MASCOT

Report on Systematic review of health system, health promotion and clinical interventions for improving maternal health in low- and middle-income countries

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Multilateral Association for Studying health inequalities and enhancing north-south and south-south COoperaTion

Deliverable 5.4

Work-package n°5

Nature of the deliverable		
R	Report	X
P	Prototype	
D	Demonstrator	
O	Other	

Dissemination Level		
PU	Public	X
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

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Acronyms

CF	Conceptual framework
CHP	Cente for Health Policy
HIS	Health information systems
HP	Health promotion
IP	intrapartum
ITN	Insecticide-treated nets
LMICs	Low- and middle-income countries
MASCOT	**M**ultilateral **A**ssociation for **S**tudying health inequalities and enhancing North-South and South-South **CO**opera**T**ion
MCH	Maternal and child health
MH	Maternal health
PHC	Primary health care
PP	postpartum
PICOT	Population, Intervention, Comparator, Outcome, Time
PROGRESS-Plus	Place of Residence, Race/Ethnicity, Occupation, Gender, Religion, Education, Socioeconomic Status, and Social Capital, and Plus represents additional categories such as Age, Disability, and Sexual Orientation
SDOH	Social determinants of health
TI/AB	Title abstract
WOTRO	Science for Global Development', part of the Dutch Organization for Scientific Research (NWO)
WP	Work package

Definitions and key concepts used in report

Maternal health This was classified as pregnancy, childbirth and the postpartum period (defined as the first two years after childbirth). Fertility treatment is excluded. Only family planning services specifically provided for women in the postpartum period were included, not other family planning services. Women of all ages are included in this review, including adolescent women.

Health systems In the review, we adapted the WHO health Systems building Blocks framework and categorised health systems interventions as follows:

1. **Service delivery:** packages; delivery models; infrastructure; management; safety & quality, integration of care; adherence to treatment protocols; standards; licensing; certification; and accreditation. Studies on integration of MH services were considered health system studies.

2. **Health workforce:** national workforce policies and investment plans; advocacy; norms, standards and data; and training.
3. **Information:** facility and population based information & surveillance systems; global standards, tools
4 **Medical equipment, infrastructure, products, vaccines & technologies:** norms, standards, policies; reliable procurement; equitable access; quality
5. **Financing:** national health financing policies; tools and data on health expenditures; costing; risk sharing/pooling; insurance; protection; and purchasing
6. **Leadership and governance:** health sector policies; harmonization and alignment; oversight and regulation; and support services such as standards and norms
7. **Demand-side interventions**, including community education; community needs, involvement, participation, responsiveness ; and male involvement. An intervention to raise patients' use of antenatal, childbirth or postpartum services was thus included, such as cash transfers, or community outreach.

Health promotion Here, health promotion was defined as activities and health education activities within the community, and for the community, including that which occurs in health service settings. Key topics of interest are: Maternity waiting homes; Health education; Birth and complication preparedness; TBAs in the health services; Role of men or role of other community influentials; Community participation in development, delivery, quality, or evaluation of the intervention, services or programme; Community participation in maternal death reviews; Community participation in public accountability; Participatory learning and action cycles; Transport schemes; Demand-side financing schemes; Promotion of human rights; Companion of choice at birth; Respectful care, Cultural competencies or Training of providers in communication and counselling; and Community health workers or services in the community.

Joint Wotro and Mascot review The review were done as part of Wotro and Mascot projects (see below), the first stage of these reviews (identifying and mapping the literature) is identical in both projects and was thus done together.

Multiple/Complex intervention These were defined as provision of a set of clinical interventions, as opposed to provision of a single clinical or laboratory intervention. These studies mainly are assessments of service delivery(Medical Research Council United Kingdom 2009).

PROGRESS-Plus The review uses this acronym to define disadvantage, the key nexus of social stratification. These categories are: Place of Residence, Race/Ethnicity, Occupation, Gender, Religion, Education, Socioeconomic Status, and Social Capital, and Plus represents additional categories such as Age, Disability, and Sexual Orientation. The acronym PRORESS-Plus is used by the Campbell and Cochrane Equity methods Group and the Cochrane Public Health Review Group.

Tracer conditions Single or multiple interventions targeting the five selected tracer conditions were included in the review. Each is defined here:

1. Maternal HIV, include all studies of single or multiple interventions related to HIV in pregnant, intrapartum or postpartum women.

2. STIs other than HIV, includes all studies of single or multiple interventions related to STIs other than HIV in pregnant, intrapartum or postpartum women. Bacterial vaginosis was not considered an STI.
3. Maternal malaria included all studies of single or multiple interventions related to malaria in pregnant, intrapartum or postpartum women.
4. Maternal hypertension included all studies of single or multiple interventions related to hypertension in pregnant, intrapartum or postpartum women, such as use of Magnesium Phosphate (MgSO4) for eclampsia. Studies on conditions that are risks for hypertension, such as antiphospholipid syndrome, were not included unless they included a clinical intervention on hypertension.
5. Antepartum or postpartum haemorrhage includes all studies of single or multiple interventions related to haemorrhage in pregnant, intrapartum or postpartum women. This includes studies of drugs such as misoprostil for preventing postpartum haemorrhage, but not use of this drug for inducing labour or for any other purpose. Cases of uterine rupture were not necessarily considered antepartum haemorrhage.

Acknowledgements

This research received funding from the European Union's Seventh Framework Programme (FP7/2007-2013) under grant agreement number 282507, within the MASCOT project. Funding for the review was also received from NWO (within the Wotro project). Investigators at the Centre for International Health, Burnet Institute, Australia participated in the review and analysis.

Executive summary

Primary evidence published in peer-reviewed literature was systematically identified and data extracted into standardised data forms and then analysed. Further data were extracted from studies related to the health system, health promotion, patient demand or the selected tracer conditions. Studies of individual clinical interventions (other than the selected tracer conditions), or descriptive studies, such as needs assessments were excluded.

Reviewers initially screened titles and, if required, abstracts, with a low threshold for searching full text. Screening was done independently, in duplicate. Differences between reviewers in extractions were reconciled by a third reviewer. If no abstract was provided, but the title was indicative of a relevant study, these were coded as "No abstract" and then the full text assessed for eligibility.

The team then screened the full text of all articles included after the screening of title and abstract. The full text articles were checked to ensure that the codes applied when the titles and abstracts were screened are correct. Articles that had been incorrectly allocated to a category in Stage 1 were then reassigned to their correct category. Variables were extracted from the full text documents into three categories of codes (depending on the topic of the study), namely: Generic variables; Health System variables; and Health promotion variables.

Mapping in Stage 1 includes identifying articles on specific specialised topics, such a demand-side financing for health promotion. Only select clinical conditions were reviewed, namely: haemorrhage, hypertension, HIV infection, sexually transmitted infections (STIs) other than HIV, and malaria – as these conditions constitute the leading causes of maternal mortality globally (Murray et al 2012, Khan et al 2006, WHO 2012). Detailed extraction was not done on other clinical interventions and services.

The review aimed to develop a comprehensive map of all maternal health literature in the period 2000-2012, and determine if the distribution of this literature matched the burden of maternal mortality. This review also sought to analyse whether single clinical interventions; health systems interventions; health promotion, and community-based interventions for maternal health were targeted at vulnerable groups. These vulnerable groups were defined in different categories of social differentiation, as defined by the mnemonic PROGRESS-Plus: Place of Residence, Race/Ethnicity, Occupation, Gender, Religion, Education, Socioeconomic Status and Social Capital, Age and Disability.

Eligibility criteria for Stage 1

Original studies on MH interventions were included, as well as systematic reviews on MH. All study designs which provide evidence to answer the review question were included in the review, provided that they report an outcome of an intervention. This broad inclusion was used as few randomised trials of health promotion or system interventions have been done in LMICs. Moreover, much relevant information is available from studies lower in the evidence hierarchy. In some previous reviews of health promotion topics, no trial evidence was located, for example a review of maternity waiting homes located no trials(van Lonkhuijzen, Stekelenburg et al. 2012). Further, inclusion of observational studies fulfils a key aim of collating evidence that corresponds to the conditions under which maternal health interventions are mostly applied in practice. Synthesis of

observational studies provides data applicable to drawing inferences for policy, in a policy-relevant manner.

We exclude the effects of single clinical interventions other than the tracer conditions we selected for review. For example, we excluded a study of the effects of iron supplementation for pregnant women. We, however, included individual health system interventions, such as an intervention to increase the numbers of midwives, or to remove user fees for childbirth services. Studies on the delivery of multiple interventions (complex interventions), such as a package of antenatal care were included. We included studies that assessed different ways or modes of implementing single clinical interventions. Assessment of different implementation strategies is clearly a health systems intervention and was included.

Arabic, English, French, Japanese, Portuguese and Spanish articles were included. Members of the Mascot and Wotro team fluent in languages other than English assisted with downloading and then extracting information from such papers.

Definitions used in review

The review defined maternal health as relating to the health of women of any age from the time of conception until two years after childbirth, thereby covering pregnancy, childbirth and the postpartum period. Only family planning services provided to women during the postpartum period were included in this definition, and fertility treatment excluded. LMICs were identified based on the World Bank's classification of country income status in 2012 (see: *http://data.worldbank.org/about/country-classifications/country-and-lending-groups*).

As per the World Health Organization (WHO) framework for health systems (WHO 2007), health systems interventions were defined as actions undertaken to improve the functioning of one or more health systems building blocks in order to enhance access, coverage, efficiency, and/or quality of maternal health services. Health promotion encompassed a defined set of activities (listed in the Definitions and key concepts section), implemented either within communities or at health facilities.

Search strategy

A systematic search of the published literature was undertaken in seven electronic databases: Cumulative Index to Nursing and Allied Health Literature (CINAHL), Embase, LILACS, Medline, PopLINE, PsycINFO, and Web of Knowledge. Search strings, comprising a combination of health system, maternal health, and LMIC related text words and subject headings, were developed and tested for relevance and comprehensiveness prior to being used in the search. Annex 1 provides details of the full search strategy. The time period searched spanned from January 1, 2000 through to August 2012. The databases searches were conducted In August and September 2012. We included search terms for maternal health, and low- and middle-income countries only.

All articles located in the search were uploaded into EPPI-Reviewer 4, a systematic review software package developed by the EPPI Centre (http://eppi.ioe.ac.uk/cms/Default.aspx?tabid=184), and duplicates subsequently removed.

Box 1 presents the inclusion and exclusion criteria for Stage 1 (full definitions and the review protocol are available on request).

Box 1: Inclusion and exclusion criteria for the review

Inclusion criteria

All the criteria below must be met for inclusion in Stage 1:

1. **Population**. Interventions must target a maternal health population (*women in pregnancy, childbirth, or within two yea postpartum*), or male involvement with a maternal health population, or be general health system interventions, provid they report outcomes in a maternal health population. If the intervention is among a maternal health population, but is primarily for the benefit of the child, it must still be included nonetheless.
2. **Study designs included.** All study designs will be included provided they report on an assessment of the outcome of an intervention. Only systematic reviews will be included, narrative reviews are classified as "Not research".
3. **Study outcomes.** Quantitative or qualitative outcomes, or data on the impact of MH interventions at a population level be reported. Outcomes may be measured in either the woman, or the newborn child. Biological, process, health system other outcomes measures are all applicable.
4. The following types of interventions:

4.1 **Health system or health promotion interventions** for improving maternal health. This includes studies of socio-economic or environmental interventions, such as improving water supply. Health system interventions generally fa within the 6 health system building blocks, listed in definitions section.

4.2 **Community-based interventions**. Interventions delivered in community settings (any activities occurring outside of health facilities), even delivery of single clinical interventions.

4.3 **Pre-specified single clinical interventions, as tracer conditions**, specifically: HIV/STIs; malaria, hypertension, haemorrhage and pregnancy sepsis.

5. **LMICs**. Only studies in LMICs will be included. See Annex 4, LMIC countries defined by the World Bank in 2012 (*http://data.worldbank.org/about/country-classifications/country-and-lending-groups*).
6. **Dates of publication included.** Studies published between 2000 and 2012 will be included.
7. **Languages included.** Arabic, English, French, Japanese, Portuguese and Spanish language studies were included.

Exclusion criteria

1. **Study designs excluded.** Exclude descriptive studies, such as those documenting prevalence of conditions and needs assessments. Policy discussion papers on system or multiple/complex interventions will be excluded unless they provide outcome data. Books are excluded
2. **Single-clinical interventions excluded** Studies of the effectiveness of single clinical interventions were excluded (apart f the tracer conditions listed above).
3. **Topics excluded.** We exclude interventions related to infertility or fertility (such as contraception failure rates). We only include interventions around contraception if part of a postnatal care intervention.
4. **Service utilisation articles**
5. **Academic theses** excluded.

Coding

All data extraction codes were first tested on a sub-set of articles by a group of reviewers, and subsequently refined prior to being applied to all records. Coding of texts was undertaken to screen retrieved records for eligibility. Firstly, an initial coding done during title and abstract screening, followed by more detailed coding and data extraction during subsequent full-text screening. The articles retrieved from the searches were divided among a team of 33 reviewers, with allocations assigned to pairs of reviewers. Each pair independently screened titles and abstracts in EPPI-Reviewer 4, and coded each paper in duplicate according to reasons for exclusion and inclusion. Publications that appeared twice in the database were coded as 'duplication' and duplicate copies were not screened for inclusion or exclusion.

In title and abstract screening, each record was first assessed for exclusion and coded once on a hierarchal basis according to one of the following criteria: (1) Not in one of the review languages - Arabic, English, French, Japanese, Portuguese or Spanish; (2) Published before 2000; (3) Does not focus on a maternal health population as defined by the review; (4) Does not report on the outcomes (quantitative or qualitative) of a maternal health intervention or service except for if the paper describes service utilization or coverage; (5) Reports on a clinical intervention other than those included in the review; (6) Not set in a LMIC; and (7) Not research.

Papers that did not meet any of the exclusion criteria were then coded for one or more applicable inclusion criteria: (1) health systems or multiple clinical intervention for conditions covered by the review; (2) community-based intervention; (3) reports on maternal malaria; (4) reports on maternal blood pressure or hypertension; (5) reports on HIV or STIs among a maternal population; (6) reports on antepartum or postpartum haemorrhage; (7) reports on pregnancy sepsis; and (8) reports on service utilization or coverage. Reviewers also coded papers as 'query' if unsure about exclusion or inclusion, and as 'no abstract' if the record did not include an abstract. Studies marked query or "no abstract were included for subsequent analysis during the stage of full-text coding. Disagreements in inclusion and exclusion were resolved by a third reviewer, or occasionally through discussion between the two reviewers.

In full-text screening, records which met the inclusion criteria in title and abstract screening were re-assessed and, if eligible, underwent further coding and data extraction. Reviewers were assigned full text articles on types of intervention, for example health systems or health promotion or one of the clinical conditions. Some data extraction from full text was done in duplicate, with the remainder by single reviewers. Reviewers received training on how to undertake the coding and data extraction. Definitions of extraction codes for each full-text record are provided in the full body text of this document. As in the first stage of coding, any disagreements in data extraction within reviewer pairs were reconciled by a third reviewer, or through discussion between the two reviewers.

Results and conclusions

Using this map we and other users are able to identify where there are gaps in systematic review evidence in maternal health, and the available research data that can be usefully synthesized in reviews to fill these gaps. The map also allowed the team to participate in systematic reviews to inform the WHO guidelines on health promotion for maternal health.

In total, 45,959 items were added to the online systematic review software EPPI-Reviewer 4. The software and individual reviewers then removed duplicate items totalling 12,071. Independently, in duplicate, we then screened the remaining records (33,888) for relevance on their title and abstract. This screening applied the review inclusion and exclusion criteria. The two reviewers or a third reviewer then reconciled any discrepancies in this coding.

From the 33,888 articles reviewed on title and abstract, 4472 were marked for full text review. This is an inclusion rate of 13.2% after screening of title and abstract. We were unable to locate the full text document for a total of 300 articles (6.7%; 300/4472). Of the 4059 full text articles reviewed, a further 36.9% were excluded (1540).

Overall, 31,167 articles were excluded after screening of title and abstract and after full text review. This is 92.0% of all the articles identified in the review. Of the studies excluded from the review that were on maternal health, the most important reason for exclusion was that the study did not describe an intervention or outcome (33.0%; 10,347/31,167). Other studies that were on maternal health, but were excluded were those on single clinical interventions other than the tracer conditions (13.9%; 4343/31, 167) or only provided data on utilisation of routine services (2.0%; 622/31,305). Other reasons for exclusion were: articles published before the year 2000 (20.3%; 6364); studies not on maternal health (25.2%; 7877/31, 167); studies not done in LMICs (2.1%; 666/31, 167); Not research (3.9%; 1213/31, 167); and an excluded language (1.0%; 303/31, 167).

The number of studies on maternal health increased progressively over time, from fewer than 900 in 2000 to double that level in 2011. There was a rapid near-linear rise in the annual numbers of papers per year from 2000 to 2005 (from about 800 to 1400 in that period). In the years 2005 to 2010 levels remained relatively stable, between 1400and 1600. Note that the numbers of papers in 2012 does not reflect the whole year, and thus cannot be compared with preceding years.

Throughout the period of the review, descriptive studies accounted for the largest proportion of studies by some margin. Studies on interventions as defined in this review (health systems, community, health promotion or the selected tracer conditions) accounted for the smallest groups of studies. The number of these interventional studies did rise over time, and were about 200 per year from 2005 to 2012.

This report provides information on whether the amount of research done in a particular country or region corresponds to the burden of maternal mortality (is research attention distributed equitably, with the amount of research done matching the need for such research, with need defined by the MMR and total number of maternal deaths). This shows a marked disjuncture between need and number of studies done. Moreover, the distribution of equity-focused studies is concerning. Some regions of the world have half the focus on equity as other regions, and worryingly, overall fewer than ten percent of studies address vulnerable groups.

Background to review

Despite the significant advances made over the past decade in improving maternal health outcomes, progress is still too slow to achieve the targets of Millennium Development Goal (MDG) 5 by 2015 (Lozano et al 2011; Hogan MC et al 2010; Bhutta et al 2010). Whilst declining maternal mortality rates have been recorded globally, from 409,100 deaths in 1990 to 273,500 deaths in 2011, and nationally in several countries, only thirteen developing countries are projected to achieve MDG 5 on time (Lozano et al 2011). Of concern also are the inequities in maternal health, not only between higher and lower income countries, but also within countries (Bhutta et al 2010; Barros et al 2012; Countdown 2008 Equity Analysis Group et al 2008). In low- and middle-income countries (LMICs), women belonging to poorer-income quintiles or living in rural areas experience considerably higher rates of maternal death than their richer and urban-dwelling counterparts (Bhutta et al 2010; Barros et al 2012; Countdown 2008 Equity Analysis Group et al 2008; Houweling et al 2007). These inequities, coupled with persisting high mortality rates, question whether the approaches pursued to date, and how these have been applied in different settings, are effectively addressing the needs of pregnant women and mothers in LMICs.

Whilst it is often emphasized that the strategies for promoting safe motherhood are now well documented (Campbell et al 2006), weaknesses in the evidence base may limit applicability of these strategies to LMIC settings. It has been argued for instance, that the evidence generated to date largely focuses on clinical interventions to reduce mortality, with relatively less exploration of factors – such as those related to health systems, health promotion and the social determinants of health – influencing the reach, accessibility, and acceptability of these interventions (Braine 2005; Tugwell et al 2010; Bhutta 2005, Gil-Gonzalez et al 2006). In addition, some researchers have questioned the quality of evidence informing the recommended approaches, highlighting that these have largely been based on retrospective and descriptive studies (Miller et al 2003, Bullough et al 2005). Others have found that research priorities in maternal health are not necessarily aligned with the prevalence of the key factors causing death. Importantly, major causes of maternal mortality such as haemorrhage and unsafe abortion, remain under-represented within the literature (Gil-Gonzalez et al 2006).

