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Scoping review of maternal and newborn health interventions and programmes in Nigeria

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ABSTRACT

Objective To systematically scope and map research regarding interventions, programmes or strategies to improve maternal and newborn health (MNH) in Nigeria.

Design Scoping review.

Data sources and eligibility criteria Systematic searches were conducted from 1 June to 22 July 2020 in PubMed, Embase, Scopus, together with a search of the grey literature. Publications presenting interventions and programmes to improve maternal or newborn health or both in Nigeria were included.

Data extraction and analysis The data extracted included source and year of publication, geographical setting, study design, target population(s), type of intervention/programme, reported outcomes and any reported facilitators or barriers. Data analysis involved descriptive numerical summaries and qualitative content analysis. We summarised the evidence using a framework combining WHO recommendations for MNH, the continuum of care and the social determinants of health frameworks to identify gaps where further research and action may be needed.

Results A total of 80 publications were included in this review. Most interventions (71%) were aligned with WHO recommendations, and half (n=40) targeted the pregnancy and childbirth stages of the continuum of care. Most of the programmes (n=74) examined the intermediate social determinants of maternal health related to health system factors within health facilities, with only a few interventions aimed at structural social determinants. An integrated approach to implementation and funding constraints were among factors reported as facilitators and barriers, respectively.

Conclusion Using an integrated framework, we found most MNH interventions in Nigeria were aligned with the WHO recommendations and focused on the intermediate social determinants of health within health facilities. We determined a paucity of research on interventions targeting the structural social determinants and community-based approaches, and limited attention to pre-pregnancy interventions. To accelerate progress towards the sustainable development goal MNH targets, greater focus on implementing interventions and measuring context-specific challenges beyond the health facility is required.

Strengths and limitations of this study

- A comprehensive search strategy was used including three (3) large databases (PubMed, Embase and Scopus) as well as grey literature.
- The review employed a unique framework to map the evidence and identify gaps in maternal and newborn health (MNH) research and action in Nigeria—using an integrated framework combining the WHO recommendations for MNH, the continuum of care model for maternal health and the social determinants of health.
- We recognise that there may be publication bias, as not all interventions/programmes for MNH in Nigeria may have been published and captured in the study.

INTRODUCTION

Nigeria has the second highest estimated maternal deaths globally, and accounts for one of the highest neonatal mortality rates in Africa.[1 2] The WHO estimates the maternal mortality ratio (MMR) to be over 800 maternal deaths per 100 000 live births with a neonatal mortality rate of 33 per 1000 live births[1 3] in 2019. These figures contrast with corresponding figures from the UK and the USA which are around 10–18 deaths per 100 000 live births, respectively, with neonatal mortality rates below 4 deaths per 1000 live births.[1 2] Maternal and newborn health (MNH) outcomes are intricately linked; maternal deaths significantly affect newborn survival and development.[4–6] The sustainable development goal (SDG) 3 calls for all countries to reduce MMRs to less than 70 per 100 000 live births and neonatal mortality to less than 12 deaths per 1000 live births by 2030.[1 7] However, if current trends continue, Nigeria will fall far short of these targets despite existing efforts and resource allocations.[8] Of note, the global MNH community has recently intensified efforts on innovative indicators to measure progress in MNH towards achieving the SDG targets.[9–11]

Most maternal deaths in Nigeria are reportedly due to preventable obstetric causes.[6] Furthermore, complications of preterm birth, intrapartum events and infections account

for over 80% of newborn deaths and stillbirths.[1 6 12] Underlying these conditions, socioeconomic, cultural, political and environmental factors contribute to the persistently high and inequitable burden of maternal and neonatal mortality in Nigeria.[7] The highest rates of deaths and morbidity occur among the poor, rural communities, where many challenges to improve MNH remain.[8 13] In addition, some religious and sociocultural norms adversely influence health-seeking behaviour and expose women to discriminatory practices which pose serious health risks.[8 13] Addressing these underlying social conditions and inequities will both facilitate efforts to improve maternal and neonatal mortality and morbidity and may improve other dimensions of health and well-being.

Beyond the clinical causes and social determinants that underpin maternal and newborn morbidity and mortality, evidence shows that coordinated strategies across the reproductive, maternal, newborn, child and adolescent health continuum of care improves the general well-being of young women and mothers and the development of newborns.[4 6] Thus, the WHO recommends that the 'essential packages of interventions for low and middle-income settings' should be provided across the continuum of care to improve MNH.[5 14–16] Such interventions include family planning, appropriate antenatal care, immediate thermal care for newborns and early initiation of exclusive breastfeeding among others. Furthermore, increasing evidence suggests that addressing maternal health inequities through action on the social determinants of health can significantly improve MNH outcomes.[17]

It is not entirely clear why, despite laudable efforts to improve the situation in Nigeria, the burden of maternal and newborn mortality and morbidity persists.[8] Understanding the evidence and gaps for maternal and neonatal health interventions and programmes will help to identify areas to focus new MNH measurement tools and direct future resource allocations.

This study aims to systematically scope and map the published literature on interventions, programmes or strategies implemented to improve MNH in Nigeria. By integrating and applying existing key frameworks in MNH,[17–20] this study identifies evidence gaps that require further research and highlights areas where action is needed. The following objectives were formulated following an initial exploratory search:

a. Outline the types of interventions for MNH in Nigeria and their characteristics.
b. Describe the nature and range of evidence.
c. Elaborate the study settings and target populations.
d. Examine reported evidence of outcomes or effectiveness or impact.
e. Identify reported facilitators and barriers of effective implementation of interventions.

METHODS

The review was conducted according to the methodological guidance for scoping reviews provided by the Joanna Briggs Institute manual for evidence synthesis.[21] The main research question guiding the review was: what is the evidence available for MNH interventions in Nigeria? An intervention was defined as 'a single or a combination of program elements or strategies designed to produce behavioural changes or improve health status, outcomes, or both among individuals or an entire population'.[22] We focused on research studies evaluating the effectiveness of interventions on outcomes related to MNH.

Search strategy

A preliminary database search was undertaken to identify keywords and index terms for articles related to the review topic and refine the search strategy. Thereafter, the definitive search of search of PubMed, Embase (via OVID) and Scopus (via OVID) was conducted by NN between June and July 2020 to identify relevant publications. The searches were updated in May 2021 by rerunning the searches and through email alerts. The search expressions in PubMed including keywords and MeSH terms used were: 'Maternal Health' OR 'Infant, Newborn' OR 'Infant Health' AND 'Nigeria' AND (intervention OR programme OR strategy). No filter was used to restrict results. Similar search terms were used for the other databases. A summary of the search strategy for each database is provided (online supplemental file 1). This was supplemented by a web-based search of the grey literature, and a Google scholar search using similar terms, including a directed search of relevant key organisations websites. Cited references were examined by browsing the reference lists of studies to identify additional eligible studies.

Eligibility criteria and selection of sources of evidence

Table 1 outlines the inclusion and exclusion criteria and the sources of evidence. The results from the searches were screened in an iterative process by two authors (NN and AKA). First, the sources were screened based on the information presented in the title and abstract. Next, full-text articles were assessed to determine their eligibility for inclusion using the criteria in table 1. Discrepancies regarding eligibility were resolved by consensus and discussion with a third author (PA).

Data charting and summary

The included literature was reviewed using a data extraction form developed through an iterative process to identify the data elements critical to answering the review question and objectives. The form was piloted with 10% of the included studies to ensure consistency and revised, as necessary.

The extracted data included authors, year of publication, geographical setting, study design, target population(s), type and description of intervention, duration of implementation, reported outcomes and any facilitators or barriers.

Table 1 Inclusion and exclusion criteria

Criteria	Inclusion	Exclusion
Type of studies	Any existing literature including journal articles, systematic reviews, grey literature and evaluation reports.	Conference proceedings, study protocols, editorials, cost effectiveness studies, modelling studies or commentaries on MNH interventions.
Setting	Nigeria; international/ multicountry studies including Nigeria.	Studies with topics not reporting on MNH interventions in Nigeria.
Time period	No time limits set.	
Language	Studies in English.	Studies not in English.
Focus of study	Studies focused on maternal and newborn health (MNH) interventions/ programmes.	Studies without an intervention/programme for MNH or outcomes not focused on MNH. Studies where intervention/ programme focused only on child health and did not include newborns.

The first author (NN) charted the data, and the second author (AKA) reviewed the data. Any disagreements between the reviewers were resolved by a consensus involving the third author (PA) whenever necessary.

In line with the scoping review methodology, a formal assessment of the methodological quality of the included studies was not undertaken, as the intention was to provide a broad overview of the existing literature related to the review question.[21] Data extracted across the included sources of evidence were summarised using figures, tables and summaries.

To map and summarise the evidence, we used an integrated model developed from the WHO recommended interventions for MNH,[4 18 20] the continuum of care approach for maternal health[19] and the social determinants of health framework[17 23] (figure 1). The model combines WHO's consensus recommendations of both clinical and non-clinical interventions for MNH as outlined in the guidelines issued in 2011 and 2017 and presents these interventions across the continuum of care for maternal, newborn and child health. We assessed whether interventions described in the included studies were in line with any of the WHO recommended interventions outlined in the model. The model also adapts the social determinants of health framework to highlight interventions aimed at addressing structural factors (such as those related to the distribution of wealth and power) and intermediary factors (such as the ability of women to access health services) which influence maternal health.

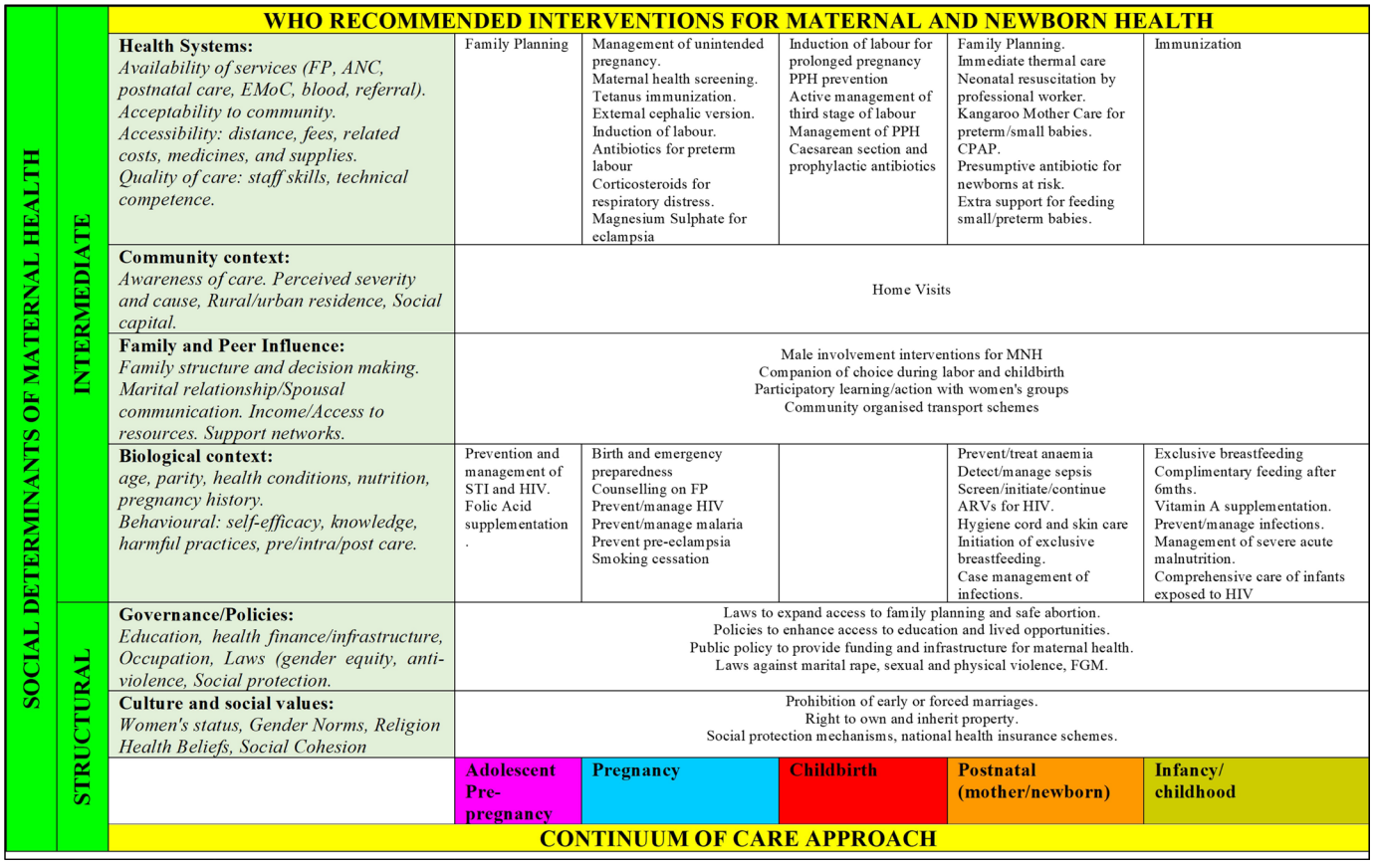

Figure 1 Integrated framework of the WHO recommendations, continuum of care approach and social determinants of maternal health.

