assessment
24 JUL 2019

DR M MOODLEY

DIRECTOR: HEALTH IMPACT ASSESSMENT

Western Cape Government
Health

Health Impact Assessment
Health Research sub-directorate
Health.Research@westerncape.gov.za
tel: +27 21 483 0866: fax: +27 21 483 9895
5th Floor, Norton Rose House, 8 Riebeek Street, Cape Town, 8001
www.capegateway.gov.za)

REFERENCE: WC_201906_006
ENQUIRIES: Dr Sabela Petros

University of Western Cape

Robert Sobukwe Road

Bellville

Cape Town

7530

For attention: Ms Mary Kinney, Prof Asha George

Re: **Understanding implementation of quality improvement initiatives for maternal and newborn health: exploring maternal and perinatal death audit**

Thank you for submitting your proposal to undertake the above-mentioned study. We are pleased to inform you that the department has granted you approval for your research.

Please contact the following people to assist you with any further enquiries in accessing the following sites:

Hermanus Hopistal	**Dr Erma Mostert**	**028 312 1166**
Swellendam Hospital	**Dr Jacques Du Toit**	**028 514 8400**

Kindly ensure that the following are adhered to:

1. Arrangements can be made with managers, providing that normal activities at requested facilities are not interrupted.
2. By being granted access to provincial health facilities, you are expressing consent to provide the department with an electronic copy of the final feedback (**annexure 9**) within

six months of completion of your project. This can be submitted to the provincial Research Co-ordinator (Health.Research@westerncape.gov.za).

3. In the event where the research project goes beyond the *estimated completion* date which was submitted, researchers are expected to complete and submit a progress report (**Annexure 8**) to the provincial Research Co-ordinator (Health.Research@westerncape.gov.za).

4. The reference number above should be quoted in all future correspondence.

Yours sincerely

Dr Melvin Moodley
Director: Health Impact Assessment
13 AUG 2019

DR M MOODLEY

DIRECTOR: HEALTH IMPACT ASSESSMENT

2) Case study information sheet

UNIVERSITY OF THE WESTERN CAPE

Private Bag X 17, Bellville 7535, South Africa
Tel: +27 21-959 2809 Fax: 27 21-959 2872
E-mail: soph-comm@uwc.ac.za

INFORMATION SHEET
for interview

Project Title: Understanding implementation of quality improvement initiatives for maternal and newborn health: exploring maternal and perinatal death audit

What is this study about?
This is a research project being conducted by Mary Kinney at the University of the Western Cape. We are inviting you to participate in this research project because you are involved with perinatal death audit in a selected public health facility in the Western Cape. The purpose of this research project is to understand the implementation of perinatal death audits including the Perinatal Problem Identification Program (PPIP) and the mortality and morbidity (M&M) meetings in order to identify and describe factors that enable implementation of quality improvement mechanisms.

What will I be asked to do if I agree to participate?
You will be asked to provide responses to questions during an interview on your understanding, perceptions and beliefs on your experience of perinatal death audits, including PPIP and M&M meetings, as a part of quality improvement. Each interview will take approximately 60 to 90 minutes. The interviews will be conducted at clinic or place where participant is comfortable. The summary of the questions that you will be asked is included with this form so you are aware of what information will be needed in advance.

Would my participation in this study be kept confidential?
The researchers undertake to protect your identity and the nature of your contribution. If you agree, we would like to make an audio recording of your interview so that the researcher will be able to capture your words correctly and so that your contribution will be accurately analysed for this study. To ensure your anonymity, (1) your name will not be included on the interview recordings and transcripts or data collection form; (2) a code will be placed on the transcripts and other collected data; (3) the audio recording and transcription will be securely stored on a study computer, using password-protected computer files; (4) through the use of an identification key, the researcher will be able to link your survey to your identity; (5) only the researcher will have access to the identification key, the audio recordings and the transcripts; and (6) all data will be destroyed five years after completion of the research. To ensure your confidentiality, all data will be will be locked up in a safe drawer during the study, and destroyed when the study is completed. The soft copies of the transcripts will be protected using password-protected computer files. The results of the study will be published in academic books/papers, but you will not be identified by name as the information will be either grouped together (by facility) or codes will be used to protect your identity. If there is a need to use information or views that may be identifiable they will only be used after consultation with and permission from you.

What are the risks of this research?
There may be some risks from participating in this research study. All human interactions and talking about self or others carry some amount of risks. Interviews could cause minor discomfort, making you feel uncomfortable, fearful, embarrassed or fatigued. The study contains some questions that you may

find difficult to answer as it may involve reflecting on past experiences and feelings. We will minimise such risks and act promptly to assist you if you experience any discomfort, psychological or otherwise during the process of your participation in this study. Where necessary, an appropriate referral will be made to a suitable professional for further assistance or intervention.

What are the benefits of this research?
This research is not designed to help you personally, but the results may help us learn more about how to improve perinatal death audit processes in the Western Cape. We hope that in the future, other people might benefit from this study through improved understanding of barriers to the implementation PPIP and M&M meetings. The outcomes of this study could be used to influence implementation support, training and curriculum and policies on quality improvement both here and in other countries.

Do I have to be in this research and may I stop participating at any time?
Your participation in this research is completely voluntary. You may choose not to take part at all. You may choose not to have the interview audio-taped. If you decide to participate in this research, you may stop participating at any time. If you decide not to participate in this study or if you stop participating at any time, you will not be penalized. Written permission from the health department or facility will be obtained and submitted to the UWC Biomedical Research Ethics Committee for record-keeping.

What if I have questions?
This research is being conducted by Mary Kinney of the School of Public Health at the University of the Western Cape. If you have any questions about the research study itself, please contact Mary Kinney at: University of the Western Cape, Robert Sobukwe Road, Bellville, Tel: +27 83 444 8211 E-mail: mkinney@uwc.ac.za

Should you have any questions regarding this study and your rights as a research participant or if you wish to report any problems you have experienced related to the study, please contact:

Prof Uta Lehmann
School of Public Health
Head of Department
University of the Western Cape
Private Bag X17
Bellville 7535
soph-comm@uwc.ac.za

Prof Anthea Rhoda
Dean of the Faculty of Community and Health Sciences
University of the Western Cape
Private Bag X17
Bellville 7535
chs-deansoffice@uwc.ac.za

This research has been approved by the University of the Western Cape's Research Ethics Committee.

BIOMEDICAL RESEARCH ETHICS ADMINISTRATION
Research Office
New Arts Building, C-Block, Top Floor, Room 28
University of the Western Cape, Private Bag X17, Bellville 7535

Please remove this page and keep it for your records.

3) Case study consent sheet used for data collection

UNIVERSITY OF THE WESTERN CAPE

Private Bag X 17, Bellville 7535, South Africa
Tel: +27 21-959 2809, Fax: 27 21-959 2872
E-mail: soph-comm@uwc.ac.za

INTERVIEW CONFIDENTIALITY BINDING FORM

Title of Research Project: Understanding implementation of quality improvement initiatives for maternal and newborn health: exploring maternal and perinatal death audit

The study has been described to me in language that I understand. My questions about the study have been answered. I understand what my participation will involve and I agree to participate of my own choice and free will. I understand that my identity will not be disclosed to anyone. I understand that I may withdraw from the study at any time without giving a reason and without fear of negative consequences or loss of benefits.

☐ I agree to be audiotaped during my participation in this study

☐ I do not agree to be audiotaped during my participation in this study

Participant's name……..

Participant's signature……

Date……

Should you have any questions regarding this study or wish to report any problems you have experienced related to the study, please contact:

Prof Uta Lehmann
School of Public Health
Head of Department
University of the Western Cape
Private Bag X17
Bellville 7535
soph-comm@uwc.ac.za

This research has been approved by the University of the Western Cape's Research Ethics Committee.

BIOMEDICAL RESEARCH ETHICS ADMINISTRATION
Research Office
New Arts Building, C-Block, Top Floor, Room 28
University of the Western Cape, Private Bag X17, Bellville 7535

Researcher to remove this page and keep it for records.

Appendix 4: Reviewer comments

Paper 1: Scoping review protocol

Reviewer comments available online at
https://bmjopen.bmj.com/content/bmjopen/9/11/e031328.reviewer-comments.pdf

Paper 2: Scoping review results paper

First decision letter and comments from reviewers

From: Health Policy and Planning <onbehalfof@manuscriptcentral.com>
Date: Thu, Dec 3, 2020 at 12:55 PM
Subject: Health Policy and Planning - Decision on Manuscript ID HEAPOL-2020-Sep-0776
To: <mkinney@uwc.ac.za>, <mvkinney@gmail.com>

03-Dec-2020

Dear Ms. Kinney,

Your manuscript entitled "Maternal and perinatal death surveillance and response in low and middle-income countries: a scoping review of implementation factors" (HEAPOL-2020-Sep-0776), which you submitted to Health Policy and Planning, has been reviewed. The comments of the reviewer(s) are included at the bottom of this letter.

The reviewer(s) have recommended publication, but also suggest some minor revisions to your manuscript. Therefore, I invite you to respond to the reviewer(s)' comments and revise your manuscript.

To revise your manuscript, log into https://mc.manuscriptcentral.com/heapol and enter your

Author Center, where you will find your manuscript title listed under "Manuscripts with Decisions". Under "Actions", click on "Create a Revision". Your manuscript number has been appended to denote a revision.

You will be unable to make your revisions on the originally submitted version of the manuscript. Instead, revise your manuscript using a word processing program and save it on your computer. Please also highlight the changes to your manuscript within the document by using the track changes mode in MS Word or by using bold or coloured text.

Once the revised manuscript is prepared, you can upload it and submit it through your Author Center.

Please prepare 2 copies of the revised manuscript:

File Type "Manuscript" revised manuscript-changes marked/highlighted/underlined/bold

File Type "Manuscript" revised manuscript clean version (black/white)

When submitting your revised manuscript, please respond to the comments made by the reviewers in the space provided. Use this space to document the changes you have made to the original manuscript, on a point-by-point basis. Please be as specific as possible in your response to the reviewers - this will help to expedite our processing of the revised manuscript.