To maximize the utility of current and future research in informing policy and practice on how to effectively and equitably address maternal mortality in LMICs, it is important to first gain an understanding of the evidence base available from these settings, and how studies of this topic are distributed globally. Leading direct causes of maternal death in LMICs are hypertensive disorders, haemorrhage, sepsis, and unsafe abortion, whilst important indirect causes include infection with HIV and malaria (Murray et al 2012, Khan et al 2006, WHO 2012). The main purpose of this study was therefore to assess the extent and distribution of research activities undertaken in LMICs on the key causes of maternal deaths and on health systems' interventions to improve maternal health. A systematic review and bibliometric analysis was thus done to examine the characteristics of literature on maternal health in LIMCs published between 2000 and 2012.

Scope of this report

This report summarises the findings of the systematic review done for the Multilateral Association for Studying Health Inequalities and Enhancing North-South and South-South Cooperation (MASCOT) project. The findings reported here constitute part of a larger systematic review presently underway.

The review, consistent with the overarching aims of MASCOT, assessed maternal health inequities in LMICs by assessing whether the distribution of maternal health research corresponds to burden of disease in LMICs. Here, we report on the results of the systematic mapping of maternal health research in LMICs in the period under study. Stage 2, outside the remit of the MASCOT project, will consist of conducting individual systematic reviews. Review topics will be assigned to different members of the review team in Stage 2. This report covers Stage 1 of the review, which was done for the **reporting of activities in the MASCOT Work package 5.**

Review objectives

Overall, the review aimed to systematically map the evidence on interventions related to health systems and selected tracer conditions concerning maternal health. The review seeks to identify which conditions have been targeted by maternal health researchers in which LMICs, or regions of the world.

Specific objectives of the Mascot review

1. To systematically map studies on health system, health promotion or key clinical interventions for maternal health;
2. To systematically identify evidence on the distribution of research on interventions to improve maternal heath in LMICs, identifying differentials in research outputs
3. To assess the extent to which maternal health interventions are explicitly designed and evaluated to address inequities in maternal health (whether effects on equity are explicitly taken into account when designing the intervention
4. Determine the influence of HICs on research in maternal health in LMICs
5. Determine which health system building blocks have been focused on in this research and in which countries or regions of the world
6. Build a team of collaborators working together across several continents

The intense and highly productive collaboration between the review team fits well with one of the main objectives of the MASCOT project, which is to stimulate cooperation between countries from Europe, Africa and Latin America. Ultimately, these strengthened collaborative actions aim to build productive relations to address maternal and child health inequalities in the future. The systematic review incorporated input from almost all partners within the MASCOT team, and from other relevant stakeholders, including end users of the data (other researchers and global policy makers). The Mascot review team and other stakeholders together defined the research question(s), the conceptual framework for the review and other review outputs.

Importantly, documenting the proportion of studies that are specifically designed to address PROGRESS-Plus populations fits well within the objective of Mascot about identifying strategies for tackling health inequalities affecting mothers and children. Demonstrating the paucity of evidence on maternal health interventions in some regions of the world similarly addresses that aim. In the review we also identified illustrative countries and case studies for subsequent study.

Conducting a systematic review examining equity impacts of health system or clinical interventions (including multiple or complex interventions) is challenging. Main challenges stem from the complex nature of the processes of policy implementation and programmes. These processes make it hard to determine and to describe the dynamics of interventions with precision, and to definitively identify

the factors that influenced effectiveness of interventions, and its differential impacts. Authors of articles thus seldom provide information on these outcomes. In particular, systematic reviews seldom consider effects on health equity. As opposed to other reviews, an equity-focused review requires a deeper investigation of primary studies, with a greater consideration of the implementation processes and context, and of the quality of studies.

This review shows the proportion of maternal health research which targets disadvantaged populations. The review adopts the approach that disadvantage can be measured across categories of social differentiation, using the mnemonic PROGRESS-Plus (Evans, 2003 and Oliver, 2008). PROGRESS is an acronym for Place of Residence, Race/Ethnicity, Occupation, Gender, Religion, Education, Socioeconomic Status and Social Capital, and Plus represents the additional categories such as Age (Adolescents) and Disability. Not all these categories were relevant in this review. The review thus examined the extent to which programmes or sets of services for improving maternal health had been specifically designed to address relevant disadvantaged groups.

Studies included within the review were classified into two categories. Firstly, targeted intervention studies, where the programme/service aims explicitly to target a disadvantaged group or setting (often one of the PROGRESS-Plus groups). The population sample in these studies is thus restricted to disadvantaged populations or settings in which most people are disadvantaged. In targeted studies there is often no comparison group, making it difficult to assess differential effects of interventions on study groups. Some of these studies among vulnerable populations do, however, report outcomes among sub-groups at especially high vulnerability. The second category, involves a universal or general population intervention, which was designed for the general population, but may report on the differential effects of the programme/service on different population groups. Data may thus be stratified by one or more categories of differentiation (PROGRESS-Plus categories). Some combinations of targeted and universal study types are also possible. For example, a targeted study of an intervention aimed at poor groups might report effects on the extremely poor, or on those with both poverty and disability, or other combinations of disadvantages.

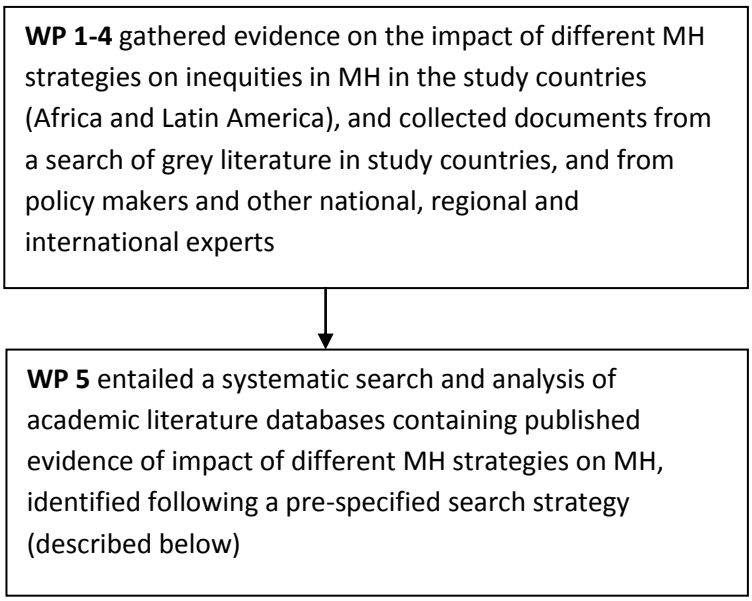
This review adopted a health system framework, encompassing the seven intervention areas described in the definitions and concepts section above. We aimed to map the published evidence about how health system components have been applied within maternal health programmes or projects in LMICs. This review adopts a broad approach to systems thinking, extending beyond the six WHO building blocks, with the inclusion of mapping of demand-side initiatives for example.

For this review, Maternal Health was defined as the time from conception until two years after childbirth, thus covers pregnancy, childbirth and the postpartum period. Primary evidence published in peer-reviewed literature was systematically identified, data extracted into standardised data forms and overall findings collated. In addition, evidence was drawn from systematic reviews of the impact of initiatives to improve health systems, health promotion, or address the selected tracer conditions for maternal health, or to increase demand for such services (such as altering household-decision making)(Manandhar, Osrin et al. 2004). Only interventions related to health system or patient demand were included, not studies of individual clinical interventions (other than the selected tracer conditions), or descriptive studies, such as needs assessments. All study designs used to evaluate an intervention were eligible.

In the final analysis, we stratify countries by region of the world and by the country's income level, and determine the distribution of maternal health research across these categories.

Link with previous work packages in Mascot project

The review, done as Work Package 5 of the MASCOT project was designed to strongly complement activities in other Work Packages of MASCOT, and to identify best practices and principles.



Review conceptual framework

The first task done in this review, as in all reviews, was for the research team to agree on a conceptual framework (CF), a critical element, applied throughout the review. The CF defines the parameters of the study, and provides the team with a clear and transparent tool which depicts their shared understanding and knowledge of review concepts, in what is a highly complex area. The CF also informs selection of study inclusion criteria, search strategies, and development of a descriptive coding tool(Harris, Helfand et al. 2001; Anderson LM, Petticrew M et al. 2011). Though the CF was designed at the onset of the review, some minor incremental changes were made to the framework as knowledge accumulates in the review.

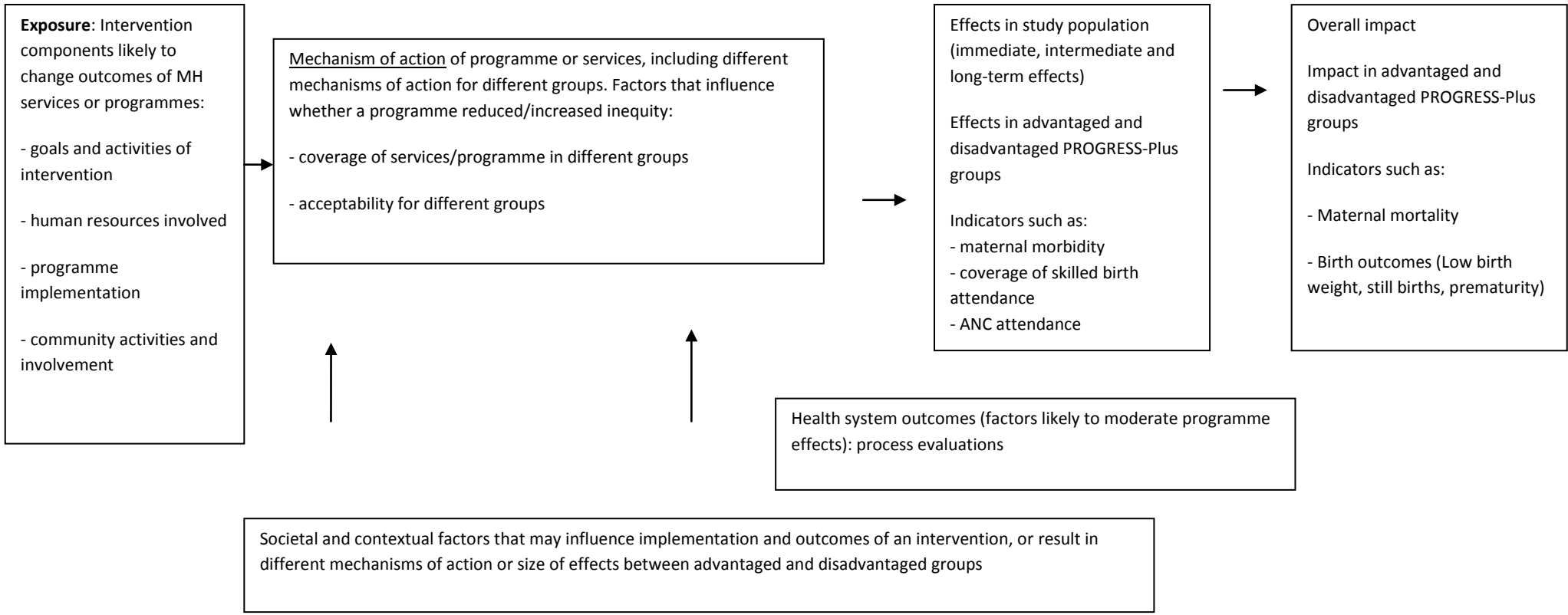
Conceptual frameworks, which identify important elements and relationships within a system, have been used extensively in the understanding of complex programmes to improve social and health outcomes. They illustrate how a programme is designed to achieve its intended outcomes, connections between the determinants of outcomes and causal factors, and which competing factors affected the distribution of outcomes of a programme/service. The conceptual framework facilitated the process of gathering and integrating studies of health system interventions or packages of care (complex or multiple interventions), and also informs the interpretation of cumulative results. It identifies the complex links between determinants, outcomes and intervention components, and guides technical aspects of the review. Factors specified within the model may act directly on processes of the conceptual framework, or as mediating mechanisms on the processes depicted.

Devising the conceptual framework helped delineate the conceptual boundaries of the review. Further, specifying the conceptual framework *a priori*, uninfluenced by the review findings, is

intended to reduce bias in researcher judgement. The final model depicts how the interventions work in different populations, and whether mechanisms through which they work differ between populations.

In this review, the conceptual framework illustrates the conceptualisation of the review; the hypothesized causal links, and effect modifiers and mediators; intermediate outcomes; and the subgroups which are the focus of the analysis (Figure 1). The conceptual framework includes the hypothesized mechanism of action of each programme or service identified, that is, how the intervention is expected to work.

Figure 1: Draft conceptual framework showing the hypothesized relation between maternal health interventions, mediating factors and, overall effects as well as equity outcomes



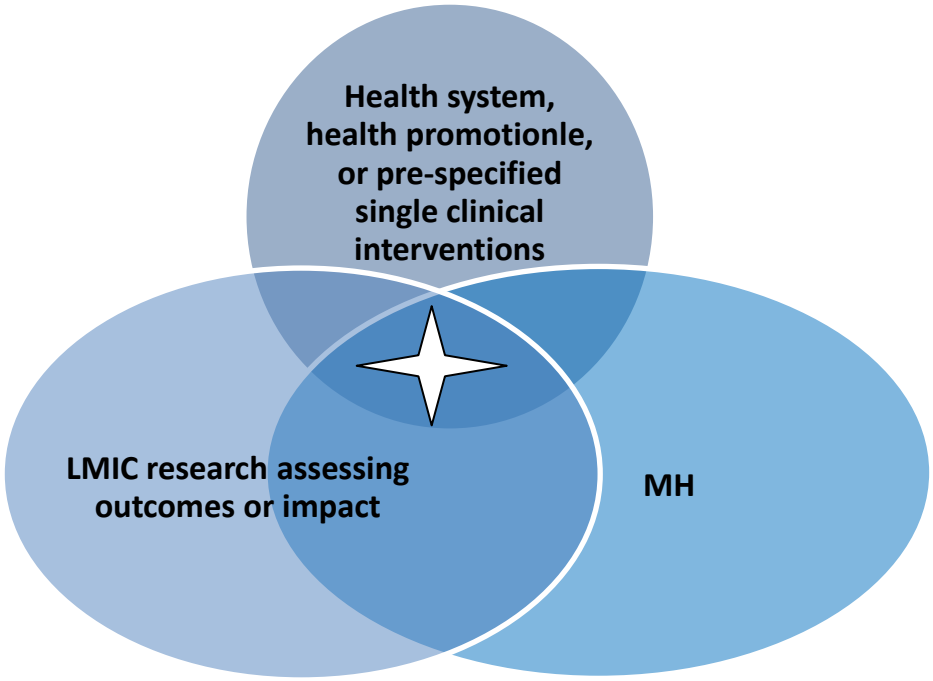
Literature search strategy

The star in Figure 2 below indicates the relevant literature for the review (studies in LMICs that assess outcomes or impact of an intervention addressing health systems, health promotion, or one of the pre-specified clinical conditions among a maternal health population.

Tackling global inequalities in maternal health research requires systematic reviews of relevance to LMICs. A major challenge is how to identify and include research literature conducted in LMICs, much of which is not indexed by the major international research databases, and it can be hard to identify literature. This review attempts to address this issue by searching a range of research sources that includes regional databases specific to LMICs. Given the breadth of the potential research literature on maternal health, and the difficulties in identifying research related to health inequalities in publications, the search was both broad and inclusive.

Data sources include both unpublished and published literature, drawn from academic and other databases, as well as from experts. Piloting searches helped to determine what research evidence to identify and the exploratory searches assisted in refining the search criteria. Search terms for Medline (Pubmed) and other database were finalised following piloting (filters and search limits).

Figure 2: Literature located and analysed in the review



Search terms

A highly-sensitive search strategy using both controlled vocabulary and free-text terms to identify studies on PubMED were developed, and adapted for subsequent searches of other electronic sources. Searches were limited to the period from 2000 to 2012. No language restrictions were employed in searching. Search terms for maternal health were combined with terms for low and

middle income countries as defined by the World Bank (see Annex 2). Given that findings related to health inequalities are often a sub-analysis of a study and are frequently not reported in titles and abstracts we did not include search terms for any specify categories of disadvantage (Oliver et al 2008). In particular, important negative findings of sub-group analysis are less likely to be mentioned in the title and/or abstract of an article. The final search strategy is in Annex 1.

Databases searched and other sources

The box below shows the final list of the databases that were searched

Sources
CINAHL (Cumulative Index to Nursing and Allied Health Literature)
MEDLINE
EMBASE
PsycINFO
Web of Knowledge (Science Citation Index Expanded; Social Sciences Citation Index
PopLINE
African Journal Online
African Index Medicus
LILACS
Index Medicus for the South Eastern Region (IMSEAR)

We also contacted some experts in the field of health promotion for maternal health to request them to help identify additional studies which may have appropriate data, particularly those that are unpublished. Reference lists of some systematic reviews, especially those on health promotion for maternal health were also examined. Further studies identified by experts, reference searches or any other means were assessed for eligibility using the criteria listed below.

Screening of articles for eligibility

The systematic review used pre-specified methods, which are reported transparently and with sufficient detail to be replicable. Reference and data extraction tools were developed on the EPPI-Centre software (http://eppi.ioe.ac.uk/cms/Default.aspx?tabid=184). EPPI-Reviewer 4 was thus used for screening of titles, abstracts and full text, and for data extraction from full text articles. This software is developed and maintained by the EPPI-Centre of the Institute of Education at the University of London, UK (eppi.ioe.ac.uk).

Throughout the review, we piloted codes and finalised codes and their definitions in consultation with the review team. Piloting of codes gave a good indication of the volume of evidence available on each topic. Definitions were made for each code that is used in Stage 1 (examples of coding applied are provided in Annex 3).Definitions of each code was included on the EPPI software so reviewers could see the definition of a code at all times. A list of key examples of coding, which were practical illustrations of the coding, was sent to the review team so they could view model coding prior to beginning coding (Annex 3).

Arabic, English, French, Japanese, Portuguese and Spanish articles were included in the review. Members of the Mascot team from French, Portuguese and Spanish speaking countries assisted with extracting information from papers in languages other than English.

