

Systematic Review on Human Resources for Health Interventions to Improve Maternal Health Outcomes: Evidence from Developing Countries



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Acknowledgement

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List of Acronyms

AIDS	Acquired Immunodeficiency Syndrome
AMO	Assistant Medical Officer
ANM	Auxiliary Nurse Midwives
ACNM	American College of Nurse Midwives
BEmOC	Basic Emergency Obstetric Care
CHN	Community Health Nurse
CHW	Community Health Worker
CEmOC	Comprehensive Emergency Obstetric Care
CFR	Case Fatality Care
DFID	Department For International Development
EmOC	Emergency Obstetric Care
EmONC	Emergency Obstetric and Newborn Care
GHWA	Global Health Workforce Alliance
GNI	Gross National Income
HIV	Human Immunodeficiency Virus
HMIS	Health Management Information System
HR	Human Resource
HRH	Human Resources for Health
ICPD	International Conference of Population Development
LMIC	Low and Middle Income Countries
MCHW	Mother and Child Health Worker
MDG	Millennium Development Goal
MoH	Ministry of Health
MNCH	Maternal, Newborn and Child Health
NGO	Non-Government Organization
PAC	Post Abortion Care
STI	Sexually Transmitted Infections
SBA	Skilled Birth Attendant
TBA	Traditional Birth Attendant
TFR	Total Fertility Rate
UNDP	United Nations Development Program
UNFPA	United Nations Fund for Population Agency
WHO	World Health Organization
WHR	World Health Report

Background

There is a broad consensus and evidence which shows that qualified, accessible and responsive human resources for health make a difference in the health of populations. At the same time there is recognition that there are widespread HRH crises particularly in low- and middle-income countries,¹ which impedes the achievement of health goals and targets. The impact of this crisis is even more explicit when discussing achievement of Millennium Development Goal (MDG) 4 and 5, where MDG 5 considers the availability of skilled birth attendants as a precondition to the reduction of maternal mortality.

Maternal health is one of the main global health challenges and reduction of the maternal mortality ratio by three-quarters by 2015 is the target for the MDG 5. However this goal is the one towards which the least progress has been made and complications during pregnancy and childbirth remain a leading cause of death and disability among women of reproductive age in developing countries.² Less than one percent of the annual maternal deaths occur in the developed world, while a large proportion of these occur in developing countries. Further, for every woman dying, at least 30 others suffer complications which often end up being long-term and devastating. They include infertility and damage to the reproductive organs. There is not a simple and straight-forward intervention, which by itself will bring maternal mortality significantly down; and it is commonly agreed that the high maternal mortality can only be addressed if the health system is effective and strengthened.¹ The health workforce has been identified as the key to effective health services.³ The shortage of health workers in many countries is the most significant constraint to attaining the three health-related MDGs, to improve maternal health, to reduce child mortality and to combat HIV/AIDS and other diseases.³⁻⁶

In the early 20th century, industrialized countries halved their maternal mortality by providing professional midwifery care at childbirth and in the 1950s maternal mortality was further reduced by improving access to hospitals.⁷ A similar picture has been generated in many low income countries where increased access to skilled attendance with the backup of a well functioning health system has resulted in decreased maternal mortality.^{8,9} Based on these experiences, long-term initiatives and efforts to provide skilled professional care at birth are believed to be the way forward when aiming at addressing maternal mortality. The consensus about the importance of skilled attendance at delivery is also reflected in the MDGs, where the proportion of births attended by skilled health personnel is considered a key indicator for the MDG 5 of improving maternal health and reducing maternal mortality.

Unfortunately, the workforce is distributed unevenly in the world.^{10, 11} Asia, a continent with the half of the world's population, has an access to only 30 percent of the world's health professionals. Africa, highest burden of disease continent, has an access to only 1

percent of the world's health professionals.¹² Whereas, America which has 10 percent of global burden of disease has approximately world's 40 percent of health professionals. The scenario within each country also shows asymmetry in the distribution of health professionals with low number of professionals in rural areas as compare to urban areas.¹³ Apart from all this maldistribution, many countries face difficulties in producing, recruiting and retaining health professionals. Insufficient number of medical schools, low salaries of existing health workforce, poor working conditions, lack of supervision, low morale and motivation and lack of infrastructure are the other prominent causes of losing them for which they tend to migrate to wealthier countries.¹⁴⁻¹⁶ To overcome the failure of providing birthing women with skilled attendance, poor countries are now investing on training Traditional Birth Attendants (TBAs) to at least provide them with some sort of assistance instead of no assistance at all.¹⁷ Many health professionals and policymakers are now supporting training TBAs as a initial step of following safe motherhood movement.¹⁸ Despite the tremendous resources invested in training Traditional Birth Attendants (TBA) over the past two decades, scientific evidence from around the world has shown that training TBAs has not reduced maternal mortality.^{19, 20} Any improvement observed when TBA training programmes have been introduced was because of the associated supervision and referral systems and because of the quality of essential obstetric services available at first referral level.¹⁷ Conversely, evidence from numerous studies has shown reduced maternal and perinatal morbidity and mortality when women have a skilled attendant (a qualified health care provider who has midwifery or obstetric skills) present at every birth.

The shortage of emergency obstetric and surgical services in low and middle income countries over the last decade has attracted substantial attention.^{4, 21-23} In response to this situation governments, health organizations and communities are taking actions to address HRH planning and management, paying attention to the health needs of the populations and trying to address gaps in coverage and equity of services. There is an increasing body of evidence that documents bold initiatives and innovative actions that allow for improved efficiency in using existing human resources, including team approaches to delivery of intervention, multi tasking, task shifting and sharing, increased involvement of communities in responding to different health needs, etc. However, most of the innovative approaches are implemented in small scale or as time limited projects.

In this context, the need for better planning, distribution and management of the limited stock of human resources which makes explicit assumptions regarding workforce needs to address MDG 5 is very important. At the same time the HRH planning and management for MDGs 5 has to be informed from the different lessons learned from the field and allow for scaling up of effective responses in a comprehensive way.

Box 1: Definition of Skilled Birth Attendant and Skilled Birth Attendance

Skilled birth attendant

A joint WHO/ICM/FIGO statement, endorsed by UNFPA and the World Bank defines a skilled attendant as 'an accredited health professional, such as a midwife, doctor or nurse, who has been educated and trained to proficiency in the skills needed to manage normal (uncomplicated) pregnancies, childbirth and the immediate postnatal period, and in the identification, management and referral of complications in women and newborns'²⁴

Skilled birth attendance

Skilled attendance is the process by which a pregnant woman and her infant are provided with adequate care during pregnancy, labor, birth, and the postpartum and immediate newborn periods, whether the place of delivery is the home, health centre, or hospital. In order for this process to take place, the attendant must have the necessary skills and must be supported by an enabling environment at various levels of the health system, including a supportive policy and regulatory framework; adequate supplies, equipment, and infrastructure; and an efficient and effective system of communication and referral/transport.^{25, 26}

Source: DFID 2005²⁷

Although the scientific literature or the web are crowded with different examples of addressing HRH needs for better maternal and child health outcomes, there is a need to systematize the findings, recommendations and lessons learned from the different studies and country experiences. At the same time there is a need to understand how much of this wealth of knowledge has become a reality in the national strategies, plans and response to the HRH crises and MDGs. This literature review will focus on identifying lessons learned, gaps and recommendations that derive from studies and implementation experiences of HRH interventions for better maternal health outcomes. A similar literature review has already been undertaken for child health outcomes and will not be included in this review.

Our review will focus on the impact of HRH interventions on the health care professionals defined as Skilled Birth Attendants (SBAs)^{28, 29} (**Box 1**) to decrease maternal mortality and morbidity. We will derive lessons, gaps and recommendations based on the studies conducted on HRH implementations in developing countries.

Objectives

The specific objectives of the systematic review included:

- ❖ Review of the evidence base on the impact derived from studies and implementation experiences of HRH interventions to health personnel only, defined as SBAs (nurses, midwives, doctors or health personnel with midwifery skills) for better maternal outcomes.
- ❖ Based on the review, the identification of lessons learned, gaps and recommendation for HRH development for improved maternal outcomes.

Methods

Criteria for considering studies for this systematic review

This literature review focused on health personnel only, as defined in SBA (nurses, midwives and doctors or health personnel with midwifery skills. Our review did not include interventions provided by Traditional Birth Attendants (TBAs) or Community Health Workers (CHWs).