Patient and public involvement

Patients and public were not involved in the design, conduct or reporting of this study.

Ethics approval statement

Due to the nature of the study (scoping review), the study did not involve human participants.

RESULTS

Overview of the literature search

The systematic literature search resulted in 827 publications after removing duplicates. A total of 79 full texts were assessed, of which 52 were included in the review. An additional 28 articles were retrieved from citations, and the full texts were assessed and included in the review. A total of 80 publications were included in the final review.[24–103] A Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews flow diagram in figure 2 summarises the search results and screening processes for this study.

Characteristics of included literature

The characteristics of the included sources of evidence are summarised in table 2, and the details of each publication are presented in online supplemental table S2. Figure 3 shows the results of mapping the studies to the integrated framework developed in this study. The results are summarised below.

Intervention and programmes along the continuum of care for maternal and newborn health

Half (n=40) of the interventions targeted pregnancy, childbirth or both. Only four interventions targeted the

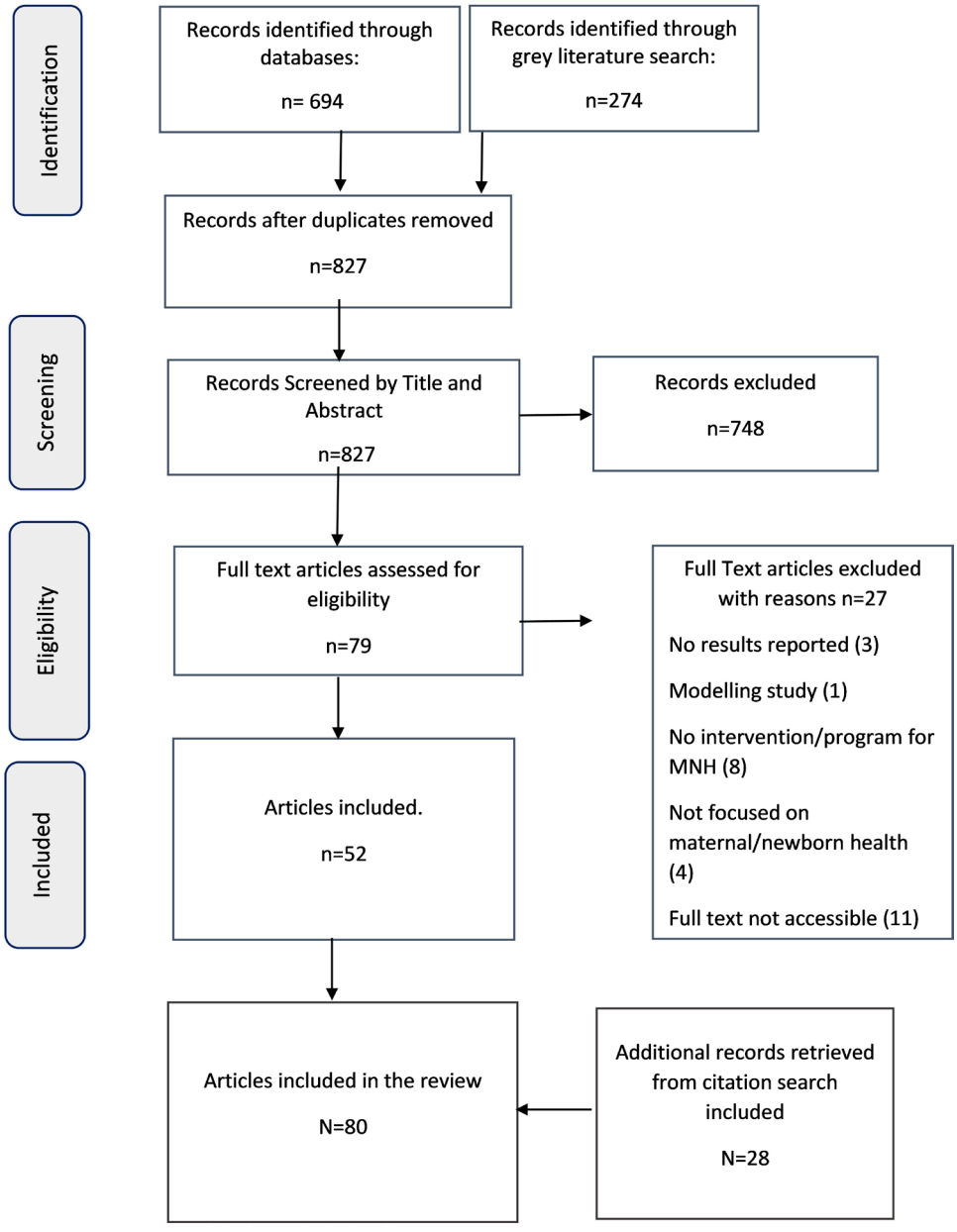

Figure 2 Flow chart of the selection process of sources of evidence.

Table 2 General characteristics of included sources of evidence

Characteristics	Number of studies (%), n=80	References
Study design		
Systematic review	1 (1.25)	49
RCT	8 (10)	26 38 80 82 84 95 96 103
Quasi-experimental	16 (20)	36 50 54 63–65 72 74–76 81 89 97 101 102
Cohort/longitudinal	6 (7.5)	37 51 53 57 61 69
Postintervention/programme evaluation	13 (16.25)	25 28 32–34 43 52 60 83 88 91 94 98
Prepost/before after studies	15 (18.75)	24 39 40 55 56 59 62 66 67 71 73 79 87 92 93
Process/outcome/impact evaluation	21 (26.25)	27 30 31 35 41 42 44–46 48 58 68 70 77 78 85 86 90 99 100
Type of study		
Qualitative	7 (8.75)	25 28 48 85 91 92 94
Quantitative	71 (88.75)	24 26 27 29–31 34–46 49–78 80–82 84 86–90 93 95–103
Mixed methods	2 (2.5)	79 83
Control or comparison group/unit		
Yes	24(30)	26 29–31 36–40 61 76 80–82 84 85 87 89 95–97 101–103
No	56(70)	24 25 27 28 32–35 41–60 62–75 77–79 83 86 88 90–94 98–100
Setting		
Rural	38 (47.5)	26 27 31 33 38 39 42–46 50 53 55 57 60 61 63 71 73 74 76–78 81 85 87 89 90 92 93 96 97 99–103
Urban	27 (33.75)	25 32 34–37 40 51 52 56 58 62 65–68 79 80 82 84 86 88 91 94 95 98
Rural and urban	15 (18.75)	24 28–30 41 47–49 54 59 64 69 70 75 83
Site of intervention		
Community	31 (38.75)	26 28–31 33 38 39 42 45 50 51 53 55 57 63 65 71 73–75 81 85 87 90 92 95 99–101
Health facility	37 (46.25)	25 27 32 34–37 40 41 43 44 46 52 54 56 58–62 64 66–68 70 72 78–80 82–84 86 88 92 94 96 103
Community and health facility	12(15)	24 47–49 69 77 89 91 93 97 98 102
Geographical region		
North West	22 (27.5)	24 25 28 30 31 33 36 38 47 48 64 65 70 71 78 85 91–93 97 103
North Central	5 (6.25)	37 56 84 89 94
North East	3 (3.75)	27 50 58
South West	8 (10)	26 39 40 66 74 80 95 96
South East	4 (5)	32 57 60 68
South South	9 (11.25)	55 61 63 73 82 83 98 99 101
Multiple: Northern regions	8 (10)	29 42 45 46 54 76 79 102
Multiple: North and South regions	9 (11.25)	35 43 44 51 53 62 77 86 90
Country-wide: all geographic regions	10 (12.5)	34 41 49 52 59 67 69 75 81 87
Multi-country: Nigeria included	2 (2.5)	88 100
Lead author/institution base		
Nigeria	48 (60)	25 27 30–32 34 37 39 40 42–47 49 50 53 54 57–60 62–64 66–68 70 71 73–75 78 81 83 85 91–99
International	32(40)	24 26 28 29 33 35 38 41 48 51 52 55 69 72 76 77 79 80 82 84 86–90 100 102 103

RCT, randomised controlled trial.

prepregnancy stage and involved family planning or contraception services.[46 50–52] Nine interventions focused on the postpartum period for mothers, newborns or both, and involved postpartum family planning,[44 79] promoting early breastfeeding,[38 39] neonatal resuscitation,[34] keeping the baby warm,[69] immunisation[73 95] and a combination

SOCIAL DETERMINANTS OF MATERNAL HEALTH		WHO RECOMMENDED INTERVENTIONS FOR MATERNAL AND NEWBORN HEALTH						
	INTERMEDIATE	**Health Systems:** *Availability of services (FP, ANC, postnatal care, EMoC, blood, referral). Acceptability to community. Accessibility: distance, fees, related costs, medicines, and supplies. Quality of care: staff skills, technical competence.*	42,46–49,55	20,28,32,37,49,50,52,56,60,63,64,78,80,83,86,96,97	24,31,58,61,62,68,81,83,86	24,30,31,39,75,78	69,75,91	21,23,77,82,84,87,90,98,25,43–45,54,66,72,73
		Community context: *Awareness of care. Perceived severity and cause. Rural/urban residence. Social capital.*						67
		Family and Peer Influence: *Family structure and decision making. Marital relationship/Spousal communication. Income/Access to resources. Support networks.*		81	81			95
		Biological context: *age, parity, health conditions, nutrition, pregnancy history. Behavioural: self-efficacy, knowledge, harmful practices, pre/intra/post care.*	22,70 .	26,36,51,53,76,80,89,92,99		29,34,35,53,65	33	
	STRUCTURAL	**Governance/Policies:** *Education, health finance/infrastructure, Occupation, Laws (gender equity, anti-violence, Social protection.*	71,74,79,85,94					
		Culture and social values: *Women's status, Gender Norms, Religion Health Beliefs, Social Cohesion*	41,88,93					
			Adolescent Pre-pregnancy	**Pregnancy**	**Childbirth**	**Postnatal (mother/newborn)**	**Infancy/ childhood**	**Across the Continuum**
		CONTINUUM OF CARE APPROACH						

Figure 3 Mapping of interventions to the WHO recommendations, continuum of care approach and social determinants of health.

of essential newborn interventions.[43] Just over one-third (34%, n=27) of the programmes spanned all stages of the continuum of care.

Alignment with WHO recommendations for improving maternal and newborn health

Most of the publications reviewed (71%, n=57) reported interventions aligned with the recommendations outlined in figure 2 based on the WHO 2011 and 2017 guidelines for MNH. The remaining studies (29%, n=23) aimed to improve quality or standard of MNH services mainly through capacity building of health providers, improving access through community health insurance schemes, providing free MNH services, emergency loans, conditional cash transfers and outreach services. These were not specifically listed as priority interventions in 2011 and 2017 guidelines, although may be stated elsewhere in other WHO guidance.