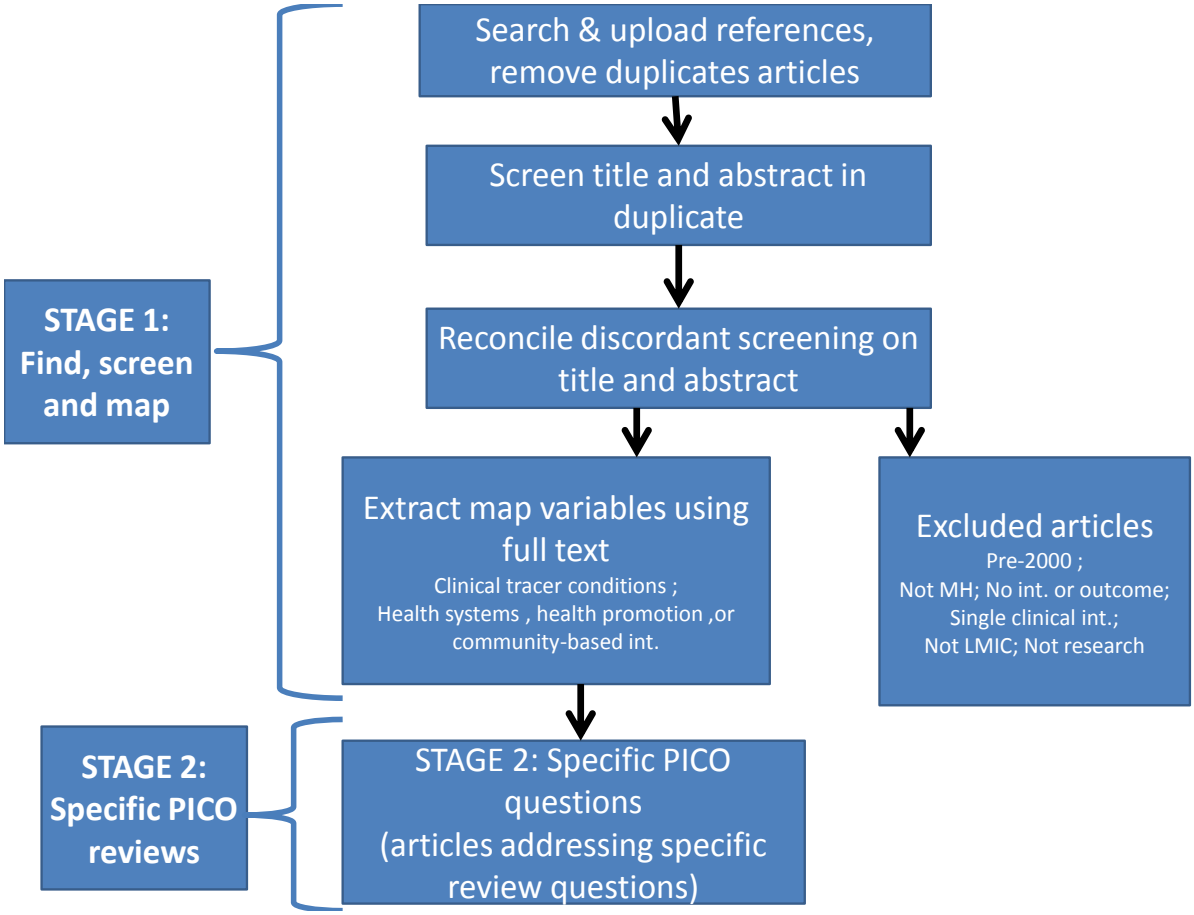
Box 2: Overview of the sequence of tasks in the review

Tasks list and descriptions thereof
Coordination of the review. Oversight of review; finalise review protocol; design, pilot and finalise codes for data extraction; develop tools in EPPI-reviewer; train the review team members on review methods and software; and resolve queries about EPPI-reviewer software.
Allocate studies to reviewers for screening and extraction, and perform quality assurance (duplicate screening)
Screen articles on title and abstract
Reconcile differences between screeners of title and abstract, and give feedback and training for reviewers
Download full text of included articles, upload onto EPPI-reviewer. Retrieval of full text articles was done by a team of people in South Africa and in Central America as access to electronic databases varies between these areas.
Finalise review articles coded as "query", "no abstract" during the screening stage
Data extraction from full text articles for the selected clinical tracers. Code sets used here were: Screening of full text for eligibility; and Generic codes for full text articles. More than 80% of these extractions were reviewed for quality control, with feedback given to reviewers.
Data extraction for reviewers of health system and community-based studies. Code sets used here were: Screening of full text for eligibility; Generic codes for full text articles; and Specialist Health System codes.
Data extraction for reviewers of health promotion studies. Code sets used here were: Screening of full text for eligibility; Generic codes for full text articles; and Specialist Health promotion codes. Specialist Health System codes were applied if the health promotion interventions concerned the health system.
Analysis of review findings. Data extracted was exported into STATA version 12.0 and analysed for this report.

During screening, if reviewers were uncertain how to code an article, they marked the study as a query, which was then resolved by a senior member of the review team, or in discussion among members of the review team (Figure 3). Reviewers screened document titles and abstracts, with a low threshold for searching full text. Each article was coded according to the code set shown in Box 2 above.

Screening on title and abstract was done in independently, in duplicate. We aimed to pair reviewers for each allocation who had complementary skills, by pairing a clinician with a public health person, for example. Differences in extractions were mostly reconciled by a third reviewer, or by the reviewer pair themselves. If no abstract was provided, but the title was indicative of a relevant study, these were coded as "No abstract" and then the full text assessed.

Figure 3: Stages of the review



Eligibility of articles: inclusion and exclusion criteria

Overall, the review included articles on public health interventions (health system or health promotion interventions), as well as interventions addressing selected clinical conditions. Original studies on MH interventions were included, as well as systematic reviews on MH. We excluded studies of single clinical interventions other than the tracer conditions in the review. For example, we excluded a study of the effects of iron supplementation for pregnant women. We, however, included individual health system interventions, such as an intervention to increase the numbers of midwives, or to remove user fees for childbirth services.

Studies on the delivery of multiple interventions, such as a package of antenatal care were included (outcomes of multiple or complex interventions) if they cover one of the selected tracer conditions. We included studies that assessed different ways or modes of implementing single clinical intervention. Assessment of different implementation strategies is clearly a health systems intervention, and was included.

All study designs which provide evidence to answer the review questions were included in the Stage 1 mapping. Thus, no restrictions were placed in the selection criteria for study designs, so that all studies reporting outcomes of a health system intervention or other intervention of interest are included, both trial and observational studies. Quantitative and qualitative studies had to include an outcome of an intervention (those only describing an intervention and not its outcomes were excluded). Books and doctoral dissertations were excluded.

This broad inclusion was used as few randomised trials of system interventions have been done in LMICs. Moreover, much relevant information is available from studies lower in the evidence hierarchy. Further, inclusion of observational studies fulfils the review's aims of collating evidence that corresponds to the conditions under which health policies are mostly applied in practice. Mostly these are observational studies, a synthesis of research that is applicable to drawing inferences for policy, in a policy-relevant manner.

Inclusion criteria for stage 1 of review

All the criteria below must have been met for inclusion in this review:

1. **Population included**. Interventions must target a maternal health population (*women in pregnancy, childbirth, or within two years postpartum*), or male involvement with a maternal health population, or be general health system interventions, provided they report outcomes in a maternal health population. For example, we included studies describing a general intervention to raise the salary payment levels of all health staff, but that reports outcomes of this intervention among pregnant women. Maternal health in adolescents is included, not only studies among adults. We included interventions around contraception if part of a postnatal care intervention, and if they meet other inclusion criteria. Articles on interventions for breastfeeding women were included, provided that they addressed maternal health in some way. We included articles on abortion, provided they satisfy other inclusion criteria. If the intervention is among a maternal health population, but is primarily for the benefit of the child, it was still included.

2. **Study outcomes included.** Quantitative or qualitative outcomes, or data on the impact of MH interventions at a population level must be reported for a study to be eligible. The

intervention **must** have directly or indirectly involve a maternal health population (defined immediately above), but outcomes may be measured in either the woman, or the newborn child. Biological, process, health systems and other outcomes measures are all applicable.

3. Interventions included. The following types of interventional studies were included, provided they also meet the other inclusion criteria.

3.1 **Health system or health promotion interventions included**. Studies that report outcomes of: health systems interventions for improving maternal health; health services research; or organisation of care interventions. This included studies of socio-economic or environmental interventions, such as improving water supply. Health system interventions generally fall within the six health system building blocks or aim to raise patient demand for services (see section on study definitions). Interventions that aimed for general health systems strengthening (such as building more primary care facilities), but that measure the effects of this intervention on maternal health outcomes, were also be included. Interventions around traditional birth attendants are classified as health system interventions (human resources building block. An intervention could include making a diagnosis of a condition and providing treatment as part of patient management (provided it meet all other inclusion criteria). But we excluded articles where making a diagnosis was only for the assessment of burden of a condition in a population (i.e. disease surveillance or burden of disease studies are excluded, unless they aim specifically to compare alternative surveillance methods). Comparisons of different indicators of maternal health are included (information health system building block). Assessments of the outcomes of implementing clinical practice guidelines or similar guidelines are included under health systems interventions. Descriptions of clinical guidelines without any process or impact outcomes are excluded.

Interventions in the health information building block often do not contain an outcome, but are audits of maternal death or service utilisation. We excluded such studies. A comparison of two alternative means of assessing maternal mortality would be considered a health information intervention. Similarly, if the study assesses whether the information gathered in an audit was able to alter practice that was considered an intervention.

PMTCT programmes are not necessarily health systems interventions, rather health services. The PMTCT intervention may consist of training, but only if that was a substantial part of the intervention and of the evaluation, then that would be considered a human resource intervention, and coded as a health system intervention.

Health promotion includes: health promotion activities and health education activities within the community, and for the community, including that which occurs in health service settings. Key topics of interest are: Maternity waiting homes; Health education; Birth and complication preparedness; TBAs in the health services; Role of men or role of other community influentials; Community participation in development, delivery, quality, or evaluation of the intervention, services or programme; Community participation in maternal death reviews; Community participation in public accountability; Participatory learning and action cycles; Transport schemes; Demand-

side financing schemes; Promotion of human rights; Companion of choice at birth; Respectful care, Cultural competencies or Training of providers in communication and counselling; and Community health workers or services in the community.

3.2 **Community-based interventions**. Interventions delivered in community settings (any activities occurring outside of health facilities) were included provided they describe some outcome (including process/uptake outcomes), even delivery of single clinical interventions. This included community 'micro-financing' & 'peer services'.

3.3 **Pre-specified single clinical interventions, as tracer conditions.** Certain pre-specified single clinical interventions targeting maternal health were included, namely: HIV; STIs other than HIV; malaria, hypertension; and haemorrhage.

4. **LMICs**. Only studies in LMICs were included. See Annex 4, LMIC countries defined by the World Bank in 2012 (*http://data.worldbank.org/about/country-classifications/country-and-lending-groups*).
5. **Study designs included.** All study designs were included. Studies may thus be with or without a control group, (e.g. RCTs, cluster randomised trials, pre-test/post-test studies), process evaluations (covering aspects of design, content, delivery, satisfaction and evaluation of an intervention), or qualitative research (conducted as part of process or outcome evaluation, or to provide women's views of intervention acceptability, appropriateness or the barriers and facilitators of uptake of relevant health care). Only systematic reviews were included, narrative reviews are classified as "Not research".
6. **Dates of publication included.** Studies published between 2000 and 2012 were included.
7. **Languages included.** Arabic, English, French, Japanese, Portuguese and Spanish language studies were included.

Exclusion criteria for Stage 1 of review

The exclude category uses a hierarchy approach, whereby the reviewer marked only the exclusion criteria highest on the list that applies to the study.

1. **Publication pre-2000**. This refers to date of publication, not date of the intervention.
2. **Study designs excluded.** Descriptive studies were excluded, such as those documenting prevalence of conditions and needs assessments. Studies merely describing an intervention were excluded, outcome data were required. Policy discussion papers on systems were excluded unless they provide outcome data. Academic theses or books were excluded.
3. **Service utilisation only.** Non-intervention studies describing utilisation rate or coverage of services (single or multiple services), other than those for the tracer conditions. This meant excluding studies reporting population-level survey findings of associations between exposures and interventions, such as antenatal care in different groups. If studies report an intervention to alter use of services, they were coded as a health system intervention, and not as a service utilisation study. Hypothetical interventions, where women are asked about their attitudes to a possible intervention in future are excluded.
4. **Population not Maternal Health**: Exclude studies on infertility, fertility (such as studies on population-level effects of fertility rates) or on failure of contraception. Kangaroo care, and

similar interventions, in the postpartum are excluded as they aim largely to enhance child health.

5. **No intervention**: Paper doesn't report outcomes of a clinical or system intervention, it describes burden of disease, risk factors or a possible intervention without reporting any intervention outcomes, for example. Basic laboratory interventions unrelated to direct patient care are also not considered interventions in this review. Studies only reporting findings of routine information or surveillance are excluded; there had to be an intervention to alter the health information system, or its use.
6. **Single-clinical interventions excluded** Studies of the effectiveness of single clinical interventions were excluded (apart from the tracer conditions listed above). Studies comparing a single clinical intervention to another single clinical intervention (or to two other single clinical interventions) were also excluded (e.g. an efficacy trial comparing two drugs, or two surgical procedures). Also excluded were articles on use of single tools to monitor individual patients, such as a partogram. However, we included tools for monitoring of overall services (such as an audit), as a health system intervention. Note the case studies of a health system or service intervention must not be classified as a single clinical intervention, only clinical cases must.
7. **Not LMIC**: Exclude any study which does not take place in a low- or middle-income country. Also, we excluded studies which take place among low-income groups in upper middle income to high income countries.
8. **Not research**: Paper includes only policy discussion, descriptions of government policies, editorials, or an opinion on a topic. This does not include articles that are systematic reviews, which should be considered research.

Screening of titles and abstracts in Stage 1: variables and instructions

Data extracted during screening of titles and abstracts in Stage 1

1. **EXCLUDE** on title and/or abstract, and why excluded (hierarchy approach: mark only highest applicable item on list):
    - An excluded language
    - Publication pre-2000
    - Population not maternal health
    - No intervention or outcome
    - Single clinical intervention (other than the selected tracer conditions)
    - Not LIMC
    - Not research
    - Other, specify
2. **INCLUDE**, code the topic and study design for all included studies (multiple-response question, MARK ALL APPLICABLE!)
    - **Include Interventional Topic** MARK ALL APPLICABLE RESPONSES
        - Health systems or multiple clinical interventions
        - Community-based interventions
        - Maternal malaria
        - Maternal BP/Hypertension
        - Maternal HIV/STIs
        - Antepartum postpartum haemorrhage
        - Pregnancy sepsis
    - **Include Other**
        - Service utilisation/coverage
3. **NO ABSTRACT**, title indicates article may be relevant but abstract not available
4. **QUERY**, need Full Text to decide if INCLUDE (specify reason for query).
5. **DUPLICATE**
4. **BACKGROUND** is EXCLUDED or INCLUDED on TI/AB, but need to check references of an article, or is an article of much interest to the review

Screening of Full Text articles

Here, we screened the full text of all articles included after screening of title and abstract, provided that the full text of the article was obtainable. The full text of articles was checked to ensure that the codes applied when the titles and abstracts were screened are correct. For example, the full text of articles sometimes, for example, showed that a study was actually done in a high-income country.

Intervention type	Screening of full text for eligibility	Generic codes for full text articles	Health System codes	Specialist Health promotion codes
Clinical tracer conditions	**DONE**	**DONE**	Only if applicable	Only if applicable
Health system and community-based studies	**DONE**	**DONE**	**DONE**	Only if applicable
Health promotion studies	**DONE**	**DONE**	Only if applicable	**DONE**

Codes for screening of full text articles in Stage 1

Duplicate

Include Health systems, including health promotion

Include Community settings

Include tracer condition/clinical intervention

Include tracer condition/other interventions

Include-Service utilisation and non-intervention (ONLY EXTRACT ARTICLES IN THIS GROUP IF ON THE CLINICAL TRACER CONDITIONS)

Include - query

EXCLUDED CATEGORIES OF ARTICLES (NO FURTHER EXTRACTION TO BE DONE):

- Exclude - not maternal health
- Exclude language
- Exclude - pre 2000
- Exclude - no intervention/outcome
- Exclude-Non-relevant clinical intervention(s)
- Exclude - not LMIC
- Exclude - not research

Background only e.g. need to check references of an article, or is an article of much interest to the review

Query unclear (details)

Full Text Screening was performed, by checking the article is eligible, and then reclassifying if required. Each article was coded within only one of the following categories: exclude (and reason for exclusion); include (multiple responses were possible), or query. Duplicates were noted and removed.

The exclusion categories used a hierarchy approach, whereby the reviewer marked only the exclusion criteria highest on the list that applies to the study (only one exclusion criteria was marked).

If the study met the inclusion criteria, then it was marked as a Clinical tracer condition; Health Systems or Health promotion; or Community Intervention. All applicable include categories were marked. For example, a study on a PMTCT systems intervention around childbirth that compares the effects of employing lay counsellors at an intervention hospital and another control site was marked as Include Clinical tracer condition and Include Health Systems. Articles on multiple clinical interventions were only included if they addressed one of the review tracer conditions.

We aimed to capture a few papers which contain useful references for the review, or which may be especially useful during writing up the background and findings of the review. These background papers did not necessarily meet all the inclusion criteria. All background papers were thus also classified as exclude, include or query. This code was used sparingly.

Full details of the codes applied to Full text articles are provided in the sections that follow, which cover: Generic codes applied to the tracer conditions; codes for Health systems, and community-based interventions; and codes for Health promotion interventions.

Full text extraction for mapping clinical tracer conditions

Variables to be extracted from full text documents were piloted and then finalised. Data extraction was mostly done by a single reviewer, but most of these were assessed by another reviewer. Data extraction in this phase was based on the abstract and body text of the articles.

Code sets applied in full text extractions from articles on the clinical tracer conditions were: Screening of full text for eligibility (code set shown above); and Generic codes for full text articles. If an article on a tracer condition is also a health system intervention, the article was coded with the health system codes described in the section which follows below. The codes below were also applied to articles on health systems, community interventions or on health promotion.

Sometimes the reviewer had to do brief additional searching for the information required. For example, an author may give the name of their university but not the country of the university, and a search on Google was then done to find out the country of the university.

Variables to be extracted from full text of all articles included after screening of full text.

A. Generic codes, apply to all included FULL TEXT articles:

1. Country(ies) where research conducted. Tick next to name of country(ies) or type name of country(ies) in other details
2. Country(ies) of first author affiliation. Tick next to name of country(ies) or type name of country(ies) in other details
3. Study population is a PROGRESS-Plus group? PROGRESS-PLUS=Place of Residence, Race/Ethnicity, Occupation, Gender, Religion, Education, Socioeconomic Status, and Social Capital, and Plus represents additional categories such as Age, Disability and Sexual Orientation
4. Paper addresses WHO health promotion? *Tick* Yes if fits into the WHO definition of WHO Health Promotion. Note this is a wide definition involving activities within the community, for the community or with the community, including that which occurs in health service settings, or that which reports community/user involvement/empowerment/engagement. Tick unclear if unsure. Please see below for full definition of WHO health promotion.
5. Research question(s) study might answer (tick all applicable) Health systems (CODE C); Community settings; WHO Health promotion; Tracer conditions with single clinical intervention; Tracer conditions with complex/multiple interventions; Health service utilisation/non-intervention research; Other (details)
6. Study design, enter name of study if provided. Also coded as: Systematic Review; Review (other); Randomised controlled trial (RCT); Effectiveness evaluation including process evaluation (not RCT); Qualitative design; Formative non-intervention research; Other (details); Unclear
7. Intervention topic(s) (tick all that apply) *Emergency obstetric care; Prolonged or obstructed labour; Maternal bleeding/haemorrhage; Sepsis/infection; STIs - other than HIV; Malaria; HIV or MTCT; Hypertension/blood pressure; Induced abortion or post-abortion care; Demand side financing; Miscarriage; Male involvement; Transport schemes;; Traditional birth attendants; Maternity waiting homes; Birth and complications preparedness; Female genital mutilation; Family planning (postpartum or post abortion); Other (add details); Not applicable*
8. DIRECT intervention recipient/population (tick all that apply): Women; Family; Male partner; Community; Community health worker; Traditional birth attendant; Midwife/Nurse; Other mid-level provider (add details); Doctor/Obstetrician; Managers; Planner; Policy maker(s) (add details); Other (add details); Not applicable (add details)
9. Period mainly targeted by intervention (tick all that apply) Pregnancy; Childbirth; Post birth
10. Data collected: maternal health outcomes, service utilisation; cost/health economics; child health outcomes; other
11. Funder. Name of funder, or government funder if mentioned

Definitions of generic variables to extract

1. **Country(ies) where study done** Multiple responses were possible. Both high-income country (HIC) names and LMIC country(ies) names were extracted if a study was done in both LMIC and HIC. For systematic reviews and modelling studies, we did not extract the country of study. To be included in the review, a systematic review or modelling study had to include at least one study from a LMIC or data from a study in LMICs.
2. **Country(ies) of first author** Multiple responses were possible, with all country names extracted if the first author had more than one country of affiliation. We entered Nepal in the following example: “Save the Children-USA, Himalayan Field Office, GPO Box 2218, Kathmandu, Nepal”. If

a study group was given as the first author, then the first name listed in the study group was taken as the first author and her/his country(ies) extracted.

