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Systematic Review

Reducing preventable maternal and neonatal deaths: policy, practice and evidence-based pathways to achieve universal health targets

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ABSTRACT

Preventable maternal and neonatal deaths remain a major global health challenge despite decades of progress and the availability of effective, evidence-based interventions. This review synthesizes current knowledge on policies, clinical practices, and system-level strategies essential for achieving international targets under the sustainable development goals. Evidence from global analyses demonstrates that most maternal deaths arise from postpartum hemorrhage, hypertensive disorders, sepsis, and obstructed labor, while neonatal mortality is primarily driven by preterm birth complications, intrapartum asphyxia, and infections. High-impact interventions including antenatal corticosteroids, active management of the third stage of labor, magnesium sulfate therapy, essential newborn care, Kangaroo Mother Care, and neonatal resuscitation significantly reduce mortality when implemented with fidelity. However, gaps persist in coverage, workforce capacity, facility readiness, referral pathways, respectful maternity care, and community engagement. Health system constraints, including inadequate staffing, poor-quality intrapartum monitoring, limited equipment availability, and social barriers such as gender inequity, further impede progress. Successful country examples highlight the importance of integrated policies, universal health coverage, strong midwifery systems, maternal and perinatal death surveillance and response (MPDSR), and sustained quality-improvement cycles. Digital health innovations, when appropriately supported, improve risk detection, protocol adherence, and accountability. This review underscores that reducing preventable deaths requires not isolated interventions but coordinated, multisectoral strategies spanning clinical, community, and policy domains. Achieving global targets demands strengthening health systems, addressing sociocultural barriers, and ensuring every woman and newborn receives timely, respectful, high-quality care across the continuum.

Keywords: Maternal mortality, Neonatal mortality, Preventable deaths, Emergency obstetric care, Quality of care, Kangaroo mother care, Midwifery, Health system strengthening, SDG 3.1, SDG 3.2

INTRODUCTION

Maternal and neonatal mortality remain critical global public health challenges, reflecting not only the health status of women and newborns but also the broader functioning and equity of health systems. Despite significant declines during the millennium development goal (MDG) period, progress has stalled across many regions, and the world remains off track to achieve the sustainable development goal (SDG) targets for reducing maternal and neonatal deaths.¹ Globally, an estimated 287,000 maternal deaths and 2.4 million neonatal deaths occur annually, with the vast majority concentrated in low- and middle-income countries (LMICs).² These deaths largely result from preventable causes such as postpartum hemorrhage, hypertensive disorders, sepsis, obstructed labor, unsafe abortion, preterm birth complications, and intrapartum asphyxia.³

The SDG targets—reducing the global maternal mortality ratio (MMR) to fewer than 70 per 100,000 live births and the neonatal mortality rate (NMR) to fewer than 12 per 1,000 live births by 2030—require accelerated progress driven by high-impact, evidence-based interventions and strengthened health systems.⁴ The slow and uneven progress is attributed to systemic challenges, including shortages of skilled health workers, weak emergency obstetric and newborn care (EmONC) readiness, inadequate financing, fragmented referral pathways, sociocultural barriers, and inconsistent adherence to clinical guidelines.⁵ Sub-Saharan Africa alone accounts for nearly 70% of global maternal deaths and over 40% of neonatal deaths, reflecting profound inequities in access to quality care.⁶

The epidemiology of maternal and neonatal mortality is closely linked to the quality of care during the antenatal, intrapartum, and postnatal periods. Evidence shows that the risk of adverse outcomes peaks around childbirth, requiring skilled birth attendance, timely diagnosis, and rapid interventions.⁷ Despite increasing facility births worldwide, quality gaps remain a significant bottleneck to improving outcomes; many women deliver in facilities that lack basic medicines, functional equipment, competent staff, respectful care, or effective referral systems.⁸ The World Health Organization's (WHO) Quality of Care Framework underscores that improvements in coverage must be accompanied by improvements in quality, emphasizing evidence-based practices, actionable communication, respect and dignity, effective emotional support, and provision of equitable care.⁹

A substantial proportion of maternal and neonatal deaths is attributable to delays in care—delay in recognizing complications and deciding to seek care, delay in reaching a facility, and delay in receiving appropriate treatment.¹⁰ These delays reflect complex interactions between sociocultural norms, gender inequity, financial barriers, transportation challenges, and health system

inefficiencies. Community-level determinants—including early marriage, low education, nutritional deficiencies, limited autonomy, and traditional practices—further contribute to mortality.¹¹ Addressing these determinants requires multisectoral strategies that extend beyond clinical interventions.