Mapping interventions to the social determinants of health framework for maternal health

Nearly all interventions (93%, n=74) focused on the intermediate social determinants of health. These include health system factors such as demand, access, quality and utilisation of MNH services (n=38), improving maternal health knowledge and behaviour (n=18) and improving the health status of mothers and newborns by addressing obstetric and/or newborn complications and diseases (n=18). Only six studies had interventions targeted at structural social determinants of health, including public policies, gender dynamics or sociocultural norms.[45 75 78 92 97 99]

Types of studies, year of publication and lead author/institution

Of the literature included, 71 publications were journal articles and nine were programme evaluation reports. The publication year ranged from 1982 to 2020, with most sources (n=64) published between 2010 and 2018 (figure 4). The publications included in this review employed many study types/designs. One-quarter of the reviewed studies involved a process, outcome or impact evaluation (n=21), followed by quasi-experimental designs (n=16), preintervention or postintervention designs (n=15) and postintervention analysis (n=13). Nearly one-third (30%, n=24) of the reviewed studies reported having a comparison group, including eight (8) randomised control trials. Only six (6) sources used

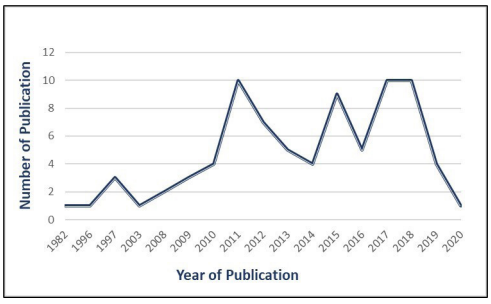

Figure 4 Number of publications per year.

qualitative methods, and the remaining 74 were quantitative, two of which used a mixed-methods design.[79 83] Over half (60%, n=48) of the reviewed articles had the lead author or institution based in Nigeria. Study duration varied as follows: less than a year (n=10), 1 year–5 years (n=53) and greater than 5 years (n=13).

Geographical region, setting and site of intervention

Based on Nigeria's six geopolitical regions, over half (51%, n=41) of the studies reported interventions in a single region, and 21 studies reported interventions across two or more regions. About a third (n=28) of the studies were conducted in the northern regions and 21 studies in the southern regions. Thirteen studies (16%) involved settings in both the northern and southern regions. Six studies reported national coverage, including one study involving all 36 states of Nigeria and the Federal Capital Territory.[75] Two studies reported multicountry sites, including Nigeria.[88 100]

There were fewer community-based interventions or programmes (39%, n=31) compared with those in health facilities (46%, n=37). The health facilities included ranged from primary care clinics to referral hospitals. A small portion (15%, n=12) of the studies reported both community and health facility programme sites. More studies (47.5%, n=38) were conducted in a rural setting compared with an urban environment (34%, n=27), with approximately 19% (n=15) involving both rural and urban settings.

Target populations

Most interventions in the literature reviewed (79%, n=63) were targeted mainly at pregnant women, mothers and women of childbearing age, described as 15–49 years of age, with one specifically focused on young adolescent females.[42] Eleven interventions focused on healthcare providers, including community health workers and midwives.[25 34 35 58 60 87 88 91 97 100] Four interventions involved community members, including the male members of the community, husbands or both.[45 89 92 99] Two interventions specifically targeted policymakers.[48 75]

Reported outcomes, effectiveness, or impact

The interventions outlined in the reviewed literature sought to address a wide range of outcomes. Nearly half (45%, n=33) had outcomes related to improving the demand, access, coverage, quality and utilisation of essential MNH services, interventions or both. Other outcomes include reducing maternal or newborn deaths or both;[24 26 27 32 34 49 60 62 64 67–69 72 78 102] improving knowledge of preventive practices and self-management;[30 38 39 50 51 55 65 71 73 74 93 95] improving community participation in MNH including male members of the community;[28 45 92 99] capacity building of the health workforce[44 77 79 86 88] and the prevention and management of pregnancy or newborn-related diseases and complications, or both.[31 35 37 40 41 57 61 66 96 103]

Reported barriers and facilitators

Not all included studies reported facilitators and/or barriers of implementing the interventions. Forty-six studies (n=46) reported factors that facilitate or positively influence the intervention or programme. The most common facilitators reported were community engagement and participation (50%, n=23).[24 25 27 28 31 39 41 42 45 51 53 54 63 65 77 85 91 92 98 100–102] Others included an integrated approach to implementation of interventions;[31 48 85 89 98] communication of adequate (and culturally appropriate) knowledge about the programme or intervention[54 65 69 103] and demand creation activities.[52 53]

Forty-two studies (n=42) reported barriers, with funding limitations posing the main challenge to implementation reported in 11 studies.[25 27 33 53 78 80 82 86 91 92 94] Nine studies reported negative attitudes and perceptions regarding the intervention, the health system, or both as a barrier.[36 39 48 53 64 71 79 82 83]

DISCUSSION

It is promising to see increasing research on maternal and neonatal health programmes in Nigeria. Following a systematic search of literature on existing interventions and programmes in Nigeria, this study used a novel framework to identify gaps for research and action on MNH interventions and programmes in Nigeria. We developed an integrated model combining the WHO recommendations for MNH with the continuum of care and the social determinants of health frameworks. This approach can provide researchers and policy makers a rigorous method to examine and assess gaps in MNH interventions and service delivery and identify country-specific priorities to focus attention.

Our findings show that the interventions in a large majority of studies in this review (71%) aligned with the WHO recommendations for MNH. Most interventions targeted the pregnancy and childbirth stages of the continuum of care. This is likely related to evidence showing that the critical causes of maternal and newborn deaths occur during these periods.[7 104] Only a few studies focused on the prepregnancy stage and the provision of family planning services. This area requires further attention, as studies have shown that providing reproductive health services, mainly contraceptive services, can

help with further reductions in maternal and newborn mortality.[7 17 104]

Accordingly, most studies examined the intermediate social determinants of health, such as access to and availability of relevant health services within health facilities, with only a few investigating programmes aimed at the more structural social determinants of health, such as gender, cultural and religious norms and public policies. Although these proximal social determinants remain essential, growing evidence emphasises the significant role of distal determinants influencing maternal health and its outcomes.[17 104] Furthermore, increasing evidence suggests actions to improve these distal social determinants can improve MNH outcomes.[17] This highlights the need for further research on how social interventions affect maternal and neonatal health outcomes in Nigeria to inform programme development and implementation.

Of the 80 publications reviewed, over 80% reported achieving the interventions' intended outcomes. Many of the programmes investigated interventions related to WHO recommendations, with a focus on women and their engagement with health facilities. Our review also highlights the focus of existing programmes on measuring coverage of evidence-based MNH interventions in health facilities, with limited attention to community-based interventions. Importantly, the research synthesised does not clearly show whether these interventions were chosen to align with country-level priorities. Consequently, to accelerate progress towards the SDG goals of ending preventable maternal and newborn deaths, a broader lens to identify and measure critical and context-specific factors beyond the health facility is required. Country level researchers may be better posed to understand and highlight country-level priorities for MNH research. Of note, international collaborators led over a third of the research in this review. Going forward, we implore global health institutions to actively improve local research capacity and funding as articulated by the African Academy of Science.[105 106]

Factors that facilitated achieving intended outcomes involved engagement with the communities and integration of multiple interventions. This result supports the call for the application of integrated packages of effective health interventions across the continuum of care, re-emphasised by the strategic plans to achieve SDG 3.[19 104] In addition, these findings highlight the role of participatory mechanisms to engage families (including men) and communities in improving MNH.[17] Two key barriers to interventions achieving their intended health outcomes were funding limitations and negative attitudes and perceptions. This may be related to the need for public engagement to address participants' critical concerns and the need for more integrated interventions.

The search strategy was limited to PubMed, Embase and Scopus databases; thus, publications in excluded databases might be missing in this review. Nevertheless, we conducted a grey literature search alongside these databases to cover other relevant resources. Although we carefully considered the search terms used in our strategy, we recognise that there may be publication bias, as not all interventions/programmes for MNH will have been published.

A broad range of study designs were employed in the studies included in this review. However, most employed quantitative approaches with only a small fraction using qualitative and mixed-methods approaches. Given the nature of MNH interventions and the complexity of the challenges facing women and newborns, multidisciplinary research and mixed-methods approaches are needed to add depth to understanding the contextual nuances of MNH. This helps to uncover unknown and emerging factors which potentially informs better use of limited resources. An important domain to consider within the spectrum of factors that can influence MNH outcomes is the quality of services received by women and children,[107] especially if they suffer mistreatment.[108 109]

Conclusion

Using a novel framework combining WHO recommendations for MNH, the continuum of care and the social determinants of health frameworks, most MNH interventions were aligned with the WHO recommendations and focused on the proximal social determinants of health. These were related largely to health system factors within health facilities. In addition, our findings show only a few programmes targeting the structural social determinants of maternal health such as religious and cultural barriers and MNH policies and highlights the relative neglect of non-facility-based interventions. The evidence evaluating MNH outcomes was mostly quantitative and with only a few benefiting from qualitative and mixed-methods approaches, thus limiting the exploration of contextual factors that influence MNH outcomes. Therefore, efforts to improve MNH in Nigeria and other similar contexts may need to focus greater attention on implementing MNH interventions and measuring context-specific challenges beyond the health facility. This may help to accelerate progress towards the SDG goal of ending preventable maternal and newborn deaths.

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Contributors The conception and design of the research was conducted by all authors (NN, AKA and PA). Data collection and analysis and interpretation of results were conducted by NN, AKA and PA. The first draft of the manuscript was written by NN, and AKA and PA contributed to this version. All authors contributed to subsequent revisions. All authors read and approved the final manuscript. NN acts as guarantor for this manuscript.

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Supplementary File 1: Search strategy and terms

PubMed search terms: 1st June, 2020.

((((("Maternal Health"[Mesh]) OR "Infant, Newborn"[Mesh]) OR "Infant Health"[Mesh]) AND "Nigeria"[Mesh]) AND (("intervention" OR "program" OR "strategy"))

Embase search strategy: 11th July, 2020

1. "Maternal Health".mp. or maternal welfare/
2. "Infant, newborn".mp. or newborn/
3. "infant health".mp. or child health/
4. newborn care/ or "Newborn Health".mp.
5. 1 or 2 or 3 or 4
6. Nigeria.mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]
7. ("intervention" or "program" or "strategy").mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword, floating subheading word, candidate term word]
8. 5 and 6 and 7

Scopus search terms: 22nd July, 2020.

{maternal health} AND {newborn health} AND "Nigeria" AND "intervention" OR "program*".

Websites of key organisations searched on Google 22nd July 2020.

Jhpiego

USAID/Maternal and Child Survival Program

Maternal Newborn Child Health (MNCH2) program

World Health Organisation

United Nations Children's Fund

Bill and Melinda Gates Foundation

Supplementary File 2: Table S2: Data extraction tool and characteristics of included studies.

Authors/ Publication Year & Lead author Institution	Geographical location/ setting/site	Study design and Objective(s)	Type of Intervention*	Stage in continuum of care & Target Population(s)	Reported Outcomes (or effectiveness/impact)	Intended outcomes achieved (Yes/No)	Barriers/challenges and/or Facilitators
Sloan et al[24] (2018) International	Kano, Katsina and Kaduna (NW) urban and rural community and health facility	Program evaluation (before-after analysis): To evaluate the MNH program impact on reducing women's, neonatal and perinatal mortality, and stillbirth	Integrated maternal and neonatal health program: multiple interventions to address delays in accessing care, provide emergency obstetric care and manage complications*.	Pregnancy and childbirth Pregnant women and newborns	Statistically significant declines in Maternal mortality, Stillbirth, Neonatal mortality, and Perinatal mortality rates.	Yes: Improvements in maternal and newborn survival observed.	Facilitators: Promoting local ownership
Oguntunde et al[25] (2018) Nigeria	Jigawa, Kaduna and Kano (NW) urban health facility	Post intervention analysis (qualitative study): To assess the Facility Health Committees established in three states in northern Nigeria as a platform to improve the quality of maternal and child health services.	Facility Health committees.*	Across the continuum of care Facility health committee members: facility health providers facility clients including pregnant women.	Committee members, health providers, and facility clients all agree that the committees have a tangible positive effect on the provision of maternal and child health services and quality of care.	Yes: Facility health committees appear to have a positive influence on quality of maternal and child health services in the selected facilities.	Barriers: Inadequate funding. Facilitators: Gaining trust and support of community members.