IMPORTANT: Your original files are available to you when you upload your revised manuscript. Please delete any redundant files before completing the submission.

Because we are trying to facilitate timely publication of manuscripts submitted to Health Policy and Planning, your revised manuscript should be uploaded as soon as possible. If it is not possible for you to submit your revision within 2-4 weeks please contact the editorial office by return email.

Once again, thank you for submitting your manuscript to Health Policy and Planning and I look forward to receiving your revision.

Yours sincerely,
Dr. James Hargreaves
Section Editor: Evaluation and Implementation Research
Health Policy and Planning

Reviewer(s)' Comments to Author:

Reviewer: 1

Comments to the Author
Overall, a good paper that does a good job of bringing together a lot of detailed material

Abstract:
First paragraph – this need to be clearer about what the study is focussing on, and why the paper is of value.

Introduction:
1st paragraph p4 describing the framework. A bit more text is needed here to walk the reader through the overall purpose of the framework, its main elements and how the different elements link to each other, so that they do not have to refer to another paper or supplementary material to properly understand it ahead of reading the findings.

Results:
These are well presented and link well with the framework.
There is a lot of detail here. To help the reader pick up on the key points/themes/messages under each element/sub-heading could the authors could add a sentence or 2 at the beginning of each capturing the key points/themes/messages?

Discussion and conclusions:
These do a good job of capturing the main messages from the work.

Reviewer: 2

Comments to the Author

Very interesting manuscript using an implementation research framework to to analyse MPDSR. Extremely academic but useful. I have a few comments

I wonder why the authors did not use the more comprehensive definition of MDSR in the WHO 2013 MDSR technical guidance?

Will be great to include at the end of introduction the objective of the paper.

Figure S1.1 is very confusing (colour shade). Community to Global vs System lens to Service delivery lens

Page 10 line 3...rather than 'in the paper' say 'below'

Page 10 line 15-you mean 'according to' rather than 'assuming' surely the framework used for analysis is certain at thus point?

The initial part of the discussion repeats a lot of the results and can be shortened significantly.

Response to reviewer comments IN CAPS

Reviewer: 1

Overall, a good paper that does a good job of bringing together a lot of detailed material

THANK YOU FOR THIS POSITIVE FEEDBACK AND FOR TAKING THE TIME TO REVIEW THE PAPER.

Abstract:

First paragraph – this need to be clearer about what the study is focussing on, and why the paper is of value.

THANK YOU. WE HAVE REVISED THE INTRODUCTION TO CLARIFY THE FOCUS OF THE STUDY AND THE ADDED VALUE.

Introduction:

1st paragraph p4 describing the framework. A bit more text is needed here to walk the reader through the overall purpose of the framework, its main elements and how the different

elements link to each other, so that they do not have to refer to another paper or supplementary material to properly understand it ahead of reading the findings.
THANK YOU FOR THIS HELPFUL INPUT. WE HAVE ADDED A BOX FOCUSED ON THE FRAMEWORK IN ORDER TO ASSIST THE READER TO BETTER UNDERSTANDING IT WITHOUT HAVING TO LOOK IN THE SUPPLEMENTARY FILES AND/OR THE PROTOCOL PAPER.

Results:
These are well presented and link well with the framework.
There is a lot of detail here. To help the reader pick up on the key points/themes/messages under each element/sub-heading could the authors could add a sentence or 2 at the beginning of each capturing the key points/themes/messages?
THANK YOU FOR THIS SUGGESTION. WE HAVE ADDED AN INTRODUCTORY SENTENCE TO THE SECTIONS AS PROPOSED.

Discussion and conclusions:
These do a good job of capturing the main messages from the work.
THANK YOU.

Reviewer: 2

Comments to the Author
Very interesting manuscript using an implementation research framework to to analyse MPDSR. Extremely academic but useful. I have a few comments
THANK YOU FOR THIS POSITIVE FEEDBACK AND FOR TAKING THE TIME TO REVIEW THE PAPER.

I wonder why the authors did not use the more comprehensive definition of MDSR in the WHO 2013 MDSR technical guidance?
THANK YOU FOR RAISING THIS POINT. WE ACKNOWLEDE THAT THERE ARE DIFFERENT UNDERSTANDINGS AND DEFINITIONS OF “MPDSR”, ESPECIALLY AS THE INTERVENTION ITSELF HAS EVOLVED OVER TIME. TO ADDRESS YOUR COMMENT, WE HAVE ADDED IN ANOTHER SENTENCE TO DESCRIBE THE

INTERVENTION IN THE INTRODUCTION AND HAVE INCLUDED AN ADDITIONAL SUPPLEMENTARY FILE WITH A LONGER DESCRIPTION OF THE INTERVENTION, INCLUDING ITS EVOLUTION AND KEY TERMS.

Will be great to include at the end of introduction the objective of the paper.
WE HAVE REVISED THE INTRODUCTION ACCORDINGLY.

Figure S1.1 is very confusing (colour shade). Community to Global vs System lens to Service delivery lens
THANK YOU FOR NOTING THIS CONFUSION. WE HAVE REVISED THE TEXT TO CLARIFY THE DIFFERENT COLOUR SHADING.

Page 10 line 3...rather than 'in the paper' say 'below'
Page 10 line 15-you mean 'according to' rather than 'assuming' surely the framework used for analysis is certain at thus point?
THANK YOU FOR THESE SUGGESTIONS. REVISIONS HAVE BEEN MADE ACCORDINGLY.

The initial part of the discussion repeats a lot of the results and can be shortened significantly.
THANK YOU FOR RAISING THIS POINT. GIVEN THE COMPLEXITY OF THE FRAMEWORK AND THE WEALTH OF INFORMATION DRAWN FROM THE REVIEW, WE FEEL THAT THE LENGTHER DISCUSSION GIVES THE READER A CLEAR UNDERSTANDING OF THE MAIN FINDINGS IN LINE WITH THE FRAMEWORK. SINCE THE OTHER REVIEWER FOUND THE DISCUSSION SECTION HELPFUL, WE HAVE KEPT THE STRUCTURE; HOWEVER, WE REMOVED ANY CLEAR REPETITION.

Acceptance letter from editor

---------- Forwarded message ---------

From: **Health Policy and Planning** <onbehalfof@manuscriptcentral.com>

Date: Mon, Jan 25, 2021 at 1:08 PM

Subject: TITLE CHECK: Health Policy and Planning - Decision on Manuscript ID HEAPOL-2020-Sep-0776.R1

To: <mkinney@uwc.ac.za>, <mvkinney@gmail.com>

25-Jan-2021

Dear Ms. Kinney,

It is a pleasure to accept your revised manuscript entitled "Maternal and perinatal death surveillance and response in low and middle-income countries: a scoping review of implementation factors" for publication in Health Policy and Planning. The comments of the reviewer(s) on your manuscript are included at the foot of this letter.

Thank you for your fine contribution. We look forward to your continued contributions to the Journal.

Please note all papers undergo a Title Check by the Editors prior to processing to production. We will contact you if any amendments are required.

Health Policy and Planning will be published online-only from May 2020.

You will be able to access published articles and content via the Oxford Academic platform at https://academic.oup.com/heapol. When your article is published you will be sent a toll-free link to enable easy access to your article online. All print editions will be discontinued.

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Note: Members of Health Systems Global can benefit from reduced online access to the journal, as well as a 25% reduction on article processing charges (APCs). Contact production for your membership code to receive a discount on the APC.

Yours sincerely,
Dr. James Hargreaves
Section Editor: Evaluation and Implementation Research
Health Policy and Planning

Maternal and perinatal death surveillance and response (MPDSR), or any form of maternal and/or perinatal death review or audit, aims to improve health services and preempt future maternal and perinatal deaths. With expansion of MPDSR across low- and middle-income countries (LMIC), we conducted a scoping review to identify and describe implementation factors and their interactions. The review adapted an implementation framework with four domains (intervention, individual, inner and outer settings) and three cross-cutting health systems lenses (service delivery, societal and systems). Literature was sourced from six

electronic databases, online searches, and key experts. Selection criteria included studies from LMIC published in English from 2004 to July 2018 detailing factors influencing implementation of MPDSR, or any related form of MPDSR. After a systematic screening process, data for identified records were extracted and analysed through content and thematic analysis.

Of 1027 studies screened, the review focuses on 58 studies from 24 countries, primarily in Africa, that are mainly qualitative or mixed methods. The literature mostly examines implementation factors related to MPDSR as an intervention, and to its inner and outer setting, with less attention to the individuals involved. From a health systems perspective, almost half the literature focuses on the tangible inputs addressed by the service delivery lens, though these are often measured inadequately or through incomparable ways. Though less studied, the societal and health systems factors show that people and their relationships, motivations, implementation climate and ability to communicate influence implementation processes; yet their subjective experiences and relationships are inadequately explored. MPDSR implementation contributes to accountability and benefits from a culture of learning, continuous improvement and accountability, but few have studied the complex interplay and change dynamics involved. Better understanding MPDSR will require more research using health policy and systems approaches, including the use of implementation frameworks.

Reviewer(s)' Comments to Author:

Reviewer: 1

Comments to the Author
Many thanks for addressing the comments. I think the revised paper is strengthened, and have no further suggestions for improvements.

Reviewer: 2

Comments to the Author
Thanks for addressing all the comments.

Paper 3: Overcoming blame commentary

First decision letter from editor

08-Sep-2021

Dear Ms. Mary Kinney:

Thank you very much for submitting your manuscript "Overcoming blame culture: Key strategies to catalyze Maternal and Perinatal Death Surveillance and Response" for publication in BJOG: An International Journal of Obstetrics and Gynaecology. The referees and editors think your paper is likely to be publishable in BJOG, but at present we consider that it needs major changes before it can be accepted. We would like to consider your manuscript further, provided that you are willing to answer the points raised and modify your manuscript appropriately.

Referees' and any editors' comments are available below. Your revisions should address the specific issues these raise. I would be grateful if you could upload your revision within 5 weeks. If you submit your revision beyond this deadline, we reserve the right to treat it as a new submission. Please email us if you require an extension, explaining your reasons.