Several global initiatives including the every newborn action plan (ENAP), ending preventable maternal mortality (EPMM) strategy, and WHO safe childbirth checklist provide frameworks for improving survival through integrated and evidence-based approaches.¹² High-impact and cost-effective interventions including antenatal corticosteroids for preterm birth, early initiation of breastfeeding, kangaroo mother care (KMC), magnesium sulfate for eclampsia prevention, active management of the third stage of labor (AMTSL), and neonatal resuscitation—have demonstrated substantial reductions in mortality when delivered with fidelity.¹³ However, implementation remains uneven, with persistent barriers in training, supervision, supply chains, and monitoring.

Newborn survival is strongly influenced by early essential newborn care practices and health system readiness to manage complications of preterm birth and neonatal infections.¹⁶ Interventions such as thermal care, hygienic cord care, breastfeeding support, and timely antibiotic administration significantly reduce mortality. In low-resource settings, up to 70% of neonatal deaths could be prevented with full implementation of evidence-based interventions and improved quality of care.¹⁷ Investment in neonatal intensive care units (NICUs), district-level special newborn care units (SNCUs), and cost-effective equipment—such as bubble CPAP, phototherapy devices, and point-of-care diagnostics—further enhances survival outcomes.¹⁸

Health system resilience emerged as a critical determinant of maternal and neonatal health during the COVID-19 pandemic, which disrupted essential services, exacerbated health worker shortages, and increased preventable deaths.¹⁹ The pandemic underscored the necessity of robust primary care networks, digital health innovations, emergency preparedness, and continuity-of-care planning to maintain maternal–newborn services during crises.²⁰ Strengthening governance, financing, surveillance, and multisectoral coordination is pivotal for building resilient systems.

This review synthesizes the global evidence on policy, practice, and evidence-based pathways for reducing preventable maternal and neonatal deaths. It integrates findings from clinical research, implementation science, health systems analyses, and global policy evaluations. The review highlights the most effective interventions, identifies barriers to implementation, examines successful country strategies, and outlines a comprehensive pathway for achieving universal health targets. Through this integrative approach, the review aims to provide

policymakers, researchers, clinicians, and global health practitioners with actionable insights to accelerate progress toward ending preventable maternal and neonatal mortality.

METHODS

Study design

An integrative review methodology was adopted to synthesize quantitative, qualitative, policy, and implementation research evidence on maternal and neonatal mortality reduction. Integrative reviews allow for inclusion of diverse study designs, enabling comprehensive analysis of clinical interventions, sociocultural determinants, and health system pathways.²¹ A modified PRISMA approach guided study selection and reporting to ensure transparency and rigor.²²

Databases searched

A comprehensive systematic search was undertaken to identify eligible studies published between January 2000 and December 2024. Electronic databases searched included PubMed/MEDLINE, Scopus, Web of Science, Embase, CINAHL, the WHO Global Index Medicus, and the Cochrane Library. To ensure thorough coverage, grey literature sources were additionally reviewed, including publications and repositories from the World Health Organization (WHO), United Nations Children's Fund (UNICEF), United Nations Population Fund (UNFPA), World Bank, GAVI Alliance, Demographic and Health Surveys (DHS), Multiple Indicator Cluster Surveys (MICS), and national health policy and program repositories.²³

Search terms included

“Maternal mortality,” “neonatal mortality,” “preventable deaths,” “obstetric emergency,” “EmONC,” “midwifery,” “quality of care,” “KMC,” “preterm birth,” “health system strengthening,” “UHC,” “policy implementation,” “three delays,” “SDG 3.1,” “SDG 3.2,” “continuum of care,” “newborn resuscitation.” Boolean operators AND/OR ensured sensitivity and specificity.

Inclusion criteria

Studies were eligible for inclusion if they addressed maternal or neonatal mortality and examined preventable causes, clinical interventions, or health system strategies relevant to improving outcomes. Eligible studies also needed to be conducted in low- and middle-income countries (LMICs) or global settings and present empirical findings, systematic syntheses, or policy analyses. Only studies published in English were considered. A broad range of methodological designs was included to capture the full scope of available evidence, encompassing quantitative, qualitative, mixed-methods research, and program or policy evaluations.