Alexander et al[26] (2018) International	Oyo (SW) rural community	RCT: To compare pregnancy outcomes in women exposed to household air pollution from wood and kerosene fuel stoves to women who received ethanol CleanCook stoves.	CleanCook ethanol Stoves [plus training on how to use the stove and prevent the dangers of smoke exposure].	Pregnancy Pregnant women	Improved birth outcomes (mean birth weight, average gestational age at birth) were higher in ethanol stove users. Perinatal mortality (stillbirths and neonatal deaths) was twice as high in controls compared to ethanol stove users.	Yes: Transition from traditional biomass/ kerosene fuel to ethanol among pregnant women reduced adverse pregnancy outcomes.	Facilitators: Adequate education on the use of intervention.
Abegunde et al[27] (2015) Nigeria	Bauchi (NE) rural health facility	Program evaluation (outcome): To estimate the impact of the MNCH/FP/RH interventions implemented in Bauchi State and to evaluate the progress towards the achievement of MDGs 4 and 5.	Integrated MNCH/FP/RH program. *	Across the continuum of care Women of childbearing age (15-49 years).	Maternal, newborn and child health indicators in the continuum of care neither reached the national average nor attained the 90% globally recommended coverage level.	No: For several of the indicators, a modest improvement from baseline was found following the program.	Barriers: Inadequate financing, inadequate essential human resources for implementation. Facilitators: Involvement of community members in implementation.
Cannon et al[28] (2017) International	Sokoto (NW) urban and rural community	Post intervention assessment (qualitative): To assess the perceived successes and benefits of using Misoprostol and Chlorhexidine as	Drugs/medication Use of Misoprostol and Chlorhexidine gel. *	Childbirth/Post natal newborn Mothers and husbands health workers health service providers policy makers	Community-based distribution of Misoprostol and Chlorhexidine intervention was successful with overwhelming support for the use of the two drugs among users,	Yes.	Barriers: Stocks outs, shortage of staff, socio-cultural barriers, myths, and fears about the medication. Facilitators: Early advocacy with

		reported by different types of key stakeholders.			their spouses, and members of drug distribution system		government and broader stakeholder engagement.
Findley et al[29] (2013) International	Katsina, Yobe, Zamfara (NE and NW) urban and rural community	Program evaluation (quasi-experimental design): Examine the extent to which the intervention program has facilitated improvements in key behaviours and outcomes	Integrated maternal, newborn, and child health program*	Across the continuum of care Women of childbearing age 15-49 years.	Between baseline and follow-up, the rates of anti-tetanus vaccination and early breast feeding increased. Also, more newborns were checked by trained health workers. Women were performing more of the critical newborn care activities at follow-up, relied less on TBAs for health advice, and more on trained health workers. Infant and child mortality declined.	Yes: In the context of ongoing improvements to the primary health care system, the participatory and community-based interventions focusing on improved newborn and infant care were effective at changing infant care practices and outcomes in the intervention communities	Facilitators: Integrated approach of program, quality improvement at facilities, community participation and support.
Ishola et al[30] (2017) Nigeria	Kano and Zamfara (NW) urban and rural community	Program evaluation (outcome): To characterize the effects of volunteer household counsellors (VHCs) upon improving	ACCESS/Maternal and Child Health Integrated Program (MCHIP)*	Pregnancy Pregnant women/mother	Mothers who received counselling had better knowledge of BPCR compared to women who did not. Mothers who received counselling had greater odds of recognising danger	Yes: VHCs have substantially increased knowledge of BPCR and danger signs among women.	

		knowledge of birth preparedness and complication readiness (BPCR)			signs during delivery and post-partum.		
Orobaton et al[31] (2016) International	Sokoto state (NW) rural community	Program evaluation (process and outcome): To evaluate the community distributed SP program.	Community distribution of SP for Malaria-In-Pregnancy*	Pregnancy Pregnant women	Up to 95% coverage of SP1 doses in the intervention LGAs compared to 26% in the counterfactual LGAs. Measurable SP3+ coverage was 45% in the intervention and 0% in the counterfactual. Increased doses of IPTp-SP were associated with increases in newborn head circumference and lower odds of stillbirth.	Yes: Scale up and delivery of high impact IPTp-SP interventions in low resource malaria endemic settings, where few women access facility-based maternal health services	Facilitators: Authentic community ownership, integrated approach of program, community involvement, peer influence.
Ezugwu et al[32] (2014) Nigeria	Enugu (SE) urban health facility	Post intervention assessment (retrospective review of program data): Evaluating the impact of the adoption of this evidence-based guidelines on maternal	Promotion of Evidence based management of obstetric complications	Pregnancy and childbirth Pregnant women	There was a significant reduction in case fatality rate for both eclampsia (15.8% vs. 2.7%; P = 0.024, odds ratio = 5.84) and Postpartum haemorrhage (13.6% vs. 2.5% P value = 0.023, odds ratio = 5.5). There was 43.5% reduction in the MMR	Yes: Implementation of evidence-based guidelines/ intervention is possible in low resource settings and contributes to a significant reduction in the maternal deaths.	

		mortality reduction.			with the intervention (488 vs. 864/100 000 live births P = 0.039, odds ratio = 1.77).		
Orobaton et al[33] (2015) Nigeria	Sokoto (NW) rural community	Post program evaluation (retrospective analysis of program data): To evaluate the impact of scaling up the use of chlorhexidine digluconate 7.1% gel using a community-based distribution system	Drugs/medication : Chlorhexidine digluconate 7.1% gel plus misoprostol tablets*	Childbirth and Postnatal (newborn). Mothers and newborns	Of newborns that received the intervention (gel), 99.97% survived past 28 days.	Yes: Community led efforts to scale up the use of a single dose application of chlorhexidine digluconate 7.1% gel and instructions on the hygienic care of the cord after application led to high rates of newborn survival.	Barriers: Inadequate financing/heavy reliance on donor funding, problems with supply/availability of commodities. Facilitators: Community ownership and active involvement of men, evidence-based advocacy to government and community leaders.
Disu et al[34] (2015) Nigeria	All six geopolitical zones urban health facility	Post intervention assessment (cross sectional study): To evaluate the post-training neonatal resuscitation activities among doctors, nurses, and midwives across Nigeria	Capacity Building: Neonatal Resuscitation training	Postnatal (newborn) Health workers	Over a five-year period (2008 to 2012), a total of 727 health workers were trained. At baseline, delivery attendance rates were 11 per doctor and 9 per nurse/midwife. These rates increased to 30 per doctor and 47 per nurse in 2012. Over 90% of doctors and nurses successfully used bag and mask to help	Yes: Neonatal resuscitation training in Nigeria is well-subscribed, successful and the frequency and scope of step-down trainings are good.	

					babies breathe in the post-training period.		
Kwast[35] (1996) International	Oyo and Bauchi (SW, NE) urban health facility	Program evaluation (outcome): To describe selected MotherCare demonstration projects in the first 5 years between 1989 and 1993 in Bolivia, Guatemala, Indonesia, and Nigeria	Safe MotherHood Project: Lifesaving skills training for midwives and interpersonal communication skills for all providers*	Childbirth and Postnatal (mother and newborn). Professional midwives	Significant reductions in postpartum haemorrhage and in prolonged labour; and a decline in intrapartum stillbirths, postpartum sepsis and broken-down episiotomies was observed. Midwives performed more than half of all vacuum extractions. Some reductions in maternal death were seen.	Yes: The upgrading of skills together with provision of supplies and a supportive management policy ultimately saved lives through an enhanced delivery environment.	
Eluwa et al[36] (2018) Nigeria	Kano (NW) urban health facility	Quasi-experimental design: To assess the effect of centering pregnancy group (CPG) antenatal care on the uptake of antenatal care (ANC), facility delivery and immunization rates for infants in Kano state.	Centering Pregnancy-group (CPG) prenatal care program	Pregnancy Pregnant women 15–49 years of age and newborns.	Statistically significant improvement in proportion of women attending ANC at least once in the 2nd and 3rd trimester in intervention versus control group. More women in the intervention group had a health facility delivery, were more likely to immunize babies at 6 and 14 weeks and more likely to use postnatal health services.	Yes: Intervention had a positive effect on the use of antenatal services, facility delivery and postnatal services.	Barriers: lack of trust in health system, strong influence of socio-cultural beliefs and practices.

Sam-Agudu et al[37] (2017) Nigeria	Nassarawa and FCT (NC) urban health facility	Prospective matched cohort study: Investigate the impact of a structured peer support intervention on EID presentation and secondarily on HIV-free survival among HIV-exposed infants.	Mentor Mothers program*	Postnatal (newborn) Mothers and newborns	Exposure to MM support was associated with higher odds of timely EID presentation among infants, compared with routine PS (adjusted odds ratios = 3.7, 95% confidence interval: 2.8 to 5.0).	Yes: Closely supervised, organized MM support significantly improved presentation for EID among HIV-exposed infants and uptake of EID testing in a rural Nigerian setting.	Facilitators: supportive supervision and quality of interactions between clients and mentors.
Qureshi et al[38] (2011). International	Sokoto (NW) rural community	Randomised community trial: To assess the impact of community volunteers to promote exclusive breastfeeding.	Counselling on EBF by community volunteers*	Postnatal (mothers and newborn). Nursing mothers	After counselling, the proportion of mothers with intention to EBF (a knowledge score>50%) increased significantly and women who were exclusively breastfeeding increased. A significant proportion of women agreed EBF was beneficial to the child.	Yes: Counselling served as a useful strategy for promoting the duration of EBF for six months and for developing support systems for nursing mothers.	
Davies-Adetugbo et al[39] (1997) Nigeria	Osun (SW) rural community	Pre/post intervention assessment: To evaluate the impact of training community extension health workers on	Training of community extension health workers on promoting breastfeeding*	Postnatal (mothers and newborn) Pregnant women	Significant increase in early initiation of breastfeeding by mothers who delivered at perinatal facilities staffed by ISBFP-trained PHC workers. 32% of the	Yes: The results suggest that the training enhanced the health workers' knowledge about EBF and attitudes towards	Barriers: Negative attitudes towards EBF. Facilitators: Community participation and linkages, trainings

		breastfeeding knowledge and practice among mothers in rural communities			deliveries in intervention area reported early initiation of breast-feeding (within 30min of delivery) compared with only 6% in the control area. In all instances, trained PHC workers had better knowledge of and attitudes towards breastfeeding and made the correct recommendations on all aspects of breastfeeding than untrained controls.	breastfeeding, and that these workers have had a positive impact on at least one aspect of breastfeeding behaviour in the community: mothers' timely initiation of breastfeeding.	conducted in local language.
Ojofeitimi et al[40] (1982) Nigeria	Oyo (SW) urban health facility	Pre/post intervention assessment: To investigate the effect of regular nutritional counselling and fear mechanism techniques to motivate pregnant women to consume foods.	Nutritional counselling*	Pregnancy Pregnant women	The experimental group had a significant pattern of monthly weight gain ($P < 0.02$) and heavier babies ($P < 0.01$) than the control group.	Yes: Nutritional counselling served to correct erroneous assumptions and aversions about food.	
Danmusa et al[41] (2014) International	All six geopolitical zones urban and rural health facility	Program evaluation (process): To describe the findings of program	Magnesium sulphate for the treatment of pre-eclampsia and eclampsia*	Pregnancy Pregnant women	A significant drop in the case fatality rate due to eclampsia from 20.9% before the start of services to 2.3% after was observed in	Yes: Reductions in deaths due to eclampsia, and states have collectively made significant	Barriers: High frequency of home births, resistance to change from health providers, inadequate number of trained

		evaluation, including the challenges encountered while implementing the projects, the successes achieved, and existing opportunities for future scaling up of the services across the country.			the lead state, Kano. A significant case fatality drop (from 15.1% to 2.7%) across the six state hospitals lends local legitimacy to the use of the drug to treat pre-eclampsia and eclampsia.	progress towards the full integration of the use of magnesium sulfate into the Nigerian healthcare system.	staff for implementation, poor quality of services. Facilitators: Advocacy to stakeholders, community involvement, supportive national health policies, enhanced monitoring.
Maternal, Newborn and Child Health Programme[42] (2017) Nigeria	Jigawa, Kaduna, Kano, Katsina, Yobe, Zamfara (NW and NE) rural community	Program process and outcome evaluation: Evaluation of a program to increase access and uptake to Reproductive, Maternal, Newborn and Child Health (RMNCH) services for hard-to-reach communities	Integrated MNCH outreach services: increasing demand and access to MNCH services in hard-to-reach communities*	Across the continuum of care. Women and young married adolescents.	271 hard-to-reach communities accessed with integrated RMNCH outreach services.	Yes: Prior to intervention, the outreach teams were not meeting the full needs for maternal and child health in communities. The program has ensured a continuum of care for MNCH services, even in the most rural locations.	Facilitators: Community engagement, community needs assessment, support from states and national governments.
Maternal and Child Survival Program[43] (2018) Nigeria	Kogi, Ebonyi (NC and SE) rural health facility	Post program outcome evaluation: To reduce newborn mortality through the	Provision of key newborn interventions: neonatal resuscitation, KMC etc*	Postnatal (newborn) newborns	ENC defined as provision of skin-to-skin contact after birth, clean cord care with or without CHX, and early initiation of breastfeeding -within	Yes: MCSP's newborn health strategies have promoted the scale up of high impact interventions that	Facilitators: Incorporation into local authority's strategy health plan, demand creation activities, staff retention.