The review focused on identifying studies and implementation experiences of HRH interventions for better maternal health outcomes. We derived evidence from experimental designs and evaluations of SBAs at national, provincial, district and community level (home, community or referral facility interventions) settings. We thus identified and reviewed randomized, quasi-randomized and before/after trials which had relied upon SBAs in low- and middle-income countries. In addition, other designs like qualitative studies, observational (cohort and case-control) and descriptive studies were also reviewed to understand the context within which they were implemented, and the interventions that respond to different dimensions of the HR planning and management spectrum. The review therefore included all the papers (original papers, literature reviews, baseline studies, preliminary studies, projected interventions, already implemented interventions, etc.) that matched with the objective of the review.

Studies were included if (a) any HRH interventions in management system e.g. policy, finance, education, partnership and leadership was implemented; (b) these were related to skilled birth attendants; and (c) the studies were conducted in developing countries;³⁰ and (d) studies were in English. Studies were excluded if TBAs and/or CHWs were trained. The main objective was to observe the effect of implementation of HRH intervention.

Methods for literature search, information sources, abstraction and synthesis

All the evidence available, relevant to the role of HRH interventions in achieving improved maternal health in low- and middle income countries, was systematically analyzed. The search strategy for the review covered articles published in PubMed only. The HRH Global Resource Centre was also searched to access the available studies. Detailed examination of cross-references and bibliographies of identified studies was also performed to identify additional sources of information. The period of our review focused the last one decade (2000-10). The reason for these cutting dates is to see what progress was made up to Alma Ata health for all by 2000 deadline and what improvements followed on the agreement on MDGs.

The following search strategy was primarily used. [("midwifery" [Mesh] OR "nurse midwives" [Mesh] OR "midwifery" OR "nurse midwi*" OR "midwives" OR "midwife" OR

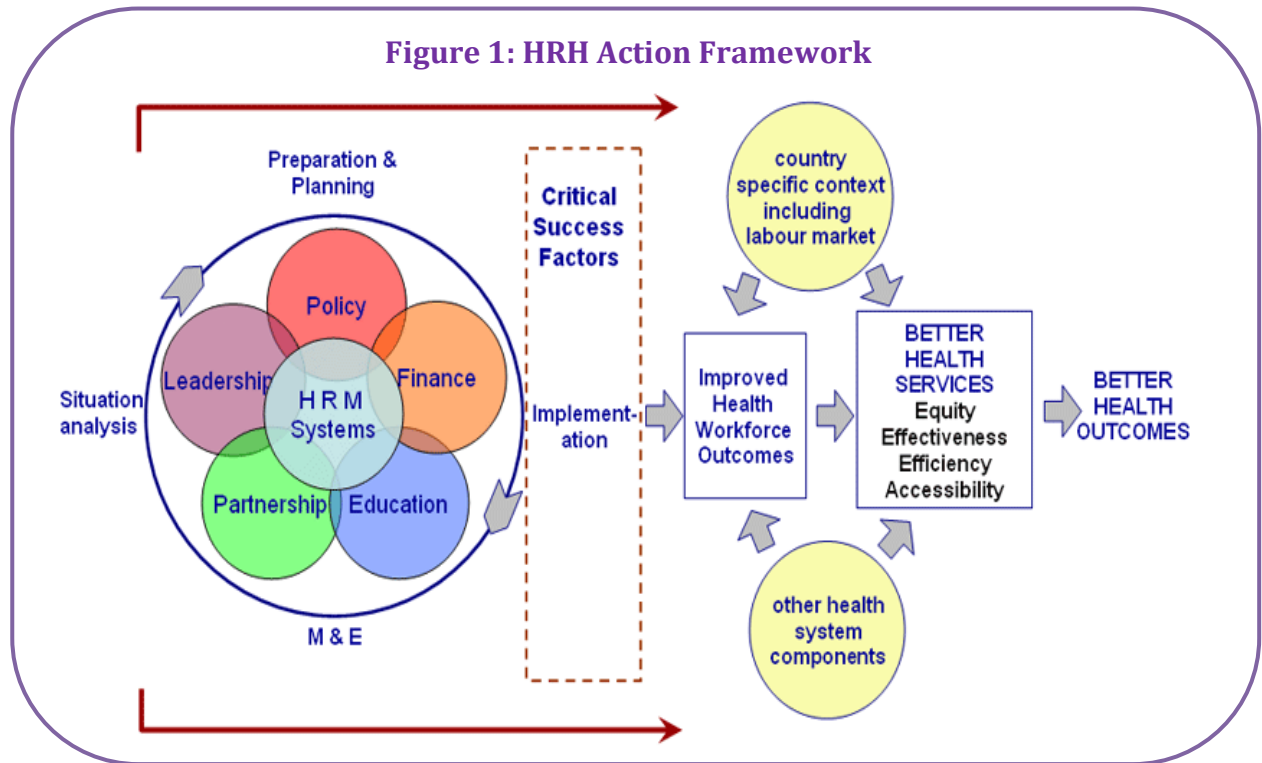
"skilled birth attendant*" OR "nurse" OR "doctor") AND ("maternal health" OR "maternal health service*" OR "maternal health care"). This search did not yield any study specifically addressing HRH management intervention on improved maternal health outcomes.

We then modified our search strategy. [("health worker*" OR "health care worker*" OR "health professional" OR "health personnel") AND (doctor*" OR "nurse*" OR "physician*" OR "midwife*") AND ("training" OR "education" OR curriculum" OR "teaching" OR "learning" OR "patient centered care" OR "patient focused care" OR "staff development" OR "medicine" OR "postgraduate training" OR "diploma training") OR (recruitment OR attraction OR deployment OR employment OR personnel selection) AND (incentive OR reward OR "cash award") AND ("low income countr*" OR middle income countr*" OR developing countr*" OR "less developed countr*" OR "least developed countr*" OR "low and middle income countr*")]. Our search strategy included MeSH terms and was limited to developing, low and middle income countries and to the publications in English language. **(Refer Annex I).**

The abstracts (and the full sources where abstracts were not available) were screened by two authors to identify studies adhering to our objectives. Any argument on selecting studies between these two authors was resolved by a third reviewer. After retrieval of the full texts of all the studies that meet the inclusion/exclusion criteria, each study was double data abstracted into a standardized form. The key variables elicited were study setting, location, study design, participants, intervention delivered, outcome, type of health workers involved, gaps identified, lessons learned and recommendations by investigating authors. All final studies were entered into the Endnote XI database. Since the objective of this systematic review is to assess the different dimensions of the HR planning and management spectrum, therefore, the HRH action framework³¹ (**Figure 1**) as defined by WHO^{29, 32-41} were used to organize, summarize and further classify the findings and recommendations of the literature. Areas covered in HRH interventions are described in **Box 2**.

Data Analysis

The studies were categorized based on interventions relevant to HRH planning and management and study design employed in order to explore the impact and effectiveness of HRH interventions in improving maternal health. This helped us in outlining the identification of lessons learned, gaps and recommendation for HRH development for improved maternal outcomes.