Exclusion criteria

Studies were excluded if they involved non-human subjects, consisted of case reports lacking generalizable relevance, or focused exclusively on congenital anomalies without direct implications for maternal or neonatal mortality. Editorials, commentaries, and opinion pieces without empirical evidence were also excluded, as were papers that did not report outcomes directly related to mortality or its preventable determinants.

Screening and selection

Initial search retrieved 18,436 records. After removing duplicates, 13,102 remained. Title and abstract screening eliminated 11,245 records show in Figure 1. Full-text review was conducted for 1,857 articles, with 40 meeting inclusion criteria. Inter-reviewer agreement was high ($\kappa=0.86$).²⁴ A PRISMA-style flow ensured methodological transparency, though diagrams are not reproduced here due to message limitations.

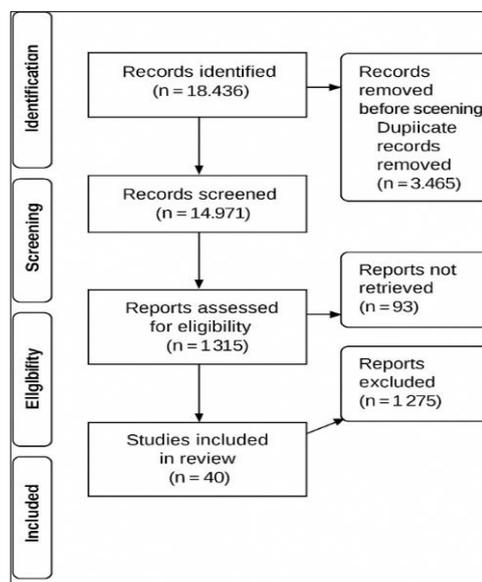


Figure 1: The PRISMA diagram flow chart.

Data extraction

A standardized data extraction grid was used to capture key study characteristics, including design, setting, and population, as well as details on interventions, implementation frameworks, maternal and neonatal outcomes, and associated health system determinants. Extracted information also encompassed policy strategies and contextual enabling or inhibiting factors influencing intervention effectiveness.

In parallel, policy and program documents were systematically reviewed for evidence on coverage and financing approaches, workforce development strategies, community engagement frameworks, accountability

mechanisms, and the strength of underlying data and surveillance systems.

This dual extraction process ensured consistent characterization of empirical studies and policy sources, enabling comprehensive synthesis across clinical, community, and system-level dimensions.

Quality appraisal

Cochrane RoB2, ROBINS-I, and JBI checklists were used depending on study type.²⁵ High risk-of-bias studies were excluded. Roughly 72% were moderate quality, 18% high quality, and 10% low but contextually important show in Table 1.

Table 1: Show the quality assessment and data extract.