		implementation of key newborn interventions.			30 minutes of birth increased from about 26% to 92%. Over 90% of asphyxiated babies in intervention states received successful neonatal resuscitation. Uptake and use of CHX increased from 0% at baseline to about 92%.	address the three major causes of newborn morbidity and mortality in Nigeria.	
Maternal and Child Survival Program[44] (2018) Nigeria	Kogi, (NC and SE) rural health facility	Post program outcome evaluation: To increase voluntary family planning uptake among postpartum women delivering in health facilities in Kogi and Ebonyi states	Integrated Post-Partum Family Planning Intervention*	Postnatal (mothers) Postpartum women	PPFP services were initiated in 233 health facilities, with 637 health care workers empowered to provide PPFP services. This increased the pool of competent service providers for both post-partum FP and long-acting reversible contraceptives (LARC). There was improved strategic planning for family planning in both states.	Yes: Trends show contraceptive access for voluntary post-partum family planning has increased in both states, despite initial low contraceptive use prevalence with an estimated 25k pregnancies averted.	Facilitators: Availability of competent health providers, effective provision of health information to women.
Maternal, Newborn and Child Health Programme[45] (2017) Nigeria	Jigawa, Kano, Kaduna, Katsina, Yobe, Zamfara (NW, NE) rural community	Program outcome evaluation: To improve health message delivery to men and encourage their active role in	Male Support Groups*	Across the continuum of care Males in intervention states.	Over 1500 support groups established and supported. Over 4,000 interpersonal communication sessions held.	Yes.	Facilitators: Active community/stakeholder engagement, community ownership.

		women and child health.					
Maternal, Newborn and Child Health Programme[46] (2016) Nigeria	Jigawa, Kano, Kaduna, Katsina, Yobe, Zamfara (NW, NE) rural health facility	Program outcome evaluation: To assess outcome of an intervention increasing the uptake of long-acting reversible contraception services in primary Health centres through Competency-based Training.	Integrated Competency Based Training for health workers	Pre-pregnancy Women of childbearing age	851 health care providers have been trained in the integrated package of reproductive, maternal, newborn and child health (RMNCH), including LARC services.	Yes.	Facilitators: Demand creation activities, good commodity supply chain.
Abegunde et al[47] (2015) Nigeria	Sokoto (NW). urban and rural community and health facility	Program evaluation-outcome: To assess the impact of interventions implemented between 2012 and 2013.	Integrated management of (MNCH)/FP/reproductive health*	Across the continuum of care women, newborns and children under 5yrs of age	None of the nine indicators associated with the continuum of maternal, neonatal, and childcare satisfied the recommended 90% coverage target for achieving MDGs 4 and 5.	No: The majority of the LGAs did not meet intended targets and require intensified program/ intervention.	Barriers: Low quality data for planning the program.
Mckaig et al[48] (2009) International	Kano (NW) urban and rural community and health facility	Program outcome evaluation (qualitative study): To examine integrated MNCH/FP services as a means towards meeting the family planning	Scale-up of postpartum family planning*	Across the continuum of care policymakers, health care providers, community members.	Significant increases in number of FP clients and method use per site following the implementation of the program.	Yes: The approach systematically increases MNCH/FP integration and had a positive effect on service use, particularly FP, even in a very	Barriers: Negative religious/community attitudes towards MNCH services. Facilitators: Service integration, community linkages.

		and reproductive health needs of women in the postpartum period.				conservative environment.	
Kana et al[49] (2015) Nigeria	countrywide urban and rural health facility and community	Systematic review: To describe and indirectly measure the effect of the Maternal, Newborn and Child Health (MNCH) interventions implemented in Nigeria from 1990 to 2014	Interventions for maternal and child health	Across the continuum of care mothers, newborns, under-five children.	The national MMR shows a consistent reduction (Annual Percentage Change (APC) = −3.10%, 95% CI: −5.20 to −1.00 %) with marked decrease in the slope observed in the period with a cluster of published studies (2004–2014).	Yes: The development of MNCH policies, implementation and publication of interventions corresponds with the downward trend of maternal and child mortality in Nigeria	
Abdul-Hadi et al[50] (2013) Nigeria	Gombe (NE) rural community	Intervention assessment (quasi-experimental design): To demonstrate effectiveness of Community Based Distribution of Injectable Contraceptives Using Community Health Extension Workers.	Community based distribution (CBD)of injectable contraceptives using community health extension workers*	Pre-pregnancy	The CBD mean couple years of protection (CYP) for injectables-depomedroxy-progesterone acetate (DMPA) and norethisterone enantate was higher (27.72 & 18.16 respectively) than the facility CYP (7.21 & 5.08 respectively) ($p < 0.05$) with no injection related complications. The CBD's mean CYP for all methods was also found to be four	Yes: Community based distribution of contraceptives was successful.	

					times higher (11.65) than that generated in health facilities (2.86) ($p < 0.05$		
Speizer et al[51] (2014) International	Kaduna, Abuja-FCT, Kwara, Oyo and Edo (NC, NW, SS and SW) urban community	Longitudinal evaluation of program/intervention: To examine the role of demand generation activities undertaken as part of the Urban RH Initiative programs-seeking to increase modern contraceptive use by 20 percentage points in targeted urban areas, particularly among the urban poor	Family planning demand creation and supply side interventions.*	Pre-pregnancy Women of childbearing age (15-49 years)	Outreach by community health or family planning workers as well as local radio programs was significantly associated with increased use of modern contraceptive methods. Television programs had a significant effect on modern contraceptive use. Program slogans and materials distributed across the cities were also significantly associated with modern method use.	Yes: Multi-level targeted demand generation activities contributed to increasing modern contraceptive use in urban areas, leading to improved access to maternal and reproductive health services.	Facilitators: community engagement.
Hotchkiss et al[52] (2011) International	Countrywide urban and rural health facility	Post program evaluation-cross sectional study: To investigate whether the expansion of the role of private providers in the provision of modern contraceptive	Expansion of the private commercial sector in the provision of contraceptive supplies	Pre-pregnancy Women of childbearing age (15-49 years).	Proportion of women who report obtaining the contraceptive supplies from the commercial private sector increased by 69 percent over the 1999 to 2008 period. In Nigeria, the private commercial sector became the most	Yes: The expansion of the private commercial sector supply of contraceptives decreased inequities in the use of modern contraceptives in Nigeria.	Facilitators: social marketing of intervention to create demand.

		supplies is associated with increased horizontal inequity in modern contraceptive use.			important source of contraceptive supplies to women in poorest wealth quintile group. In addition, women in better off wealth quintiles also became increasingly reliant on the private commercial sector.		
Fayemi et al[53] (2011) Nigeria	Bauchi, Gombe, Plateau, Edo, Ogun (NC, NE, SS, SW) rural community	Longitudinal evaluation of program/ intervention: To improve maternal mortality reduction through increasing contraceptive uptake in 10 rural local government areas (LGAs)in five Nigerian states.	Community Based Delivery (CBD) of non-prescriptive family planning services and the treatment of minor ailments*	Pregnancy Women of childbearing age (15-49 years).	Increase in the proportion of community members who had utilised FP commodities at all, from 28% at baseline to 49%, and an increase in the proportion of current contraceptive users from 16% at baseline to 37%. An increase in knowledge of common family planning methods, including male and female condoms, injectables and pills.	Yes: A community-based distribution approach played a critical role in enhancing access to Reproductive Health and Family Planning information and services in the project communities.	Barriers: Inadequate financial support for program, poor support from spouses of participating women, misconceptions of community members about family planning. Facilitators: Advocacy and community engagement, involvement of males in implementation, demand creation activities, regular monitoring, and evaluation.

Ogu et al[54] (2012) Nigeria	Kaduna, Kano, Adamawa, Bauchi, Borno, Taraba, and Katsina, Niger (NC, NE, NW) rural and urban health facility	Pre/Post-intervention (quasi-experimental): To investigate the effectiveness of an intervention designed to improve the capacity of private medical doctors to offer quality abortion and postabortion care to women in northern Nigeria	Capacity-building workshops for health workers to improve post-abortion care.	Pregnancy Women of childbearing age (15-49 years).	458 trained private medical doctors and 839 nurses and midwives across 430 private clinics treated a total of 17,009 women over the 10 years of the project (about 2,100 women annually). Not a single case of abortion-related maternal mortality was recorded, with only 33 women experiencing mild complications, while none suffered major complications of abortion care. At the same time, there was a reduction in treatment cost and a doubling of the contraceptive uptake by the women.	Yes: Building the capacity of private medical providers reduced maternal morbidity and mortality associated with induced abortion in northern Nigeria.	Facilitators: detailed community needs assessment, community engagement, culturally appropriate health education.

Mens et al[55] (2011) International	Edo (SS) rural community	Pre/Post-intervention evaluation: Explore peer to peer education as a tool in raising knowledge of MIP among women of childbearing age and preventive practices.	Peer led health education campaign to address malaria in pregnancy*.	Pregnancy Women of childbearing age: 15-49 years	The peer education campaign had a significant impact in raising the level of knowledge among the women.	Yes: The knowledge of women of childbearing age on malaria in pregnancy and its preventive measures increased.	
McNabb et al[56] (2015) International	Abuja-FCT and Nassarawa (NC) urban health facility	Pre/post intervention assessment: To determine if introducing the mobile app: 1) improved the quality of ANC services provided, and 2) improved client satisfaction with ANC services provided	An m-health technology intervention for CHEWs/HCWs to provide higher-quality ANC services*	Pregnancy Pregnant women	Overall, the intervention was associated with higher quality of ANC scores, with these improvements observed in multiple domains of care, including health counselling, technical services provided, and quality of health education. A significant improvement in overall client satisfaction was observed.	Yes: Introduction of a low-cost mobile case management and decision support application led to behaviour changes and improved the quality of services provided by a lower-level cadre of healthcare workers.	

Anyaehie et al[57] (2011) Nigeria	Imo (SE) rural community	Longitudinal evaluation of program/intervention: To assess the impact of free distribution of ITN to pregnant and nursing mothers in a rural community in Nigeria, using asymptomatic malaria parasitaemia as the main outcome measure	Roll Back Malaria Campaign: increased availability of ITNs for free distribution to pregnant women and children under at antenatal, postnatal and immunization clinics*	Pregnancy and postnatal (mother and newborn) pregnant women/nursing mothers and newborns	There was a sustained but insignificant rise in asymptomatic malaria parasitaemia post-distribution of ITNs. Out of the 990 subjects recruited, 470 tested positive with asymptomatic malaria parasitaemia.	No: Although ITN has a capacity to reduce mosquito bites and malaria prevalence, our study showed a non-significant increase in prevalence of malaria after 6 months use in a rural agrarian Nigerian community. This suggests ITN intervention must be complemented with awareness campaigns and other vector control strategies.	
Kabo et al[58] (2016) Nigeria	Bauchi State (NE) urban health facility	Program evaluation-process and outcome: To assess whether increased compliance with set performance standards was associated with improved maternal and neonatal outcomes	Standards-Based Management and Recognition (SBM-R) program	Across the continuum of care Health service providers	An increase in the percentage of SBM-R standards for MNH achieved was observed for 3 years in succession after the implementation of SBM-R at all 23 facilities. In addition, a decline in MMR and NMR observed, along with an increase in the active management of third stage of labour	Yes: Intervention helped health facilities achieve more compliance with MNH quality of care performance standards, the use of evidence-based delivery practices increased, leading to decreases in maternal and	

					and a decline in the incidence of postpartum haemorrhage.	neonatal mortality.	
Chabikuli et al[59] (2009) Nigeria	71 health facilities across Nigeria urban and rural	Pre/post evaluation of program: To measure changes in service utilization of a model integrating family planning with HIV counselling and testing (HCT), antiretroviral therapy (ART) and prevention of mother-to-child transmission (PMTCT) in the Nigerian public health facilities.	a referral-based, co-located family planning–HIV integration model	Pregnancy Women of childbearing age: 15-49 years	Attendance at family planning clinics and mean couple year of protection increased significantly following integration of services. Attendance by men at family planning clinics was significantly higher among clients referred from HIV clinics.	Yes: Family planning– HIV integration u sing the referral model improved family planning service utilization by clients accessing HIV services due to increased referrals.	Barriers: Low utilisation of intervention due to user fees, long waiting times. Facilitators: decentralisation of services, integration of programs.
Kalu et al[60] (2012) Nigeria	Ebonyi (SE) urban health facility	Post-intervention evaluation: To review the implementation of Post Abortion Care and effective linkage to other post abortion services in Ebonyi State University Teaching Hospital,	Provision of post-abortion care and effective linkage to other post abortion services*	Pregnancy Health service providers	About a third of the PAC care providers had formal training for the implementation of the PAC services. The commonest intervention offered the patients was Manual Vacuum Aspiration (MVA). Only 15% of the caregivers were	No: There is poor integration between emergency post abortion care and other reproductive health services in the centre, resulting in high rates of maternal mortality related	