3. **Study population is a PROGRESS-Plus group?** We marked "Yes", if study population was one of the PROGRESS-PLUS groups: Place of Residence, Race/Ethnicity, Occupation, Gender, Religion, Education, Socioeconomic Status, and Social Capital, and Plus represents additional categories such as Age, Disability and Sexual Orientation. We ticked "No" if the intervention was Universal**,** i.e. aimed at the whole group population, not on the basis of individual needs or risks). "No" was thus ticked if the intervention(s) targeted the general public or a whole population group that has not been identified on the basis of individual risk or needs. We used this code to capture if paper addresses health inequalities/SDOH. If a paper has been done in a rural area we did not necessarily tick "yes" unless there was a clear indication that the study was done in the area to specifically target the rural population, as opposed to other populations.
4. **Paper addresses health promotion?** Health promotion includes: activities within the community, for the community or with the community, including that which occurs in health service settings, or that which reports community or user involvement, empowerment or engagement. The main objectives of health promotion are to increase individual, family or community capacity to contribute to improved health or to increase use of maternal and new born health services. Key topics of interest are listed in the definitions and key concepts section.
5. **Research question(s) study might answer** (all applicable categories were marked), these were: Health systems; Community settings (*services provided within community settings);* WHO Health promotion; Tracer conditions; Health service utilisation/non-intervention research; Other (details)
6. **Study design codes** Multiple responses were possible as some papers reported more than one method.
    a. If specified, we captured the name of the study or intervention programme
    b. Systematic review. A systematic brings together the findings, opinions or conclusions from a range of previous studies in a systematic explicit manner. A systematic review is explicit in its reporting of the search for studies (i.e. reports the search strategy for specified databases) and the criteria for including and excluding studies; it may or may not include a meta-analysis. It may include a range of study designs, including qualitative research.
    c. Randomised controlled trial (RCT) A study in which an intervention is allocated randomly. RCT includes trials of interventions involving individual or group trials (cluster or stepped wedge etc.). Control groups may receive a placebo or other intervention. An RCT study compares different groups i.e. groups receiving different interventions or different intensities/levels of an intervention with each other; and/or with a group which does not receive any intervention at all. Participants in an RCT are allocated to the different groups in a random manner i.e. the report states that a random numbers table, a random code or numbered sealed envelopes were used to allocate participants to study groups.
    d. Effectiveness evaluation including process evaluation (not RCT) Any method of allocation different from randomisation as above, or the method of allocation is not stated or unclear. A process evaluation examines the acceptability and feasibility of an intervention; studies the ways in which the intervention is delivered; or, for example, assesses the quality of the procedures performed by the programme staff. It is designed to describe what goes on, rather than to establish whether it works or not, and may suggest ways in which the programme design and implementation

could be improved. Other designs included are controlled (non-random) trials, where the comparison is between two unrelated groups and receipt of the intervention was not randomly assigned. Includes observational, non-experimental studies where the researcher does not intervene, but describes and analyses people or situations e.g. case study, case series, case-control study, cross-sectional survey, needs assessment, surveys of user perspectives, policy analysis articles, studies on the validity of new diagnostic tests; among other designs.

e. Qualitative design, using techniques such as focus groups, in depth interviews, key informant interviews, ethnography.
f. Formative non-intervention research This includes studies that use modelling methods as the research technique.
g. Other (details).
h. Unclear (details) Code as unclear if unsure of design, noting reason for query

7. **Intervention topic(s)**. These are the topics covered by the intervention in the paper. We marked all topics that applied, options here were: Emergency obstetric care; Prolonged or obstructed labour Other terms to look for include: cephalo-pelvic disproportion; malpresentation; malposition; Maternal bleeding/haemorrhage; Sepsis/infection; STIs - other than HIV; Malaria; HIV (MTCT, or HIV-related maternal health issues); Hypertension/blood pressure; Induced abortion or PAC; Includes studies about post-abortion care PAC; Demand side financing; Miscarriage; Male involvement; Transport schemes; Traditional birth attendants; Maternity waiting homes; Birth and complications preparedness; Female genital mutilation; Family planning (postpartum or post abortion); Other (add details).

8. **DIRECT intervention recipient/population** (tick all that apply). Actual population that receives the intervention
    a. Women. This includes interventions for fetal health, such as ANC ultrasound
    b. Family
    c. Male partner (any intervention that includes the male)
    d. Community. The community that pregnant/birthing/post-partum women inhabit. Includes neighbourhoods, schools, local businesses, places of worship
    e. Community health worker. Includes village health workers, filed workers, similar cadres
    f. Traditional birth attendant
    g. Midwife/Nurse
    h. Other mid-level provider (add details) Mid-level provider, but not midwife or nurse, e.g. Medical assistant, clinical officer
    i. Doctor/Obstetrician
    j. Managers/Planners/Policy makers. Managers of health services - personnel managers, finance managers, care team managers etc. Policy maker(s) is the person responsible for policy making which impacts on health services, it can be at the level of a single institution (clinic/hospital) or beyond (area/town/region/nation). For health information interventions, tick this category (“health manager/planner/policy maker).
    k. Other (add details)
    l. Not applicable (add details)

9. Period mainly targeted by intervention or utilisation study (tick all the period(s) that apply). This is the period(s) which the intervention mainly was delivered. For service utilisation articles, which assess the use of services in one of the tracer conditions, code the period that utilisation is assessed:
    a. Pregnancy (this includes abortion and miscarriage)
    b. Childbirth
    c. Post birth (postpartum haemorrhage <6 hours after childbirth is not considered post-birth, but childbirth).
10. Data collected: Here we marked all the boxes that cover an outcome provided in the paper. Maternal health outcomes such as maternal mortality and morbidity measures in the woman (this includes maternal biomedical and mental health outcomes, but excludes outcome of pregnancy such as stillbirth or low birth weight baby). For the purposes of this review, diagnoses of postnatal depression, levels of social support, adherence to medication and measures of mental and emotional well being were also coded as maternal health outcomes. For the service utilisation code, ITNs were considered service delivery if the nets are clearly distributed by the health sector, including the private health sector. Cost / health economics was used for studies which reported any cost data linked to an outcome, or an economic analysis of the intervention, e.g. cost effectiveness, cost utility studies. Merely reporting the cost of an intervention without linking that to effectiveness or outcomes is not included. The latter studies are sometimes called cost-of-illness studies. Child health outcomes, this includes stillbirths, fetal outcomes and low birth weight, for example. Fetal health outcomes are included as child outcomes. We coded factors such as knowledge and satisfaction as "Other".
11. Funder name. This variable captures the funder of the study, which is not always the same as the funder of the intervention. We included name of government if mentioned as the funder. *To find funder name, we searched the full text document using the terms" "fund", "support", "financ", "acknowle".* The reviewer copied the text on funders acknowledged, the name of funders of the study or of individuals mentioned, e.g. National Institutes of Health if the paper says: "Christy R. Goverder was funded by National Institutes of Health". If no funder acknowledged, we ticked "No funding acknowledgement". We also extracted the funder of an investigator's salary if that was mentioned. We extracted the funder of the systematic reviews, not the funder of the studies included in the review.

Full text extraction for mapping health systems interventions for maternal health

The definition of health systems was applied to select articles for data extraction using the codes immediately below. If reviewers had doubt about whether an intervention was related to health systems, they assessed whether the study helps answer – what works, for whom, or under what conditions – a commonly used means of identifying health systems research.

Variables extracted on health systems research in maternal health

C. Specialist health systems codes

1. **Developer of intervention: National NGO; International NGO; Government (add details)** give the part of government that implemented the intervention**; Research Group; Other (add details).**
2. **Main implementing agency: National NGO; International NGO; Government (add details)** give the part of government that implemented the intervention; **Research Group; Private sector; Other (add details)**
3. **Intervention delivery extent: Entire country; More than one district but not entire country (I**ncludes states); **Single district; More than one facility but not entire district; Single facility (hospital or clinic); Other (add details)** Includes community
4. **Nature of intervention: Broad system intervention beyond MH** (A system-level intervention directly targeting one or more of the six health system building blocks): **A maternal disease/condition-specific intervention** (A maternal disease/condition-specific intervention that is expected to have (large) system-wide effects); **Other (add details)**
5. **The intervention involves (tick all with predominant focus): Changes to health services** (Changes to health services at the organizational level which are not expected to have a system-wide effect (e.g. modification of patient flow within a health facility); **Health system-level changes** (Building blocks other than service delivery); **Change at community level** (Intervention directly involving community); **Changes beyond health system** (Changes beyond health system, e.g. micro-credit schemes); **Other (add details)**
6. **Number of building blocks: Single; Multiple; None**
7. **Type of health service or system intervention:** (Type of health system intervention (derived from Table 3 in Adam et al., 2012); **Model of service delivery** (e.g. Scaling up, Integration, Quality improvements, a. Service package, b. Health service organisation: delivery platforms, integration, (de)centralisation c. Quality assurance, adherence to protocols. d. Demand creation); **Health human resource strategy (**e.g. a. Health worker training, skills b. Skills mix, task shifting c. Employment conditions (salaries, benefits, career path, training incentives) d. Supervision e. Performance review, registration, accreditation); **Information systems (a.** Availability of information systems b. Timeliness, quality of data c. Enforcing reporting requirements d. Use of data for programme improvement); **Pharmaceuticals & medical technologies (**e.g. a. Availability of drugs and technologies b. Pricing of medicines and medical supplies c. Procurement, supply chain management d. Rational prescription and use e. Introducing/scale-up of new technologies); **Financing interventions** e.g. a. Availability of finances for health (budget allocation, fiscal space). b. User fees, insurance mechanisms. c. Provider payment / incentives. d. Service vouchers (overlap with demand creation above); **Sector reforms / Governance** e.g. Decentralisation a. Roles & responsibility, level of decision making. b. Professionalism c. Accountability (incl community participation, consumer/stakeholder involvement); **Other (add details); Not health service/system intervention, specify**

Variables to be extracted from all health system and community-based articles

1. **Developer of intervention: National NGO; International NGO; Government (add details) give the part of government that implemented the intervention; Research Group; Other** (add details). This is the group who does the work of designing or developing the intervention.
2. **Main implementing agency: National NGO; International NGO; Government (add details)** give the part of government that implemented the intervention; **Research Group; Private sector; Other** (add details). This is the group who does the work of implementing the intervention.
3. **Intervention delivery extent: Entire country; More than one district but not entire country** (Includes states); **Single district; More than one facility but not entire district; Single facility (hospital or clinic); Other (add details)** Includes community. Code highest level of the study, e.g. a study of 1 facility in each of 5 districts is coded as more than one district but not entire country. This is the extent to which an intervention is implemented, not the area evaluated, e.g. a programme implemented at national level but assessed in a few hospitals should be coded as "entire country".
4. **Nature of intervention: Broad system intervention beyond MH (**A system-level intervention directly targeting one or more of the six health system building blocks): **A maternal disease/condition-specific intervention** (A maternal disease/condition-specific intervention that is expected to have (large) system-wide effects); **Other (add details)**
5. **The intervention involves** (tick all with predominant focus): **Changes to health services (**Changes to health services at the organizational level which are not expected to have a system-wide effect (e.g. modification of patient flow within a health facility); **Health system-level changes** (Building blocks other than service delivery); **Change at community level** (Intervention directly involving community); **Changes beyond health system (**Changes beyond health system (e.g. micro-credit schemes); **Other** (add details)
6. **Number of building blocks:** Single; Multiple; None
7. **Type of health service or system intervention:** (Type of health system intervention (derived from Table 3 in Adam et al., 2012); **Model of service delivery (**e.g. Scaling up, Integration, Quality improvements, a. Service package, b. Health service organisation: delivery platforms, integration, (de)centralisation c. Quality assurance, adherence to protocols. d.Demand creation); **Health human resource strategy (**e.g. a. Health worker training, skills b. Skills mix, task shifting c. Employment conditions (salaries, benefits, career path, training incentives) d. Supervision e. Performance review, registration, accreditation); **Information systems (a.** Availability of information systems b. Timeliness, quality of data c. Enforcing reporting requirements d. Use of data for programme improvement); **Pharmaceuticals & medical technologies (**e.g. a. Availability of drugs and technologies b. Pricing of medicines and medical supplies c. Procurement, supply chain management d. Rational prescription and use e. Introducing/scale-up of new technologies); **Financing interventions** e.g a.Availability of finances for health (budget allocation, fiscal space). b.User fees, insurance mechanisms. c. Provider payment / incentives. d. Service vouchers (overlap with demand creation above); **Sector reforms / Governance** e.g. Decentralisation a.Roles & responsibility, level of decision making. b.Professionalism c. Accountability (incl community participation,

consumer/stakeholder involvement); **Other (add details); Not health service/system intervention, specify**

Data extraction on health promotion interventions for maternal health

Articles on health promotion were coded using the following code sets: Generic codes for full text articles; and Specialist Health promotion codes. Specialist Health System codes were applied if the health promotion intervention concerned the health system. For the health promotion codes below, we marked all codes that applied, as interventions could fit within a number of these codes.

Variables extracted on health promotion interventions in maternal health

D. Specialist health promotion codes

Maternity waiting homes: A maternity waiting home is a setting near a health facility where women can stay in the final weeks of pregnancy. Sometimes called maternity waiting village/facility

Health education (not including birth preparedness: Interventions that use health education with pregnant women, their partners/husbands, their families or with other community members to improve key maternal & new born health outcomes, including improved care practices in the home and improved use of maternal and new born health services**.** Health education must be an explicit component of the intervention. Only include counselling interventions (e.g VCT voluntary counselling and testing for HIV) where the authors have an explicit focus on an education related elements (e.g knowledge outcomes, provider training, service uptake, educational resources).

Birth and complication preparedness: Interventions that works with pregnant women, their partners and families focusing on preparations for birth and in case of complications including who will accompany to the facility, how she will get there, saving funds if needed, what materials to bring, blood donor, etc. Often emergency for after birth including for new born can be discussed

TBA's in the health services: Interventions that involve Traditional Birth Attendants (sometimes called community midwives/traditional midwives). We are particularly interested in interventions that find roles for TBAs that do not involve assisting childbirth but give them other roles to integrate them into health services.

Role of men/other community influential: Any interventions with women, men and/or community members to increase positive male, family and community involvement in supporting the women for care during pregnancy, childbirth or after birth, including care for the child after birth. Other 'community influentials' might include mother in laws, father in laws, other relatives, friends, community leaders, religious leaders who influence decisions and social norms for care during pregnancy, for childbirth and after birth

Community participation in maternal death reviews: Use of methodologies and tools such as community epidemiological surveillance, community-based death reviews, maternal and perinatal death audits, verbal autopsies, and other research on maternal and newborn health issues, where the community is considered a partner not just a source of information i.e. including the involvement of community representatives in gathering, analysing and using the information.

Community involvement other: Use for community involvement in development, delivery, quality, and evaluation of intervention, services or programmes.

Participatory learning and action cycles: Participatory Learning and Action (PLA) is a form of action research. It is a practical, adaptive research strategy that enables diverse groups and individuals to learn, work and act together in a co-operative manner, to focus on issues of joint concern, identify challenges and generate positive responses in a collaborative and democratic manner. Include any study using this approach that works with women, families or communities.

Social accountability: Social accountability can be defined as an approach towards building accountability (of healthcare providers/services/departments) that relies on civic/community/user engagement, i.e., in which it is ordinary citizens and/or civil society organizations who participate directly or indirectly in exacting accountability.

Transport schemes: Interventions that aim to reduce transport barriers women face in accessing skilled care at birth or birth in a facility. These interventions could include a) Interventions to provide non-conventional transport methods E.g. bicycle ambulance, trucks, buses, boats, ox-carts, modified tricycles with platforms, canoes, taxis, three-wheeled motorcycles and trailers. b) Interventions that provide funds to women for transport / of pay for transport for women e.g. vouchers / community emergency funds or c) Interventions organized by the health system to improve transport to for women to facilities and between facilities.

Promotion of human rights: This includes promotion of human rights, sexual rights, reproductive rights, and right to quality health care. Study should explicitly use the language or approach of 'rights'.

Companion of choice at birth: Any intervention focusing on enabling women to have a companion of choice for birth in a facility. These companions can be partners, TBAs, family members or a doula.

Respectful car: Interventions focusing on combating physical abuse; non-consented clinical care; non-confidential care, non-dignified care i.e. verbal abuse; discrimination in services; abandonment and detention in facilities. E.g. Intervention to put in curtains between beds, increase support and supervision of health care workers to improve how they treat women.

Interpersonal/Intercultural Competencies: Include papers about improving providers and services skills to interact with women including interpersonal training, efforts to understand cultural factors that affect use of care, etc.

Community health worker/Services in the community: Interventions delivered in community settings (any activities occurring outside health facilities), provided outcome described (including process/uptake outcomes), even delivery of single clinical interventions. Includes community 'micro-financing' & 'peer services'. Include interventions that use community health workers where they are mandated to deliver services in the community.

Demand side financing: Interventions to reduce financial barriers women face in accessing ANC, childbirth and post-partum, care. I.e. conditional cash transfers/vouchers/ user fee exemptions/loans and subsidies

Other health promotion activity: Falls under the broad definition of WHO health promotion activities - BUT does not address a PICO question or topic in the list above. I.e. whose objectives relate to increasing individual, family or community capacity to contribute to improved health or to increase use of maternal and new born health services.

Review team roles and responsibilities

One of the main objectives of the overall MASCOT project is to stimulate cooperation between countries from Europe, Africa and Latin America, to identify and implement country-specific strategies for tackling health inequalities affecting mothers and children. These aims were achieved, with the review team including representatives from almost all Mascot partners. In total, 33 people were actively involved in screening of studies for eligibility or data extraction in the review (includes people from WOTRO and other projects).

Figure 4: Review timelines and milestones

Phase	**1. Review piloting**	**2. Finalise Stage 1 review protocol**	**3. Identify eligible literature**	**4. Screen articles in Stage 1**	**5. Clean data and reconcile discordant coding**	**6. Prepare map of included literature**
Indicative timing	March-April 2012	July-September 2012	July-September 2012	October 2012-Feb. 2013	Dec. 2012- April 2013	April 2013-September 2013
Outputs	Present review outline at MASCOT meeting March 2012. Search strategy piloting and decisions made about which databases to search in Stage 1. Draft data fields for Stage 1 extraction.	Pilot and finalise Stage 1 methods and protocol. Define CF. Design data capture forms for Stage 1 on EPPI Centre website	Perform searches of selected databases. Upload references into EPPI-reviewer. Remove duplicate articles.	In duplicate, screen articles for eligibility. Present first findings at Oct. 2012 MASCOT meeting in South Africa	Reconcile differences in screening of title and abstract. Resolve queries. Upload full text articles of included articles.	Do full text screening and code included articles on limited mapping variables. Finalise report on stage 1 mapping findings.

The review team was multi-disciplinary, bringing diverse skills sets and languages. Roles of each member of the review team were discussed regularly and updated as the review progressed through the steps shown in Figure 4 on review tasks.

External advisors were consulted, aiming to obtain the input of a multi-disciplinary team (MH service users, researchers and policy makers) and frequent engagement of this group. The WHO maternal health team provided key policy-relevant advice.

Methods used for analysis of review findings

Analysis methods were applied to give frequency tables which outline the research methods and topics used in maternal health research between 2000 and 2010. Both primary studies and systematic reviews are summed, as well as how this research has changed over time. We analyse the data extracted to investigate the linkages between health systems and MH, and to conceptualise these linkages. Statistical and graphical methods were used to analyse the variables extracted in the screening of full text stage and the data extraction of full text stage.