Results

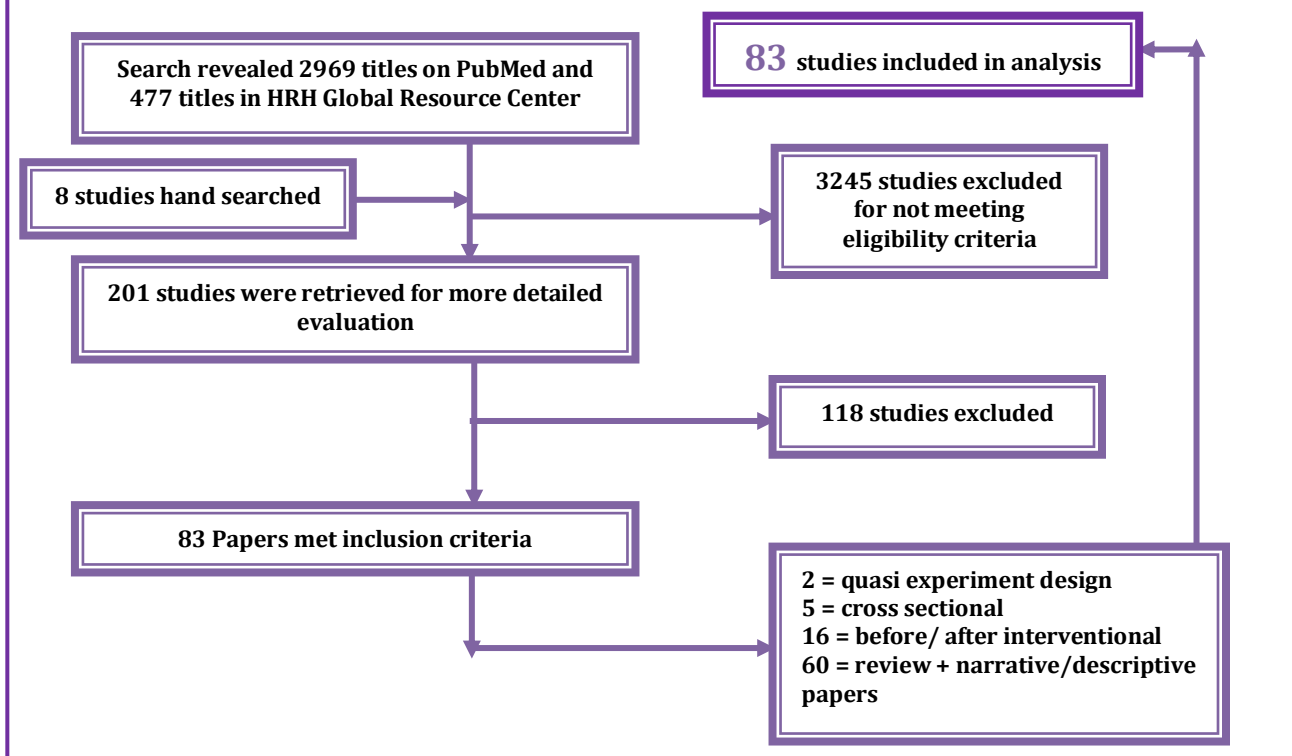
The defined search strategy identified 3,446 studies from PubMed and HRH for Global Resource Center (**Figure 2**). Two hundred and one studies were retrieved for full text review, out of which 83 papers passed the eligibility criteria for inclusion. Among these papers, 2 were quasi-experimental studies,^{42, 43} sixteen were before/after studies,⁴⁴⁻⁴⁸ five were cross-sectional studies,⁴⁹⁻⁵³ and 60 were descriptive studies.^{1, 21-23, 28, 44, 54-95,27, 96-98}

In this review, we grouped and analyzed selected studies according to different dimensions and components of HRH interventions. We only found studies that were related to training, policies, and those with multiple combined interventions.

Training

We found 12 articles related to the effect of training on maternal mortality in our literature review. Most of the interventional (before/after) and cross-sectional studies came from African and South East Asian region. In these included studies, training provided to the skilled birth attendants (doctors, nurses and midwives) as well as to other service providers (lab tech)⁴⁵ have shown to decrease maternal mortality in most of these areas. The time gap between the intervention implementation and evaluation are as mentioned in **Table 1, 2 and 3**. Training provided in all the studies included in our review was in-service and we did not find studies where pre-service training intervention was provided.

Figure 2: Study Selection Process



According to one study conducted in Ethiopia,³⁷ they discussed the national program ‘Save the Mothers Project’ that was launched in collaboration with FIGO in 1999. This project focused on providing 3 rounds of training to service providers (GPs, midwives and others) to reduce maternal deaths by promoting the availability, access and utilization of EmOC services for women with complications of pregnancy and childbirth. This was a 3-months training that focused on life saving procedures in obstetric emergencies (cesarean sections, cesarean hysterectomies including management of incomplete abortion, post abortion care (PAC) and management of ectopic pregnancy). Two midwives were also trained as master trainers in Basic EmOC. Subsequent training was provided by these GPs and midwives at Ambo Hospital. After the provision of training that started in 1999, the total number of deliveries at that hospital increased by 40 percent from the baseline when compared with the year 2001. Instrumental deliveries have increased from 6 percent in 1998 to 23 percent in 2001 because of a considerable increase in admission of complications. The CFR in 1999 was 7.2 percent based on 18 deaths; and for 2001 was 4.6 percent based on 20 deaths, suggesting that the training of service providers had an impact as evident from performance of Ambo Hospital before the intervention which was very poor as seen by the number of cesarean sections, number of deliveries and obstetric complications treated.

Box 2: HRH intervention areas

1. Management systems

- Personnel systems*: workforce planning (including staffing norms), recruitment, hiring and deployment
- Work environment and conditions*: employee relations, workplace safety, job satisfaction and career development
- Work environment and conditions: employee relations, workplace safety, job satisfaction and career development
- HR information system integration of data sources to ensure timely availability of accurate data required for planning, training, appraising and supporting the workforce
- Performance management: performance appraisal, supervision and productivity.

2. Education

- Pre-service* education tied to health needs
- In-service* training (e.g., distance and blended, continuing education)
- Capacity of training institutions
- Training of community health workers and non-formal care providers.

3. Policy

- Professional standards, licensing and accreditation
- Authorized scopes of practice for health cadres
- Political, social and financial decisions and choices that impact HRH
- Employment law and rules for civil service and other employers.

4. Leadership

- Support HRH champions and advocates
- Capacity for leadership and management at all levels
- Capacity to lead multi-sector and sector-wide collaboration
- Strengthening professional associations to provide leadership amongst their constituencies.

5. Partnership

- Mechanisms and processes for multi-stakeholder cooperation (inter-ministerial committees, health worker advisory groups, observatories, donor coordination groups).
- Public-private sector agreements
- Community involvement in care, treatment and governance of health services.

6. Finance

- Setting levels of salaries and allowances
- Budgeting and projections for HRH intervention resource requirements including salaries, allowances, education, incentive packages, etc.
- Increasing fiscal space and mobilizing financial resources (e.g., government, Global Fund, PEPFAR, donors)
- Data on HRH expenditures (e.g., National Health Accounts, etc.)

Source: Capacity Project³¹

In Rana et al.⁹⁹, a study conducted in Nepal, training was mainly focused on basic and comprehensive EmOC. Doctors, midwives and nurses were trained with emphasis on life saving skills like cesarean sections, cesarean hysterectomies including management of incomplete abortion, post abortion care (PAC) and management of ectopic pregnancies. Midwives were also trained in vacuum extraction, manual removal of placenta and suturing of episiotomies and lacerations.³⁸ Medical officers, nurses and senior auxiliary nurses were trained in providing anesthesia^{45, 99} Laboratory technicians were given training on safe blood transfusion.⁴⁵ Though there was some success through increased training capacity, the total number of targeted production of the service providers was not reached. CFR declined from 3 to 0.3 percent with varying training periods between 5 days to 6 months and the type of training provided.

Studies from Paraguay⁴⁶ by Ohnishi et al. covered both the theoretical and clinical skills part of life saving skills in obstetric emergencies. Onishi⁴⁶ focused on training to increase the knowledge of licensed nurses, auxiliary nurses and auxiliary midwives and effectiveness of the comprehensive community based antenatal care program.

Another study⁴³ conducted in Ghana, six months of self-paced learning in addition to one week residential training was given to forty providers (midwives and physicians) in the experimental group. In the comparison group, 35 providers attended the three-week residential course. Both courses covered theoretical and clinical training in life-saving skills, obstetric and infant care, family planning counseling, and post abortion care. Knowledge improved in the self-paced learning (SLP) group following the intervention, while clinical performance improved in both groups, with the residential group performing slightly better. However, overall levels of knowledge and performance remained low.

The cost of training and deploying trained AMOs was also compared with physicians in Mozambique.¹⁰⁰ It was found that 30 years cost for major obstetric surgery was approximately \$39 for AMOs and \$144 for physicians. Doubling the salaries of AMOs resulted in smaller but still substantial difference in cost per surgery between the two groups. It was also found in another study⁵⁰ that most surgeries were being performed by the trained AMOs in district hospitals in Mozambique when compared to physicians and after 7 years 90 percent of the AMOs were still working in the district hospitals while almost no physicians could be retained there.

Similar results were obtained from a study conducted in Tanzania.⁵³ Tanzania has started training AMOs in cesarean sections and other emergency surgeries in 1963 and almost 1300 AMOs are now working in the district hospitals. AMOs in Tanzania get a two years of further training from Clinical Officers (COs).¹⁰¹ As a result met need increased and CFR decreased in Mwanza and Kigoma, the two regions investigated. There were no differences in outcomes, risk indicators or quality of care indicators in obstetric operations performed by AMOs and MOs.

In another study conducted in Bangladesh,⁴⁵ medical officers were trained for one year in obstetric and anesthesia, nurses in midwifery for 6 months and lab technicians in safe blood transfusions for the period of two weeks. Midway through the initiative, a new 17-week competency-based training program, along with one-year training on obstetrics and gynecology was introduced to train medical officers and nurses in teams. As a result of the combined training natural deliveries in district hospitals and sub district health complexes increased by 63 percent, admissions of complicated cases increased by 135 percent and caesarean deliveries increased by 70 percent. As far as the expenses of these training are concerned, Bangladesh reported that their per trainee cost was approximately \$1550 for

one year for medical officers, \$1020 for the 17 week competency-based team training, \$340 for nurses and \$140 for laboratory technicians.