Preparing your revised manuscript:

1.Please prepare a response to reviewers document, including both the reviewer/editor comments and your response to each comment, itemised one by one.

2.Please indicate with 'track changes' or by 'highlighting' the alterations you have made in the manuscript, so I can identify them easily.

3.Please refer to our author resources to improve your paper: https://obgyn.onlinelibrary.wiley.com/hub/journal/14710528/author-guidelines

4.We recommend the following paper for advice on how to respond to reviewer' comments: Guyatt GH and Haynes RB. Preparing reports for publication and responding to reviewers' comments. J Clin Epidemiol.2006 Sep;59(9):900-6.

5. IMPORTANT: Please upload a completed ICMJE disclosure of interest form as supporting information (for review and online publication) for each author (NOTE: Please ensure that you select the correct file designation). The form is available to download here: http://www.icmje.org/conflicts-of-interest/

6. A maximum of 4 pages of tables and figures can appear in print (4 pages in total), and each table or figure should be no longer than 1 page. All other tables and figures can appear online only as supporting information. Please ensure that figures and tables are labelled appropriately (supporting information should be labelled Table S1, S1, Figure S1, S2 etc.)

7. You may want to produce a video abstract to promote your paper. If your paper is accepted, the video would be added to our Author Insights Vimeo channel (https://vimeo.com/album/3699866) and shared across social media. Guidance on how to produce a video abstract is available in our instructions for authors. Our submission system does not support large files. Please upload your video to a sharing site such as Dropbox or Google Drive and share the link to your upload in the cover letter of your submission. You will not be able to submit a video abstract once your paper is in production. Papers with video abstracts will be made free to view for three months.

If you do produce a video abstract can you please mention this in your response letter. Please can you also add a sentence to the revised manuscript, immediately following the references: 'This article has a Video Abstract presented by (presenting author's name).'

8.[DELETE IF NOT MAIN RESEARCH OR SYSTEMATIC REVIEW OR RCT]
Please note the following format requirements:
The word limit for the main body of text is 3500 words. The main text should be subdivided under the following subheadings:
• Introduction (to include a statement of study objective and must not exceed 400 words)
• Methods (to include discussion on core outcome sets and patient involvement, and details of study funding.)
• Results
• Discussion (to include subheadings: main findings, strengths and limitations, and

interpretation [in light of other evidence])
• Conclusion (to include practical and research recommendations). Both discussion and conclusion should not exceed 1200 words.

Please note, we expect the GRIPP2-SF checklist to be uploaded as supplementary material. More information on our expectations for reporting patient and public involvement is available here: https://obgyn.onlinelibrary.wiley.com/hub/journal/14710528/editorial-policies-for-authors.

If patients were not involved in the development of the research this should be stated in the methods section. If a core outcome set has not been used in the research this should also be mentioned.

This journal offers a number of license options for published papers; information about this is available here: https://authorservices.wiley.com/author-resources/Journal-Authors/licensing/index.html. The submitting author has confirmed that all co-authors have the necessary rights to grant in the submission, including in light of each co-author's funder policies. If any author's funder has a policy that restricts which kinds of license they can sign, for example if the funder is a member of Coalition S, please make sure the submitting author is aware.

There are two ways to submit your revised manuscript. You may use the link below to submit your revision online with no need to enter log in details:

*** PLEASE NOTE: This is a two-step process. After clicking on the link, you will be directed to a webpage to confirm. ***

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Alternatively log into https://mc.manuscriptcentral.com/bjog and enter your Author Center. You will find your manuscript title listed under "Manuscripts with Decisions." Under "Actions," click on "Create a Revision." Your manuscript number has been appended to denote a revision. Please DO NOT upload your revised manuscripts as a new submission.

Once the revised manuscript is prepared, you can upload it and submit it through your Author Center.

IMPORTANT: Your original files are available to you when you upload your revised manuscript. Please delete any redundant files before completing the submission.

Once again, thank you for submitting your manuscript to BJOG: An International Journal of Obstetrics & Gynaecology and I look forward to receiving your revision.

Sincerely,

Dr. Robert Silver (USA)
Scientific Editor, BJOG: An International Journal of Obstetrics & Gynaecology

Reviewer comments and author responses IN CAPS

Reviewer: 1
Comments to the Author
The authors are to be thanked for highlighting very clearly the importance of MPDSR and for identifying strategies to improve its implementation. While much of the information is not new, this commentary pulls together critical information in a way that will useful to clinicians and administrators.

RESPONSE: THANK YOU FOR REVIEWING THE COMMENTARY AND PROVIDING VERY HELPFUL FEEDBACK. WE ALSO HOPE IT WILL BE USEFUL TO THOSE WHO ARE SEEKING TO IMPROVE OR INITIATE THE INTERVENTION PROCESS.

One strong recommendation to strengthen this commentary is for the authors to create 1-3 short case studies (or identify a reference with useful case studies) highlighting common issues/challenges for MPDSR and ways that audit committees have addressed them.

RESPONSE: THANK YOU FOR THIS SUGGESTION. WE HAVE ADDED THREE CASE STUDIES. THE WORD AND REFERENCE LIMITATION OF A COMMENTARY RESTRICTED OUR ABILITY TO ADD MORE EXAMPLES FROM THE LITERATURE, WHICH IS WHY WE HAVE INCLUDED THE TABLE IN THE SUPPLEMENTARY FILE.

A more minor suggestion relates to Lines 15-16 which states that "A recent review found that the organizational climate and culture relating to MPDSR, including elements of blame, is a major challenge to effective MPDSR." This sentence seems to imply that this 'recent' review has identified these problems, but these issues, particularly the issue of 'blame', has been recognized as a major problem for many years. It is suggested that the authors acknowledge the long history of trying to address this serious impediment to successful implementation of MPDSR and to highlight any truly new and original points or strategies made in this commentary.

RESPONSE: THIS IS AN IMPORTANT AND VALID POINT. WE HAVE REVISED THE TEXT TO CLARIFY THE LONG HISTORY OF THIS IMPLEMENTATION BARRIER AND THE VARIOUS EFFORTS UNDERTAKEN TO ADDRESS IT. THE COMMENTARY BUILDS ON OTHER'S WORK, SUCH AS LEWIS, AND ALTHOUGH THE FRAMEWORK IS ADAPTED, IT IS UNIQUE TO THIS PIECE OF WORK DRAWING ON THE LITERATURE FROM THE PAST 15 YEARS OF IMPLEMENTATION.

Another minor comment is that lines 39-40 contain a very awkward sentence and it is suggested that the punctuation be revised to allow for a smoother and more coherent read

RESPONSE: THANK YOU. THIS HAS BEEN REVISED.

Reviewer: 2

Comments to the Author

This is a very helpful and well-written article that gives good advice on how to avoid the blame culture and promote continuous learning. It manages to avoid the temptation of using

management jargon and is very clear. If it were possible, it would be strengthened with some examples of good practice that demonstrate the principles in the paper.

RESPONSE: THANK YOU FOR TAKING TIME TO REVIEW THE COMMENTARY, AND WE ARE GLAD YOU FOUND IT USEFUL. WE HAVE ADDED CASE STUDIES AS PROPOSED TO SHOW EXAMPLES OF THE STRATEGIES PROPOSED.

Reviewer: 3
Comments to the Author
The authors summarise the work of the Global MPDSR Technical Working Group to improve maternal and newborn health in low and middle income countries under the manuscript type "commentary". The authors insist on the need to overcome the blame culture, which is very common in the medical field. This is a very important subject that needs to be highlighted regularly to hopefully change attitudes.

RESPONSE: THANK YOU FOR REVIEWING THE COMMENTARY AND PROVIDING THIS HELPFUL FEEDBACK.

On page 3, line 4, the authors indicate that maternal and neonatal mortality increased during the pandemic. This is true for developing countries but does not show the considerable disparity between high-resource and low-resource settings. It might be wise for the authors to make it clear in the opening sentences of their introduction that their Commentary is directed at low-and middle-income countries.

RESPONSE: THANK YOU FOR RAISING THIS POINT. WE HAVE MADE THE PROPOSED REVISION.

On page 4, line 55, there is a typo with a comma followed by a full stop.

RESPONSE: CORRECTED.

In the introduction, the authors emphasise the emotional exhaustion of health care workers exacerbated by the covid-19 pandemic. The authors refer to burn out, one of the

characteristics of which is the depersonalisation, the lack of empathy of health care workers towards mothers, but possibly also of health care workers towards other health care workers. This emotional exhaustion could therefore contribute to the blame culture. The authors insist on this negative aspect of the pandemic which is reflected in their conclusion. However, the 10 keys proposed do not seem to me to echo the consideration of the emotional exhaustion of health care workers. Can you please clarify how this aspect is taken into account in your recommendations?

RESPONSE: THANK YOU FOR RAISING THIS POINT. WE FULLY AGREE WITH YOUR POINT ABOUT THE IMPORTANCE OF "CARING FOR THE CARERS" AND THE IMPACT THIS CAN HAVE ON MPDSR IMPLEMENTATION AND BLAME CULTURE. UNFORTUNATELY, WE ONLY HAVE ANECDOTAL EXPERIENCE ABOUT THE IMPACTS OF THE COVID-19 PANDEMIC ON MPDSR IMPLEMENTATION AS WELL AS THE IMPACT OF EMOTIONAL EXHAUSTION OF HEALTH WORKERS ON THE RELATED BLAME CULTURE. NONETHELESS, EMOTIONAL EXHAUSTION HAPPENS EVERY DAY, ESPECIALLY IN LOW RESOURCE SETTINGS WHERE THERE IS NOT ENOUGH EQUIPMENT MEDICINES, DIAGNOSTIC TOOLS AND NO ONE TO ASK OR HELP WITH CASES THAT ARE VERY ADVANCED AND DEATH OCCURS WITHOUT THE HEALTH WORKER BEING ABLE TO IMPACT. THIS CAN CREATE A TRAUMA IN THE HEALTH WORKER WITH BLAME AS A CONSEQUENCE. SINCE WE FULLY AGREE WITH THE REVIEWERS COMMENT, WE HAVE ADDED SOME CONTENT TO THE STRATEGIES "ENABLING ENVIRONMENT" AND "NURTURE TEAM RELATIONSHIP" TO ADDRESS THIS POINT.