Frequencies, percentages, and cross-tabulations were calculated in Microsoft Excel for the variables extracted in the full text screening. Intercooled Stata 12.1 (Stata Corporation, College Station, USA) was used for statistical analysis. For analysis of categorical variables, the chi-square test was used, while for continuous variables, we used an unpaired Student's t-test or Mann-Whitney U-test for normally and non-normally distributed data, respectively. Countries were grouped by World Bank classification of regions, in order to also present findings on characteristics of publications by region of the world. Data on maternal mortality ratios by region were extracted from the 2005 and 2013 World Health Statistics Report (WHO 2013) in order to assess whether there is a correlation between the amount of literature published and the burden of maternal mortality.

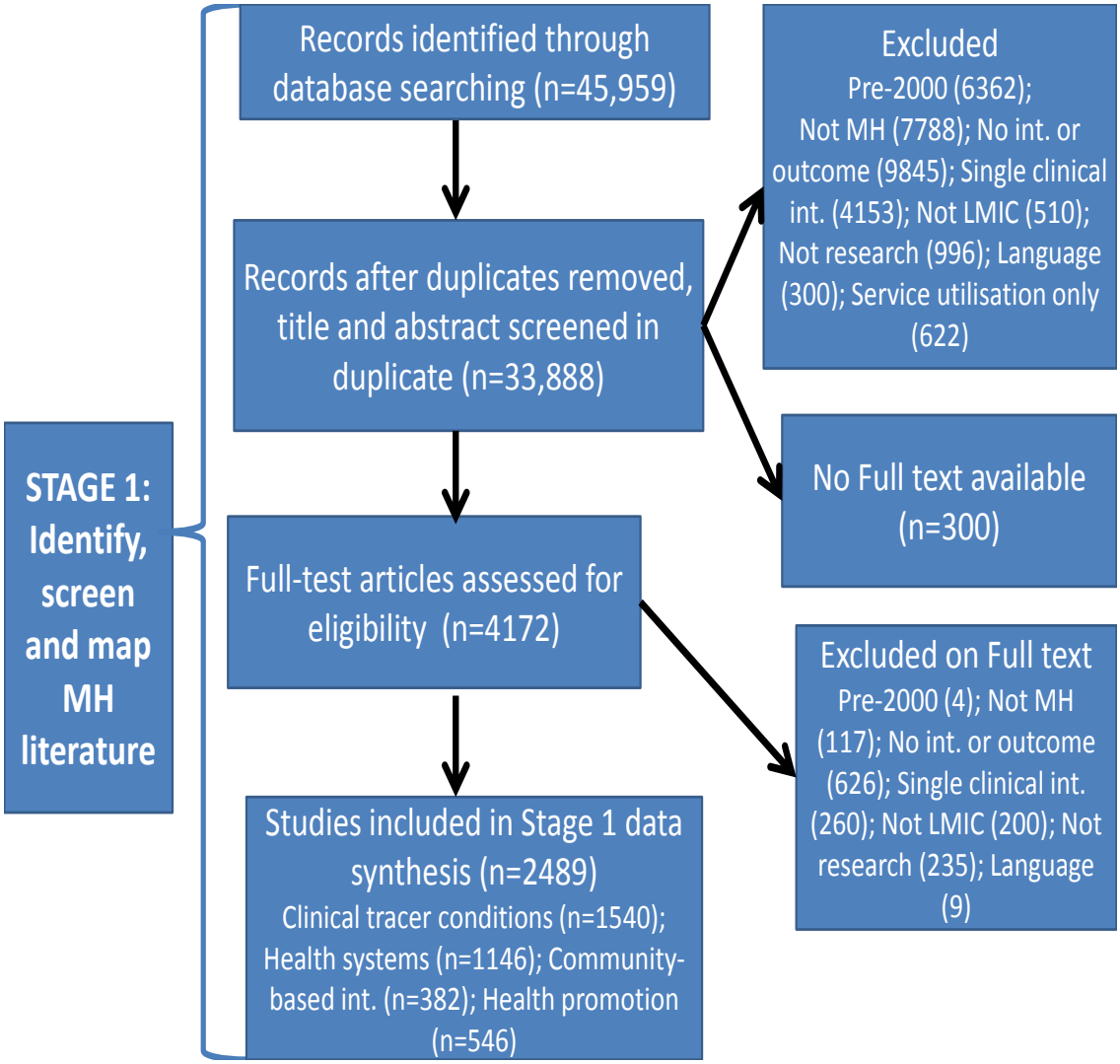
Results of review

As reported above, approaches to searching were employed that aim to increase the identification of research from all LMICs. The results of these searches are presented in Table 1 below.

Table 1 Results of searches of databases in the review

Source	Number of hits	Date of search
CINAHL	2398	03/21/2012
EMBASE	3618	21/09/2012
LILACS	3450	21/09/2012
Medline (PubMED)	13,634	17/08/2012
Popline	12,186	21/09/2012
PsycINFO	1139	21/09/2012
Web of Knowledge	8903	21/09/2012
Total references located	**45,959**	

Flow chart 1 The identification and selection of studies in the review



Once screening of all titles, abstracts, and where required, full text records had been done, we completed a flow chart depicting the flow of studies through the review process (Flow chart 1). This flow chart adheres to the recommended methods for reporting systematic reviews (Liberati, Altman et al. 2009).

In total, 45,959 items were added to the online systematic review software EPPI-Reviewer 4. The software and individual reviewers then removed duplicate items totalling 12,071. Independently, in duplicate, we then screened the remaining records (33,888) for relevance on their title and abstract. This screening applied the review inclusion and exclusion criteria. The two reviewers or a third reviewer then reconciled any discrepancies in this coding.

From the 33,888 articles reviewed on title and abstract, 4472 were marked for full text review. This is an inclusion rate of 13.2% after screening of title and abstract. We were unable to locate the full

text document for a total of 300 articles (6.7%; 300/4472). Of the 4059 full text articles reviewed, a further 36.9% were excluded (1540).

In total, 31,167 articles were excluded after screening of title and abstract and after full text review. This is 92.0% of all the articles identified in the review. Of the studies excluded from the review that were on maternal health, the most important reason for exclusion was that the study did not describe an intervention or outcome (33.0%; 10,347/31,167). Other studies that were on maternal health, but were excluded were those on single clinical interventions other than the tracer conditions (13.9%; 4343/31, 167) or only provided data on utilisation of routine services (2.0%; 622/31,305). Other reasons for exclusion were: articles published before the year 2000 (20.3%; 6364); studies not on maternal health (25.2%; 7877/31, 167); studies not done in LMICs (2.1%; 666/31, 167); Not research (3.9%; 1213/31, 167); and an excluded language (1.0%; 303/31, 167).

In total, we identified 80 articles on community-based interventions that were assessed in an RCT or a systematic review.

If the full text articles that provide information on the funder of the study, 32.2% (473/1469), reported having no funder for their work Interesting variations in presence of a funder for the study were noted across the world's regions. The highest proportion of self-funded research was in Central Europe and the Middle East (62.2%, 23/37 and 61%, 14/23 respectively); almost half of studies in Latin America reported no funder (45.5%; 76/167); and third did so in South Asia and East Asia (corresponding figures of 45/130; 34.6% and 43/118) .However, in sub-Saharan Africa only a quarter of studies were self-funded (25.4%, 165/650).

Only 8.9% of studies were targeted at a PROGRESS-Plus group (124/1399). Examining equity was more than double the mean in studies in South Asia (17.7%, 22/124) and in Latin America (15.0%, 24/160).

Local ownership of research

Overall, in analysis including both original research and systematic review, a person from a HIC was first author for half of studies in LMIC (914/1853; 49.3%).

Table 2: Proportion of articles whose first author was affiliated to a local institution

Var.cat	Variable	Locally authored articles % (n/N)	*P*
Region	**Region**		
	East-Asia Pacific	63.6 (110/173)	
	Europe & Central Asia	72.2 (39/54)	
	Latin America & Caribbean	76.4 (175/229)	
	Middle East North Africa	90.6 (29/32)	
	South Asia	82.9 (150/181)	
	Sub-Saharan Africa	50.5 (418/828)	<0.001
	Economic zone		
	LIC	43.1 (238/314)	
	LMIC	62.4 (266/426)	
	UMIC	80.4 (417/519)	<0.001
Study charact-eristics	**Time period**		
	2000-2003	50.0 (153/306)	
	2004-2007	52.6 (320/609)	
	2007-2012	50.0 (450/900)	0.59
	Study design		
	Systematic review	14.6 (24/164)	
	Randomised controlled trials	54.8 (137/250)	
	Effectiveness evaluation	58.0 (574/990)	
	Qualitative design	64.3 (63/98)	
	Formative research	33.9 (38/112)	
	Other	42.9 (18/42)	<0.001
	Cost-effectiveness studies	54.1 (33/61)	0.65
Funding	**Funded research**		
	Yes	41.6 (389/936)	
	No	71.1 (307/432)	<0.001
Equity	**Equity examined**		
	Yes	47.9 (58/121)	
	No	50.9 (621/1219)	0.04
Topic	**Health systems studies**	52.1 (280/719)	0.005
	Health promotion studies	47.0 (256/545)	0.006
	Community-based studies	41.1 (146/355)	<0.001
	Cost outcomes measured	54.1 (33/61)	0.65
	Haemorrhage studies	55.8 (72/129)	0.79
	Hypertension studies	84.7 (105/124)	<0.001
	Malaria studies	55.0 (115/209)	0.37
	Studies on STIs other than HIV	64.7 (44/68)	0.18
	HIV studies	52.4 (266/508)	0.01
Outcomes	**Outcomes reported**		
	Maternal health	62.5 (390/694)	<0.001
	Child health	59.6 (239/401)	0.20

Multiple-responses possible

Correlation between number of studies on maternal health and burden of maternal mortality in a country

Figure 4 shows the correlation between the number of studies done on maternal health and the maternal mortality ratio. It is evident that there is not a linear correlation between these two variables. When the number of maternal deaths in a country is compared to number of studies (Figure 5), it is again evident that burden of maternal deaths and number of studies is poorly correlated. Figure is a better assessment of correlation as that takes into account the population in a country. Comparing MMR and number of studies is not a fair reflection, as a small country and a larger country with the same MMR are not expected to have an equal number of studies.

Some countries which are outliers are worth noting. South Africa has a high number of studies, yet these are predominately on HIV, as will be noted below. Brazil has a high number of studies relative to the number of maternal deaths in the country. Conversely, some countries such as Niger, Angola, the DR Congo and Sierra Leone have very high numbers of maternal deaths, yet very little research is being done on maternal health in these countries.

Figure 4: Scatter plot of association between number of maternal health intervention studies and country-specific MMR

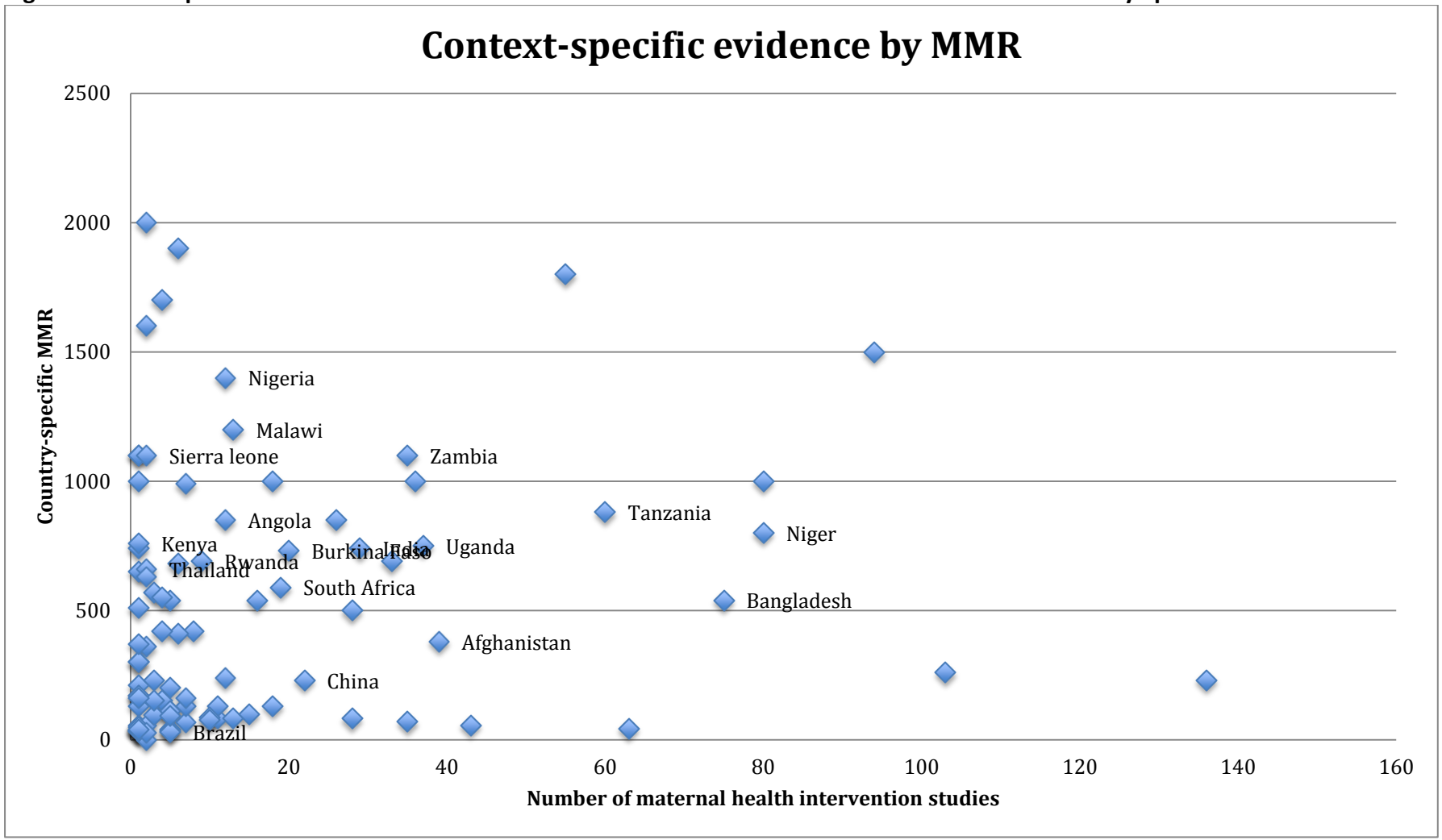
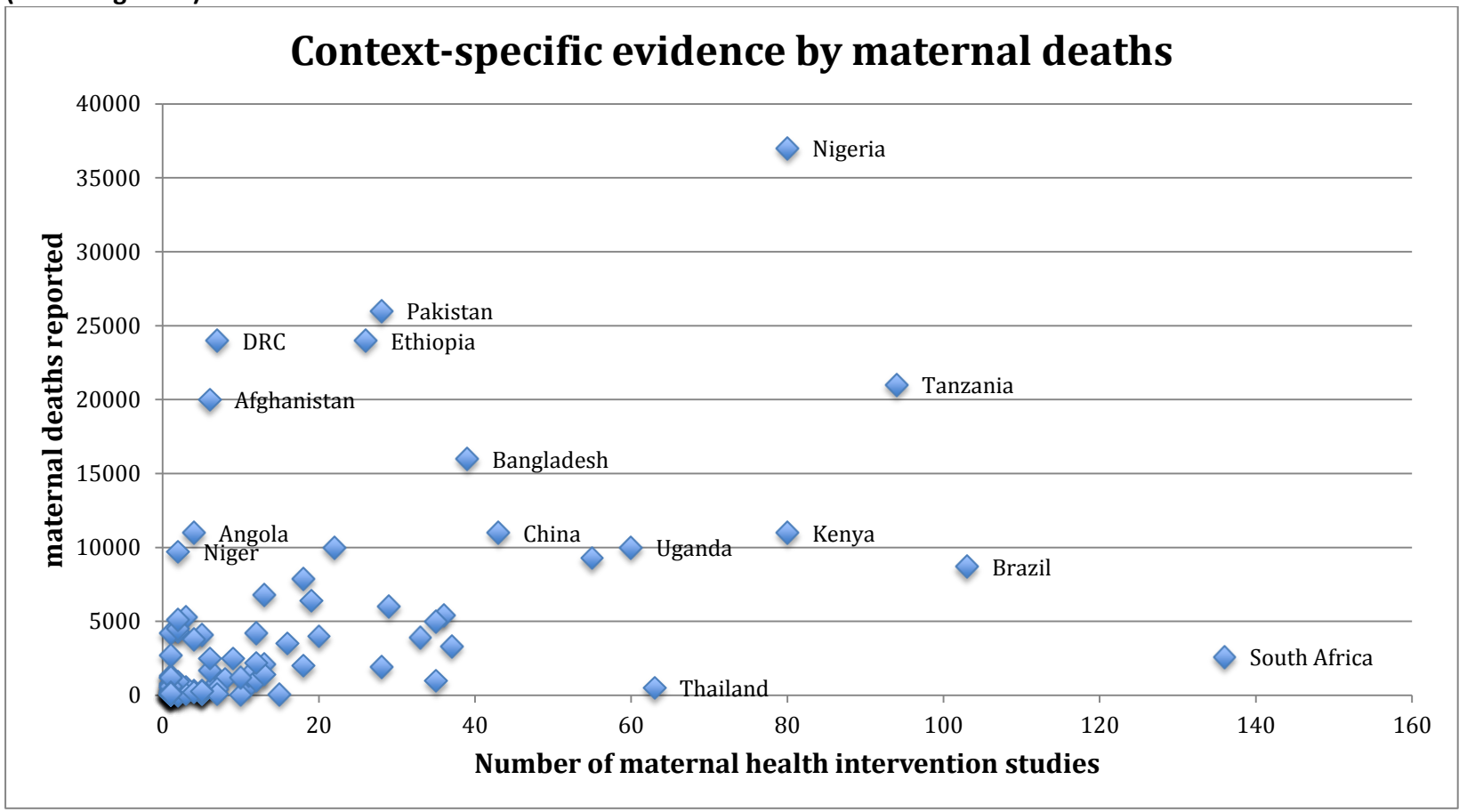


Figure 5: Scatter plot of association between number of maternal health intervention studies and country-specific maternal deaths (excluding India)



The table 3 below reports on the number of studies in each LMIC, weighted for the MMR in a country and the total number of maternal deaths in the country. While it is difficult to discern patterns in these data, some conclusions can be drawn. In Afghanistan, for example, there were only six studies in the period 2000-2012. This is the equivalent of 0.3 studies per 1000 maternal deaths. India too has few studies relative to deaths (0.6 studies per 100 deaths). Many low-income countries in West and Central Africa also have done little research. Conversely, Jamaica has the most favourable ratio, with a 222 studies

per 1000 maternal deaths. Thailand also has high number of studies: 121/1000 maternal deaths. South Africa has 52 studies/1000 deaths, but a large proportion of these concerns HIV.