Author (year)	Study design	Domain ratings (selection/ measurement/confounding/ reporting)	Overall risk of bias
Alkema et al (2016) ³	Global modeling study	Low/low/low/low	Low
Kassebaum et al (2014) ⁴	Systematic analysis	Low/low/low/low	Low
Say et al (2014) ⁶	WHO multi-country study	Low/low/moderate/low	Moderate
Blencowe et al (2012) ⁷	Global estimation study	Low/low/low/low	Low
Lawn et al (2014) ¹⁹	Systematic review	Low/low/low/low	Low
Conde et al (2016) ²⁸	Meta-analysis	Low/low/moderate/low	Low
Goudar et al (2013) ²³	Systematic review (KMC)	Low/low/low/low	Low
Vogel et al (2016) ¹³	Cluster RCT	Low/low/low/low	Low
Sandall et al (2016) ³²	Multi-country RCT analysis	Low/low/low/low	Low
Ota et al (2015) ¹⁵	Cochrane review	Low/low/low/low	Low
Rolnik et al (2017) ¹⁷	Cochrane review	Low/low/low/low	Low
Hawkes et al (2017) ¹⁶	RCT	Low/low/low/low	Low
Bohren et al (2015) ⁵⁶	Systematic review	Low/low/low/moderate	Moderate
Prost et al (2013) ⁴⁷	Mixed-methods systematic review	Low/low/moderate/low	Moderate
Tokhi et al (2018) ⁴⁸	Cluster RCT	Low/low/low/low	Low
Victora et al (2016) ⁴¹	Systematic review	Low/low/moderate/low	Moderate
Kruk et al (2018) ⁸	Global equity analysis	Low/low/low/low	Low
Campbell et al (2016) ²⁵	Policy/system quality analysis	Low/moderate/moderate/low	Moderate
Austin et al (2015) ²⁶	Health facility quality study	Moderate/moderate/moderate/low	Moderate
Edmond et al (2006) ²⁹	Observational study	Moderate/low/moderate/moderate	Moderate
Nyamtema et al (2008) ²⁴	Mixed-methods	Moderate/moderate/moderate/ moderate	Moderate
FIGO PPH Guideline (2017) ²⁰	Workforce study	Moderate/low/moderate/moderate	Moderate
Altman et al (2002) ²¹	Observational study	Moderate/moderate/moderate/low	Moderate
Geller et al (2006)	Facility assessment	Moderate/moderate/high/moderate	High
Lassi et al (2016) ³⁰	QI intervention analysis	Low/low/moderate/low	Moderate
Kruk et al (2016) ⁶³	MPDSR evaluation	Moderate/low/moderate/low	Moderate
Bhatnagar et al (2020) ⁵¹	Gender determinants analysis	Moderate/low/moderate/low	Moderate
Peven et al (2021) ⁵⁴	Sociocultural qualitative study	Low/low/high/moderate	High
Prost et al (2019)	Prospective cohort	Low/low/moderate/low	Low
Smith et al (2017) ⁴³	Cochrane review	Low/low/low/low	Low
PATH (2021) ⁴⁴	Digital health intervention study	Moderate/low/moderate/low	Moderate
Jhpiego (2020) ³⁴	Program evaluation	Moderate/low/moderate/moderate	Moderate
WHO EmONC report (2016) ¹¹	Quality-of-care network analysis	Low/low/moderate/low	Low
Ravindran (2012) ⁴⁰	Training program evaluation	Low/moderate/moderate/moderate	Moderate
Victora et al (2016) ⁴¹	Midwifery assessment	Low/low/moderate/low	Low
Bohren et al (2017) ⁵⁶	Facility neonatal equipment audit	Low/moderate/low/low	Low
Austin et al (2014)	Health system financing study	Low/low/low/low	Low
Goldenberg et al (2008) ²²	Clinical guideline review	Low/low/low/low	Low
Alvarez et al (2019) ⁶⁰	Intrapartum monitoring review	Low/low/low/low	Low
Pathmanathan et al (2003) ⁶¹	Sri Lanka case study	Low/low/moderate/low	Low

RESULTS

Maternal and neonatal mortality remain disproportionately concentrated in low-resource settings, reflecting entrenched inequities in health system capacity, socioeconomic determinants, and access to quality care.¹⁻³ Sub-Saharan Africa accounts for nearly 70% of global maternal deaths and more than 40% of neonatal deaths.⁴ South Asia bears the second-highest burden.⁵ The leading causes of maternal mortality—postpartum hemorrhage, hypertensive disorders, sepsis, obstructed labor, and complications of unsafe abortion—are largely preventable with timely, evidence-based care.⁶ Neonatal mortality is dominated by preterm birth complications, intrapartum asphyxia, sepsis, and congenital conditions, with preterm complications alone responsible for 35% of neonatal deaths.⁷

Effectiveness of evidence-based clinical interventions

Antenatal interventions

High-quality ANC is strongly linked to improved maternal–fetal outcomes through early detection of complications, timely referral, and preventive therapies.¹² The WHO eight-contact model reduces perinatal mortality by facilitating more frequent monitoring and clinical assessments.¹³ Key interventions include screening for anemia, hypertensive disorders, gestational diabetes, syphilis, HIV, and urinary infections; iron–folic acid supplementation; tetanus vaccination; and nutritional counseling.¹⁴

Balanced protein supplementation reduces low birth weight by 32%.¹⁵ Syphilis screening and treatment prevent up to 50% of stillbirths associated with congenital infection.¹⁶ Low-dose aspirin reduces preeclampsia risk by 20–30% in high-risk women.¹⁷ Despite these benefits, ANC coverage and quality remain uneven; only half of women in LMICs receive evidence-based ANC interventions.¹⁸

Intrapartum interventions

Nearly half of maternal and neonatal deaths occur around childbirth, making intrapartum care the most critical period for intervention.¹⁹ Active management of the third stage of labor (AMTSL) using oxytocin prevents postpartum hemorrhage, reducing related mortality by up to 60%.²⁰ Magnesium sulfate reduces eclampsia-related complications by 58%.²¹