		Abakaliki, Nigeria			satisfied with the linkage between PAC and the Family Planning services.	to abortion complications.	
Joseph et al[61] (2011) International	Edo (SS) urban health facility	Cohort study: To assess adverse pregnancy outcomes in HIV infected women who received highly active antiretroviral therapy (HAART) from early pregnancy compared with untreated-maternal HIV infection.	Administration of highly active antiretroviral therapy (HAART) from early pregnancy*	Pregnancy Pregnant women	Intrauterine growth restriction (IUGR), pre-term birth and caesarean delivery were significantly higher among women with untreated-HIV infection in pregnancy compared with women who received HAART from early pregnancy.	Yes: Provision of HAART significantly reduces adverse pregnancy outcomes.	
Ojengbede et al[62] (2010) Nigeria	Kano, Katsina, Oyo (NW, SW) urban health facility	Pre/post intervention evaluation: To examine the impact of the NASG on PPH at four referral facilities in Nigeria	Provision of non-pneumatic anti-shock garment (NASG) for PPH.*	Childbirth Pregnant women	Mean measured blood loss decreased by 80% between pre-intervention and post-intervention phases. Mortality decreased from 18% pre-intervention to 6% in the NASG phase (RR = 0.31, 95% CI 0.15–0.64, p = 0.0007).	Yes: The use of the NASG as part of standard management of PPH and hypovolemic shock at four referral facilities in Nigeria was associated with a significant reduction in blood loss and maternal mortality.	Facilitators: Frequent training, monitoring and evaluation.

Chiwuzie et al[63] (1997) Nigeria	Edo (SS) rural community	Program evaluation (quasi-experimental design): To evaluate a community intervention designed to increase access to emergency obstetric care qualitative methods used	Emergency loan funds to improve access to obstetric care	Pregnancy Women of childbearing age: 15-49 years community leaders health workers	Of the 13 clans contacted, 12 successfully launched loan funds. In the 1st year of the operation, 83% of loans requested by women/families were granted and 93% loans were repaid in full. In addition to being used for transport, loans were used to help pay for drugs, blood, and hospital fees.	Yes: The loan fund improved access and reduced delay in reaching care.	Facilitators: community involvement, quality improvement of health facilities.
Tukur et al[64] (2012) Nigeria	Kano (NW) urban and rural health facility	Evaluation of program (quasi-experimental): To evaluate whether a new low-cost strategy for the introduction of magnesium sulphate (MgSO4) for preeclampsia and eclampsia in low-resource areas will result in improved maternal and perinatal outcomes.	Training on the use of MgSO4 for severe pre-eclampsia and eclampsia in low-resource settings*	Pregnancy Pregnant women	1,045 patients with severe preeclampsia and eclampsia were treated. The case fatality rate for severe pre- eclampsia and eclampsia fell from 20.9 % (95 % CI 18.7–23.2) to 2.3 % (95 % CI 1.5–3.5). The perinatal mortality rate was 12.3% compared to 35.3 % in a centre using diazepam.	Yes: Introduction of MgSO4 in low-resource settings led to improved maternal and foetal outcomes in patients presenting with severe pre-eclampsia and eclampsia.	Barriers: health workers resistance to change.

Prata et al[65] (2012) International	Kaduna (NW) urban community	Before -after analysis (quasi-experimental): To demonstrate the role of community mobilization efforts and examine the safety and feasibility of misoprostol distribution for use in home births in Nigeria	Birth preparedness and the prevention of postpartum haemorrhage through prophylactic use of misoprostol in home births*.	Pregnancy/childbirth Pregnant women	Community mobilization efforts using TBAs, and CORPs reached most women with information about postpartum haemorrhage and misoprostol (88%). Availability of misoprostol at the community level gave over 70% of enrolled women protection against postpartum haemorrhage. Many women demonstrated an understanding of the threshold for postpartum haemorrhage, the risk of death from this disease, and the role of misoprostol in preventing and treating it.	Yes: Community mobilization had a significant impact on the successful distribution and uptake of a potentially life-saving health intervention.	Barriers: poor diffusion/ understanding of health messages led to reluctance to participate in intervention. Facilitators: community participation, use of culturally appropriate terms to disseminate information about intervention.
Hunyinbo et al[66] (2008) Nigeria	Ogun (SW) urban health facility	Pre/post evaluation of hospital-based intervention: To evaluate the use of criteria-based audits in improving the quality of hospital-based	Clinical/practice guidelines for optimal management of obstetric complications*	Childbirth Pregnant women	Overall, management of complications such obstetric haemorrhage, eclampsia, obstructed labour, and genital sepsis improved significantly. Clinical monitoring, drug use, and urgent attention	Yes: Criteria-based clinical audit was feasible and acceptable strategy for improving management of life-threatening obstetric complications.	Barriers: Insufficient supply of essential commodities, low morale of the staff.

		obstetric care services at the Federal Medical Centre, Abeokuta, Nigeria.			by senior medical staff also improved significantly after intervention.		
Okonofua et al[67] (2013) Nigeria	Kano, Lagos, CrossRivers, Plateau, Borno and Enugu (NW, SW, SS, NE, SE) urban health facility	Pre/Post-intervention (multi-centre) study: To investigate the effectiveness of an intervention aimed at improving the case management of eclampsia	Health worker training to improve management of pre-eclampsia	Pregnancy Pregnant women	The post intervention case fatality rate of 3.2 % was significantly less than the pre-intervention rate of 15.1 % ($p < 0.001$). The overall maternal and perinatal mortality ratios and rates respectively in the hospitals declined from 1199.2 to 954 per 100,000 deliveries and 141.5 to 129.8 per 1000 births, respectively ($p > 0.05$).	Yes: An intervention to build the capacity of care-providers to use an evidence-based protocol for the treatment of eclampsia in Nigeria was successful in reducing associated case fatality rate, maternal and perinatal mortality.	Barriers: Difficulties in supply of commodities. Facilitators: training and retraining of health providers, monitoring, advocacy to policy makers.
Igwegbe et al[68] (2012) Nigeria	Anambra (SE) urban health facility	Impact evaluation: To evaluate the impact of the introduction of the Service Compact with all Nigerians (SERVICOM) contract on maternal health at Nnamdi Azikiwe University	Improve quality of health services through SERVICOM.	Pregnancy Pregnant women	There was a progressive reduction in MMR and relative risk of maternal mortality, with a corresponding increase in live births. The presentation–intervention interval improved significantly from 2006. This measure significantly reduced type 3 delays	Yes: The resolution by the staff and management to change attitudes and service delivery according to the tenets of SERVICOM led to a gradual and consistent improvement in	

		Teaching Hospital, Nnewi, Nigeria.			from 2006, and consequently improved maternal mortality. Overall, MMR of 1098 per 100 000 live births in 2004 declined to 691 per 100,000 in 2010.	all service points within the hospital. This measure significantly reduced the delays to treatment and led to reductions in maternal mortality.	
Singh et al[69] (2017). International	All geopolitical zones (NE, NW, NC, SS, SE, SW) urban and rural community and health facility	Observational (Retrospective cohort analysis): To assess the level of practice of SSC in Nigeria and determine whether it is associated with early initiation of breastfeeding i.e., within the first hour of life	skin to skin contact*	Postnatal (newborn) newborns	Only about 10% of mothers reported babies receiving (skin-skin contact) SSC. Newborns who were perceived to be large at birth were significantly more likely to experience SSC than smaller newborns.	No: Coverage of SSC remained low despite known benefits for newborns without complications.	Facilitators: availability of skilled workers are health facilities, equitable diffusion of maternal health knowledge.
Galadanci et al[70] (2011) Nigeria	Kano and Kaduna (NW) rural health facility	Program evaluation (process and outcome): To assess the 2-year results of an ongoing total quality assurance project in 10 Nigerian hospitals in a rural setting, and their impact	Quality assurance project to improve maternal and neonatal mortality.	Across the continuum of care Pregnant women	The mean maternal mortality ratio (MMR) was reduced from 1790 per 100,000 births in the first half of 2008 to 940 per 100 000 births in the second half of 2009. The average foetal mortality ratio (FMR) decreased slightly	Yes: Continuous monitoring of quality assurance in maternity units raised the awareness of the quality of obstetric performance and improved the quality of care provided, thereby	

		on the MMR and foetal mortality ratio (FMR) in these hospitals from 2008 to 2009.			from 84.9 to 83.5 per 1000 births.	improving MMR and FMR.	
Gummi et al[71] (1997)	Kebbi (NW) rural community	Pre-post intervention assessment: To assess the effect of community education interventions to encourage utilization of emergency obstetric facilities	Community education intervention to increase knowledge and utilisation of health facilities*	Across the continuum of care Women of childbearing age husbands community leaders	A post-intervention mini survey showed knowledge gains of over 30% on awareness of the causes of maternal death, nature of obstructed labour, signs of pre-eclampsia, need for prompt treatment, and importance of delaying marriage. The increase was greatest on the need for prompt care for women with obstetric complications. The case fatality rate declined from 38 % in 1991 to 5% in 1995.	No: Increased awareness of the signs of obstetric complications and the need for prompt treatment among community women and men did not result in greater utilization of emergency obstetric services at the facilities studied.	Barriers: Needing husband's permission to participate, higher costs of emergency obstetric services.
Miller et al[72] (2009) International	Katsina (NW) urban health facility	Intervention assessment (quasi-experimental): To determine whether the non-pneumatic anti-shock garment (NASG) can	Non-pneumatic anti-shock garment (NASG) for obstetric haemorrhage*	Childbirth Pregnant women	Mean measured blood loss in the intervention phase was 73.5± 93.9mL, compared with 340.4±248.2 mL pre-intervention (P<0.001). Maternal mortality was lower in the intervention phase	Yes: The NASG showed potential for reducing blood loss and maternal mortality caused by obstetric haemorrhage-related shock.	Barriers: Limited access to services.

		improve maternal outcomes.			than in the pre-intervention phase (7 [8.1%]) vs 21 [25.3%]) (RR 0.32; 95% CI, 0.14 –0.72).		
Odusanya et al[73] (2003) Nigeria	Edo (SS) rural community	Pre-post program evaluation: To compare vaccination coverage obtained at the baseline and post-intervention.	Privately financed immunization program to increase immunization coverage in a rural community*	Postnatal (newborn) newborns children up to 2 years of age	Two years after the program was started, immunization coverage rates were 94% for BCG, 88% for DTP (third dose), and 82% for measles. 84%percent of children were fully immunized against all six diseases, compared with 43% at the commencement (p<0.0001). Hepatitis-B coverage (three doses) was 58%.	Yes: The vaccination program has significantly improved vaccination coverage.	
Amoran et al[74] (2013) Nigeria	Ogun (SW) rural community	Intervention evaluation (quasi-experimental): To determine the effect of malaria education programme on the uptake of insecticide-treated nets (ITN) among nursing mothers in rural communities in Nigeria.	Health education intervention on malaria prevention practices among nursing mothers in rural communities*	Pregnancy Nursing mothers	Knowledge of indoor spraying increased from 14.7% to 58.2% (P < 0.001) and use of window and door nets increased from 48.3% to 74.8% (P < 0.001). The proportion of those with ITN use increased from 50.8% to 87.4% (P < 0.001) while those with practice of maintaining clean	Yes: Malaria control significantly improved in rural areas, as the caregivers were adequately empowered through appropriate health education intervention.	

					environment also increased from 40.4% to 54.5% (P < 0.001). There were no significant changes in all the practice of malaria prevention methods in the control group.		
Okonofua et al[75] (2011) Nigeria	Whole country: 36 states plus FCT rural and urban community	Intervention evaluation (quasi-experimental: To determine the outcome of an advocacy program aimed at implementing a policy of free maternal and child health (MCH) services in Nigeria.	Free maternal and child health (MCH) services in Nigeria	Across the continuum of care Policy makers	By December 2009, nine States (and FCT) (24.4%) were practicing comprehensive free maternal and child health policy in Nigeria, while 14 states (37.8%) offered partially free services. This represents an increase of eight states (53.3%) over the 15 states that offered free services before the advocacy activities began. Data from one state indicated an increase in ANC utilisation and attendance for delivery and post-natal care.	Yes: Advocacy has been successful in building the commitment of high-level government officials in addressing maternal and child health in Nigeria.	Barriers: Challenges implementing free services, insufficient data to monitor and evaluate program. Facilitators: commitment of policy makers to the issue, stakeholder engagement, demand creation activities, culture of accountability.