Table 3: Number of studies in each country, weighted by total population size, MMR and total number of maternal deaths

Country	No. of studies	Population size (2000 data; thousands of people) - A	MMR in 2000 - B	Number of maternal deaths (2000 data) - C	Weighted number of studies (weighted on A)	Weighted number of studies (weighted on B)	Weighted number of studies (weighted on C)^
Cambodia	13	11168	450	2100	1.16	28.9	6.19
China	43	1277558	56	11000	0.03	767.9	3.91
Indonesia	22	212107	230	10000	0.1	95.7	2.2
Lao pdr	1	5433	650	1300	0.18	1.5	0.77
Malaysia	5	22244	41	220	0.22	122	22.73
Mongolia	5	2662	110	65	1.88	45.5	76.92
Myanmar	2	45611	360	4300	0.04	5.6	0.47
Papua New Guinea	1	4807	300	470	0.21	3.3	2.13
Philippines	5	75967	200	4100	0.07	25	1.22
Solomon Islands	1	444	130	25	2.25	7.7	40
Thailand	63	61399	44	520	1.03	1431.8	121.15
Timor l'Este	2	885	660	140	2.26	3	14.29
Vietnam	18	79832	130	2000	0.23	138.5	9
Albania	1	3113	55	35	0.32	18.2	28.57
Armenia	2	3520	55	20	0.57	36.4	100
Belarus	1	10236	35	30	0.1	28.6	33.33
Georgia	1	4968	32	20	0.2	31.3	50.0
Kazakhstan	1	16223	210	560	0.06	4.8	1.79
Moldova	1	4380	36	20	0.23	27.8	50.0
Romania	1	22327	49	110	0.04	20.4	9.09
Russian Federation	7	146934	67	830	0.05	104.5	8.43
Turkey	35	66591	70	1000	0.53	500	35
Ukraine	5	50456	35	140	0.1	142.9	35.71
Antigua Barbuda	2	68	NA	NA	29.41	NA	NA
Argentina	11	37032	82	590	0.3	134.1	18.64
Bolivia	8	8329	420	1100	0.96	19	7.27
Brazil	103	170115	260	8700	0.61	396.2	11.84
Chile	5	15211	31	90	0.33	161.3	55.56
Colombia	11	42321	130	1300	0.26	84.6	8.46
Cuba	1	11201	33	45	0.09	30.3	22.22
Dominican Republic	4	8495	150	300	0.47	26.7	13.33
Ecuador	7	12646	130	400	0.55	53.8	17.5
Guatemala	12	11385	240	970	1.05	50	12.37

Country	No. of studies	Population size (2000 data; thousands of people) - A	MMR in 2000 - B	Number of maternal deaths (2000 data) - C	Weighted number of studies (weighted on A)	Weighted number of studies (weighted on B)	Weighted number of studies (weighted on C)^
Guyana	1	861	170	30	1.16	5.9	33.33
Haiti	6	8222	680	1700	0.73	8.8	3.53
Honduras	5	6485	110	220	0.77	45.5	22.73
Jamaica	10	2583	87	45	3.87	114.9	222.22
Mexico	28	98881	83	1900	0.28	337.3	14.74
Nicaragua	3	5074	230	400	0.59	13	7.5
Panama	7	2856	160	100	2.45	43.8	70
Paraguay	1	5496	170	280	0.18	5.9	3.57
Peru	6	25662	410	2500	0.23	14.6	2.4
Uruguay	2	3337	27	15	0.6	74.1	133.33
Venezuela rb	3	24170	96	550	0.12	31.3	5.45
Egypt Arab Republic	13	68470	84	1400	0.19	154.8	9.29
Iran Islamic Republic	10	67702	76	1200	0.15	131.6	8.33
Jordan	1	6669	41	70	0.15	24.4	14.29
Lebanon	3	3282	150	100	0.91	20	30
Syrian Arab Republic	1	16125	160	780	0.06	6.3	1.28
Tunisia	1	9586	NA	210	0.1	NA	4.76
Yemen Republic	3	18112	570	5300	0.17	5.3	0.57
Afghanistan	6	22720	1900	20000	0.26	3.2	0.3
Bangladesh	39	129155	380	16000	0.3	102.6	2.44
India	75	1013662	540	136000	0.07	138.9	0.55
Nepal	29	23930	740	6000	1.21	39.2	4.83
Pakistan	28	156483	500	26000	0.18	56	1.08
Sri Lanka	5	18827	92	300	0.27	54.3	16.67
Angola	4	12878	1700	11000	0.31	2.4	0.36
Benin	12	6097	850	2200	1.97	14.1	5.45
Botswana	15	1622	100	50	9.25	150	300
Burkina Faso	36	11937	1000	5400	3.02	36	6.67
Cameroon	20	15085	730	4000	1.33	27.4	5
Chad	1	7651	1100	4200	0.13	0.9	0.24
Congo Democratic Republic	7	51654	990	24000	0.14	7.1	0.29
Congo Republic	1	2943	510	690	0.34	2	1.45
Cote d Ivoire	33	14786	690	3900	2.23	47.8	8.46
Eritrea	2	3850	630	930	0.52	3.2	2.15
Ethiopia	26	62565	850	24000	0.42	30.6	1.08
Gabon	4	1226	420	200	3.26	9.5	20
Gambia The	5	1305	540	270	3.83	9.3	18.52

Country	No. of studies	Population size (2000 data; thousands of people) - A	MMR in 2000 - B	Number of maternal deaths (2000 data) - C	Weighted number of studies (weighted on A)	Weighted number of studies (weighted on B)	Weighted number of studies (weighted on C)^
Ghana	16	20212	540	3500	0.79	29.6	4.57
Guinea	1	7430	740	2700	0.13	1.4	0.37
Guinea Bissau	1	1213	1100	590	0.82	0.9	1.69
Kenya	80	30080	1000	11000	2.66	80	7.27
Liberia	1	3154	760	1200	0.32	1.3	0.83
Madagascar	4	15942	550	3800	0.25	7.3	1.05
Malawi	55	10925	1800	9300	5.03	30.6	5.91
Mali	13	11234	1200	6800	1.16	10.8	1.91
Mauritania	1	2670	1000	1200	0.37	1	0.83
Mozambique	18	19680	1000	7900	0.91	18	2.28
Namibia	1	1726	300	190	0.58	3.3	5.26
Niger	2	10730	1600	9700	0.19	1.3	0.21
Nigeria	80	111506	800	37000	0.72	100	2.16
Rwanda	12	7733	1400	4200	1.55	8.6	2.86
Senegal	9	9481	690	2500	0.95	13	3.6
Sierra Leone	2	4854	2000	4500	0.41	1	0.44
Somalia	2	10097	1100	5100	0.2	1.8	0.39
South Africa	136	40377	230	2600	3.37	591.3	52.31
Sudan	19	29490	590	6400	0.64	32.2	2.97
Swaziland	1	1008	370	120	0.99	2.7	8.33
Tanzania	94	33517	1500	21000	2.8	62.7	4.48
Uganda	60	21778	880	10000	2.76	68.2	6
Zambia	37	9169	750	3300	4.04	49.3	11.21
Zimbabwe	35	11669	1100	5000	3	31.8	7

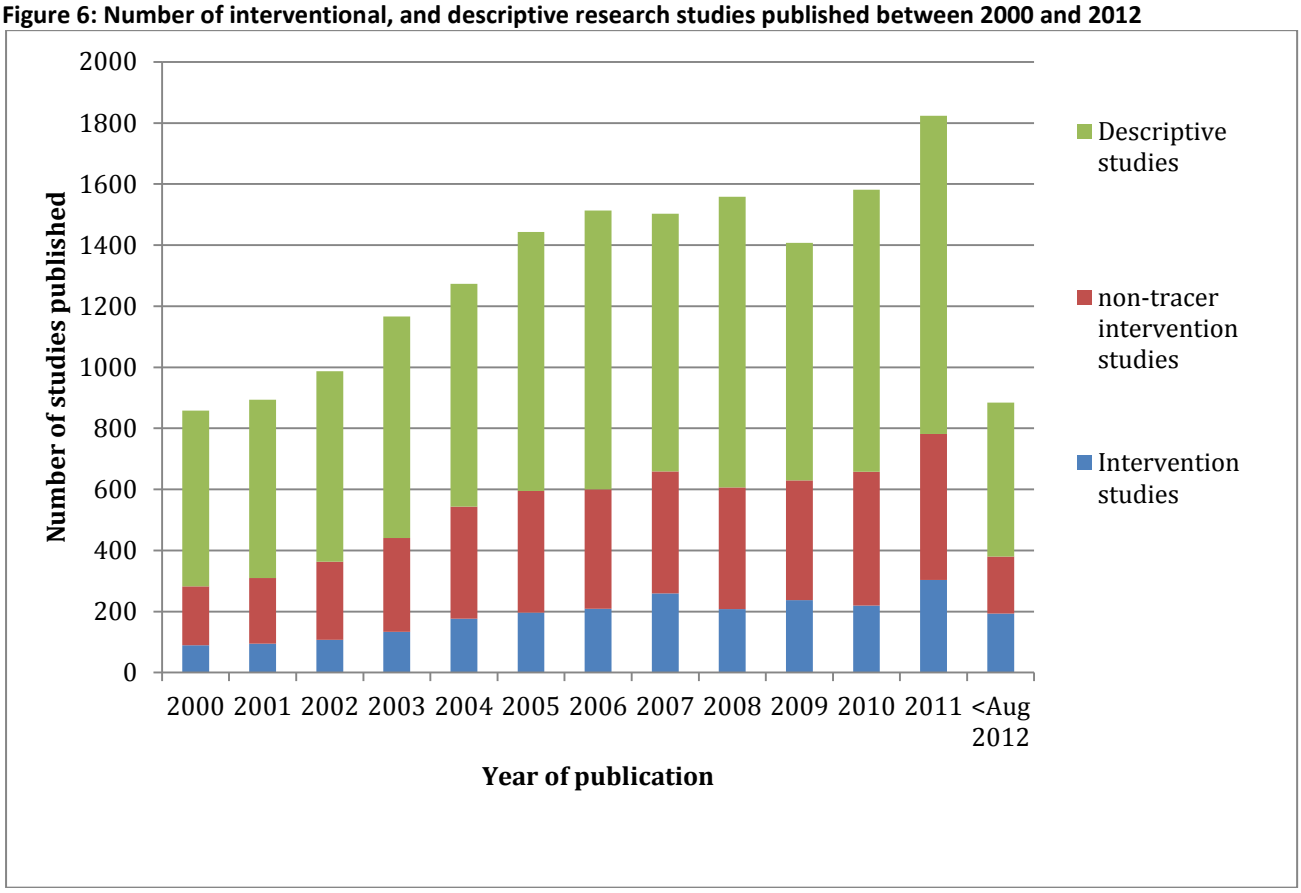
^number of studies per 1000 maternal deaths

Descriptive and interventional research in low- and middle-income countries

The graph below shows that overall, the number of studies on maternal health increased progressively over time, from fewer than 900 in 2000 to double that level in 2011. There was a rapid near-linear rise in the annual numbers of papers per year from 2000 to 2005 (from about 800 to 1400 in that period). In the years 2005 to 2010 levels remained relatively stable, between 1400and 1600. Note that the numbers of papers in 2012 does not reflect the whole year, and thus cannot be compared with preceding years.

Throughout the period of the review, descriptive studies accounted for the largest proportion of studies by some margin. Studies on interventions as defined in this review (health systems, community, health promotion or the selected tracer conditions) accounted for the smallest groups of studies. The number of these interventional studies did rise over time, and were about 200 per year from 2005 to 2012.

Figure 6: Number of interventional, and descriptive research studies published between 2000 and 2012



The graph below shows the distribution of interventional studies in key topic areas of the review. The smallest group, in each year of the review was community-based studies. Conversely, studies on the five tracer conditions were the largest of the groups. The proportion of studies on health systems, promotion and community rose however over time. This group of topics accounted for slightly more than 60% of all studies from 2008 onwards.

Figure 7 4: Intervention studies by intervention-type published between 2000 and 2012

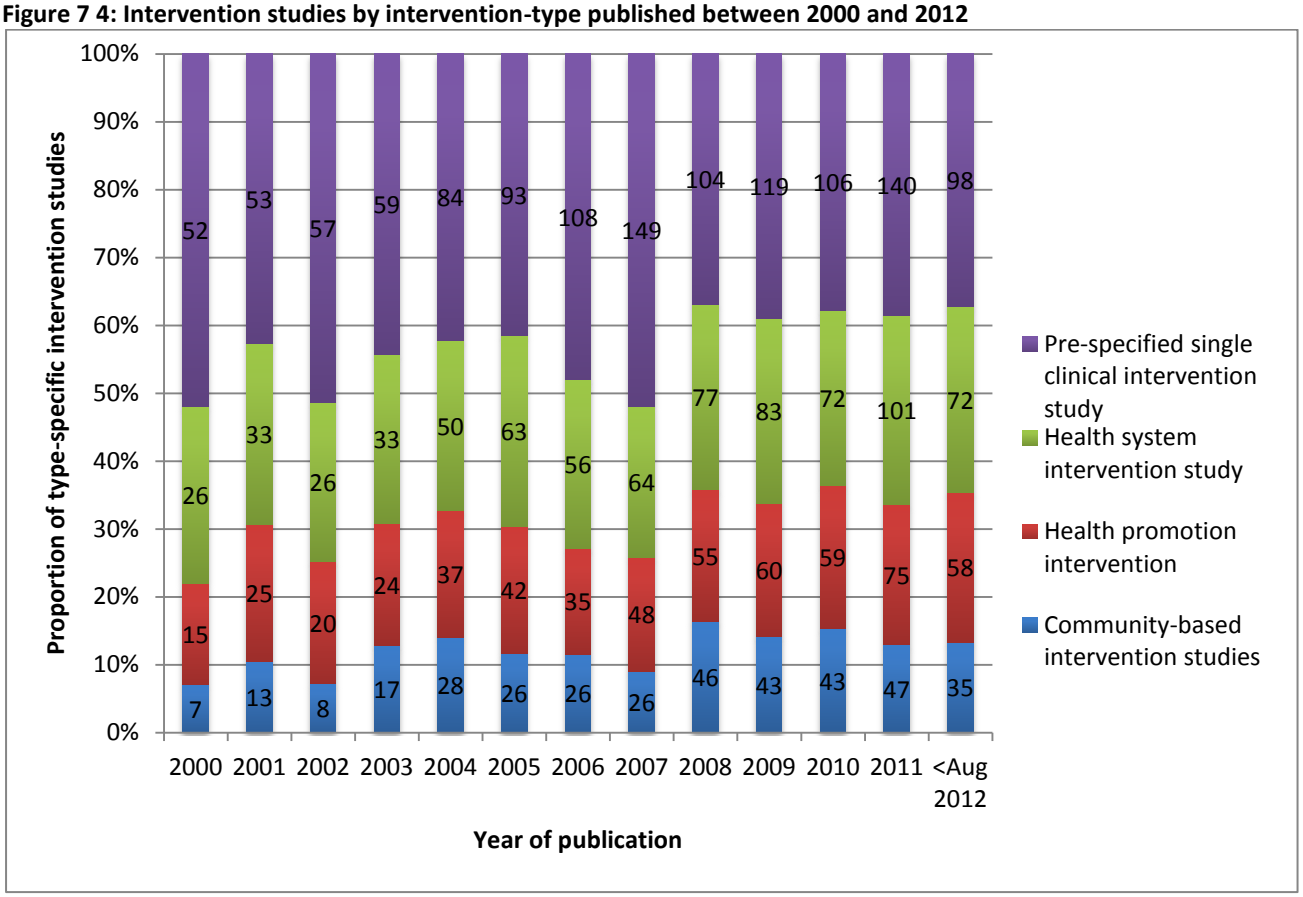


Table 4 below depicts the types of study designs used in different topic areas. Studies on HIV (n=604) formed the largest group, around three-fold the number of the next highest topic. Only 92 studies on SRIs other than HIV were located. Among the community-based studies, these mostly entailed health education interventions (n=205), with about 100 papers identified on each of traditional birth attendants and birth and complication preparedness. Around 100 studies included an intervention to enhance male involvement in maternal health.

Qualitative studies made up 10% or fewer of studies on all topics, aside from STIs other than HIV (20%), malaria (16%) and maternity waiting homes (23%). and Of note, compared to other topic areas, studies on maternal hypertension had high levels of systematic reviews (35%, 72/204). By comparison, only 7% (45/604) studies on maternal HIV were systematic reviews. Most HIV studies addressed the effectiveness of these services (62%), much higher than most other intervention areas. About a quarter of maternal malaria and haemorrhage studies were RCT. Among community-based interventions, much fewer were RCTs.

Table 4: Design of studies on clinical and health systems aspects of maternal health

Intervention topic	Total studies (n)	SR or non-SR review	cRCT and RCT	Effectiveness studies*	Qualitative	Other#
Community-based & health promotion						
Health education	205	27 (13%)	34 (17%)	119 (58%)	9 (4%)	16 (8%)
Demand-side financing	70	12 (17%)	2 (3%)	43 (61%)	7 (10%)	6 (9%)
Transport schemes	43	5 (12%)	1 (2%)	29 (67%)	4 (9%)	4 (9%)
Maternity waiting homes	22	4 (18%)	0	11 (50%)	2 (9%)	5 (23%)
Male involvement	99	4 (4%)	7 (7%)	71 (72%)	9 (9%)	8 (8%)
Traditional birth attendants	103	23 (22%)	15 (15%)	47 (46%)	11 (11%)	7 (7%)
Birth and complications preparedness	114	14 (12%)	15 (13%)	71 (62%)	6 (5%)	8 (7%)
Single clinical intervention						
Maternal HIV/STI	604	45 (7%)	83 (14%)	376 (62%)	30 (5%)	70 (12%)
STI (Non HIV)	92	8 (9%)	11 (12%)	53 (58%)	2 (2%)	18 (20%)
Maternal malaria	209	21 (10%)	48 (23%)	102 (49%)	4 (2%)	34 (16%)
Maternal hypertension	204	72 (35%)	36 (18%)	90 (44%)	0	8 (4%)
Haemorrhage (APH or PPH)	168	24 (14%)	42 (25%)	85 (51%)	3 (2%)	14 (8%)

cRCT cluster-randomised clinical trial RCT randomised clinical trial; *Non-randomised controlled studies, before-after studies, cohort, and cross-sectional studies. # includes mixed methods studies

Review limitations

Having teams from several world regions aimed to limit the potential for selection bias in obtaining of articles (title and abstract searches, as well as location full text articles) and in selection of eligible studies. The MASCOT team includes European, Latin American, African and Australasia countries. The Centre for International Health, Burnet Institute, Australia took part in the review. This partner, which has much experience with Asian research, was included to diminish the potential bias from not having a partner familiar with Asian research. Though the review teams were spread across more than a dozen countries and over four continents, the team did not have global coverage. This may have biased the studies included in the review. For examples, people from a specific region may be very familiar with studies in their area and be less able to code articles from other regions of the world. The quality of included studies was not appraised. Though we aimed for transparent reporting of judgements made, reviewers sometimes had to employ judgement in screening for eligibility or in data extraction, as rules guiding a review of this size could not cover all eventualities. Though other members of the review team examined the extractions done, there may have been some variation in such judgements across the review.

Finally, the review aimed to include studies of interventions related to socio-economic or environmental interventions, such as improving water, on maternal health. We, however, mostly searched biomedical sources, which may not index all studies on such topics.

Future use of findings of the review

The map developed in stage 1 will be made freely available and be a searchable resource open to any user. It will help identify gaps in primary research relevant to reducing maternal mortality in LMICs. The map may be an especially useful resource for other research groups and funding bodies to identify systematic review topics of relevance to reducing health inequalities in maternal health in LMICs. It will be used to select topics for more detailed specific systematic reviews, as the studies to

be included in these reviews were identified during this review. The map will be shared with key stakeholders to assist them to identify the most policy-relevant review topic(s). Systematic review topics would then be prioritized by the Mascot team and addressed in the remaining work packages of the project. Other interested people within the team, or beyond the team will also be able to lead systematic reviews on specific questions.

Conclusions

This large review, of over 33,000 records, enabled the Mascot project to describe the proportion of maternal health literature that focuses on health systems and on some key tracer clinical conditions. We also documented the study designs used for MH interventional research, as well as other key characteristics of maternal health research since 2000. This is useful information, and will be collated in scientific publications.