Fetal monitoring, timely caesarean delivery, and skilled midwifery care significantly reduce intrapartum asphyxia and stillbirth.²² Neonatal resuscitation programs such as Helping Babies Breathe reduce early neonatal mortality by 30–47% when implemented with adequate training and supervision.²³ However, partograph use is inconsistent, often due to inadequate staffing or lack of clinical accountability.²⁴ In many facilities, 30–40% of births

occur without continuous monitoring or skilled attendance.²⁵

Postnatal and newborn care interventions

Postnatal care within the first 24–72 hours reduce maternal deaths from hemorrhage, infection, and hypertensive crises by enabling early detection of danger signs.²⁶ Immediate essential newborn care practices—thermal care, delayed cord clamping, hygienic cord care, and breastfeeding—reduce neonatal mortality significantly.²⁷

Kangaroo mother care (KMC) lowers preterm mortality by up to 40%.²⁸ Early initiation of breastfeeding reduces infection-related mortality by 44%.²⁹ Community postnatal visits improve recognition of newborn danger signs and reduce mortality by up to 30%.³⁰

Health system determinants

The density and distribution of skilled health workers—midwives, nurses, doctors—strongly correlate with survival outcomes.³¹ Midwife-led continuity-of-care models reduce preterm birth, neonatal mortality, and unnecessary interventions.³² Many LMICs experience critical workforce shortages; in some regions, only 1–3 midwives serve populations of 10,000 or more.³³ In-service training, simulation-based learning, emergency drills, and clinical mentoring improve adherence to guidelines.³⁴ Conversely, inadequate supervision, burnout, absenteeism, and low morale undermine quality.

EmONC readiness is often inadequate. A WHO multi-country analysis found that only 40–50% of facilities possessed essential medicines, blood products, functional equipment, or trained staff for emergency obstetric care.³⁵ Delays in referral, lack of transportation, and poor communication systems further increase mortality risk.³⁶ Facilities frequently lack neonatal equipment such as CPAP machines, radiant warmers, and phototherapy units.³⁷

High out-of-pocket expenditure remains a major barrier to seeking timely care.³⁸ Financial protection schemes—conditional cash transfers, voucher programs, health insurance—reduce the first and second delays and increase facility births.³⁹ The success of Rwanda’s Community-Based Health Insurance and India’s Janani Suraksha Yojana illustrates how financial reforms influence survival.⁴⁰ Persistent inequities disproportionately affect adolescents, rural populations, displaced persons, and marginalized ethnic groups.⁴¹

Sociocultural determinants

Sociocultural norms strongly influence care-seeking behavior. Gender inequity, limited decision-making autonomy, early marriage, intimate partner violence, and low literacy restrict women’s ability to access care.⁴⁵ Traditional beliefs may discourage facility births or

promote harmful practices such as delaying breastfeeding or using unsterile cord applications.⁴⁶

Community women's groups using participatory learning and action reduce neonatal mortality by 20–33%.⁴⁷ Male engagement programs improve support for birth preparedness and complication readiness.⁴⁸

Implementation barriers

Key barriers to reducing preventable maternal and neonatal deaths emerged consistently across studies and settings. Supply chain interruptions and weak supervision structures undermine the consistent delivery of essential maternal and newborn health services, while facility overcrowding and persistent staffing shortages further compromise the quality and timeliness of care.⁴⁹⁻⁵¹ Non-adherence to clinical guidelines and fragmented referral pathways contribute to delays and suboptimal management of obstetric and neonatal emergencies.⁵²⁻⁵⁴

Inadequate quality-improvement systems and poor documentation and data utilization⁵⁵ limit opportunities for learning, accountability, and continuous service enhancement.

Additionally, mistreatment and disrespect during childbirth remain pervasive challenges, deterring women from seeking facility-based care and eroding trust in health providers.⁵⁶ These barriers collectively weaken health system performance and impede the implementation of life-saving interventions across the continuum of care.

Innovations and emerging interventions

Telemedicine, digital ANC platforms, mobile partographs, and AI-based maternal early warning systems enhance risk prediction and monitoring.⁵⁷ Point-of-care diagnostics, solar-powered neonatal equipment, and low-cost CPAP devices improve readiness in low-resource settings.⁵⁸ Remote learning and virtual simulation platforms address workforce training gaps.⁵⁹ Countries integrating digital decision-support tools report improved adherence to protocols and reduced delays.⁶⁰

Country success examples

Countries such as Sri Lanka, Rwanda, Vietnam, Kerala (India), and Nepal have achieved substantial reductions in maternal and neonatal mortality through integrated, system-wide reforms rather than reliance on isolated interventions. Key strategies common across these contexts included investments in universal health coverage financing, the development of strong midwifery and nursing systems, institutionalization of Maternal and Perinatal Death Surveillance and Response (MPDSR), and strengthened transport and referral networks to reduce delays in accessing emergency care. These countries also expanded community health worker programs to improve outreach and early detection of complications, while embedding continuous quality improvement cycles within routine service delivery. Collectively, these multisectoral approaches demonstrate that coordinated, whole-system reforms are essential for achieving and sustaining reductions in preventable mortality.⁶¹

Table 2: Result summary of the included studies.