On page 6, line 98, the authors recommend linking MPDSR with routine monitoring systems in order to reducing duplicative data capture. While it is pragmatic to increase the efficiency of the system, cross-sourcing is still a guarantee of quality by reducing the number of data losses.

RESPONSE: THANK YOU FOR THIS COMMENT. WE HAVE CORRECTED THE LANGUAGE AS WE DID NOT MEAN THAT THESE SYSTEMS SHOULD BE INTEGRATED BUT RATHER THE PROCESSES AROUND DATA COLLECTION AND

USE HARMONIZED IN ORDER TO PROMOTE EFFICIENCY AS WELL AS ENABLING CROSS-SOURCE CHECKING FOR QUALITY.

On page 8, line 10, the authors talk about engaging "communities" but it is not clear to me whether the authors mean the community of health care workers, the community of care recipients, or both.
The references available in the supporting information refer systematically and solely to the writings of Animesh Biswas on social autopsies in India. In any case, depending on the health system, it is likely that the health care worker community will only be able to benefit from the integration of the cared-for community (the population) into the review of maternal deaths once the culture of safety in health care (and the avoidance of the culture of blame) is well implemented within all the members of the health care worker community.

RESPONSE: WE HAVE ADDED IN SOME ADDITIONAL REFERENCES FROM OTHER SETTINGS AROUND COMMUNITY ENGAGEMENT IN MPDSR.

Apart from these comments which lead more to some eventual clarifications than to modifications, I reiterate my very favourable opinion towards the publication of these recommendations for the abolition of the blame culture in healthcare.

RESPONSE: THANK YOU.

Editors comments:
Please note how this paper differs and adds new information to what is published and on line for WHO with many points also highlighted in a BJOG supplement on Quality of Care.

RESPONSE: WE HAVE ENSURED CLEAR LINKAGE TO THE BJOG SUPPLEMENT ON QUALITY OF CARE FROM 2014 TO SHOW THAT THIS FRAMEWORK SEEKS TO BUILD FROM THAT WORK BY PROVIDING CLEAR STRATEGIES FOR IMPLEMENTATION. THIS COMMENTARY COMPLEMENTS THE WHO MATERIALS ON MPDSR IMPLEMENTATION BY SYNTHESIZING THE MATERIALS FOR THE READERS OF A JOURNAL COMMENTARY AND REFLECTING ON THE

IMPLEMENTATION OF THESE STRATEGIES DURING THIS TIME OF COVID – WHICH WAS NOT CONSIDERED FOR THE WHO MATERIALS.

Please add case studies as examples as suggested by the reviewers.

RESPONSE: THANK YOU. WE HAVE ADDED THESE AS FIGURES AS DIRECTED BY YOUR EDITORIAL OFFICE SINCE THE JOURNAL DOES NOT ALLOW FOR "BOXES" OR "PANELS".

Acceptance letter from editor

On Sun, Oct 17, 2021 at 6:55 PM BJOG: An International Journal of Obstetrics & Gynaecology <onbehalfof@manuscriptcentral.com> wrote:

17-Oct-2021

Dear Ms. Mary Kinney:

I am pleased to accept your manuscript "Overcoming blame culture: Key strategies to catalyze Maternal and Perinatal Death Surveillance and Response" for publication in BJOG: An International Journal of Obstetrics and Gynaecology. We may make some minor editorial changes in wording, but otherwise plan to publish it as submitted.

Your article cannot be published until you have signed the appropriate license agreement. Within the next few days you will receive an email from Wiley's Author Services system which will ask you to log in and will present you with the appropriate licence for completion.

This journal offers a number of license options for published papers; information about this is available here: https://authorservices.wiley.com/author-resources/Journal-Authors/licensing/index.html. The submitting author has confirmed that all co-authors have the necessary rights to grant in the submission, including in light of each co-author's funder policies. If any author's funder has a policy that restricts which kinds of license they can sign, for example if the funder is a member of Coalition S, please make sure the submitting author is aware.

What happens next?

The accepted version of your manuscript will be available online very shortly. Accepted Articles are unedited, preprint manuscripts that are published online within a week after final acceptance. Accepted Articles are citable using their DOI number.

Your article will also enter the full production process, which includes copy-editing and typesetting. You will receive a proof of your article for final corrections.

It is possible that our press team will approach you to promote your research to the media. They will seek short quotes about your research to be incorporated into a press release and we would encourage you to assist in this request. BJOG research tends to get wide coverage in the national and international media and your help is welcome. If you have any personal media contacts or suggestions on who to approach in your local media, please do inform the BJOG editorial office (bjog@RCOG.ORG.UK). We must also be informed in advance if your institution's press office wishes to publicise your study. Please note, all BJOG papers are strictly embargoed until the day of online publication. BJOG papers selected for press release will not be published as an 'Accepted Article' as described above.

We are committed to sharing over 90% of our content via social media. We encourage you to engage with @BJOGTweets and our Facebook page (www.facebook.com/BJOGJournal) and help us disseminate your research to as wide an audience as possible. If you would prefer to post your own coverage, please do mention us.

Please read this Search Engine Optimization tip sheet for guidance on getting your research discoverable: http://www.wiley.com/legacy/wileyblackwell/pdf/SEOforAuthorsLINKSrev.pdf. Wiley's Author Services system comes with a wealth of resources, including a feature for you to nominate up to 10 specialists to receive a publication notice and invitation to view the PDF free; this feature is designed to drive readership and citations to your article. You will also be able to sign up to Kudos (https://www.growkudos.com/), an award winning platform that allows you to promote your paper further.

Again, congratulations on this good work and many thanks for your interest in the journal!

Sincerely,
Dr. Robert Silver (USA)
Scientific Editor, BJOG: An International Journal of Obstetrics & Gynaecology

Paper 4: Multi-country facility assessment results paper

Available online at
https://journals.plos.org/plosone/article/peerReview?id=10.1371/journal.pone.0243722

Original Submission January 7, 2020

First decision letter from editor

April 29, 2020
PONE-D-20-00503

"It might be a statistic to me, but every death matters.": An assessment of facility-level maternal and perinatal death surveillance and response systems in four sub-Saharan African countries

PLOS ONE

Dear Ms Kinney,

Thank you for submitting your manuscript to PLOS ONE. After careful consideration, we feel that it has merit but does not fully meet PLOS ONE's publication criteria as it currently stands. Therefore, we invite you to submit a revised version of the manuscript that addresses the points raised during the review process.

We would appreciate receiving your revised manuscript by Jun 12 2020 11:59PM. When you are ready to submit your revision, log on to https://www.editorialmanager.com/pone/ and select the 'Submissions Needing Revision' folder to locate your manuscript file.

If you would like to make changes to your financial disclosure, please include your updated statement in your cover letter.

To enhance the reproducibility of your results, we recommend that if applicable you deposit

your laboratory protocols in protocols.io, where a protocol can be assigned its own identifier (DOI) such that it can be cited independently in the future. For instructions see: http://journals.plos.org/plosone/s/submission-guidelines#loc-laboratory-protocols

Please include the following items when submitting your revised manuscript:

A rebuttal letter that responds to each point raised by the academic editor and reviewer(s). This letter should be uploaded as separate file and labeled 'Response to Reviewers'.
A marked-up copy of your manuscript that highlights changes made to the original version. This file should be uploaded as separate file and labeled 'Revised Manuscript with Track Changes'.
An unmarked version of your revised paper without tracked changes. This file should be uploaded as separate file and labeled 'Manuscript'.
Please note while forming your response, if your article is accepted, you may have the opportunity to make the peer review history publicly available. The record will include editor decision letters (with reviews) and your responses to reviewer comments. If eligible, we will contact you to opt in or out.

We look forward to receiving your revised manuscript.

Kind regards,
Natasha McDonald
Associate Editor
PLOS ONE

Reviewer comments and author responses IN CAPS

REVIEWER #1

Assessing the implementation of the maternal and perinatal death surveillance and response system (MPDSR) is a relevant research topic. Indeed, there are very few serious evaluations of the implementation of such MPDSR systems. The strength of this paper, apart that it is beautifully written, is the trial to set up a standardized assessment tool based on scores for

each of the six stages of implementation defined by the authors. The weaknesses are linked to the biased sample of facilities investigated, the debatable choice of markers in the scores, the small scope of the literature reviewed for the topic, and the relative lack of investigation of the factors enabling the implementation or the barriers. Nevertheless, I found the paper sufficiently interesting to be published. I have a few suggestions below.

THANK YOU FOR YOUR HELPFUL REVIEW. WE HAVE ADDRESSED THE WEAKNESSES MENTIONED HERE IN THE RESPONSES BELOW AND IN THE MANUSCRIPT.

Detailed comments

The introduction is excellent: well organized and well written. THANK YOU.

Method section

The sample is purposive, depending on the presence of US Agency for International Development (USAID)'s Maternal and Child Survival Program (MCSP) staff. This is of course a source of two possible biases: 1) a choice of facilities made on the basis of a specific program favouring MPDSR and 2) interviews led by people who have an interest in making the program a success (there was no allusion to how the researchers dealt with reflexivity, preconceptions and metapositions (Malterud K. 2001. Qualitative research: standards, challenges, and guidelines. Lancet 358: 483–88)).

THANK YOU FOR NOTING THE ISSUE OF REFLEXIVITY AND THE IMPORTANCE OF ACKNOWLEDGING ANY POTENTIAL BIASES. WE HAVE INCLUDED A STATEMENT IN THE LIMITATION SECTION NOTING THESE POTENTIAL BIASES.

The authors described the number of facilities selected in each area but did not provide the total number of facilities in these areas. That would give some perspective.