Findley et al[76] (2013) International	Katsina, Zamfara and Yobe (NE, NW) rural community	Intervention evaluation quasi-experimental	Community Based Maternal, Newborn and Child Health Service Delivery*.	Across the continuum of care Women of childbearing age (15-49yrs)	Anti-tetanus vaccination rates and early breast-feeding rates increased. Compared to the control communities, more than twice as many women in intervention communities knew to watch for specific newborn danger signs and significantly fewer mothers did nothing when their child was sick. The largest changes in care for sick children were seen in the use of medications across intervention areas, leading to improved home care for fever and coughs.	Yes: The community-based approach to promoting improved newborn and sick childcare through community volunteers and CHWs resulted in improved newborn and sick childcare.	Facilitators: Group learning and communication model used as part of program strategy.
Pathfinder International[77] (2011) International	Kano, Lagos, Borno (NW, SW) rural community and health facility	Intervention evaluation (process and outcome): To improve health system and community structures to enable sustainable change in the quality and coordination of	Maternal Health Care Improvement Initiative: Capacity building and Health system strengthening	Across the continuum of care Health workers Community and political leaders.	MCHIC members, facility health workers, male motivators, young mother peer educators, CHWs and TBAs were trained in various maternal health care concepts and advocacy. There was an observed increase in community	Yes	Barriers: Political constraints, inadequate infrastructure, cultural and religious perceptions and practices, poor monitoring, and evaluation.

		maternal health (MH) service delivery, and to shape MH care-seeking behaviour among key populations.			service uptake for skilled birth attendants.		Facilitators: community involvement.
Galadanci et al[78] (2010) Nigeria	Kano (NW) rural and urban health facility	Impact evaluation: To demonstrate the impact of introduction of free maternity services in Kano state	Free Maternity Health Service Policy at Secondary Facilities	Across the continuum of care Women of childbearing age (15-49yrs)	Since the introduction of free maternity services in 2001, ANC attendance and facility deliveries. Only 50% of women in the State utilize antenatal clinic.	No: Despite eight years of free maternity services in Kano State, there is still low utilization of maternity services.	Barriers: Inadequate funding, poor stock of commodities, inadequate infrastructure, and staff retention.
Charurat et al[79] (2010) International	Kano, Zamfara and Katsina (NW, NE) urban health facility	Pre/Post intervention evaluation (mixed methodology): To determine the effectiveness of systematic screening to increase the use of FP and PPFP services in selected MCHIP-supported sites in Northern Nigeria.	Postpartum Systematic Screening*	Postnatal (mothers and newborn) Post-partum women	With this postpartum systematic screening checklist, clients attending immunization, newborn care and paediatric/sick baby services were more likely to be screened for FP, postnatal care and immunisation services. In response to high unmet need for FP, the majority (73%) of trained providers knew at least three family planning methods that are suitable for postpartum women,	No: The initiative increased screening for postpartum services and overall quality of counselling/ knowledge of providers. It however did not result in an increase in FP uptake.	Barriers: stock outs of commodities, needing husband's permission, long distances, women's lack of information about services.

					and all of them were providing family planning counselling to pregnant or postpartum women. While family planning referral increase dramatically, only few women (15%) said they would go for referrals same day.		
Omole et al[80] (2018) International	Osun (SW) urban health facility	RCT: To determine the impact of an SMS based intervention on maternal health seeking behaviour.	mhealth/SMS based health promotion intervention*	Pregnancy Pregnant women	An increase in facility-based delivery seen in the intervention group. Most participants in the intervention group expressed support for the use of text message for maternal health promotion	Yes: Positive impact of SMS intervention on facility-based delivery.	Barriers: financial constraints, low level of literacy among recipients.
Okoli et al[81] (2014) Nigeria	FCT, Nassarawa, Ogun, Kaduna, Zamfara, Bauchi, Anambra, Ebonyi, Bayelsa (NC, SW, NW, NE, SE, SS) rural community	Program evaluation (quasi-experimental design): To describe the use and effect of a Conditional Cash Transfer (CCT) programme to encourage use of critical MNCH services among rural women in Nigeria	Conditional Cash Transfer (CCT) for maternal and child health	Across the continuum of care Women of childbearing age (15-49yrs)	The CCT intervention is associated with a statistically significant increase in the monthly number of women attending four or more ANC visits ($p < 0.01$; 95% confidence interval 7.38 to 22.85). A statistically significant increase was also observed in the monthly number of women receiving two	Yes: CCT intervention showed significant effects on service uptake, although results for several outcomes of interest were inconclusive.	Barriers: loss of CCT beneficiaries to follow up, limited capacity of facilities to meet additional work required. Facilitators: Collaborations with other organisations, building trust and promoting utilisation through prompt delivery of intervention.

					or more Tetanus toxoid doses during pregnancy ($p < 0.01$; 95% CI 9.23 to 34.08). Changes for other outcomes (number of women attending first ANC visit; number of deliveries with skilled attendance; number of neonates receiving OPV at birth) were not found to be statistically significant.		
Liu et al[82] (2019) International	Akwa Ibom (SS) urban health facility	Pragmatic randomised control trial: To implement and evaluate a conditional cash transfer (CCT) programme for preventing mother-to-child transmission (PMTCT) in Akwa Ibom, Nigeria.	Conditional Cash Transfer (CCT) to improve utilisation of health services for PMTCT	Pregnancy and postnatal (mother and newborn) Pregnant women	Women offered the CCT programme were more likely to give birth at the facility compared to women in standard care. For EID testing there was an absolute difference of 12.8% between those offered the CCT intervention and those in standard care. Over 86% of the facility-delivered newborns received nevirapine, and ITT and PP estimates were like those for facility deliveries.	Yes: CCTs improved the likelihood of HIV-positive women giving birth at a facility, of nevirapine being administered to their newborn, and of undergoing EID testing in Akwa Ibom, Nigeria.	Barriers: Challenges with accessing funds/cash, needing to obtaining partner permission, lack of integrated information systems across facilities, requirements to participate and dealing with a new HIV diagnosis. Facilitators: Positive encouragement, regular reminders, and counselling of participants.

Edu et al[83] (2017) Nigeria	Cross Rivers (SS) rural and urban health facility	Program evaluation using a mixed method design: To evaluate the effect of a free maternal health care program on the health care-seeking behaviours of pregnant women in Cross River State, Nigeria.	Free Maternal Health Care Program at primary and secondary health facilities	Across the continuum of care Women of childbearing age (15-49yrs)	Results of quantitative data show increase in the percentage of women accessing maternal health services. Qualitative results showed that women perceived that there have been increases in the number of women who utilize Antenatal care, delivery, and Post-Partum Care at health facilities, following the removal of direct cost of maternal health services.	Yes: Intervention led to an increase in the number of women who utilise health facilities for their care.	
Noguchi et al[84] (2020) International	Nassarawa State (NC) urban health facility	Pragmatic, cluster randomized, controlled trial: To investigate the impact of G-ANC on various maternal newborn health-related outcomes- IPTp uptake and insecticide-treated nets (ITN) use.	Grouped Antenatal Care for MIP interventions*	Pregnancy Pregnant women	Mean number of IPTp doses received was higher for intervention versus control arm. Reported use of ITN the previous night was similarly high in both arms for mothers in Nigeria (over 92%). Reported ITN use for infants (but not mothers) was higher in the intervention versus control arm in Nigeria.	Yes: G-ANC may support uptake of important MIP interventions, particularly IPTp coverage and IPTp-SP uptake.	

Oguntunde et al[85] (2018) Nigeria	Kaduna and Jigawa (NW) rural community	Program outcome evaluation: To assess the perceptions of stakeholders and beneficiaries of ETS in two states in northern Nigeria, comparing two models of ETS [stand alone or part of an integrated package of MNH interventions].	Emergency Transport Schemes (ETS)*	Pregnancy and childbirth. Pregnant women husbands community members community health workers health service providers	Demand creation activities – especially working with traditional birth attendants and religious leaders – provided a strong linkage between the ETS and families of women in need of emergency transport services. Community members perceived the ETS model that included demand-generating activities as being more reliable and responsive to women's needs.	Yes: ETS remained a key solution to lack of transport as a barrier to utilizing maternal and newborn health services in emergency situations in many rural and hard-to-reach communities.	Barriers: Security challenges, need for husband's permission, poor road conditions, driver's reluctance to attend to non-emergencies. Facilitators: Dedication of drivers in the scheme, integrated approach of program, community awareness.
Lalonde & Grellier[86] (2012) International	Edo, Anambra, and Kaduna (SE, SS, NW) urban health facility	Program impact evaluation: An assessment of FIGO Saving Mothers and Newborns Initiative 2006–2011	FIGO Saving Mothers and Newborns Initiative: training in emergency obstetric and newborn care (EmONC)	Across the continuum of care Mothers and newborns	Magnesium sulfate supplied to all State hospitals by Kaduna State Government. Efforts led to the cost of magnesium sulfate reduced by manufacturers. And at least 4 obstetric protocols introduced. Significant reduction (approx. 28%) in maternal mortality due to eclampsia at the project site.	Yes.	Barriers: Limited financial resources, civil unrest. Facilitators: community participation and ownership.

Okeke et al[87] (2017) International	Enugu, Kwara and Kano (SE, NC, NE) rural community	Program evaluation-outcome: To assess the outcomes of the implementation of the Nigeria Midwives Service Scheme	Midwives Service Scheme (MSS)*	Pregnancy and childbirth. Pregnant women Midwives	A slight increase of the use of antenatal care was observed, with no measurable impact on skilled birth attendance. Findings report important design, implementation and operational challenges that likely contributed to the program's lack of impact.	No: Program achieved only a modest impact on the use of antenatal care and no measurable impact on skilled birth attendance.	Barriers: Problems with the design of program, geographical challenges, limited awareness of clinic services and poor quality of services.
Ameh et al[88] (2016) International	Multi-country: Nigeria included urban health facility	Post program evaluation: To evaluate the effectiveness of healthcare provider training in Emergency Obstetric and Newborn Care (EmOC&NC)	standardised EmONC training package	Across the continuum of care Healthcare providers	99.7% of healthcare providers improved their overall score for knowledge and for skill. There were significant improvements in knowledge and skills for each cadre of healthcare provider ($p<0.05$), with the largest change seen for recognition and management of obstetric haemorrhage.	Yes: Short in-service EmOC&NC training was associated with improved knowledge and skills for all cadres of healthcare providers working in maternity wards.	Barriers: Problems with intervention design.

Brals et al[89] (2017) International	Kwara (NC) rural community and health facility	Interrupted time series- (quasi-experimental design): To evaluate the effect of the introduction of a multifaceted voluntary health insurance programme on hospital deliveries in rural Nigeria	Kwara State Health Insurance program- a community-based health insurance scheme	Across the continuum of care Households	Insurance coverage reached up to 70.2% in four years in the program area. An increase in hospital deliveries was observed in the program area during the 4-year follow-up period. Even women who did not enrol in health insurance but who could make use of the upgraded care, delivered more often in a hospital during the follow-up period than women living in the control area.	Yes: Voluntary health insurance combined with quality healthcare services was highly effective in increasing hospital deliveries in rural Nigeria, by improving access to healthcare for insured and uninsured women in the program area.	Barriers: Long distance from facilities. Facilitators: Integrated approach, improvement in quality of services.
Okeke et al[90] (2016) International	Whole country-Nigeria rural community	Pre/post program evaluation: To examine the effects of the Midwives Service Scheme (MSS), a public sector program in Nigeria that increased the supply of skilled midwives in rural communities on pregnancy and birth outcomes.	Midwives Service Scheme (MSS)*	Pregnancy and childbirth Women of childbearing age	The main measured effect of the scheme was a 7.3 percentage point increase in antenatal care use in program clinics and a 5-percentage point increase in overall use of antenatal care, both within the first year of the program. We found no statistically significant effect of the scheme on skilled birth attendance or on maternal delivery complications.	No: Minimal improvements seen following the program, highlighting that scaling up supply of midwives may not be sufficient on its own to improve maternal and newborn health.	Barriers: Challenges with retention of midwives in scheme, poor quality of services, low perceived need for services, lack of transportation facilities.