We found that HR interventions focusing on training of the service providers resulted in increase in the basic knowledge and skills⁴³ of the providers in managing obstetric emergencies and understanding of primary level health care. However, overall level of knowledge and performance remained low on many indicators. Skills in performing abdominal examinations and in observing safety measures for taking blood samples were uniformly strong (above the 70 percent mark), while only about 40 percent of providers had appropriate skills in obtaining clients' medical and behavioral histories or in educating clients. We see an increase in utilization of these services and the number of women delivering at EmOC facilities has increased. Health seeking in Ghana among women with complications increased to almost 3 folds from 26 percent in 1993 to 73 percent in 1995 and the proportion of these who were referred to tertiary care facility for treatment of obstetric complications dropped from 42 to 14 percent.³⁸, as the providers became more competent in handling them.

According to the authors, important implementation aspects of the interventions contributing to change were:

- Adopting training topic according to local needs of that community/hospital. Such as training medical officers, nurses and auxiliary nurses in providing anesthesia, safe blood transfusion techniques, life saving procedures in obstetric emergencies (cesarean sections, cesarean hysterectomies including management of incomplete abortion, post abortion care (PAC) and management of ectopic pregnancy).^{37, 45, 99}
- Developing trainer for future pre-service and in-service.³⁷
- Including a component to strengthen health system, such as improving drug availability, equipment and referral systems.^{37-39, 99}

Task shifting

A different approach was taken in a study conducted in Mozambique.^{50, 103} Assistant Medical Officers (AMOs) with previous surgical experience were trained for three years by MoH. A comparative study of cesarean sections by these trained AMOs and obstetricians was conducted. The only significant difference seen between the two groups was in superficial wound separation due to hematoma, which was slightly higher in AMOs (0.35 percent) versus the specialists (0.05 percent). The first trained group of the AMOs had contributed significantly. They have won respect among people and their availability at first referral level in district hospitals has meant success in attempts to provide life saving surgeries there, particularly in obstetrics.¹⁰³

Table 1: Studies related to HRH interventions: Training and Task shifting

Study, year and type	Type of training	Duration of training	Time b/w intervention & evaluation	Who was trained	Who trained	Where trained	Other interventions	Effects of training	Cost of training
Training Studies									
Mekbib 2003³⁷ Ethiopia Prospective (before/after)	This training focused on life saving procedures in obstetric emergencies (cesarean sections, cesarean hysterectomies including management of incomplete abortion, post abortion care (PAC) and management of ectopic pregnancy).	3 rounds of training were conducted. A 3 months period of GPs at Addis Ababa was considered adequate and a 1.5 months period of training for other service providers by these masters trainers at Ambo Hospital was acceptable	Interventions began in 1999 and the results were analyzed in 2001.	GPs, Midwives and other service providers in EmOC.	Department of obs /gyne and master trainers	Gandhi Memorial hospital in Addis Ababa and Ambo hospital	Management and coordination. Equipments, supplies and drugs. Record keeping Blood supply	The total number of deliveries at Ambo Hospital increased by 39.7% from the baseline when compared with the year 2001. Instrumental deliveries have increased from 6% in 1998 to 23% in 2001. The CFR for 1999 it was 7.2% based on 18 deaths; and for 2001 was 4.6% based on 20 deaths	almost \$100 000 was used
Rana 2006⁹⁹ Nepal Prospective (before/after)	Comprehensive EmOC specifically for cesarean section & other surgical procedures was provided to junior doctors. BEmOC and post abortion care (PAC) to nurses, as well as anesthetic services to nurses, health assistants, and senior auxiliary health workers	Varied from 5 days to 6 months depending on the type of training	The intervention started in 2000 and the first assessment was done in 2001 and the program lasted for 4 years till 2004.	Doctors, nurses, AWH, ANM, medical officers, lab technicians, peons,	Senior doctors used clinical training and curriculum for EmOC developed by JHPIEGO & AMDD	Hospitals	Infrastructure improvements Data collection Equipment Policy advocacy and Community information activities	In 5 years, 3 comprehensive and 4 basic EmOC facilities were established in an area where adequate EmOC services were previously lacking. From 2000 to 2004, met need for EmOC improved from 1.9 to 16.9%; the proportion of births in EmOC project facilities increased from 3.8 to 8.3%; and the case fatality rate declined from 2.7 to 0.3%	Technical training US\$ 205,660 Management training US\$ 97,170
Ohnishi 2006⁴⁶ Paraguay Prospective (before/after)	The purpose of training was to increase knowledge and understanding of primary level healthcare personnel to increase the effectiveness of the comprehensive community-based ANC program	9 days. The first 3 days focused on acquiring fundamental knowledge and understanding regarding maternal healthcare services, including comprehensive ANC programs, which was achieved mainly through lecture, group work, demonstration, and	The pretest knowledge was assessed in oct 1997. Follow up test was conducted in march 1998. A post-evaluation of the training course was conducted using the same test as used in the	Health care personnel (licensed nurses, auxiliary midwives and auxiliary nurses)	Physicians & nurses of Caazapa Hospital. The training course was conducted as a part of the “Improvement of Community Health Project” in the Caazapa Region funded by the Japan International	Caazapa Regional Hospital		The average scores of the participants’ knowledge increased significantly from 41.0 before to 60.1 after training (p<0.001). The enrollment rates of pregnant women in ANC increased from 2.2 times per pregnancy in 1996 to 3.4 times in 1998 (p<0.001).	

Table 1: Studies related to HRH interventions: Training and Task shifting

Study, year and type	Type of training	Duration of training	Time b/w intervention & evaluation	Who was trained	Who trained	Where trained	Other interventions	Effects of training	Cost of training
		role-playing to stimulate cognitive and psychomotor learning The last six days involved hands-on practice	follow-up test in June, 1999		Cooperation Agency (JICA).				
GHWA 2006⁴⁵ Bangladesh Prospective (before/after)	The WRLH initiative included in-service training of medical officers in obstetrics and anesthesia, nurses in midwifery, and laboratory technicians in safe blood transfusion. Midway through the initiative, in 2003, a new 17-week competency-based training program, along with one-year training on obs & gyne was introduced to train medical officers and nurses in teams.	Training of medical officers was originally designed as a six-month course, but was later extended to one year. Similarly, training of nurses was extended from six weeks to four months. Laboratory technicians participated in a two-week training course.	Baseline figures were taken in 1999 and then interventions were implemented and first evaluation took place in 2003	Medical officers, nurses and lab technicians	Medical officers were trained in Nepal under the Maternal and Neonatal Health Care project. curricula were developed and the training was organised at the eight medical college hospitals in Bangladesh, where the nurses and lab technicians were being trained.	Bangladesh medical college Hospitals	Employment and retention Monitoring and Evaluation	Natural deliveries increased by 63%, admissions of complicated cases increased by 135% and caesarean deliveries increased by 70%.	Per trainee costs were approximately \$1550 for one year for MO, \$1020 for the 17 week competency-based team training, \$340 for nurses and \$140 for laboratory technicians.
Djan 1997³⁸ Ghana Prospective (before/after)	Life saving skill training program. Each midwife was trained in vacuum extraction, manual removal or retained placenta, and suturing of episiotomies and lacerations. Training was also provided to improve provider – client interaction. -Medical officers were trained to manage obstetric emergencies.	2 weeks training	Intervention implemented 1993 and 1994 and evaluated in 1995	Midwives and medical officers		Koforidua, Ghana and tertiary hospital KATH	Operating theatre Blood bank Maternity refurbished Revolving drug fund. Running water supply Improving access and reducing delay to care	The number of women with complications coming increased almost 3 folds from 26 in 1993 to 73 in 1995 and the proportion of these who were referred for treatment dropped 42-14%. Surgical obstetric procedures performed at JTHC increased from 23 to 90. Midwives performed 32% manual removal, 58% vacuum extractions and 98% episiotomy repairs. No death occurred among the women treated.	US\$ 30 000 but mostly for equipments and supplies