THANK YOU FOR THIS RECOMMENDATION. GIVEN THAT THE FACILITIES IN THE ASSESSMENT WERE SELECTED FROM THOSE PROVIDING CHILDBIRTH

SERVICES AND WITH CURRENT OR RECENT EXPERIENCE CONDUCTING MATERNAL AND/OR PERINATAL DEATH AUDITS, THE TOTAL NUMBER OF FACILITIES IN THESE AREAS IS NOT A TRUE REPRESENTATION OF WHERE MPDSR MIGHT BE MOST USEFUL. WE EMPHASIZE IN THE TEXT THAT THE FACILITY SAMPLE IS IN NO WAY REPRESENTATIVE IN ANY COUNTRY AND INCLUDING ALL FACILITIES MIGHT IMPLY THAT WE WERE TRYING TO DO A NATIONAL SAMPLE AND COULD BE MISLEADING. ADDITIONALLY, PROVIDING THE TOTAL NUMBER OF FACILITIES WOULD BE A CHALLENGE AND COULD BE MISREPRESENTATIVE FOR THE FOLLOWING REASONS:

1) WE DO NOT KNOW THE DENOMINATOR OF FACILITIES CONDUCTING MPDSR PROCESSES IN EACH ADMINISTRATIVE UNIT FROM WHICH WE SAMPLED FACILITIES.

2) DEFINING THE SMALLEST "ADMINISTRATIVE UNIT" CONSISTENTLY (E.G. SUB-DISTRICT, DISTRICT, REGION) COULD BE QUITE CHALLENGING GIVEN THE MIX OF HOSPITALS AND HEALTH CENTERS IN 3 OF THE 4 COUNTRIES AND THE INCLUSION OF HOSPITALS ONLY IN ZIMBABWE.

There is a mixture of health centres and hospitals in the sample. Why health centres? Do they all implement death reviews? Are health centres equipped to deal with severe morbidity? Are these patients not transferred to hospitals?

THANK YOU FOR RAISING THIS POINT. IN SOME COUNTRIES, HEALTH CENTRES CONDUCT DEATH REVIEWS, DEPENDING ON THEIR SIZE AND CAPACITY. IN THIS STUDY, ALL FACILITIES HAD TO MEET THE BASIC CRITERIA OF PROVISION OF CHILDBIRTH SERVICES, INCLUDING REFERRAL- AND PRIMARY-LEVEL FACILITIES, AND CURRENT OR RECENT EXPERIENCE CONDUCTING MATERNAL AND/OR PERINATAL DEATH AUDITS. HEALTH CENTRES IN THIS STUDY EXPERIENCED MATERNAL AND PERINATAL DEATHS, AND BREAKDOWNS IN REFERRAL SYSTEMS THAT COULD BE POTENTIALLY IDENTIFIED AND ADDRESSED THROUGH MPDSR.

WE DID LOOK AT THE DATA BETWEEN HEALTH CENTRES AND HOSPITALS. IN NIGERIA, ONLY THE FACILITIES WITH A HIGHER VOLUME OF REFERRAL CASES DEMONSTRATED EVIDENCE OF PRACTICE OR ABOVE. THE VOLUME OF FACILITY BIRTHS WAS NOT ASSOCIATED WITH A FACILITY'S MPDSR IMPLEMENTATION PROGRESS SCORE IN RWANDA AND ZIMBABWE. HIGHER-VOLUME REFERRAL FACILITIES IN TANZANIA SCORED HIGHER THAN HEALTH CENTRES IN GENERAL, BUT FEW HOSPITALS WERE FOLLOWING THE NATIONAL GUIDELINE COMPLETELY, INCLUDING WITH RESPECT TO INFORMATION FLOW TO OTHER LEVELS AND LITTLE COMMUNITY FOLLOW-UP. FURTHER RESEARCH IS NEEDED TO EXAMINE THE VALUE OF DEATH REVIEWS AT HEALTH CENTRES, WHICH WAS BEYOND THE SCOPE OF THIS STUDY. WE HAD ADDED THIS POINT IN THE LIMITATIONS SECTION.

In Rwanda, no stakeholder was interviewed. Why? Is it really only a question of availability?

ALL OF THE NATIONAL AND SUB-NATIONAL STAKEHOLDERS WERE ENGAGED IN A MEETING THE WEEK OF THE ASSESSMENT AND NOT AVAILABLE FOR INTERVIEWS. WE HAVE ADDED THIS TO THE LIMITATION SECTION.

Table 3 (and Figure 3) is quite interesting since the authors described the rationale or their hypotheses on which the markers are based, and allows some discussion. Did they try a sensitivity analysis to estimate the effect of modifying a score?

WE HAVE ADDED IN TEXT AROUND THE TOOL DEVELOPMENT IN THE METHODS SECTION AS WELL AS INCLUDED LEARNINGS ABOUT THE USE OF THE TOOL IN THE DISCUSSION SECTION. AS PART OF THE PROCESS OF DEVELOPMENT, WE ASSESSED THE FACE VALIDITY BY GROUNDING THE CONSTRUCTS IN THE LITERATURE ON THE TOPIC, ENGAGING EXPERTS IN THE DEVELOPMENT OF THE CRITERIA AND CONSULTING GLOBAL AND NATIONAL GUIDELINES. ASSESSING OTHER FORMS OF VALIDITY WERE BEYOND OUR SCOPE. THIS TOOL SOUGHT TO CLASSIFY PROGRESS MARKERS OF MPDSR PROCESSES. ITS SENSITIVITY IN BEING ABLE TO CORRECTLY IDENTIFY A FACILITY'S ABILITY TO DEMONSTRATE SPECIFIC IMPLEMENTATION

MARKERS WAS NOT FORMALLY ASSESSED IN COMPARISON TO ALTERNATIVE ASSESSMENT TOOLS. DIFFERENCES IN THE APPLICATION OF THE TOOL BY VARIED TYPOLOGIES OF USERS IS NOTED IN THE LIMITATION SECTION, AS A CONCERN IN FUTURE USE.

Line 140: how many assessors for the same facility? Did the authors find any discrepancies between the data collectors?

WE HAVE ADDED TO THE TEXT THE SIZE OF THE ASSESSMENT TEAMS FOR EACH FACILITY, WHICH VARIED FROM 2-5 PEOPLE. THE DATA COLLECTION TOOL ITSELF INCLUDES A SECTION FOR DATA COLLECTORS TO REFLECT ON FINDINGS, AS SHOWN IN THE APPENDIX. THE DATA COLLECTORS USED THIS REFLECTION PROCESS TO GUIDE THE DISCUSSION AROUND ANY DISCREPANCIES AND COME TO CONSENSUS ON THE FINDINGS. THERE IS A STATEMENT IN THE LIMITATIONS REGARDING POSSIBLE VARIABILITY ACROSS ASSESSMENT TEAMS.

Line 146: the fact that, facilities with a score of less than 10 points were excluded clearly means that only those facilities with some success in implementation are investigated. What is the reason explaining why these facilities did not reach the minimum score of 10 points?

THANK YOU FOR RAISING THIS POINT; YOUR UNDERSTANDING OF WHY THESE FACILITIES WERE EXCLUDED IS CORRECT. THE ORIGINAL SAMPLE OF 55 WAS REDUCED TO INCLUDE FACILITIES AT THE IMPLEMENTATION PHASE FROM WHICH LESSONS COULD BE LEARNED ABOUT THE ACTUAL PRACTICE OF MPDSR IN FACILITIES. THE REASONS EXPLAINING WHY THESE FACILITIES DID NOT ATTAIN THE MINIMUM IMPLEMENTATION SCORE OF 10 POINTS WAS NOT INVESTIGATED BEYOND WHAT WE ASSESSED FOR IMPLEMENTATION FACTORS.

What is then the meaning of an average score (very precise!) calculated only for the best implementers (line 173)?

THE AVERAGE SCORE DEMONSTRATES THE AVERAGE LEVEL OF IMPLEMENTATION ACROSS ALL THE FACILITIES DEMONSTRATING EVIDENCE OF PRACTICE AT THE TIME OF THE ASSESSMENT (I.E. THOSE THAT SCORED MORE THAN 10 POINTS) INCLUDED IN THE FINAL SAMPLE AND THEN ASSESSED FOR IMPLEMENTATION FACTORS.

OUR STUDY FACILITY SELECTION CRITERIA SPECIFIED THAT FACILITIES NEEDED TO MEET A MINIMUM STAGE OF IMPLEMENTATION ("EVIDENCE OF PRACTICE"), AND OUR ANALYSIS INCLUDED ONLY THESE FACILITIES. THUS THE AVERAGE SCORE MEASURES THE SPECIFIC STAGE OF IMPLEMENTATION, ON AVERAGE, ACROSS 3 PROGRESSIVE "IMPLEMENTATION STAGES" IN FACILITIES THAT DEMONSTRATED A MINIMUM STAGE OF IMPLEMENTATION.

GIVEN OUR STUDY'S FOCUS ON ASSESSING FACTORS RELATED TO IMPLEMENTATION OF MPDSR PROCESSES (AS CONTRASTED TO "PRE-IMPLEMENTATION" READINESS FACTORS) WE DID NOT CONDUCT ANY ANALYSIS OF FACILITIES THAT DID NOT MEET A MINIMUM STAGE OF IMPLEMENTATION AS SPECIFIED IN OUR SELECTION CRITERIA ("EVIDENCE OF PRACTICE").

I wonder why in the progress markers there was nothing about the coverage of deaths reviewed, i.e. the number of maternal deaths reviewed on the total of maternal deaths during the period and the same for perinatal deaths. This may be a well standardized indicator useful for comparing facilities if the policy is to review each case, of course. A second indicator would be the capacity of a facility to stop/prevent the problems/mismanagement that contributed to the deaths. THANK YOU FOR NOTING THESE IMPORTANT POINTS. ONE OF THE REASONS THAT COVERAGE WAS NOT INCLUDED AS AN INDICATOR IS BECAUSE NOT ALL SETTINGS HAD A MANDATE TO REVIEW 100% OF DEATHS THROUGH THE MPDSR PROCESS. WE AGREE THAT FURTHER WORK NEEDS TO BE DONE TO STRENGTHEN THIS MEASUREMENT PROCESS INCLUDING CONSIDERATION AROUND COVERAGE AS WELL AS THE FACILITY'S ABILITY TO MANAGE PROBLEMS THAT CONTRIBUTE TO DEATHS. WE HAVE ADDED A SECTION TO THE DISCUSSION FOCUSING ON THE

LEARNINGS FROM THE DEVELOPMENT AND TESTING OF THE IMPLEMENTATION TOOL.