Interventions included in the review were very diverse, encompassing those provided to individuals or groups of women (in childbirth, during or after pregnancy); to staff providing services to these women; to the facilities where these women receive services; or to the community where these women live, including men in these communities. The unit that received the intervention thus varied considerably. Similarly, interventions targeted, in diverse ways, women in childbirth, during or after pregnancy. This also included involvement of men in maternal health.

This report also provides information on whether the amount of research done in a particular country or region corresponds to the burden of maternal mortality (is research attention distributed equitably, with the amount of research done matching the need for such research, with need defined by the MMR and total number of maternal deaths). This shows a marked disjuncture between need and number of studies done. Moreover, the distribution of equity-focused studies is concerning. Some regions of the world have half the focus on equity as other regions, and worryingly, overall fewer than ten percent of studies address vulnerable groups.

Annexes

Annex 1: Search strategies and interim results of literature searches in stage 1

Strategy for the Medline search (Pubmed interface) provided here. The search strategies used in the other databases included in this review (CINAHL, Embase, PsycINFO, Web of Knowledge, Popline and LILACS) are available on request.

PubMED search strategy

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federation"[All Fields])) OR ("russia"[MeSH Terms] OR "russia"[All Fields])) OR ("ussr"[MeSH Terms] OR "ussr"[All Fields])) OR ("serbia"[MeSH Terms] OR "serbia"[All Fields])) OR ("seychelles"[MeSH Terms] OR "seychelles"[All Fields])) OR ("south africa"[MeSH Terms] OR ("south"[All Fields] AND "africa"[All Fields]) OR "south africa"[All Fields])) OR ("saint kitts and nevis"[MeSH Terms] OR ("saint"[All Fields] AND "kitts"[All Fields] AND "nevis"[All Fields]) OR "saint kitts and nevis"[All Fields] OR ("st"[All Fields] AND "kitts"[All Fields] AND "nevis"[All Fields]) OR "st kitts and nevis"[All Fields])) OR ("saint kitts and nevis"[MeSH Terms] OR ("saint"[All Fields] AND "kitts"[All Fields] AND "nevis"[All Fields]) OR "saint kitts and nevis"[All Fields])) OR (("saints"[MeSH Terms] OR "saints"[All Fields] OR "saint"[All Fields]) AND Kitts[All Fields])) OR ("saint lucia"[MeSH Terms] OR ("saint"[All Fields] AND "lucia"[All Fields]) OR "saint lucia"[All Fields] OR ("st"[All Fields] AND "lucia"[All Fields]) OR "st lucia"[All Fields])) OR ("saint lucia"[MeSH Terms] OR ("saint"[All Fields] AND "lucia"[All Fields]) OR "saint lucia"[All Fields])) OR ("saint vincent and the grenadines"[MeSH Terms] OR ("saint"[All Fields] AND "vincent"[All Fields] AND "grenadines"[All Fields]) OR "saint vincent and the grenadines"[All Fields] OR ("st"[All Fields] AND "vincent"[All Fields] AND "grenadines"[All Fields]) OR "st vincent and the grenadines"[All Fields])) OR (St. Vincent[Author] OR St. Vincent[Investigator])) OR ("saint vincent and the grenadines"[MeSH Terms] OR ("saint"[All Fields] AND "vincent"[All Fields] AND "grenadines"[All Fields]) OR "saint vincent and the grenadines"[All Fields])) OR Saint Vincent[Author]) OR ("saint vincent and the grenadines"[MeSH Terms] OR ("saint"[All Fields] AND "vincent"[All Fields] AND "grenadines"[All Fields]) OR "saint vincent and the grenadines"[All Fields] OR "grenadines"[All Fields])) OR ("suriname"[MeSH Terms] OR "suriname"[All Fields])) OR ("thailand"[MeSH Terms] OR "thailand"[All Fields])) OR ("tunisia"[MeSH Terms] OR "tunisia"[All Fields])) OR ("turkey"[MeSH Terms] OR "turkey"[All Fields])) OR ("uruguay"[MeSH Terms] OR "uruguay"[All Fields])) OR ("venezuela"[MeSH Terms] OR "venezuela"[All Fields]))))

Annex 2. List of low- and middle-income countries

http://data.worldbank.org/about/country-classifications/country-and-lending-groups (The World Bank 2012)

East Asia and Pacific		
American Samoa	Malaysia	Samoa
Cambodia	Marshall Islands	Solomon Islands
China	Micronesia, Fed. Sts	Thailand
Fiji	Mongolia	Timor-Leste
Indonesia	Myanmar	Tuvalu
Kiribati	Palau	Tonga
Korea, Dem. Rep.	Papua New Guinea	Vanuatu
Lao PDR	Philippines	Vietnam
Europe and Central Asia		
Albania	Kosovo	Russian Federation
Armenia	Kyrgyz Republic	Serbia
Azerbaijan	Latvia	Tajikistan
Belarus	Lithuania	Turkey
Bosnia and Herzegovina	Macedonia, FYR	Turkmenistan
Bulgaria	Moldova	Ukraine
Georgia	Montenegro	Uzbekistan
Kazakhstan	Romania	
Latin America and the Caribbean		
Antigua and Barbuda	Dominican Republic	Nicaragua
Argentina	Ecuador	Panama
Belize	El Salvador	Paraguay
Bolivia	Grenada	Peru
Brazil	Guatemala	St. Kitts and Nevis
Chile	Guyana	St. Lucia
Colombia	Haiti	St. Vincent and the Grenadines
Costa Rica	Honduras	Suriname
Cuba	Jamaica	Uruguay
Dominica	Mexico	Venezuela, RB
Middle East and North Africa		
Algeria	Jordan	Tunisia
Djibouti	Lebanon	West Bank and Gaza
Egypt, Arab Rep.	Libya	Yemen, Rep.
Iran, Islamic Rep.	Morocco	
Iraq	Syrian Arab Republic	
South Asia		
Afghanistan	India	Pakistan
Bangladesh	Maldives	Sri Lanka
Bhutan	Nepal	
Sub-Saharan Africa		
Angola	Gambia, The	Nigeria
Benin	Ghana	Rwanda
Botswana	Guinea	São Tomé and Principe
Burkina Faso	Guinea-Bissau	Senegal
Burundi	Kenya	Seychelles
Cameroon	Lesotho	Sierra Leone
Cape Verde	Liberia	Somalia
Central African Republic	Madagascar	South Africa
Chad	Malawi	South Sudan
Comoros	Mali	Sudan

Congo, Dem. Rep.	Mauritania	Swaziland
Congo, Rep	Mauritius	Tanzania
Côte d'Ivoire	Mayotte	Togo
Eritrea	Mozambique	Uganda
Ethiopia	Namibia	Zambia
Gabon	Niger	Zimbabwe
Low-income economies ($1,005 or less)		
Afghanistan	Gambia, The	Myanmar
Bangladesh	Guinea	Nepal
Benin	Guinea-Bisau	Niger
Burkina Faso	Haiti	Rwanda
Burundi	Kenya	Sierra Leone
Cambodia	Korea, Dem Rep.	Somalia
Central African Republic	Kyrgyz Republic	Tajikistan
Chad	Liberia	Tanzania
Comoros	Madagascar	Togo
Congo, Dem. Rep	Malawi	Uganda
Eritrea	Mali	Zimbabwe
Ethiopia	Mozambique	
Lower-middle-income economies ($1,006 to $3,975)		
Angola	India	São Tomé and Principe
Armenia	Iraq	Senegal
Belize	Kiribati	Solomon Islands
Bhutan	Kosovo	Sri Lanka
Bolivia	Lao PDR	Sudan
Cameroon	Lesotho	Swaziland
Cape Verde	Marshall Islands	Syrian Arab Republic
Congo, Rep.	Mauritania	Timor-Leste
Côte d'Ivoire	Micronesia, Fed. Sts.	Tonga
Djibouti	Moldova	Turkmenistan
Egypt, Arab Rep.	Mongolia	Tuvalu
El Salvador	Morocco	Ukraine
Fiji	Nicaragua	Uzbekistan
Georgia	Nigeria	Vanuatu
Ghana	Pakistan	Vietnam
Guatemala	Papua New Guinea	West Bank and Gaza
Guyana	Paraguay	Yemen, Rep.
Honduras	Philippines	Zambia
Indonesia	Samoa	
Upper-middle-income economies ($3,976 to $12,275)		
Albania	Ecuador	Namibia
Algeria	Gabon	Palau
American Samoa	Grenada	Panama
Antigua and Barbuda	Iran, Islamic Rep.	Peru
Argentina	Jamaica	Romania
Azerbaijan	Jordan	Russian Federation
Belarus	Kazakhstan	Serbia
Bosnia and Herzegovina	Latvia	Seychelles
Botswana	Lebanon	South Africa
Brazil	Libya	St. Kitts and Nevis
Bulgaria	Lithuania	St. Lucia
Chile	Macedonia, FYR	St. Vincent and the Grenadines
China	Malaysia	Suriname
Colombia	Maldives	Thailand
Costa Rica	Mauritius	Tunisia
Cuba	Mayotte	Turkey

Dominica	Mexico	Uruguay
Dominican Republic	Montenegro	Venezuela, RB

Annex 3. List of key coding examples

Screening on title and abstract

Not maternal health

Impact of comorbidities on time in therapeutic range in patients with nonvalvular atrial fibrillation

2012

Choi J C; Damaraju C ; Mills R M; Wildgoose P ; Fields L ; Schein J ; Nelson W W;

OBJECTIVES: Time in therapeutic range (TTR) may be a quality indicator for anticoagulation. Previous studies have demonstrated that heart failure (HF) and other comorbidities are associated with poorer anticoagulation control; however, this association was not studied in a representative US population. The objective was to determine the association between HF, other comorbidities, patient characteristics, and TTR among patients with nonvalvular atrial fibrillation (NVAF). METHODS: We analyzed longitudinal patient-level anticoagulation management records collected between 2006 and 2010 by decision support software, Coag- Clinic. Adult patients with NVAF who used warfarin over 12 months with no gap >60 days between visits were identified. The Rosendaal method was used to cal- culate TTR, and TTR <55% was defined as "lower TTR". CHADS2>=2 was defined as "higher CHADS2". Logistic regression analyses were conducted to determine the association between comorbidities and TTR. RESULTS: We identified 23,425 patients. The mean (+/-SD) age was 74.8+/-9.7 years, with 84.8% >=65 years. The most common comorbidities were hypertension (41.7%), diabetes (24.1%), HF (11.7%), and stroke (11.1%). The mean (+/-SD) TTR was 67.3+/-14.4; 18.7% of patients had "lower TTR". In multivariable analyses, using age, gender, hypertension, diabetes, stroke, and region as covariates, HF was associated with "lower TTR" [adjusted OR (95%CI) = 1.41 (1.28, 1.56); p<.001]. Diabetes [1.28 (1.19, 1.38); p<.001], and stroke [1.15 (1.04, 1.27); p<.001] were also associated with "lower TTR". In the second multivariable analyses, using gender, and region as covariates, "higher CHADS2" was associated with "lower TTR" [adjusted OR (95%CI) = 1.11 (1.04, 1.18); p<.001]. CONCLUSIONS: Common comorbidities that accompany NVAF are associated with "lower TTR". HF was associated with the greatest likelihood of a "lower TTR", followed by diabetes, then stroke. Anticoagulation control is more challenging for patients with these conditions. Novel agents offering a predictable dose-response may benefit these patients.

Not maternal health

Implementation of computerized provider order entry in a neonatal intensive care unit: Impact on admission workflow

2012

Chapman A K; Lehmann C U; Donohue P K; Aucott S W;

Objective: The study objective was to determine if computerized provider order entry (CPOE) systems impaired or enhanced workflow in the neonatal intensive care unit (NICU) by comparing the timing of administration of the first dose of antibiotics before and after CPOE system implementation. Methods: We conducted a pre-post intervention comparative study of the length of time between admission and administration of initial antibiotics in neonates before and after a CPOE system was implemented. Clinical information and timing of antibiotic administration were collected on all inborn infants, who were admitted to the NICU in the first 4. h of life and treated with antibiotics, for one year prior to the implementation of computerized order entry and for one year after the implementation. Results: Infants admitted to the NICU were similar in both periods (mean birth weight 2183. g vs. 2091. g, gestational age 33.3 weeks vs. 33.0 weeks). There was no significant difference in mean length of time from admission to antibiotic administration in the pre-CPOE group (131. min [CI 124-139]) compared to the post-CPOE group (125. min [CI 116-133]) (p=0.07). The mean time to pharmacy verification for a subset of patients was significantly shorter for patients in the post-CPOE group (61 +/- 58. min) compared to the pre-CPOE group (88 +/- 76. min) (p=<0.001). Conclusions: While the introduction of a CPOE system in the NICU did not significantly improve antibiotic administration times, the timeliness of an important aspect of the medication process, time to pharmacy verification, was improved. These findings imply other factors are impeding workflow. Further studies are needed to evaluate how CPOE systems combined with patient care activities affect workflow and overall patient care. 2011 Elsevier Ireland Ltd.

Not maternal health

Childhood attention-deficit/hyperactivity disorder and future substance use disorders: Comparative meta-analyses

2011

Charach A ; Yeung E ; Climans T ; Lillie E ;

Objective In recent years cohort studies have examined childhood attention-deficit/hyperactivity disorder (ADHD) as a risk factor for substance use disorders (SUDs) in adolescence and young adulthood. The long-term risk is estimated for development of alcohol, cannabis, combined alcohol and psychoactive SUDs, combined SUDs (nonalcohol), and nicotine use disorders in children with ADHD. Method MEDLINE, CINHAL, PsycINFO, and EMBASE were searched through October 2009; reference lists of included studies were hand-searched. Prospective cohort studies were included if they compared children with ADHD to children without, identified cases using standardized criteria by mean age of 12 years, followed participants until adolescence (nicotine use) or young adulthood (psychoactive substance use disorder, with and without alcohol, alcohol use disorder, cannabis use disorder), and reported SUD outcomes. Two independent reviewers examined articles and extracted and cross-checked data. Effects were summarized as pooled odds ratios (ORs) in a

random effects model. Results Thirteen studies were included. Only two of five meta-analyses, for alcohol use disorder (N = 3,184) and for nicotine use (N = 2,067), estimated ORs showing stability when evaluated by sensitivity analyses. Childhood ADHD was associated with alcohol use disorder by young adulthood (OR = 1.35, 95% confidence interval = 1.11-1.64) and with nicotine use by middle adolescence (OR = 2.36, 95% confidence interval = 1.71-3.27). The association with drug use disorder, nonalcohol (N = 593), was highly influenced by a single study. Conclusions Childhood ADHD is associated with alcohol and drug use disorders in adulthood and with nicotine use in adolescence. 2011 American Academy of Child and Adolescent Psychiatry.

Single Clinical Intervention

Management of a pregnant patient with Graves' disease complicated by propylthiouracil induced agranulocytosis.

2005

Cho YY ; Shon HS ; Yoon HD ;

Relapse and exacerbation of Graves' disease during pregnancy is rare, and thionamide induced agranulocytosis is an uncommon side effect. We report a case of a pregnant woman in her 24th week of gestation that experienced a relapse of Graves' disease that was complicated by propylthiouracil induced agranulocytosis. Following the discontinuation of propylthiouracil and administration of a broad-spectrum of antibiotics, agranulocytosis subsided within 10 days. A total thyroidectomy to avoid any future relapse was planned and a short course of a beta-adrenergic blocker and Lugol solution were prescribed before the operation. At the 28th week of gestation, a total thyroidectomy was performed without complications and thyroxine replacement therapy was commenced. At the 40th week of gestation, labor was induced and a 3,370 g healthy male infant was born without clinical features of thyrotoxicosis. We report herein on the patient and the treatment options for this rare and complicated case.

Single Clinical Intervention

Laparoscopic cornuotomy using a temporary tourniquet suture and diluted vasopressin injection in interstitial pregnancy.

Choi YS ; Eun DS ; Choi J ; Shin KS ; Choi JH ; Park HD ;

2009

OBJECTIVE: To evaluate the efficiency of laparoscopic cornuotomy. DESIGN: Retrospective case review. SETTING: An urban medical center. PATIENT(S): Eight patients with interstitial pregnancy who have undergone laparoscopic cornuotomy. INTERVENTION(S): Laparoscopic cornuotomy was performed using a temporary tourniquet suture and the injection of diluted vasopressin around the cornual mass. The tourniquet suture was removed completely after repairing the cornu. MAIN OUTCOME MEASURE(S): Operating time, hemorrhage, beta-hCG levels. RESULT(S): The estimated blood loss was 50 +/- 22 mL (mean +/- SD), and the operating time was 58 +/- 16 minutes. The serum beta-hCG level returned to within the normal range approximately 4 weeks postoperatively in all patients. There were no major postoperative complications, such as hemorrhage, and no postoperative adjuvant therapy was required. CONCLUSION(S): Laparoscopic cornuotomy is a safe and effective method in interstitial pregnancy, and we believe that it has the advantage of preserving reproductive capacity over cornual resection.

Single clinical intervention

Labor induction at term: a comparison of the effects of 50 microg and 25 microg vaginal misoprostol.

2007

Eroglu D ; Oktem M ; Yanik F ; Kuscu E ;

PURPOSE OF INVESTIGATION: To compare the effects of 50 microg of vaginal misoprostol with 25 microg for labor induction at term. METHODS: One hundred and forty-seven pregnant women with indications for labor induction and cervical Bishop's score of < or = 6 were randomly assigned to receive either 50 microg (n = 74) or 25 microg (n = 73) of vaginal misoprostol every four hours until either a Bishop's score of > or = 8 or adequate uterine contraction frequency had been achieved. Induction-to-vaginal-delivery time was considered the primary outcome measure. RESULTS: Mean induction-to-vaginal-delivery time was significantly shorter in the 50-microg group than in the 25-microg group (526 +/- 141 min vs 745 +/- 218 min, respectively); oxytocin was administered to 65.8% of the patients in the 25-microg group and to 35.1% in the 50-microg group ($p < .05$). The incidence of tachysystole was significantly higher in the 50-microg group than in the 25-microg group (12% vs 2.7%, $p < .05$). We found no statistically significant difference between the two groups with respect to the rate of primary cesarean section, incidence of hyperstimulation syndrome, or neonatal outcome ($p > .05$). CONCLUSION: Fifty micrograms of vaginally administered misoprostol is an effective and inexpensive means of inducing labor at term. Uterine tachysystole may be associated more frequently with a 50-microg dose of vaginal misoprostol than with a 25-microg dose. Clinicians must accurately document the frequency and intensity of uterine contractions before every 50-microg dose of misoprostol is administered.

Single clinical intervention or no intervention

Laparoscopic management of a primary omental pregnancy after clomiphene induction.

2009

Esin S ; Yildirim H ; Tanzer F

OBJECTIVE: To describe the successful laparoscopic management of a primary omental pregnancy. DESIGN: Case report. SETTING: Department of Obstetrics and Gynecology, Dr. Sami Ulus Obstetrics, Gynecology and Children's Hospital, Ankara, Turkey. PATIENT(S): A 22-year-old patient with an omental pregnancy. INTERVENTION(S): Laparoscopic partial omentectomy. MAIN OUTCOME MEASURE(S): Successful laparoscopic management of an omental pregnancy. RESULT(S): A 22-year-old woman presented to the emergency room with

abdominal pain and vaginal spotting. She was undergoing clomiphene (CC) induction for infertility and had a positive urine pregnancy test at home. A right adnexal ectopic pregnancy was reported by ultrasonography. Due to increasing pain, laparoscopy was performed. The uterus and fallopian tubes appeared normal without any signs of pregnancy. A well-vascularized intact omental gestational sac was discovered in the right adnexal region in close proximity to the right ovary. By laparoscopy, the sac was resected with partial omentectomy. A primary omental pregnancy was confirmed by beta-hCG-positive trophoblast cells among omental fat cells. CONCLUSION(S): Omental pregnancy is rather difficult to identify due to localization. When in close proximity to the adnexal region, it may mimic a tubal ectopic pregnancy. Laparoscopy offers a minimally invasive method for diagnosis and therapy.