Table 1: Studies related to HRH interventions: Training and Task shifting

Study, year and type	Type of training	Duration of training	Time b/w intervention & evaluation	Who was trained	Who trained	Where trained	Other interventions	Effects of training	Cost of training
Population council 2006⁴³ Ghana Quasi Experimental	Self-paced learning (SPL) course developed by the PRIME II project; and the three week residential course. Both courses covered theoretical and clinical training in life-saving skills, obstetric and infant care, family planning counseling, and post abortion care.	40 providers (midwives and physicians) in The experimental group received six months of SPL in addition to a one-week residential training course. In the comparison group, 35 providers attended the three-week residential course.	Implantation started in 2001 and continued till 2004. Analysis was done during this period	Midwives and physicians		Two administrative regions in northern Ghana		Knowledge improved in the self-paced learning (SLP) group following the intervention, while clinical performance improved in both groups, with the residential group performing slightly better. Mean scores for management of obs complications, post abortion care, & pregnancy-related complications improved significantly in the SPL group. However, average scores for performance in the management of complications remained low Btw 50 & 60 %.	The self-paced learning approach cost more per learner than the residential course (US\$2,154 versus \$1,330),
Ifenne 1999³⁹ Nigeria Prospective (before/after)	In- house training of midwives and residents in principles and practices of EmOC		Intervention started in 1993 and results were analyzed on 1994 and 1995	Midwives and residents		Ahmadu Bello University Teaching Hospital	-Surgical theatre restored -Maternity ward renovated -Improved access and - reduced delay to care -Blood bank system Drug pack system	Admission to treatment interval was reduced from 3.7 h to 1.6h. the proportion of women treated in less than 30mins increased from 39% to 87%. CFR fell from 14% -11%. The annual number of women with complication declined from 326- 65	US \$ 135 000
Vaz 1996¹⁰² Mozambique Quasi experimental	Assistant medical officers with previous experience of surgical work were trained for 3 years.	3years	The AMOs were trained in 1992 and the evaluation took place in 1996	Assistant medical officers	Ministry of health			No difference in indication for cesarean deliveries. The surgical intervention associated with C/S did not differ in the two groups. The only significant difference was in the group of superficial wound separation which was slightly more (0.35% vs 0.05%) in AMO vs specialist group.	
McCord 2009⁵³ Tanzania Prospective (before/after)	Tanzania started to train AMOs to do cesarean sections and other emergency surgeries in 1963. There are now more than 1300 surgically		Tanzania started training AMOS in 1963. Evaluation was done in	Assistant Medical Officers	Ministry of Health			Among 1134 complicated deliveries and 1072 major obstetric operations, there was no significant difference between AMOs and MOs in outcomes, risk indicators or quality. There was significant difference between	

Table 1: Studies related to HRH interventions: Training and Task shifting

Study, year and type	Type of training	Duration of training	Time b/w intervention & evaluation	Who was trained	Who trained	Where trained	Other interventions	Effects of training	Cost of training
	trained AMOs working in district hospitals		2006					mission and government hospitals.	
Kruk 2007¹⁰⁰ Mozambique Prospective (before/after)	2 years classroom based instruction and 1 year internship	2-3 years	Training began in 1983/84 and was evaluated in 2007	Nurses and medical assistants	Surgeons in Mozambique	Provincial hospitals		In 2002, 47 specialists and 53 AMOs performed 5264 and 6914 major obstetric surgeries respectively.	The 30 years cost for major obstetric surgery was \$38.9 for AMOs and \$144.1 for physicians. Doubling the salaries of AMOs smaller but still substantial difference in cost per surgery between the two groups.
Task Shifting Studies									
Vaz & Bergstrom 1992¹⁰³ Mozambique Cross Sectional	The 3-year program for these tecnicos de cirurgia comprised lectures on general principles of surgery and anesthesiology, and on surgical techniques and methods. The trainees the; circulated' in general surgery, obstetrics and gynecology, urology, orthopedic, otolaryngology, ophthalmology, and intensive care	3 years		Surgical technicians	Ministry of health		Further education of maternal and child health nurses and instruction of traditional birth attendants,	First trained group has contributed substantially with their recently acquired theoretical and practical skills in their new position as tcnicos de cirurgia. They have won respect; their peripheral availability at the first referral level at district hospitals has meant a tangible success in the attempts to provide life-saving surgery there, particularly in obstetrics.	
Pereira 2007⁵⁰ Mozambique Cross sectional	2 years of clinical surgical training and 1 year of internship	3 years	Surgical procedures during 2002; longitudinal study of TCs and doctors graduating in 1987, 1988 and 1996.	Assistant medical officers	Surgeons	Central hospital in Maputo and provincial hospital		Nonphysicians ,trained in surgery do most of the emergency obstetric surgery and almost all of that (92%) performed in district hospitals. After 7 yeats around 90% of the nonphysicians are still working in district hospitals.	

Critical success factors for the interventions were training another cadre of staff for the skills that SBA acquired in their professional training. This does not only enrich a second cadre of staff with required skills but fulfil the demand of community by availability of such advance service in their locality and in their accessibility.

Policy implementation that has HRH components

Four studies from our review showed the effect of policy implementation in developing countries on improving maternal health outcomes. Two studies focused on the policy regarding emergency obstetric facilities provided in the country,^{34, 41} but that included clauses related to training of skilled birth attendants.

In the beginning of 1994, in Bangladesh,⁴¹ EmOC approached in conjunction with UNICEF, UNFPA and Averting Maternal Death and Disability Program (AMDDP). They worked for the upgrading and betterment of the present facilities and training of the service providers in those facilities. This approach was broadened to include the rights approach and safer motherhood plan by the development of National Maternal Health Strategy in 2001. It was incorporated into the ongoing Health and Population Sector Program (HPSP) and subsequently into the Health, Nutrition and Population Sector Program (HNPSPP). Skilled birth attendant strategy was initiated in the plan in the year 2001 with guidance from WHO and UNFPA. As a result of this policy implementation MMR in Bangladesh has declined from 514 in 1986-90 to 400 in 2003, that is 22 percent in the 11 intervening years. During 2000-04 only 13 percent of women used professional care which was reported to be 18 percent by 2007; whereas, the 15 percent of births were in facilities as compared to 9 percent previously. The rate of cesarean section in rural areas increased from 0.9 to 1.7 percent from 1996 to 2004 and then to 5.4 percent by 2007. The policy implementation also affected the antenatal consultation which more than doubled in 17 years from 27 percent in 1991-94 to 60 percent in 2005-07.

Similarly Nepal National Safe Motherhood Project,³⁴ implemented from 1997-2004, focused on improving emergency obstetric services and midwifery care in selected health facilities. The main aim of the project was to increase access to midwifery and obstetric services and to improve management of service provision for women of reproductive age. Government policy was developed by offering both local knowledge about implementation and international lessons for key individuals prepared to take the political agenda forward. Project research on user costs and field knowledge of the inadequate working of the exemption systems, for example, helped to catalyze government discussion of subsidizing service delivery for all, announced in 2004. Project experience of contracting NGOs for training and service provision to the public sector also helped develop local policy thinking about working collaboratively with non-state health care providers. As a result, the average annual increase in met need increased to 1.3 percent per year over the intervention period,

bringing it to the 2004 level of 14 percent in public sector facilities in project-supported districts, In a further four districts supported by UNICEF, met need increased from 1.9 percent to 17 percent between 2000-04. Deliveries attended auxiliary nurse midwife or nurse increased from 3 percent in 2001 to 8 percent in 2006. Free or reduces cost for services and transport introduces was valued by the communities and increased confidence in being able to cope with emergencies.

User fees introduced at a public hospital, the National Maternal and Child Health Center (NMCHC) of Cambodia⁴⁴ helped hospital to retain revenue and improve the quality of services focusing on the work environment and conditions of HR intervention. Patient satisfaction rate showed 93 percent and number of outpatient doubled. Average monthly number of deliveries increased from 319 to 585. Bed occupancy also increased from 51 to 70 percent.

Financial barrier is one of the most important constrain in Ghana,⁴⁷ that is preventing women to seek skilled care during delivery. Exemptions from delivery fees were introduced by the government of Ghana in September 2003 in the four most deprived regions of the country, which was extended to the remaining six regions in April 2005. The policy was funded through Highly Indebted Poor Country (HIPC) debt relief funds, which were channeled to the districts to reimburse public, mission and private facilities according to the number and type of deliveries attended monthly. Few direct financial incentives were provided as part of the delivery exemption policy but the overall increase in pay as a part of wider pay reforms compensated for increased workload. The free delivery policy received a positive response and allowed for early reporting and better handling of complications. Thus the introduction of this fee exemption policy proved to be manageable and workable even within the relatively constrained human resources environment of countries like Ghana.