Results

Table 4 is not easy to understand. Actually, each stage seems independent from the others while in reality it is difficult to understand that a facility without meeting minutes available, action items and follow-up have regular meetings and engagement.

THANK YOU FOR FLAGGING THIS ISSUE. WE FULLY AGREE THAT THESE STAGES REPRESENT A LINKED PROGRESSION IN IMPLEMENTATION AND SHOULD NOT BE CONSIDERED INDEPENDENT FROM EACH OTHER. FOR THIS REASON, WE REPORT IMPLEMENTATION SCORES BASED ON INDIVIDUAL PROGRESS MARKERS FOR EACH STAGE (RATHER THAN STAGE-SPECIFIC IMPLEMENTATION SCORES). THE PURPOSE OF TABLE 4 IS TO ALLOW READERS TO VISUALIZE ALL PROGRESS MARKERS IN A SINGLE TABLE AND TO BE ABLE TO APPRECIATE THAT INDIVIDUAL STAGES ARE NOT FULLY INDEPENDENT OF ONE ANOTHER.

To come back on the suggestion of building an indicator that identifies the progress in correcting mismanagement, the verbatim line 227 (‘Providing information about preventable factors that contribute to maternal death and using information to guide actions is key for preventing similar death in the future.’ –Facility interview, Rwanda’) shows that this is also a demand from the health workers and something measurable.

THANK YOU FOR NOTING THIS, WE FULLY AGREE. WE HAVE ADDED A SECTION TO THE DISCUSSION SECTION ABOUT THE PROCESS OF DEVELOPING THE TOOL, LESSONS LEARNED AND ADDITIONAL MARKERS TO CONSIDER.

It is surprising to read that line 232: Few facilities had agreements or procedures in place regarding the conduct of MPDSR meetings (9%). All teams were supposed to have been trained. This should be discussed.

THANK YOU FOR FLAGGING THIS IMPORTANT POINT. WE HAVE ADDED THIS TO THE DISCUSSION WITH REFERENCES.

Line 298: “Though national guidelines included schematics on the reporting structure, including how responses should be tracked, less than one-third (28%) of facilities reported a formal written documentation system for tracking follow-up of recommended actions. Only one facility each in Zimbabwe and Tanzania and three in Rwanda demonstrated a formal process for follow-up of recommendations, apart from reviewing minutes at the next mortality audit meeting. None of the facilities in Nigeria had a systematic process for following up on recommendations.” This seems to be an interesting synthesis indicator of the effectiveness of maternal and perinatal death reviews.

THANK YOU FOR NOTING THIS. WE HAVE ADDED A SECTION TO THE DISCUSSION SECTION ABOUT THE ADAPTED TOOL, LESSONS LEARNED AND KEY INDICATORS TO CONSIDER.

I appreciated also the ST4 with a trial to build a full synthesis indicator that considers each successive step. The progress marker ‘There is evidence of change based on recommendations that arise from death review findings’ reached by 45% of facilities is an achievement, even in a sample of facilities supported by the USAID program.

THANK YOU FOR RECOGNIZING THIS AS AN ACHIEVEMENT. WE ALSO AGREE.

The section of enablers and barriers is really small and does not add to what we already know.

THANK YOU FOR NOTING THIS ISSUE. WE HAVE EXPANDED THIS SECTION WITH ADDITIONAL FINDINGS GIVEN ONE OF OUR MAIN OBJECTIVES WAS TO UNDERSTAND THE ENABLERS AND BARRIERS OF IMPLEMENTATION. MORE DETAILS ARE ADDED IN THE SUPPLEMENTARY FILES AROUND THESE FINDINGS.

Discussion

The discussion section does not discuss the limitations of the method itself. To what extent the scoring sufficiently reflects the effectiveness of the implementation of these death reviews?

THANK YOU FOR NOTING THIS CONCERN. WE HAVE ADDED SUBSTANTIAL ADDITIONAL TEXT TO THE LIMITATION SECTION AS WELL AS SECTION ABOUT THE LEARNINGS AROUND THE DEVELOPMENT AND USE OF THE IMPLEMENTATION SCORING TOOL.

The discussion section is supported by few references (8x #22, 7x #23, 4x #32 and 9 other references), see below 'supporting literature'.

Supporting literature

Most of the cited literature are documents or articles from WHO or WHO civil servants, then from US authors. Table 3, explaining the rationale for the items in the score, is mainly based on 3 references (#21 13x; #22 5x; and #23 5x) while the discussion is based mainly on 2 references (#22 8x and #23 7x).

However, important literature on clinical audits and maternal death reviews comes from different groups of researchers. Among them: Johnston G, Crombie I K, Alder E M, Davies H T O and Millard A. Reviewing audit: barriers and facilitating factors for effective clinical audit Qual. Health Care 2000;9;23-36. doi:10.1136/qhc.9.1.23; Ivers N, Jamtvedt G, Flottorp S, Young JM, Odgaard-Jensen J, French SD, O'Brien MA, Johansen M, Grimshaw J, Oxman AD. Audit and feedback: effects on professional practice and healthcare outcomes. Cochrane Database of Systematic Reviews 2012, Issue 6. Art. No.: CD000259. DOI: 10.1002/14651858.CD000259.pub3; Filippi V, Brugha R, Browne E, Gohou V, Bacci A, De Brouwere V, Sahel S, Goufodji S, Alihonou E, Ronsmans C. 2004. How to do (or not to do) . . . Obstetric audit in resource poor settings: lessons from a multi-country project auditing 'near miss' obstetrical emergencies. Health Policy and Planning, 19(1), 57-66; Müffler N, Trabelssi M, De Brouwere V. 2007. Scaling up clinical audits of obstetric cases in Morocco. Tropical Medicine & International Health 12(10), 1248-1257; and the numerous papers from

Kongnyuy et al. exploring maternal death reviews in Malawi).

Please, note that the references are not standardized: sometimes, the reference is with the acronym of the journal (bjog), sometimes in full (Health policy & planning) and careful attention should be paid to have a correct list.

THANK YOU FOR PROVIDING ADDITIONAL LITERATURE FOR US TO REVIEW AND INCLUDE. WE ALSO APPRECIATE YOU FLAGGING ISSUES WITH THE REFERENCE FORMAT, WHICH WE HAVE CORRECTED.

REVIEWER #2

The rate of maternal and perinatal death in developing countries are still high, so it is urgent issue to prevent future deaths. Therefore, this study is very significant. A huge amount of data has been analyzed in detail and I think it is valuable information. Please tell me the following: THANK YOU. WE ARE PLEASED THAT YOU FOUND THE STUDY VERY SIGNIFICANT.

1) It was written that you used a standardized scoring methodology. Which is the name of the score scale and which paper shows that the scale is standardized?

Is there a description of the validity of this measure in this paper?

WE APPRECIATE YOUR QUESTION AND HAVE ADDED A NEW SECTION ON THE SCORING TOOL IN THE DISCUSSION TO PROVIDE MORE DETAILS ABOUT THE DEVELOPMENT OF THE TOOL AND WHAT WE LEARNED IN USING IT.

AS PART OF THE PROCESS OF DEVELOPMENT, WE ASSESSED THE FACE VALIDITY BY GROUNDING THE CONSTRUCTS IN THE LITERATURE ON THE TOPIC, ENGAGING EXPERTS IN THE DEVELOPMENT OF THE CRITERIA AND CONSULTING GLOBAL AND NATIONAL GUIDELINES. ASSESSING OTHER FORMS OF VALIDITY WERE BEYOND OUR SCOPE. THIS TOOL SOUGHT TO CLASSIFY PROGRESS MARKERS OF MPDSR PROCESSES. ITS SENSITIVITY IN

BEING ABLE TO CORRECTLY IDENTIFY A FACILITY'S ABILITY TO DEMONSTRATE SPECIFIC IMPLEMENTATION MARKERS WAS NOT FORMALLY ASSESSED IN COMPARISON TO ALTERNATIVE ASSESSMENT TOOLS. DIFFERENCES IN THE APPLICATION OF THE TOOL BY VARIED TYPOLOGIES OF USERS IS NOTED IN THE LIMITATION SECTION, AS A CONCERN IN FUTURE USE.

2) What is the mean implementation progress score in developed countries, especially those with low maternal and perinatal mortality?

WE DO NOT KNOW THE MEAN IMPLEMENTATION PROGRESS SCORE IN ANY OTHER COUNTRIES OR CONTEXT SINCE THIS IS THE FIRST TIME THE TOOL USED IN THIS STUDY WAS APPLIED TO ASSESS MPDSR IMPLEMENTATION PROCESSES. FURTHER APPLICATION AND ADAPTATION OF THE TOOL IN ADDITIONAL SETTINGS COULD PROVIDE THIS INFORMATION.

3) It feels redundant overall, can you summarize it a little more concisely? You can leave the necessary information as it is.

THANK YOU. WE HAVE ATTEMPTED TO REDUCE ANY REDUNDANCY AS WELL AS APPROPRIATELY ADDRESS COMMENTS FROM THE EDITOR AND THE REVIEWERS.

Second decision letter from editor

Decision Letter - Jennifer Yourkavitch, Editor
November 10, 2020
PONE-D-20-00503R1

"It might be a statistic to me, but every death matters.": An assessment of facility-level maternal and perinatal death surveillance and response systems in four sub-Saharan African countries

PLOS ONE

Dear Dr. Kinney,

Thank you for submitting your manuscript to PLOS ONE. After careful consideration, we feel that it has merit but does not fully meet PLOS ONE's publication criteria as it currently stands. Therefore, we invite you to submit a revised version of the manuscript that addresses the points raised during the review process.

Please submit your revised manuscript by Dec 25 2020 11:59PM. If you will need more time than this to complete your revisions, please reply to this message or contact the journal office at plosone@plos.org. When you're ready to submit your revision, log on to https://www.editorialmanager.com/pone/ and select the 'Submissions Needing Revision' folder to locate your manuscript file.