Okereke et al[91] (2015) Nigeria	Jigawa (NW) urban community and health facility	Post intervention assessment (qualitative): To assess the potential of clinical mentoring to improve maternal, newborn and child health service delivery, as well as the successes/challenges associated with the implementation	Clinical mentoring for health workers	Across the continuum of care health workers health service providers	Clinical mentoring improved service delivery within the health facilities. Significant improvements in the professional capacity of mentored health workers were observed. Best practices were introduced with the support of the clinical mentors such as the use of magnesium sulphate and misoprostol for the management of eclampsia and post-partum haemorrhage respectively.	Yes: Stakeholders report that the introduction of clinical mentoring into the Jigawa State health system gave rise to an improved capacity of the mentored health care workers to deliver better quality maternal, newborn and child health services	Barriers: Financial costs of recruiting clinical mentors, insufficient time for health providers. Facilitators: promoting local ownership and sustainability.
Oguntunde et al[92] (2019) Nigeria	Kaduna and Katsina (NW) rural community	Pre/post intervention evaluation (qualitative): To examine an intervention that educated married men in northern Nigeria about health issues related to pregnancy, labour, delivery, and the postpartum	Men's support group intervention to increase male involvement in women's health*	Across the continuum of care Married men.	Perceptions of the male support groups were overwhelmingly positive. Participants internalized important messages they learned, which influenced their decisions related to the health of their wives and children. Some take it upon themselves to educate others in their communities about	Yes: In the northern Nigeria context, educating men about danger signs of pregnancy, labour, delivery, newborn, and child health was crucial to improving maternal and newborn health outcomes. The intervention was	Barriers: Financial cost of associated services. Facilitators: Inclusion of the community, positive perceived benefits of participation.

		period, as well as newborn and child health, through participation in male support groups.			what they learned, and many say they see changes at the community level, with more utilization of maternal, newborn, and child health services.	successful such that the effect of the intervention went beyond participants to the community.	
Adaji et al[93] (2019) Nigeria	Kaduna (NW) rural community and health facility	Pre/post intervention assessment: To assess women's experience of group prenatal care in a rural Nigerian community.	Centering Pregnancy Model- group prenatal care program*	Pregnancy Pregnant women	Mothers who could mention at least five out of eight danger signs of pregnancy increased significantly. Commitment to birth preparedness plans was high. The mothers enjoyed the group sessions and shared the lessons they learned with others.	Yes: Group prenatal care was acceptable to women and utilised.	Barriers: Limited health service providers for implementation. Facilitators: positive peer group dynamics and social networks.
Onwujekwe et al[94] (2019)	FCT (NC) urban health facility	Post program assessment (Qualitative): To examine the implementation of the NHIS-MCH project and identify barriers and facilitators for implementation, adaptation and scale up.	Free maternal and child health program	Across the continuum of care Pregnant women	The program enrolled about 1.5 million pregnant women and children during the period of implementation in the country. The respondents perceived the program as pro-poor, efficient, and effective, and led to marked improvement in the functionality of the facilities, availability	Yes: The NHIS-MDG FMCHP had positive impact on the target population though it was not sustained following the conclusion of the MDG program in 2015.	Barriers: Inadequate stakeholder consultation, alleged corrupt practices, human resources challenges, infrastructural challenges, issues with counterpart funding and public financing. Facilitators: Problems with project design.

					of services and reduced out-of-pocket expenditure, which led to increased demand and utilization of MCH services.		
Brown et al[95] (2016) Nigeria	Oyo (SW) urban community	Cluster randomized control trial: To evaluate the effect of reminder/recall system and Primary Health Care Immunization Providers' Training (PHCIPT) intervention on routine immunization completion among infants.	Community Nurse led Reminder/Recall (R/R) system Alone and in combination with Primary Health care immunization providers' training	Postnatal (infant) Mothers and infants.	Cell phone reminder/recall was associated with the highest immunization completion rates among the children in the study.	Yes: cell phone reminder/recall was effective in improving immunization completion rates.	
Asa et al[96] (2008) Nigeria	Osun (SW) rural health facility	Open randomised control trial: To evaluate the efficacy of intermittent preventive treatment of malaria using sulphadoxine-pyrimethamine (SP) in the	Intermittent Preventive Therapy in Pregnancy IPT-p for malaria using sulphadoxine-pyrimethamine (SP)	Pregnancy Pregnant women	33 (22.6%) and 52 (37.1%) women in the study and control groups, respectively, had anaemia. With multivariate analysis, the difference in the incidence of anaemia in the two groups remained significant (p = 0.01; odds ratio =	Yes: The IPT regime with sulphadoxine-pyrimethamine is an effective, practicable strategy to decrease risk of anaemia in women of low parity residing in	Facilitators: acceptability of intervention among target populations.

		prevention of anaemia in women of low parity in a low socio-economic, malaria endemic setting.			0.5; 95% confidence interval = 0.29–0.85).	areas endemic for malaria.	
Walker et al[97] (2018) Nigeria	Katsina (NW) rural community and health facility	Post intervention evaluation (quasi-experimental design): To assess the impact of Muslim opinion leaders' training of healthcare providers on the uptake of MNCH services in Northern Nigeria	Muslim Opinion Leaders' led training of health workers	Across the continuum of care Healthcare providers	The result indicates a significant difference both in perception and in practices between healthcare providers in intervention and control facilities, with respect to MNCH uptake. Access to services was higher in intervention facilities than in control facilities, with routine immunisation (including polio) recording highest hospital visits followed by other MNCH services related to pregnancy/child development. Family planning and hospital delivery were the least accessed services.	Yes: The healthcare providers who received trainings on Islamic precepts related to MNCH were able to spend greater amount of time with clients, providing counselling on Islam and MNCH. This led to improvements in MNCH.	

Ehigiegba et al[98] (2012) Nigeria	Rivers (SS) urban community and health facility	Post program evaluation: To assess the implementation of a PMTCT program in a semi-urban cottage hospital, with a community health insurance scheme.	Community Health Insurance Scheme to promote the utilisation of MNCH services	Across the continuum of care Pregnant women.	Service utilisation increased significantly. Average deliveries increased from about 20 to 120 per month. New infections were less than 2% in the period compared to 29% prior to the CHIS.	Yes: CHIS encouraged women to book early for ANC, which improved utilisation of VCT and other PMTCT services.	Facilitators: active community engagement, integration/ coordination of activities.
Adeleye et al[99] (2011) Nigeria	Edo (SS) rural community	Program process and outcome evaluation: To describe the development and implementation process of the Ekialodor safe motherhood program and to analyze how it improved maternal health in the community.	Ekialodor safe motherhood program: communication intervention to increase positive male engagement in maternal health	Across the continuum of care Community elders young adult males	A useful communication intervention was developed that increased the possibility of positive male engagement in maternal health.	Yes: Through small-group health talks, the male leaders in Ekiadolor, Southern Nigeria, became motivated to act as change agents and encouraged other men to assist with maternal health in their community.	Facilitators: delivery of intervention in line with local governance and customs
Haver et al[100] (2015) International	Akwa Ibom (SS) rural community	Program evaluation: To describe outcomes, commonalities and lessons learned from country programs in which tasks in health promotion and distribution of	CHW-led IPTp provision, insecticide-treated net distribution as part of a community-directed intervention for malaria control*	Pregnancy Community health workers	The effects of the CDI program were largest for IPTp adherence, increasing the proportion of pregnant women taking at least two sulfadoxine-pyrimethamine doses during pregnancy by five times in the CDI communities	Yes: The health promotion and distribution of commodities afforded by these community based strategies yielded greater uptake of interventions than would have been achieved through	Barriers: poor access to underserved areas and absence of political will and commitment. Facilitators: community engagement

		commodities were intentionally shifted from skilled providers to CHWs to advance MNH strategies			compared with three times in the control group, for whom IPTp was available only at prenatal care (P<0.001)	facility-based services alone.	
Okeibunor et al[101] (2011) International	Akwa Ibom (SS) rural community	Before and After analysis (quasi-experimental design): To determine the degree to which community-directed interventions can improve access to malaria prevention in pregnancy	A community directed intervention (CDI) to improve effective access to malaria prevention.	Pregnancy Pregnant women	More women slept under an ITN during pregnancy in the treatment areas. The effects of the CDI programme were largest for IPTp adherence, increasing the fraction of pregnant women taking at least two SP doses during pregnancy by 35% relative to the control areas.	Yes: Inclusion of community-based programmes with supply-side interventions substantially increased effective access to malaria prevention, and increase access to formal health care access-particularly ANC.	Barriers: Limited availability of intervention (ITNs). Facilitators: training and involvement of community members as volunteers.
Findley et al[102] (2015) International	Katsina, Zamfara (NW) and Yobe (NE) rural community and health facility	Quasi-experimental design: To evaluate an integrated maternal, newborn, and child health (MNCH) program to improve maternal health outcomes in Northern Nigeria	Integrated Maternal, Newborn and Child Health (IMNCH) program*	Across the continuum of care Women of childbearing age: 15-49 years	There was significant improvement in nearly all maternal health indicators assessed. These include women with standing permission from their husband to go to the health centre; health care utilization; delivery with a skilled birth attendant, knowledge of maternal danger signs	Yes: The improvements between 2009 and 2013 demonstrate the measurable impact on maternal health outcomes of the program through local communities and primary health care services.	Facilitators: Integration of interventions, improved quality of services at facilities, community engagement.

					and having at least 1 antenatal care (ANC) visit.		
Leight et al[103] (2018) International	Jigawa (NW) rural health facility	Cluster randomized control trial: To examine the association between birth care receipt and use on maternal and neonatal health outcomes in Jigawa, Nigeria.	Community Resource Person (CoRP) led distribution of safe birth kits to pregnant women*	Pregnancy Women of childbearing age: 15-49 years	Only about half of women who received the birth kits, used the kits. There were no significant associations between birth kit use and facility-based delivery, completion of 4 or more ANC visits, skilled birth attendance and post-natal care. Women more likely to report prolonged labour and postpartum bleeding.	No: Introduction and the use of birth kits was not associated with reductions in maternal or neonatal morbidity, which may have been shaped by the mechanisms through which women accessed and utilise the kits.	Barriers: low level of penetration of birth kits, challenges with insecurity, low level of use of birth kits. Facilitators: adequate education about the intervention.

* Interventions aligned with WHO 2011 and 2017 guidelines used in study.
NC: North-Central region
NW: North-West region
NE: North-East region
SS: South-South region
SE: South-East region
SW: South-West region

Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
TITLE			
Title	1	Identify the report as a scoping review.	1
ABSTRACT			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	2
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	4,5
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	5
METHODS			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	N/A
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	6,7
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	6
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	Supplementary file 2
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	6
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	6,7
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	6
Critical appraisal of individual	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe	N/A

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
sources of evidence§		the methods used and how this information was used in any data synthesis (if appropriate).	
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	6,7
RESULTS			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	8
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	Table 2, 10
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	N/A
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	Supplementary file 1
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	8-11
DISCUSSION			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	12, 13
Limitations	20	Discuss the limitations of the scoping review process.	13
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	13
FUNDING			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	1

JBI = Joanna Briggs Institute; PRISMA-ScR = Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews.

* Where *sources of evidence* (see second footnote) are compiled from, such as bibliographic databases, social media platforms, and Web sites.

† A more inclusive/heterogeneous term used to account for the different types of evidence or data sources (e.g., quantitative and/or qualitative research, expert opinion, and policy documents) that may be eligible in a scoping review as opposed to only studies. This is not to be confused with *information sources* (see first footnote).

‡ The frameworks by Arksey and O'Malley (6) and Levac and colleagues (7) and the JBI guidance (4, 5) refer to the process of data extraction in a scoping review as data charting.

§ The process of systematically examining research evidence to assess its validity, results, and relevance before using it to inform a decision. This term is used for items 12 and 19 instead of "risk of bias" (which is more applicable to systematic reviews of interventions) to include and acknowledge the various sources of evidence that may be used in a scoping review (e.g., quantitative and/or qualitative research, expert opinion, and policy document).

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