National programs adopted the policy and integrated into their health policy was the key success feature because adoption of any goal in national priority means achieving them into an integrated manner and with multi-sectoral and holistic approach. Apart from this factor, one study introduced user fees and generated revenue and a share of which was also distributed to service provider by raising their salary.⁴⁴ Whereas on the other hand, Ghana exempted it and favored demand side approach but also compensated their providers to handle increased workload.⁴⁸

Combined interventions

Six studies in our literature review showed a combined approach of HRH management system and its effect on the maternal mortality in the developing countries. In these studies

Table 2: Studies related to HRH Intervention: Policy

Study	Policy implemented	When	Areas implemented on	Outcomes
Koblinsky 2009⁴¹ Bangladesh Prospective (before/after)	Beginning in 1994, the emergency obstetric care (EmOC) approach dominated with assistance from the United Nations Children’s Fund (UNICEF), United Nations Population Fund (UNFPA), and the Averting Maternal Death and Disability programme in the renovation and up gradation of existing facilities and training of facility staff. With the development of the National Maternal Health Strategy in 2001, the approach broadened, building on the rights’ approach for safer motherhood and was incorporated into the ongoing Health and Population Sector Programme (HPSP) and subsequently into the Health, Nutrition and Population Sector Programme (HNPSPP) To complement the facility approach to obstetric care, a skilled birth attendant strategy was initiated in 2001 with guidance from the World Health Organization (WHO) and UNFPA	1994 & 2001 and first evaluation took place in 1995	EmOC at the facility level CSBAs providing safe delivery care at home.	Since 1990, the MMR in Bangladesh has declined from 514 in 1986-1990 to 400 in 2003—22% in the 11 intervening years. Deaths from induced abortion have declined in both Matlab intervention area and adjacent government service area when the 1995-2005 level is compared with the pre-intervention levels of 1976-1980. During 2000-2004 when the MMR was 322, only 13% of delivering-women used professional care for birthing, and 9% of births were in facilities. By 2007, these rates had improved: 18% were reported delivering with professional care and 15% were in facilities. For cesarean section in rural areas, the rate increased from 0.9% to 1.7% from 1995-1996 to 2000-2004 and then to 5.4% in 2005-2007 while in urban areas, the corresponding rates doubled—from 5.6% to 11.4% and then increased to 16.2% in 2005-2007. The increase in the use of antenatal care has shown promise—the proportion of women who had at least one antenatal care consultation more than doubled over the 17 years for which there are data—from 27% in 1991-1994 to 60% in 2005-2007
Rath 2007³⁴ Nepal Prospective (before/after)	Nepal National Safer Motherhood Project was a collaborative intervention between the Nepal Ministry of Health and Population and the UK Department for International Development (DFID), managed by Options Consultancy Services	1997-2004 , evaluation was done yearly	In Phase 1, the Project focused mainly on improving midwifery and emergency obstetric services in selected health facilities in three districts (Baglung, Kailali and Surkhet). Two main components were developed: i) management of service provision for women of reproductive age, including improvements to the physical infrastructure of hospitals, equipment and supplies, and training of personnel; and ii) increasing access to midwifery and obstetric services by improving the social context to enable women to utilize services. Following a mid-term review in 2000, Phase 2 extended the Project to six more districts	Availability of birthing facilities Met need for emergency obstetric care was <5% in the Phase 1 districts in 1997. The average annual increase in met need has been 1.3% per year over the intervention period, bringing it to the 2004 level of 14% in public sector facilities in project-supported districts. In a further four districts supported by UNICEF, met need increased from 1.9% to 16.9% between 2000 to 2004. Availability of a skilled birth attendant near the home The 2001 Demographic and Health Survey (DHS) found that only 3.1% of deliveries of the approximately 900,000 births per annum were attended by an auxiliary nurse-midwife or nurse. This had increased to 8.3% in the 2006 DHS. Free or reduced costs for services and transport Communities valued these funds and that they increased confidence in being able to cope with emergencies.
Akashi 2004⁴⁴ Cambodia Prospective (before/after)	User fees introduced at a public hospital, the National Maternal and Child Health Center (NMCHC) of Cambodia	1997	MOH started discussions to improve health care financing and introduce user contributions in 1995, and initiated a user-fee pilot program in selected national health facilities in 1997	After the introduction of user fees, however, revenue was retained by the hospital, and used to improve the quality of hospital services. Consequently, the patient satisfaction rate for the user-fee system showed 92.7%, and the number of outpatients doubled. The average monthly number of delivery of babies increased significantly from 319 before introduction of the system to 585 in the third year after the user-fee introduction, and the bed occupancy rate also increased from 50.6% to 69.7% during the same period. As patient utilization increased, hospital revenue increased. The generated revenue was used to accelerate quality improvement further, to provide staff with additional fee incentives that compensated their low government salaries, and to expand hospital services
Witter et al.	Exemptions from delivery fees were introduced by	2003 and	Few direct financial incentives were	The free delivery policy received a positive response and allowed for

Table 2: Studies related to HRH Intervention: Policy

Study	Policy implemented	When	Areas implemented on	Outcomes
2007 Ghana	the government of Ghana in September 2003 in the four most deprived regions of the country, which was extended to the remaining six regions in April 2005	evaluated in 2005	provided as part of the delivery exemption policy but the overall increase in pay as a part of wider pay reforms compensated for increased workload.	early reporting and better handling of complications. Thus the introduction of this fee exemption policy proved to be manageable and workable even within the relatively constrained human resources environment of countries like Ghana.

interventions were done for various human resource development areas like training of the service providers, policy and advocacy, partnerships and supervision. All studies showed a significant decrease in maternal mortality after the implementation of these interventions. Other interventions included in all studies fitted into the criteria of skilled birth attendance in which they provided the supply of equipments and drugs for the emergency management of complications, made renovation of the hospitals and provision of easy access to the facility. Radio communication and transport system for emergency obstetric cases was also established.⁴⁰

In one study conducted in Rwanda³² CARE's work supported a comprehensive package of focused interventions which included training of the doctors and midwives with the knowledge and skills to manage major obstetric complications. They were also trained to ensure complete recording of case notes and filling out of registers as a part of the management system. One of the main strategies of the project was to engage the participation of district supervisors as partners for improving and transforming this process. The process of interventions was supervised by district supervisors in the MoH, local partners in safe motherhood such as UNFPA, district health officials and hospital health professionals were involved in various processes of the project. District health team, specialists from the national referral hospital, and staff from the midwifery training school were the main partners. Main strategies of the project was to engage the participation of district supervisors as partners for improving and transforming this process As a result of this intervention numbers of deliveries increased by almost 25 percent from 2001-02, and the obstetric complications managed increased by almost the same magnitude (27 percent). Cesarean section increased 63 percent during this time. There was a continuous decrease in the case fatality rate over the 4 years of the project from 2.2 percent in 2001, to 1.8 in 2002, and finally 1.2 percent in 2004.

Another project FEMME was started in 2000 by CARE in Peru³³ showed similar results of decrease in CFR from 1.7 to 0.1 percent and increase in met needs from 30 to 84 percent after the implementation of HRH management interventions. A 15 days training program with on call duties along with supervision of quality of care. Project staff conducted external supportive supervision and on-site quality improvement processes were used to enhance efficient service delivery and proper documentations and record maintenance helped the project to achieve these goals. The FEMME Project worked with community groups to form local committees that complemented work at the 5 facilities. CARE's most important partners in the FEMME Project have been the IMP in Lima, the Ayacucho DIRESA and the Regional Hospital.

In a study conducted in Mozambique³⁶ 137 professionals were trained in four years which included 11 physicians, 4 surgical technicians, 15 medical and MCH technicians, 16 mid

level nurses, 63 basic nurses and 28 elementary midwives. Policy was developed to emphasize on the improvement of the quality, access and utilization of the EmOC as key strategy for reducing maternal mortality. Supportive supervision, logistics for supplies, equipment and drugs, record keeping, monitoring and evaluation, and quality improvement techniques such as maternal death audits were targeted as specific management aspects for improvement. Support and supervision of some activities were also provided by NGOs as a component of community involvement. UNFPA was AMDD's partner in the project and hired technical advisors to coordinate activities related to the national strategies to decrease maternal mortality. Government support was available at both the national and provincial level by covering the salaries of facility personnel and the recurrent costs of drugs, supplies, and facility maintenance. As a result of the implementation of these HRH components the met need increased from 11 to 33 percent and the cumulative CFR decreased from approximately 3 to 1.6 percent.