Please include the following items when submitting your revised manuscript:

A rebuttal letter that responds to each point raised by the academic editor and reviewer(s). You should upload this letter as a separate file labeled 'Response to Reviewers'.
A marked-up copy of your manuscript that highlights changes made to the original version. You should upload this as a separate file labeled 'Revised Manuscript with Track Changes'.
An unmarked version of your revised paper without tracked changes. You should upload this as a separate file labeled 'Manuscript'.
If you would like to make changes to your financial disclosure, please include your updated statement in your cover letter. Guidelines for resubmitting your figure files are available below the reviewer comments at the end of this letter.

If applicable, we recommend that you deposit your laboratory protocols in protocols.io to enhance the reproducibility of your results. Protocols.io assigns your protocol its own identifier (DOI) so that it can be cited independently in the future. For instructions see: http://journals.plos.org/plosone/s/submission-guidelines#loc-laboratory-protocols

We look forward to receiving your revised manuscript.

Kind regards,

Jennifer Yourkavitch

Academic Editor

PLOS ONE

Additional Editor Comments (if provided):

Thank you for responding to the reviewers' comments. It appears that you edited the reference list; however, there are no tracked changes. Please indicate those edits with tracked changes.

You noted that you based the tool on literature, expert opinion, and national policies; however, Table 3 indicates justifications for tool elements based only on literature. You mention policy differences at different points in the Discussion--around lines 410-420 and 475--but the reader doesn't get a sense of what the national policies contain, how they differ from each other, and how they differ from global standards in the main text. The information in Supplemental Files 1 and 2 is useful but we still can't see how the policies measure up against the tool. In other words, is the tool measuring things not contained in the policies for one or more countries? And might national policy deviance from literature or global standards account in part for the scoring? It would be useful to know if facility scores result more from a lack of adequate national policy or lack of capacity at facilities. You seem to imply the latter without addressing the former possibility. This issue would benefit from an organized discussion rather than mentioning policy issues in different places.

[Note: HTML markup is below. Please do not edit.]

Reviewers' comments:

Reviewer's Responses to Questions

Comments to the Author

1. If the authors have adequately addressed your comments raised in a previous round of review and you feel that this manuscript is now acceptable for publication, you may indicate that here to bypass the “Comments to the Author” section, enter your conflict of interest statement in the “Confidential to Editor” section, and submit your "Accept" recommendation.

Reviewer #1: All comments have been addressed

Reviewer #2: All comments have been addressed

****

2. Is the manuscript technically sound, and do the data support the conclusions?

The manuscript must describe a technically sound piece of scientific research with data that supports the conclusions. Experiments must have been conducted rigorously, with appropriate controls, replication, and sample sizes. The conclusions must be drawn appropriately based on the data presented.

Reviewer #1: Yes

Reviewer #2: Partly

****

3. Has the statistical analysis been performed appropriately and rigorously?

Reviewer #1: N/A

Reviewer #2: Yes

****

4. Have the authors made all data underlying the findings in their manuscript fully available?

The PLOS Data policy requires authors to make all data underlying the findings described in their manuscript fully available without restriction, with rare exception (please refer to the Data Availability Statement in the manuscript PDF file). The data should be provided as part of the manuscript or its supporting information, or deposited to a public repository. For example, in addition to summary statistics, the data points behind means, medians and variance measures should be available. If there are restrictions on publicly sharing data—e.g. participant privacy or use of data from a third party—those must be specified.

Reviewer #1: Yes

Reviewer #2: Yes

****

5. Is the manuscript presented in an intelligible fashion and written in standard English?

PLOS ONE does not copyedit accepted manuscripts, so the language in submitted articles must be clear, correct, and unambiguous. Any typographical or grammatical errors should be corrected at revision, so please note any specific errors here.

Reviewer #1: Yes

Reviewer #2: Yes

****

6. Review Comments to the Author

Please use the space provided to explain your answers to the questions above. You may also

include additional comments for the author, including concerns about dual publication, research ethics, or publication ethics. (Please upload your review as an attachment if it exceeds 20,000 characters)

Reviewer #1: just a few typos in the revised version, e.g. "characterstics" instead of "characteristics", line 543, p.28.

Also, please, standardize the references so that we don't have sometimes the full name of the journal and sometimes a short name.

Reviewer #2: (No Response)

****

7. PLOS authors have the option to publish the peer review history of their article (what does this mean?). If published, this will include your full peer review and any attached files.

If you choose “no”, your identity will remain anonymous but your review may still be made public.

Do you want your identity to be public for this peer review? For information about this choice, including consent withdrawal, please see our Privacy Policy.

Reviewer #1: Yes: Vincent De Brouwere

Reviewer #2: Yes: Mako Morikawa

[NOTE: If reviewer comments were submitted as an attachment file, they will be attached to this email and accessible via the submission site. Please log into your account, locate the manuscript record, and check for the action link "View Attachments". If this link does not appear, there are no attachment files.]

Third decision letter from editor

November 30, 2020

Decision Letter - Jennifer Yourkavitch, Editor

"It might be a statistic to me, but every death matters.": An assessment of facility-level maternal and perinatal death surveillance and response systems in four sub-Saharan African countries

PONE-D-20-00503R2

Dear Dr. Kinney,

We're pleased to inform you that your manuscript has been judged scientifically suitable for publication and will be formally accepted for publication once it meets all outstanding technical requirements.

Within one week, you'll receive an e-mail detailing the required amendments. When these have been addressed, you'll receive a formal acceptance letter and your manuscript will be scheduled for publication.

An invoice for payment will follow shortly after the formal acceptance. To ensure an efficient process, please log into Editorial Manager at http://www.editorialmanager.com/pone/, click the 'Update My Information' link at the top of the page, and double check that your user information is up-to-date. If you have any billing related questions, please contact our Author Billing department directly at authorbilling@plos.org.

If your institution or institutions have a press office, please notify them about your upcoming paper to help maximize its impact. If they'll be preparing press materials, please inform our press team as soon as possible -- no later than 48 hours after receiving the formal acceptance. Your manuscript will remain under strict press embargo until 2 pm Eastern Time on the date of publication. For more information, please contact onepress@plos.org.

Kind regards,

Jennifer Yourkavitch

Academic Editor

PLOS ONE

Acceptance letter from editor

December 7, 2020
Acceptance Letter - Jennifer Yourkavitch, Editor
PONE-D-20-00503R2

“It might be a statistic to me, but every death matters.”: An assessment of facility-level maternal and perinatal death surveillance and response systems in four sub-Saharan African countries

Dear Dr. Kinney:

I'm pleased to inform you that your manuscript has been deemed suitable for publication in PLOS ONE. Congratulations! Your manuscript is now with our production department.

If your institution or institutions have a press office, please let them know about your upcoming paper now to help maximize its impact. If they'll be preparing press materials, please inform our press team within the next 48 hours. Your manuscript will remain under strict press embargo until 2 pm Eastern Time on the date of publication. For more information please contact onepress@plos.org.

If we can help with anything else, please email us at plosone@plos.org.

Thank you for submitting your work to PLOS ONE and supporting open access.

Kind regards,

PLOS ONE Editorial Office Staff

on behalf of

Dr. Jennifer Yourkavitch
Academic Editor
PLOS ONE

Paper 5: Lessons from institutionalizing perinatal audit

First decision letter and comments from editor
From: GHSP Journal <em@editorialmanager.com>
Date: Mon, Jul 18, 2022 at 9:23 PM
Subject: Your submission to GHSP
To: Mary V Kinney <mkinney@uwc.ac.za>
Re: GHSP-D-22-00213: From pre-implementation to institutionalization: Lessons from sustaining a perinatal audit program in South Africa

Dear Ms Kinney,

Thank you for submitting your manuscript for consideration to Global Health: Science and Practice (GHSP). I apologize for the delay in updating you on your manuscript.

The editors have discussed it and feel it is a good fit. However, they have some suggestions for improving your manuscript before we can consider sending it for peer review.

1. The editors are aware of another related paper in BMJ.
https://pubmed.ncbi.nlm.nih.gov/35738843/
Some of the findings and direction are the same as this paper. Please make sure there is a clear distinction between the BMJ paper and this one.

2. This is an interesting topic but there needs to be more balance between detail and lessons for others. It is very South Africa and history specific. Why does the history matter outside of South Africa? Please describe how this is helpful for other countries and regions beyond South Africa.

3. This program has been in place for decades. Please reflect on the amount of time it has taken to institutionalize this, the process, and what that means for setting expectations.

4. The abstract, key lessons and key implications do not make it clear what evidence this offers with regard to whether MPDSR, in this instance, results in improved practices. Did it work? How do you ensure a meaningful, non-perfunctory, critical process, and minimized blame ducking? You can be successful scaling up what may be a fairly empty administrative process. The process has to be meaningful. This gets a little bit of attention on page 21, but needs more. Please more substantively address the challenge of resistance to meaningful review, when participants have reason to fear being blamed in an additional paragraph or a box.

5. Figure 2 is a bit hard to interpret; what's the x-axis? How are we to ready the position of the dots, on the x-axis dimension?

If you decide to revise your submission, please include a point-by-point response to the editors' feedback and note whether or not you made changes to the manuscript in a 2nd cover letter. Please include a track changes version as a supplemental file.

Please submit your revision within 30 days if possible. If you need more time, please let me know.

You can access your submission by going to www.editorialmanager.com/ghsp.

Your username is: MKinney-925
If you have forgotten your password, click this link to reset it:
https://www.editorialmanager.com/ghsp/l.asp?i=170084&l=13WVET2P

I look forward to receiving your revised manuscript.

Kind regards,

Natalie Culbertson
Managing Editor
Global Health: Science and Practice

Response letter to editor

Mary Kinney
University of the Western Cape
Bellville, South Africa

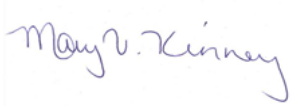
15 August 2022

Dear Editors at *Global Health: Science and Practice*,

Thank you for considering this original research for publication in your journal. We appreciate that you feel it is a good fit for your journal and the helpful feedback provided. As requested, we have made revisions to the manuscript incorporating your suggestions and feedback. We have also provided point-by-point responses to the editors' feedback with our responses in CAPS.