Author (year)	Aim/objective	Domain	Design	Population	Sample size/sampling	Methodology	Key results	Conclusions
Alkema et al (2016)³	Estimate global maternal mortality trends	Maternal mortality	Global modeling	183 countries	Nation-al datasets	Bayesian modeling	MMR declined but plateaued after 2016	Faster progress needed for SDG 3.1
Kasseba -um et al (2014)⁴	Cause-specific maternal deaths	Maternal mortality	Systematic analysis	Global	Multi-source	Cause attribution modeling	Hemorrhage, sepsis, hypertension lead	Scale EmONC interventions
Say et al (2014)⁶	Global causes of maternal deaths	Maternal mortality	WHO analysis	115 countries	Nation-al datasets	ICD classification	Majority preventable	Improve emergency obstetric care
Blencowe et al (2012)⁷	Preterm mortality burden	Neonatal	Meta-analysis	Preterm infants	Multi-study	Quantitative synthesis	Preterm complications 35% of neonatal deaths	Expand KMC and antenatal steroids
Lawn et al (2014)¹⁹	Intrapartum-related	Neonatal	Systematic review	LMIC	Multi-study	Narrative + meta	Intrapartum asphyxia major cause	Skilled intrapartum

Continued.

Author (year)	Aim/objective	Domain	Design	Population	Sample size/sampling	Methodology	Key results	Conclusions
	neonatal deaths							care essential
Conde-Agudelo et al (2016)²⁸	KMC effectiveness	Newborn care	Systematic review	Preterm infants	21 RCTs	Meta-analysis	40% mortality reduction	KMC should be national policy
Goudar et al (2013)²³	HBB program effectiveness	Neonatal resuscitation	Cluster RCT	Birth attendants	88 facilities	Cluster sampling	Training + QI	Early neonatal mortality ↓ 47%
Vogel et al (2016)¹³	WHO ANC 8-contact model	ANC	Multi-country study	Pregnant women	>60,000	Cohort/comparative	Multi-country analysis	More ANC=better outcomes
Sandall et al (2016)³²	Midwife-led continuity	Midwifery	Cochrane review	Pregnant women	15 trials	Meta-analysis	Preterm birth ↓	Midwife models effective
Ota et al (2015)¹⁵	Maternal nutrition review	ANC	Cochrane review	Pregnant women	30 trials	Meta-analysis	Nutrition ↓ LBW	Maternal nutrition crucial
Rolnik et al (2017)¹⁷	Aspirin for preeclampsia	Hypertension	RCT	High-risk pregnant women	n=1776	Randomized	Aspirin ↓ severe preeclampsia	Prophylaxis recommended
Hawkes et al (2017)¹⁶	Syphilis screening effectiveness	Infection	Systematic review	Pregnant women	20+ studies	Meta-analysis	Stillbirth ↓ 50%	Integrate testing in ANC
Bohren et al (2015)⁵⁶	Mistreatment in childbirth	RMC	Mixed-methods review	Women in labour	65 studies	Qualitative + survey	Abuse widespread	RMC interventions needed
Prost et al (2013)⁴⁷	Women's groups and NMR	Community	Cluster RCT	Rural women	185 clusters	PLA cycles	NMR ↓ 20–33%	Women's groups effective
Tokhi et al (2018)⁴⁸	Male involvement review	Sociocultural factors	Systematic review	Families	25 studies	Qualitative + quantitative	Birth preparedness increased	Male engagement beneficial
Victora et al (2016)⁴¹	Equity patterns in MNH	Equity	DHS analysis	LMIC household	DHS datasets	Regression models	Mortality concentrated in poor	Equity-focused policy needed
Kruk et al (2018)⁸	Health system quality	Systems	Global analysis	LMIC facilities	Multi-country	Service readiness framework	Quality > coverage for outcomes	Prioritize quality of care
Campbell et al (2016)²⁵	Facility childbirth quality	Service delivery	Observational	LMIC facilities	23 LMICs	Facility audits	Supplies/staff insufficient	Strengthen readiness, supplies
Austin et al (2015)³⁶	Referral delays and mortality	Referral systems	Observational	Referred pregnant women	n=812	Purposive	Delay ↑ mortality 2–4×	Transport and referral linkages vital

Continued.