Similar study conducted in Nepal²⁹ showed that the utilization of antenatal care services increased from 39 to 72 percent, delivery by a trained skilled birth attendants from 9 to 19 percent, institutional delivery from 8 to 18 percent, caesarean sections from 1 to 3 percent and CFR decreased from 0.5 to 0.4 percent after the interventions were taken to train the skilled birth attendants and a policy to provide EmOC to the most deprived was established. Various incentives were given to the mothers and health workers attending deliveries to address the financial barriers to women accessing maternal services. A multi-partner forum, jointly chaired by the National Health Training Centre and Family Health Division, provides technical and strategic planning support for training in this project. A range of external agencies have supported staff training, infrastructure and equipment, behavior change interventions promoting antenatal, skilled delivery and postpartum care, and community emergency funds and transport schemes.

Critical success factors for intervention implementation were:

- Including a component to strengthen health systems such as improving drug availability, equipment and supervision.^{32, 33, 36}
- Involving local stakeholders such as communities and staff and adopting interventions to the local situation.³⁶

Descriptive/ Narrative Studies

We included 60 descriptive studies in our review which focused on the maternal mortality and factors influencing this outcome. These studies analyzed the situation of maternal health and health care delivery in developing countries. The authors were able to conclude that the major challenges faced are the unavailability of skilled birth attendants, lack of

Table 3: Studies related to HRH Intervention: Combined interventions

Study	HRH management system						Personnel system	Time between interventions and evaluation	Others
	Training	Policy	Management	Incentive	Supervision	Partnership			
Kayongo 2006³³ Peru Prospective (before/after Implementation)	Training sessions are for 15 days with on-call duty After an analysis of the causes of maternal death, the treatment and prevention of postpartum hemorrhage received special emphasis in the trainings		Development of a more efficient and systematic mechanism for recordkeeping and data collection. Placement of trained staff was coordinated with to ensure a wide distribution of technical capability to resolve obstetric emergencies		Quality of care was enhanced through the use of Criterion-Based Audits . External supportive supervision and on-site quality improvement processes were used to enhance efficient service delivery	The FEMME Project worked with community groups to form local committees. CARE's most important partners in the FEMME Project have been the IMP in Lima, the Ayacucho DIRESA and the Regional Hospital.		The intervention started in 2000 and the first evaluation took place in 2001 and then in next three years till 2004.	Facility set-up, including adequate infrastructure, equipment and supplies
Outcomes	CFR has decreased from 1.7% to .01%, increases in met needs from 30% to 84% in 5 years and a small increase in cesarean sections from 4% to 6%.								
Kayongo 2006³² Rawanda Prospective (before/after Implementation)	CARE conducted several trainings to provide doctors and midwives with the knowledge and skills to Manage major obstetric complications most significant training course was a 12- module competency-based training		Staff, including doctors and midwives, were trained and supported to ensure complete recording of case notes and filling out of registers		Main strategies of the project was to engage the participation of district supervisors as partners for improving and transforming this process.	Stakeholders in the MoH, local partners in safe motherhood such as UNFPA, district health officials and hospital health professionals were involved in various process of the project. District health team, specialists from the national referral hospital, and staff from the midwifery training school.		The interventions started in 2001 with first evaluation in 2002 and then consequently in 2003 and 2004.	Renovations and provision of essential equipment and supplies
Outcomes	Numbers of deliveries increasing by almost 25% from 2001 to 2002, and the obstetric complications managed increased by almost the same magnitude (26.5%). Cesarean section increased 63% during this time. There was a continuous decrease in the case fatality rate over the 4 years of the project from 2.2% in 2001, to 1.8 in 2002, and finally 1.2% in 2004.								
Jamisse 2004⁴⁰ Mozambique Prospective (before/after Implementation)	Technicians trained in surgery and anesthesia, as well as nurses trained as surgical assistants.				Supervision of the activities described above for the city of Maputo and the district			Intervention started in 1998 and the first evaluation was done in 1999 and then	Supplementing equipment and essential supplies at the

	Maternal and Child Health nurses and basic midwives were trained in the provision of basic and comprehensive EmOC, and in the diagnosis, treatment and monitoring of women with major obstetric complications. This training included communication and counseling skills				of Manhica was the responsibility of the Department of Family and Reproductive Health at the Ministry of Health. In Sofala province, on the other hand, provincial health authorities were responsible for the supervision and monitoring of activities			consequent evaluations for 2 more years.	EmOC units. Radio communication and transport system was established
Outcomes	Jose Macamo Hospital, which dealt with 14% of all deliveries and 2.5% of all C sections in 1998, was responsible for 32% of all deliveries and 38% of all C-sections in Maputo city in 2001. Mavalane never succeeded in providing comprehensive EmOC 24 h a day. It did succeed, however, in almost doubling the number of deliveries, from 2500 in 1998 to almost 5000 in 2001. While in 1998 the Manhica Hospital managed 29% of institutional deliveries and 8.2% of cesarean sections in the district, these percentages increased to 33% and 31.2%, respectively, in 2001. The maternal deaths per total number of deliveries occurring in the district's institutions were 572/100 000 live births in 1998 and 433/100 000 in 2001. The case fatality rate in basic EmOC units decreased from 4.7 in 2000 to 2.4 in the first 6 months of 2002								
Santos 2006³⁶ Mozambique Prospective (before/after)	Training	Policy	Management	Incentives	Supervision	Partnership	Personnel system	Time between interventions and evaluation	
Implementations	The 4-week training session for basic EmOC consisted of one week of theory and 3 weeks of practical hands on experience. The 3 month comprehensive course had 1 month of theory and 2 months devoted to honing practical skills. In addition to the training in clinical management of obstetric complications, training was given in infection prevention with an emphasis on HIV prevention for health workers and the cleaning and sterilization of new equipment. HR development meant training provincial health directorate staff in the maintenance and repair of radios & solar panels, critical elements to the	The AMDD project in Mozambique was developed in a policy environment that clearly endorsed EmOC as a key strategy to reducing maternal mortality	The project used the UN process indicators for obstetric services as its monitoring tools		Supportive supervision was considered a key component to improving the quality of services. Originally, to promote sustainability and ownership of the project, the Medical Director of the Provincial Health Directorate and the Chief Nurse were given the responsibility to coordinate all activities of the project, which included frequent supervisory visits to the facilities.	AMDD's partner in Mozambique was UNFPA AMDD was supported by the Bill and Melinda Gates Foundation		Interventions started in 1999 and first evaluation began in 2002 and was continued for three years till 2005.	Renovation of the hospitals, equipments and emergency drugs and supplies were provided

	emergency transport & referral system								
Outcomes	Utilization among women with complications (met need or the proportion of women expected to have complications who are admitted for treatment) increased threefold, from 11.3% to 32.8% in all facilities. The aggregate case fatality rate (CFR) was reduced by almost half (2.9% to 1.6%).								
Islam 2006³⁵ Bangladesh Prospective (before/after)	Training	Policy	Management	Incentives	Supervision	Partnership	Personnel system	Time between interventions and evaluation	
Implementations	Training of medical officers was originally designed as a six-month course but was later extended to one year. Similarly, training of nurses was extended from six weeks to four months. Laboratory technicians participated in a two-week training course		Project reports, the training database and bimonthly facility update reports were used in management. A checklist was developed for monitoring visits to training facilities to capture information such as trainees' performance, lecture classes, opportunities for skills practice, training facility caseload, number of other trainees in the department, training problems and general observations recorded in reports	Trainees were provided with a monthly scholarship, book grant, travel allowance and training materials	Training activities were coordinated locally by the Training Coordination Committee at each medical college hospital	UNFPA and UNICEF	The Reproductive Health Programme Manager of the Directorate General of Health Services selected the medical officers for training through interview, while nurses and laboratory technicians were selected directly from the designated facilities where they were working.	Intervention started in 2003 and evaluation was done in 2004.	Supply of necessary equipment and logistics. Renovations of the facilities
Outcomes	In 2004, 105 of the 120 sub-district hospitals had become functional for EmOC, 70 with comprehensive EmOC and 35 with basic EmOC, while 53 of 59 of the district hospitals were providing comprehensive EmOC compared to 35 in 1999.								
Barker 2007²⁹ Nepal Prospective (before/after)	Training	Policy	Management	Incentives	Supervision	Partnership	Personnel system	Time between interventions and evaluation	
Implementations	work is ongoing to incorporate training for skilled birth attendants into pre-service courses for doctors and certificate nurses	SSMP is working with other safe motherhood stakeholders to support significant policy and planning developments as a		SSMP is supporting a Maternity Incentives Scheme to address financial barriers to women accessing maternity services		Civil society, political parties, local media, development program and health workers. A multi-partner forum, jointly chaired by the National Health Training Centre and Family Health Division, provides technical and strategic planning support for training		Interventions started in 1997 and evaluations began in 1998 and continued till 2005 every year.	Supplies of emergency drugs and equipment

foundation
to the
national
programme

Outcomes Utilization of antenatal care services increased from 39% to 72%, delivery by a trained health worker from 9% to 19%, institutional delivery from 8% to 18% and caesarean sections from 1% to 2.7%. CFR decreased from 0.5% to 0.4 %

proper referral^{74, 104} and transport system⁹⁵ and inadequate infrastructure in most of the rural areas of these countries.^{105, 106} Some studies mentioned that more lives of mothers can be saved if adequate importance is given to the EmOC services and they are made integral part of the health system.^{57, 74} Importance of collaboration between skilled birth attendants and other health care providers like obstetricians and anesthesiologists as well as lay health providers was mentioned in another study^{28, 80} and should be adopted in national policies.^{65, 67, 69, 82}