We look forward to hearing from your regarding this re-submission.

Sincerely,



Mary Kinney
School of Public Health
University of the Western Cape

COMMENTS FROM EDITORS AND AUTHOR RESPONSES

1. The editors are aware of another related paper in BMJ.
https://pubmed.ncbi.nlm.nih.gov/35738843/
Some of the findings and direction are the same as this paper. Please make sure there is a clear distinction between the BMJ paper and this one.

THANK YOU FOR RECOGNIZING THIS AS THESE TWO PAPERS ARE INTENDED TO BE COMPLEMENTARY. THIS MANUSCRIPT FOCUSES ON THE INPUTS REQUIRED FOR IMPLEMENTATION AND DESCRIBES "HOW" THE INTERVENTION IS IMPLEMENTED IN THE DIFFERENT CASE STUDIES. THE BMJ GH PAPER EXAMINES "WHY" THE INTERVENTION IS SUSTAINED. WE HAVE MADE EDITS TO CLARIFY THESE DISTINCTIONS AND HAVE REFERENCED THE OTHER PAPER WHEN NECESSARY (AS WE REFERENCE OTHER STUDIES FROM SOUTH AFRICA).

2. This is an interesting topic but there needs to be more balance between detail and lessons for others. It is very South Africa and history specific. Why does the history matter outside of South Africa? Please describe how this is helpful for other countries and regions beyond South Africa.

THANK YOU. MANY COUNTRIES LOOK TO SOUTH AFRICA AS AN EXEMPLAR FOR MPDSR SINCE THE COUNTRY HAS A LONG HISTORY OF IMPLEMENTING THE PERINATAL AUDIT PROGRAM. THE PPIP TOOL HAS ALSO BEEN ADAPTED AND APPLIED IN OTHER LMICS. YET TO DATE, THERE HAS NOT BEEN A COMPREHENSIVE, ANALYTICAL ANALYSIS LOOKING AT THE LONG HISTORY OF THE PERINATAL AUDIT PROGRAM AND ITS IMPLEMENTATION. WE BELIEVE IT MAY BE HELPFUL TO OTHER COUNTRIES WHO ARE INTRODUCING OR SCALING UP MPDSR TO UNDERSTAND THE PROCESS IN SOUTH AFRICA IN ORDER TO ADAPT OR ADJUST THEIR APPROACH. WE HAVE MADE PROPOSED REVISIONS, INCLUDING A PANEL ON LESSONS LEARNED, TO BETTER DESCRIBE WHY WE THINK THIS WILL BE HELPFUL IN OTHER SETTINGS.

3. This program has been in place for decades. Please reflect on the amount of time it has taken to institutionalize this, the process, and what that means for setting expectations.

THANK YOU FOR RAISING THIS IMPORTANT POINT. WE HAVE MADE EDITS TO BRING OUT THIS MESSAGE IN THE TEXT.

4. The abstract, key lessons and key implications do not make it clear what evidence this offers with regard to whether MPDSR, in this instance, results in improved practices. Did it work? How do you ensure a meaningful, non-perfunctory, critical process, and minimized blame ducking? You can be successful scaling up what may be a fairly empty administrative process. The process has to be meaningful. This gets a little bit of attention on page 21, but needs more. Please more substantively address the challenge of resistance to meaningful review, when participants have reason to fear being blamed in an additional paragraph or a box.

THIS IS AN IMPORTANT POINT. EVEN THOUGH THE CASE STUDY RESEARCH WAS NOT DESIGNED TO ASSESS IMPACT OF MPDSR OR THE QUALITY OF PRACTICE, WE AGREE MORE CAN BE ADDED ABOUT THE LIMITATIONS OF THE TOOLS AND WHAT WE WERE ABLE TO LEARN ABOUT IMPACT AND QUALITY. YOU WILL SEE WE HAVE MADE REVISIONS TO BOTH THE RESULTS AND DISCUSSION SECTIONS ACCORDINGLY.

5. Figure 2 is a bit hard to interpret; what's the x-axis? How are we to ready the position of the dots, on the x-axis dimension?

WE HAVE REMOVED THE FIGURE SINCE THE DATA IS ALSO PROVIDED IN TABLE 4.

Paper 6: Factors explaining sustained practice paper

First decision letter and comments from reviewers

From: BMJ Global Health <onbehalfof@manuscriptcentral.com>
Date: Tue, May 10, 2022 at 6:05 AM
Subject: BMJ Global Health - Decision on Manuscript ID bmjgh-2022-009242
To: <mkinney@uwc.ac.za>

10-May-2022

bmjgh-2022-009242 - "Exploring the sustainability of perinatal audit in four district hospitals in the Western Cape, South Africa: a multiple case study approach"

Dear Ms. Kinney,

Following review of your article to BMJ Global Health, we invite you to submit a major revision.

The review comments can be found at the end of this email, together with any comments from the Editorial Office regarding formatting changes or additional information required to meet the journal's policies at this time.

Please note that your revision may be subject to further review and that this initial decision does not guarantee acceptance at this time. To submit your revised article please click this link: *** PLEASE NOTE: This is a two-step process. After clicking on the link, you will be directed to a webpage to confirm. ***

https://mc.manuscriptcentral.com/bmjgh?URL_MASK=b9e81fec1c2548bfaa93615419ce8e3e. Alternatively, you can log on to your Author Dashboard in ScholarOne and under "Action" click "create a revision".

Please read and respond to all of the peer review comments. You should provide a point-by-

point response to explain any changes you have (or have not) made to the original article and be as specific as possible in your responses.

The original files will be available to you when you start your revision. Please delete any files that you intend to replace with updated versions and upload the following using the appropriate file designation:
- ‘’Main Document’’ - This is a clean copy (without tracked or highlighted changes) of your revised article. Please delete your original submission file.
- “Main Document - marked copy” - This is the edited version of your original article, including edits to address the peer review comments. Any changes have been highlighted using a track change function or bold or coloured text.
Please replace any other files that have been updated e.g. Images, forms

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If you have any queries, please contact the Editorial Office at info.bmjgh@bmj.com.

Kind regards,

Editor in Chief, BMJ Global Health

Dr. Seye Abimbola
Associate Editor, BMJ Global Health

Formatting Amendments (where applicable):

Reviewer(s)' Comments to Author (if any):

Reviewer: 1
Overall comments
I enjoyed reading this paper which provides very rich perspective around implementing and sustaining MPDSR practices particularly in an LMIC setting where it is much need. The theory driven approach made for a very interesting results and discussion section focusing on much neglecting role of health system software in driving change and improvement
There are several areas for consideration to help improve the paper as highlighted below
Specific areas for improvement
Minor Comments
Introduction
The authors should consider adding a brief section on 'whole of system' approach and while doing that briefly describe what micro, meso and macro levels are for the sake of audiences that might not be familiar with this literature.
The claim that there is evidence that perinatal audits lead to health system improvement in line 100-102 needs to be better articulated. Provide examples of how better audits improve health systems, what indicators are used to ascertain that
Methods
Sampling - the paper would benefit from a clear explanation of exactly what criteria was used to identify the participants. Simply stating that they were part of the audits is not conclusive, what were their roles, what about those roles made them ideal candidates?
In addition, for selection of the regions who are the 'other stakeholders' mentioned in line 132 and please , briefly highlight the focus/criteria of their inputs in selecting the study regions
Analytical methods -please provide a brief explanation of the coding framework and the

iterative process described in line 162

Results

Very well written with only a few questions/comments to better understand the findings provided. These are provided as tracked changes in the main document attached with this review summary

Discussion

In the introductory text of the discussion section, please specify what literature these three lenses are drawn from and justify why these lenses were used to frame the findings

On line 387-389, the authors describe the lack of knowledge of the MPSR . Might the authors reflect on the implication of this lack of knowledge on how the audit cycle links on the sustainability of practicing MPDSR

On line 386-389, other than perceived adequacy of resources, was there a way for the study team to objectively check adequacy of these resources? perhaps a facility resource assessment and judge this against stipulated guidelines/norms?

Reviewer: 2

This is a well-researched, thoughtful and very well presented paper. I can't fault the writing and the work is extensively referenced. I also believe the use of NPT is very appropriate and that the use of this approach in assessing the programme is very important as it's clearly having an impact. I have minor concerns regarding the positionality of the researchers and the the minimal novelty of the findings.

126 - Sample criteria includes demonstrating characteristics from a pprevious study. Was there any relationship to this study?

139 - Were the interviewers known to the interviewees? The authors seem to be local experts - could this have changed how interviews were conducted (power effects)? A statement on positionality of reviewers would be a very useful addition.

185 - 'official links to the information system..' what is this?

General findings comment - it's perhaps a problem of the design of the study, but there seems

to be a trend towards finding that these sub-districts are successful because the various aspects of NPT have went well. But when we look at the behaviours under these areas, it's not clear how the transition to this state was made. So, norms have changed and now MPDSR is well-established and this helps ensure that its use continues. Great, but how do you get to this point? Accordingly, the results section seems to be a proof of the aptness of NPT rather than working towards an understanding of how less well-performing regions might reach this higher level. Added to which, many of the activities, norms, structures described as helping structurate MPDSR seem to be well known to the authors (and they've often supported this with references) but this would suggest that the main output of the paper is to reorganise well-known guidance/insights into the NPT concepts. This might be a bit unfair as the excellent referencing shows the knowledge of the writers, but I think it would help to have some stronger direction in the paper regarding what is novel and how this can change practice or policy.

Acceptance letter from editor

---------- Forwarded message ---------
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Date: Sun, May 29, 2022 at 3:53 AM
Subject: Your submission to BMJ Global Health has been accepted
To: <mkinney@uwc.ac.za>

29-May-2022
bmjgh-2022-009242.R1 - Exploring the sustainability of perinatal audit in four district hospitals in the Western Cape, South Africa: a multiple case study approach

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Associate Editor, BMJ Global Health