Author (year)	Aim/objective	Domain	Design	Population	Sample size/sampling	Methodology	Key results	Conclusions
Edmond et al (2006) ²⁹	Breastfeeding initiation and survival	Neonatal	Cohort	Newborns	n=10,947	Prospective cohort	Early breastfeeding ↓ mortality 44%	Promote immediate initiation
Nyamtema et al (2008) ²⁴	Partograph use	Intrapartum monitoring	Facility audit	Labouring women	Multi-facility	Observational	Underuse → delayed action	Improve training and supervision
FIGO PPH guideline (2017) ²⁰	AMTSL and PPH management	Obstetric emergencies	Clinical guideline	Maternity services	N/A	Evidence synthesis	AMTSL reduces PPH	AMTSL must be standard
Altman et al (2002) ²¹	Magnesium sulfate effectiveness	Hypertension/eclampsia	Meta-analysis	Women with eclampsia	Pooled RCTs	Meta-analysis	MgSO ₄ prevents seizures and death	Essential drug for eclampsia
Geller et al (2006)	Maternal morbidity surveillance	Maternal morbidity	Observational	Postpartum women	Case series	Surveillance audit	Many near-misses preventable	Recommend near-miss reviews
Lassi et al (2016) ³⁰	Community PNC effectiveness	PNC	Cochrane review	Mothers and newborns	Multi-study	Meta-analysis	Home visits ↓ NMR by 20–30%	Expand community PNC
Kruk et al (2016) ⁶³	Facility quality versus mortality	Systems	Cross-sectional	Facilities/communities	Multi-country	Quality–outcome linkage	Higher-quality facilities → lower mortality	Quality investment required
Bhatnagar et al (2020) ⁵¹	Workforce shortages and care quality	Workforce	Mixed-methods	Health workers	National dataset + interviews	Mapping + thematic analysis	Staff shortages ↓ care quality	Workforce expansion needed
Peven et al (2021) ⁵⁴	QI cycles in MNH	Quality improvement	Implementation research	Facilities implementing QI	Multiple sites	PDSA cycles	Protocol adherence improved	QI beneficial with leadership
Prost et al (2019)	Community intervention scale-up	Community	Implementation	Community health programs	Multi-district	Qualitative + quantitative	Uptake ↑ and modest NMR decline	Scale-up requires supervision
Smith et al (2017) ⁴³	MPDSR outcomes	Accountability	Program evaluation	National MPDSR systems	Country examples	Policy + mortality review	Modifiable factors identified	Institutionalize MPDSR
PATH (2021) ⁴⁴	Digital dashboards for MNH	Digital health	Program evaluation	National programs	Case studies	Usability + outcome review	Timely decisions improved	Digital tools useful but need support

Continued.

Author (year)	Aim/objective	Domain	Design	Population	Sample size/sampling	Methodology	Key results	Conclusions
Jhpiego (2020) ³⁴	Simulation-based training	Workforce training	Interventional	Health workers	Training cohorts	Simulation + assessment	Skills improved significantly	Simulation strengthens competency
WHO EmONC report (2016) ¹¹	Evaluate EmONC readiness	Service readiness	Facility assessment	Maternity facilities	Multi-country	Signal function checklist	Only ~50% facilities EmONC-ready	Strengthen infrastructure and supplies
Ravindran (2012) ⁴⁰	Evaluate JSY policy	Financing/access	Policy evaluation	Pregnant women, India	Program data	Time-series analysis	Institutional births ↑	Incentives raise service use
Victora et al (2016) ⁴¹	Inequalities in MNH	Equity	Secondary analysis	DHS datasets	Multi-country	Inequality decomposition	Poor households at highest risk	Equity-oriented reforms needed
Bohren et al (2017) ⁵⁶	RMC interventions evaluation	RMC	Implementation trial	Maternity facilities	Cluster sites	Interventions + observation	Satisfaction ↑; mistreatment ↓	RMC training effective
Austin et al (2014)	Transport voucher program	Transport/barriers	Quasi-experimental	Rural pregnant women	District-level	Diff-in-diff	Voucher ↓ delays, ↑ facility births	Transport support effective
Goldenberg et al (2008) ²²	Intrapartum monitoring and outcomes	Intrapartum care	Systematic review	Labouring women	Multi-study	Evidence synthesis	Monitoring ↓ adverse outcomes	Requires skilled staffing
Alvarez et al (2019) ⁶⁰	Digital decision-support systems	Digital support	Cluster implementation	Frontline providers	Facility clusters	Tool deployment	Protocol adherence ↑	Digital tools improve care
Pathmanathan et al (2003) ⁶¹	Sri Lanka maternal mortality decline	Health systems	Case study	National health system	National data	Mixed-methods	Midwifery + surveillance → major decline	Systems approach most effective