No Intervention/Outcome

Barriers to utilization of prenatal care services in Turkey.

2003

Erci B ;

PURPOSE: To identify barriers to utilization of prenatal care services in Turkey, including pregnant women's attitudes toward pregnancy and prenatal care. DESIGN: Descriptive. The population was Turkish women who lived in Erzurum and had delivered their infants but were still hospitalised. METHODS: The sample of 446 women had or had not received prenatal care, had no complications during pregnancy, carried their pregnancies to term, and were considered to have normal deliveries. Attitudes toward pregnancy and prenatal care and barriers to prenatal care services were measured by use of a questionnaire. FINDINGS: Low education of pregnant women and unwanted pregnancy were barriers to use of prenatal care services. Additional barriers were negative attitudes toward pregnancy and attitudes toward prenatal care. These barriers decreased frequency of use and delayed early initiation of prenatal care. The most important barrier reported by the women was being too busy at home to seek care. CONCLUSIONS: Although this sample was limited, the findings indicate barriers for attention by health care providers to ensure appropriate prenatal care and maternal and infant health.

No Intervention or outcome

A case of Mallory-Weiss syndrome complicating pregnancy in a patient with scleroderma.

2003

Cho KH ; Heo SW ; Chung SH ; Kim CG ; Kim HG ; Choe JY ;

The majority of patients with scleroderma have gastrointestinal involvement, and a few experience gastrointestinal hemorrhage, however, gastrointestinal hemorrhage due to Mallory-Weiss syndrome is very rare. We report upon a 24-year-old pregnant woman with scleroderma who had gastrointestinal hemorrhage due to Mallory-Weiss syndrome.

No Intervention or outcome

Obesity and periodontal disease in diabetic pregnant women.

2005

Chapper A ; Munch A ; Schermann C ; Piacentini CC ; Fasolo MT ;

This cross-sectional study investigated the impact of pregestational overweight and obesity on periodontal status of patients with gestational diabetes mellitus (GDM). Sixty pregnant women with gestational diabetes mellitus (GDM) were recruited for the study. According to the pregestational body mass index (BMI), patients were classified into 3 groups: normal, overweight or obese. The periodontal assessment parameters were the presence of gingival bleeding (GB) and bleeding on probing (BOP) per tooth. Clinical attachment loss (CAL) was assessed per tooth and classified according to following values: 1) absence of attachment loss; 2) between 1 and 2 mm, 3) between 3 and 5 mm; and 4) CAL > or = 6 mm. The means of individual percentage of teeth with GB and BOP and the means of the individual classified values of CAL were compared through ANOVA. Differences between the groups were established through post hoc Bonferroni test for multiple comparisons ($p < 0.05$). The analysis revealed significant differences between the normal group and the obese group considering GB (52.76% +/- 27.99% and 78.85% +/- 27.44%, respectively) and CAL (2.21 +/- 0.41 and 2.61 +/- 0.54, respectively). Although an increase was found in BOP as the BMI increased (ranging from 55.65% to 75.31%), no statistically significant differences were found among the groups. Patients with GDM and pregestational obesity had significantly more gingivitis and periodontal attachment loss that those with normal pregestational BMI. Periodontal treatment should be considered in the establishment of future recommendations for metabolic control for this special group of patients.

No intervention or outcome (If this was about overall service use then could be coded as service utilisation)

MEN IN MATERNAL CARE: EVIDENCE FROM INDIA

2012

Chattopadhyay A ;

Men's supportive stance is an essential component for making women's world better. There are growing debates among policymakers and researchers on the role of males in maternal health programmes, which is a big challenge in India where society is male driven. This study aims to look into the variations and determinants of maternal health care utilization in India and in three demographically and socioeconomically disparate states, namely Uttar Pradesh, West Bengal and Maharashtra, by husband's knowledge, attitude, behaviour towards maternal health care and gender violence, using data from the National Family Health Survey III 2005-06 (equivalent to the Demographic and Health Survey in India). Women's antenatal care visits, institutional delivery and freedom in health care decisions are looked into, by applying descriptive statistics and multivariate models. Men's knowledge about pregnancy-related care and a positive

gender attitude enhances maternal health care utilization and women's decision-making about their health care, while their presence during antenatal care visits markedly increases the chances of women's delivery in institutions. From a policy perspective, proper dissemination of knowledge about maternal health care among husbands and making the husband's presence obligatory during antenatal care visits will help primary health care units secure better male involvement in maternal health care.

Health Systems
+ Other evaluation design
Determinants of reduction in maternal mortality in Matlab, Bangladesh: a 30-year cohort study.
No year given
Chowdhury ME ; Botlero R ; Koblinsky M ; Saha SK ; Dieltiens G ; Ronsmans C ;
BACKGROUND: Research on the effectiveness of strategies to reduce maternal mortality is scarce. We aimed to assess the contribution of intervention strategies, such as skilled attendance at birth, to the recorded reduction in maternal mortality in Matlab, Bangladesh. We examined and compared trends in maternal mortality in two adjacent areas over 30 years, by separate analyses of causes of death, underlying sociodemographic determinants, and areas and time periods in which interventions differed. METHODS: We analysed survey data that was routinely collected between 1976 and 2005 for about 200 000 inhabitants of Matlab, in Bangladesh, in adjacent areas served by either the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B) or by the government. We used logistic regression to assess time trends in maternal mortality. We separately analysed deaths due to direct obstetric causes, abortion-related causes, and other causes. FINDINGS: Maternal mortality fell by 68% in the ICDDR,B service area and by 54% in the government service area over 30 years. Maternal mortality remained stable between 1976 and 1989 (crude annual OR 1.00 [0.98-1.01]) but decreased substantially after 1989 (OR 0.95 [0.93-0.97]). The speed of decline was faster after the skilled-attendance strategy was introduced in the ICDDR,B service area in 1990 (p=0.09). Abortion-related mortality fell sharply from 1990 onwards (OR 0.91 [0.86-0.95]). Educational differentials for mortality were substantial; the OR for more than 8 years of schooling compared with no schooling was 0.30 (0.21-0.44) for maternal mortality and 0.09 (0.02-0.37) for abortion mortality. INTERPRETATION: The fall in maternal mortality over 30 years occurred despite a low uptake of skilled attendance at birth. Part of the decline was due to a fall in abortion-related deaths and better access to emergency obstetric care; midwives might also have contributed by facilitating access to emergency care. Investment in midwives, emergency obstetric care, and safe pregnancy termination by manual vacuum aspiration have clearly been important. However, additional policies, such as those that bring about expansion of female education, better financial access for the poor, and poverty reduction, are essential to sustain the successes achieved to date.

Health systems
+other evaluation design
Postpartum care survey results from Sub-Saharan Africa.
2008
Charurat E ; Nash-Mercado A ;
This report assembles survey results conducted between March and June of 2008 to identify, document, and share information on the status of postpartum care services implemented through USAID and our partners. The survey results indicate a number of opportunities to integrate postpartum family planning with many programs. A total of 37 projects in sub-Saharan Africa responded to the survey; most were working in family planning, HIV/AIDS, child survival/child health and maternal and newborn health. Training, service delivery, behavior change communication and community approaches were the main intervention areas of the projects surveyed. Since most of the projects work with women of reproductive age and children under five years, there are opportunities to integrate postpartum family planning (PPFP) with routine immunization, well-child and sick-child visits. Opportunities to include postpartum family planning (PPFP) in trainings also exist in a number of the projects. Survey results indicated that there are a number of opportunities to integrate postpartum family planning (PPFP) with many programs. Recommendations include: 1) Utilize community-based volunteers in PPFP interventions; 2) Emphasize the Lactational Amenorrhea Method (LAM) as a transition method; and 3) Advocate for policies that effectively promote PPFP.

Health Systems
+ Impact evaluation
Potential for reducing child and maternal mortality through reproductive and child health intervention programmes: an illustrative case study from India.
2006
Choe MK ; Chen J ;
In this paper, the authors first examine patterns of major correlates of under-five mortality rate and maternal mortality ratios, as well as the progress towards meeting the Goals of reducing under-five mortality rate and maternal mortality ratio among the countries in the Asian and Pacific region. Doing so, one hopes to get a better understanding of why some countries are progressing well towards meeting some of the Goals while some are lagging behind. It is followed by an in-depth analysis of estimating potential for reducing under-five mortality through reproductive and child health intervention programmes including family planning, antenatal care and child immunization, using India as an illustrative example. (excerpt)

Maternal HIV/STIs

+ Impact Evaluation

Changes in vertically transmitted human immunodeficiency virus infection Chile

2007

Chávez P ; Ana ; Alvarez P ; Ana M ; Wu H ; Elba ; Peña D ; Anamaría ; Vizueta R ; Eloísa ;

La identificación de diversos factores que inciden en el riesgo de la transmisión madre-hijo del virus de inmunodeficiencia humana (VIH), permitió diseñar estrategias dirigidas a disminuir su transmisión, entre ellas, medidas destinadas a disminuir la carga viral de la madre, disminuir la exposición del niño al VIH durante el parto y eliminar la exposición al mismo a través de la leche materna. Destaca la administración de anti-retrovirales durante el embarazo, parto y en el recién nacido, inicialmente, como protocolo PACTG 076 que utilizaba zidovudina y, posteriormente, el uso de trite-rapia. De esta manera, en las madres incorporadas en protocolos de profilaxis de transmisión vertical (TV) del VIH se logró reducir la transmisión de este virus, inicialmente, a 9,5 por ciento y en la última evaluación, realizada entre 1998 y julio 2005, a 2 por ciento. Sin embargo, han continuado naciendo niños infectados hijos de madres en las que no se conocía su condición serológica, lo que reafirma que la medida fundamental para disminuir los casos de infección por VIH en niños, es la pesquisa universal de la infección en las mujeres embarazadas, de manera que accedan en forma oportuna a protocolos de profilaxis, lo que se espera lograr con la nueva norma de prevención de TV del VIH, promulgada en agosto de 2005, por la Comisión Nacional del SIDA del Ministerio de Salud.(AU) The identification of various risk factors of vertical human immunodeficiency virus (HIV) transmission resulted in the development of strategies whose aim was to decrease the mother's viral load, to reduce her child's exposure to it during delivery, and to avoid the subsequent viral exposure due to breastfeeding. The administration of antiretroviral treatment during pregnancy, delivery and to the neonate (PACTG 076) proved to be useful. At a first stage, zidovudine was used. A triple combination therapy was then administered. Initially, the viral transmission in mothers who were enrolled in protocols for vertically transmitted HIV prophylaxis was reduced to 9.5 percent, whereas the last measurement carried out between 1998 and 2005, the initial figure was brought down to 2 percent. Nevertheless, the delivery of infected children whose mother's HIV status was unknown is still considered likely to happen. The main step to be taken to reduce HIV infection among children is to perform universal HIV tests during pregnancy, so that HIV positive pregnant patients conveniently receive proper prophylaxis. We look forward to achieving this by following the new prevention guidelines of vertically-transmitted HIV infection, developed by the Comisión Nacional del SIDA of the Chilean Health Ministry.(AU)

Maternal HIV/STIs

+ Other design

Comparison of mother-to-child transmission rates in Ugandan women with subtype A versus D HIV-1 who received single-dose nevirapine prophylaxis: HIV Network For Prevention Trials 012.

2005

Eshleman SH ; Guay LA ; Mwatha A ; Brown E ; Musoke P ; Mmiro F ; Jackson JB ;

OBJECTIVE: To compare the rate of mother-to-child transmission (MTCT) in women with subtype A versus D HIV-1 who received single-dose nevirapine (NVP). METHODS: The MTCT rates were compared in women with subtype A versus D at birth and at 8 weeks and 18 months of age of the infants. The rate of late MTCT (after 8 weeks of age) was also analyzed. RESULTS: HIV-1 subtypes were determined for 300 of 306 women who received NVP in the HIV Network for Prevention Trials 012 study (158 women with subtype A and 105 women with subtype D). Infant infection status was known for 297 women. The cumulative rate of MTCT at 18 months was 13.2% for subtype A and 18.3% for subtype D (P=0.34). The rate of late transmission was 3.8% for subtype A and 7.6% for subtype D (P=0.28). Maternal baseline viral load was a significant predictor of MTCT, but maternal baseline CD4 cell count and subtype were not. CONCLUSIONS: No significant difference was observed in the rate of MTCT in women with subtype A versus D. There was a trend toward a higher rate of MTCT among women with subtype D, however, which was also apparent among women whose infants were infected after 8 weeks of age.

Health Systems and Maternal HIV/STIs

+ process evaluation

A paediatric and perinatal HIV/AIDS leadership initiative in Kingston, Jamaica

2004

Christie C D;

BACKGROUND AND PURPOSE: In Jamaica 1-2 of pregnant women are HIV-positive; 876 HIV-positive pregnant women will deliver and at least 283 newly infected HIV-infected infants were born in 2003; HIV/AIDS is the leading cause of death in children aged one to four years. We describe a collaborative [quot]Town and Gown[quot] programme to address the paediatric and perinatal HIV epidemic in Kingston. METHOD: A team of academic and government healthcare personnel, comprising paediatricians, obstetricians, public health practitioners, nurses, microbiologists, data management and information technology personnel collaborated to address this public health emergency. RESULT: A five-point plan was implemented This comprised leadership and training of a core group of paediatric/perinatal HIVprofessionals to serve Greater Kingston and St Catherine and be a model for the rest of Jamaica. Mother-to-child transmission of HIV/AIDS is prevented by counselling and HIV-testing women in the antenatal clinics, giving azidothymidine (AZT) to HIV pregnant women beginning at 28 weeks gestation, throughout labour and to the HIV-exposed infants for the first six weeks of life. A unified parallel programme for identifying the HIV-infected infant and delivering paediatric HIV care at the major paediatric centres was implemented In three years, over 30,000 pregnant women are being tested for HIV; 600 HIV-exposed babies are being identified and about 140 paediatric HIV infections were prevented The team is building research capacity which emphasizes a strong outcomes-based research agenda and

implementation of clinical trials. We are collaborating, locally, regionally and internationally. CONCLUSION: Collaboratively, the mission of reducing mother-to-child transmission of HIV/AIDS and improving the quality of life for those already living and affected by HIV/AIDS can be achieved

BP/Hypertension

+ Other evaluation design

Doppler ultrasound screening during the first trimester of pregnancy for preeclampsia: a cohort study: Bogotá, Colombia 2007 -2008 2009

Cortés-Yepes Hernán

Objetivos: determinar la utilidad diagnóstica y el poder de detección del índice de pulsatilidad anormal de las arterias uterinas durante el primer trimestre del embarazo en relación con la aparición de preeclampsia en una población de bajo riesgo. Metodología: estudio de cohorte prospectivo, en el cual se midió el índice de pulsatilidad de las arterias uterinas en 444 pacientes que asistieron a control prenatal normal entre las semanas 11 y 14 de gestación. Se evaluó de manera prospectiva la aparición de preeclampsia o hipertensión gestacional y preeclampsia severa y se determinaron las características operativas de esta prueba a diferentes puntos de corte. Resultados: en total, 30 pacientes presentaron preeclampsia o hipertensión gestacional (7,8%) y 6 desarrollaron preeclampsia severa (1,5%). El índice de pulsatilidad de las arterias uterinas durante el primer trimestre fue significativamente más alto en las mujeres que luego desarrollaron preeclampsia que en aquellas que no la presentaron (1,9 - 1,45, p=0,0001). Asimismo, este índice mostró un mejor desempeño para la detección de preeclampsia severa. Conclusión: el presente estudio demuestra que un Doppler anormal durante el primer trimestre se asocia de manera significativa con el desarrollo de preeclampsia. De este modo, esta prueba puede ser una herramienta útil para seleccionar a las mujeres que se beneficiarían de una vigilancia más estrecha durante el control prenatal.(AU) Objectives: this prospective study was aimed at determining the diagnostic usefulness and detection power of the abnormal pulsatility index in the uterine arteries during the first trimester of pregnancy related to the appearance of preeclampsia in a low-risk population. Methodology: this was a prospective cohort study of the uterine artery pulsatility rate in 444 patients who attended normal prenatal checkups between 11 to 14 weeks of pregnancy. It prospectively assessed the onset of preeclampsia or gestational hypertension and severe preeclampsia. This test's operative characteristics were determined at different cut-off points. Results: thirty patients suffered from gestational preeclampsia or gestational hypertension (7.8%) and six patients developed severe preeclampsia (1.5%). Uterine artery pulsatility rate during the first trimester was significantly higher in women who later developed preeclampsia than those who did not suffer (1.9 - 1.45, p=0.0001). Uterine artery pulsatility rate presented a better function for determining severe preeclampsia. Conclusions: the present study demonstrated that an abnormal Doppler result during the first trimester of pregnancy was significantly associated with developing preeclampsia. This test may be a useful tool for selecting women who could benefit from closer attention during prenatal checkups.(AU)

Health System

+ Policy review

Impact of organizational change on the delivery of reproductive services: a review of the literature.

2005

Ensor T ; Ronoh J ;

In order to understand the impact of specific maternal health interventions, it is necessary to understand the likely effect of the health system structure. An important aspect of this structure is the organizational culture. Many systems in low-income countries have been based on a centrally planned and financed system. In recent years a series of organizational changes have been introduced into many systems and these substantially alter the way in which the system operates and impacts on reproductive health care provision. The main changes reviewed in this paper are: (i) decentralization, (ii) privatization and (iii) integration and sector wide approaches. Each of these changes is seen to have important implications for reproductive health. In each case it is clear that the nature of the impact depends crucially on the way it is implemented. Quantifying the impact of these changes remains extremely difficult given the many different ways they can be introduced and the many confounding factors that affect the overall impact. The literature does, however, point to a number of key issues that impinge on the way in which change is likely to affect reproductive health initiatives. (author's)

Health System

+ Policy review

What drives health policy formulation: insights from the Nepal maternity incentive scheme?

2009

Ensor T ; Clapham S ; Prasai DP

Although maternal health outcomes have improved considerably in Nepal, continued low levels of skilled attendance and unequal access to safe emergency obstetric care continues to be central policy concern. The financial costs of delivery exacerbated are thought to continue to represent a major barrier to care to accessing services. Policy interest in this area moved swiftly. Skilled birth attendance came under the spotlight in 2001 while research on costs was commissioned in 2003. The resulting conclusions suggested substantial costs particularly on the demand side in the form of transport costs. After the research was completed the Government moved quickly to develop policy on financial barriers to skilled attendance leading to the Maternity Incentive Scheme that was implemented in 2005. We explored the reasons for policy acceptance and implementation based on recent studies in this area and a series of key informant interviews in the country. A variety of reasons can be shown to be important in ensuring that the research was utilised quickly. The conduct of the research process was importance, particularly by ensuring that results were communicated widely in a way that responded

to both technical and political policy-making concerns. A convergence of political interests that meant that the policy became an ideal vehicle for improving the flagging fortunes of the government was also seen as crucial in expediting policy change although it also meant that the policy had to be adjusted to cater to political rather purely technical concerns. The experience also underlines the importance of political champions within or close to government in advocating a strong policy line through channels that researchers can rarely access.

References and key resources used

Equity extension of PRISMA guidelines

Website references

EPPI-Reviewer 4 web based systematic review software
http://eppi.ioe.ac.uk/cms/Default.aspx?alias=eppi.ioe.ac.uk/cms/er4

EPPI-Centre Health Promotion and Public Health Reviews Facility
http://eppi.ioe.ac.uk/cms/Default.aspx?tabid=73

EPPI Centre website and list of all systematic reviews:
http://eppi.ioe.ac.uk/cms/Default.aspx?tabid=62

EPPI Centre Teaching and Learning

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