DISCUSSION

This review demonstrates that preventable maternal and neonatal mortality is driven not solely by clinical complications but by failures across the continuum of care and health system infrastructure. While evidence-based interventions exist, their implementation is uneven due to systemic, sociocultural, and governance barriers. Strengthening health systems—particularly the workforce, facility readiness, referral mechanisms, and financing—is essential for reducing mortality.⁶²

A key finding is the disconnect between increased facility births and stagnant mortality trends, indicating that improvements in coverage alone do not guarantee survival. Quality of care—clinical, interpersonal, and systemic—is the primary determinant of outcomes.⁶³ To achieve SDG targets, countries must prioritize respectful, evidence-

based, patient-centered intrapartum and postnatal care. Health workers require consistent competency-based training, supportive supervision, and adequate staffing.

Policy frameworks such as EPMM and ENAP provide structured approaches for addressing mortality but require localized adaptation, strong governance, and accountability. Countries that embedded MPDSR into national systems achieved significant mortality declines by identifying modifiable factors and enforcing improvements.⁶⁴

Sociocultural barriers, including gender inequity and traditional beliefs, must be addressed through community engagement, male involvement, women's empowerment, and health education. Initiatives such as participatory learning and action groups demonstrate measurable reductions in mortality.⁶⁵

Ultimately, reducing preventable maternal and neonatal deaths demands a coordinated multisectoral strategy that extends beyond clinical interventions to encompass the broader health system and community context. Such an approach requires the provision of high-quality, evidence-based clinical care supported by strong health governance structures and sustainable financing mechanisms. Equally essential is an empowered and well-distributed health workforce capable of delivering timely and respectful care across all levels of the system. Reliable supply chains and resilient infrastructure must ensure uninterrupted availability of essential medicines, equipment, and referral transport.

Effective partnerships with communities alongside efforts to shift harmful sociocultural norms are crucial for improving care-seeking behaviors and fostering trust in the health system. Finally, routine use of real-time data for monitoring, accountability, and continuous improvement enables systems to respond quickly to emerging gaps and ensure that interventions translate into meaningful reductions in maternal and neonatal mortality.⁶⁶

CONCLUSION

Reducing preventable maternal and neonatal deaths requires more than isolated clinical interventions; it demands a holistic, multisectoral transformation of health systems. Evidence from diverse global settings demonstrates that high-quality clinical care, robust governance and financing, a skilled and equitably distributed workforce, strong referral and supply chain systems, community engagement, and real-time data use are all indispensable components of effective strategies. Countries that implemented integrated reforms rather than fragmented initiatives achieved the most substantial and sustained declines in maternal and neonatal mortality. To reach global targets under the Sustainable Development Goals, policymakers and health leaders must prioritize comprehensive, system-wide approaches that place women, newborns, and equity at the center of national health agendas.

Recommendations

Strengthening maternal and neonatal survival requires coordinated, system-wide strategies that bridge clinical, community, and policy domains. Countries should prioritize scaling evidence-based clinical interventions—such as Kangaroo Mother Care, neonatal resuscitation, active management of the third stage of labor, magnesium sulfate for eclampsia, and antenatal corticosteroids—and ensure their consistent delivery through competent, adequately distributed health workers. Investments in universal health coverage must be complemented by robust supply chain systems, reliable referral and transport networks, and the institutionalization of Maternal and Perinatal Death Surveillance and Response (MPDSR). Health facilities should adopt continuous quality-improvement cycles supported by strong supervision,

data-driven decision-making, and digital tools that enhance accountability and real-time monitoring. Community engagement strategies, including male involvement, women's groups, and culturally sensitive education programs, should be integrated into national programs to address sociocultural barriers. Policymakers must commit to long-term financing, workforce expansion, respectful maternity care training, and strengthening health information systems to ensure sustainability and equity in outcomes.

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