It was observed that “brain drain” described as the recruitment of skilled workers from developing countries was one of the important factor in absence of professional workers in these rural areas and emphasis needs to be made on discouraging this process.^{94, 107} Even at the low level the deployment, recruitment and retention of care providers especially the pair of nurses and specialist is a major challenge of the supply side.^{59, 94, 106} Few specialist who are deployed in the government system are overloaded with clinical as well as administrative responsibilities.^{60, 69} The barriers to recruitment, deployment and retention of skilled personnel should be assessed and urgently addressed.⁵⁸

Lack of ongoing training or in-service training was also identified as a major gap to be filled to accomplish MDG 5.^{83, 85} Olenja et al. documented that only 18 percent of studied staff in Kenya had received life saving skills and only 37 percent received training related to prevention of mother-to-child HIV transmission, which is the utmost required skill in the country like Africa.⁸⁵

Few studies emphasized and explored the continuum of care for the reduction of maternal mortality.^{60, 78, 79, 81} The continuum of care that mother receives before during and after delivery is the major determinant of the survival and well being of mother and the child.⁸⁹ It was observed that mothers, newborns and babies all benefit from these packages of continuum of care. Studies have also identified that EmOC should also be integrated with family planning services for optimal results.⁸⁴

The limited management capacity is one of the main reasons of slow progress in maternal health.¹⁰⁶ It was observed that a well functioning health system with appropriate supply of equipments, drugs and other supplies is needed for timely management of delivery complication to prevent maternal death.¹

In few studies importance was given to the fact that the utilization of health services may be low because of the gender inequality and status of the women as well as cultural barriers. Empowerment of women and education has shown to positively influence the health seeking behavior and decrease in maternal mortality,^{61, 66, 68, 95} thus efforts should be

made to improve this area for sustainability of the interventions to decrease maternal mortality and improve overall health care utilization. The same phenomenon has been underscored by Thaddeus and Maine in 1994 in the form of three delays for maternal mortality: (1) delay the decision to seek care; (2) delay arrival at a health facility; and (3) delay the provision of adequate care (**Box 3**).¹⁰⁸ Patients who make a timely decision to seek care can still experience delay, because the accessibility of health services is an acute problem in the developing world. In rural areas, a woman with an obstetric emergency may find the closest facility equipped only for basic treatments and education, and she may have no way to reach a regional centre where resources exist. Finally, arriving at the facility may not lead to the immediate commencement of treatment. Shortages of qualified staff, essential drugs and supplies, coupled with administrative delays and clinical mismanagement, become documentable contributors to maternal deaths.¹⁰⁸

Box 3: Three delays of maternal mortality

1

Delay in seeking appropriate medical help for an obstetric emergency for reasons of cost, lack of recognition of an emergency, poor education, lack of access to information and gender inequality



Access to health information and education.
 Access to affordable and physically accessible health care.
 Enjoyment of the right to health on the basis of non-discrimination and equality.

2

Delay in reaching an appropriate facility for reasons of distance, infrastructure and transport



Safe physical access to health care.

3

Delay in receiving adequate care when a facility is reached because there are shortages in staff, or because electricity, water or medical supplies are not available.



An adequate number of health professionals.
 Availability of essential medicines.
 Safe drinking, water, sanitation and other underlying determinants of health.

Table 4: descriptive studies

Author/ Year / Country	Study Design	Worker Involved	Participants	Description	Outcome	Lessons	Gaps /Limitations	Recommendation
Pereira 2010¹⁰¹ Tanzania	Descriptive	Doctors and assistant medical officers	16 hospitals of Kigoma and Mwanza region	To calculate met need for CEmOC in 2 Tanzanian regions and to document contribution of non physician clinicians and medical officers to provision of CEmOC and to calculate fatality for complicated deliveries	Estimated met need was 35% in mwanza and 23% in kigoma. AMOs operating independently did most major obstetric surgeries. CFR was 2.0% in mwanza and 1.2% in Kigoma	AMOs carry most of the burden of life saving surgeries.		Hospital system needs to be expanded and referral system improved
UNFPA 2006⁵⁵ Zimbabwe	Country experiences before after	midwives		Midwives and others with midwifery skills have a pivotal role in addressing the first two of the “three delays” that eventually lead to death from pregnancy related complications, by working with and empowering women and communities and providing basic EmONC	Between 1980 and 1990 Zimbabwe needed to accelerate the production of providers to offer maternal and neonatal health care in the community because of the rapid movement of the population soon after the liberation struggle. The country embarked on a six-month program to upgrade cadres who were medics. After two years it was clear that this program was too short to give providers the competencies which would make a difference in the community. The upgrading course was therefore extended to 12 months, adding more competencies. After brief experience, decision-makers in the community demanded that the cadres have still more competencies, so midwifery training was extended again from 12 months to 18 months. The 18-month program produced midwives able to make decisions, offer life-saving procedures, manage some complications and refer others appropriately and timely.			

Table 4: descriptive studies

Author/ Year / Country	Study Design	Worker Involved	Participants	Description	Outcome	Lessons	Gaps /Limitations	Recommendation
Olenja et al. 2009⁸⁵ Kenya	cross sectional			We examine data from the 2004 Kenya Service Provision Assessment (KSPA) to assess the availability of EmOC services in Kenya, and to demonstrate the importance of health worker training in the delivery of these life-saving services.	less than 20 percent of maternal health workers interviewed had received training in focused antenatal or postnatal care in the last three years. Among caregivers providing delivery services, only 18 percent had received training in lifesaving skills, and only 37 % had received training in the prevention of mother-to-child transmission of HIV during the last 3years.	Another limitation is that health workers were not observed during the course of an obstetric emergency to see how they actually provided care.		Training is a critical element in the detection and management of complications.
Gupta et al. 2009⁷⁴ India	cross sectional study	doctors, nurses		To study the existing referral system for emergency obstetric care in the state of Gujarat, evaluate its strengths and weaknesses, and suggest ways of improvement for providing better referral service.	The study revealed a rudimentary government referral transport system. The focus of the system is more on number of ambulance and drivers, and less on the number of referrals provided. Most of the PHCs do not have proper ambulances. The lack of standard procedure and referral protocols in the government facilities were aggravated by absence of records related to referrals.	By giving due importance to EmOC referral system and treating it as an integral part of maternal health, many more lives of mothers can be saved. The referral system and transport should focus on the requirements of the patients. Public Private Partnership can be one of the options for providing transport but ultimate responsibility of providing quality services rests with the government.		
Koblinsky & Kureshy 2009¹⁰⁵ South Asian countries	observational	Skilled birth attendants and stakeholders		Through the case studies in this issue of the Journal, we have initiated a response to the growing call for evidence to support improved local implementation, gathering	Countries have responded positively but implementation has varied. Many countries focus only on a part of the intrapartum care strategy	The participatory process of engagement of stakeholders fostered critical reflection and	Major challenges are typically the lack of available skilled care at birth and referral support, poor	Priority strategy is quality intrapartum care where women deliver in health facilities staffed with a team of midwives available 24 hours a day,

Table 4: descriptive studies

Author/ Year / Country	Study Design	Worker Involved	Participants	Description	Outcome	Lessons	Gaps /Limitations	Recommendation
				lessons from practice within and across more and less successful areas of South Asian countries. The aim is to build a body of knowledge by looking at patterns of problems and solutions to improve safe motherhood implementation at the national & sub country levels		learning focused on solutions to address challenges within and beyond national and sub national borders;	quality of care at birth, and lack of use of such care due to costs, distance, and other traditional barriers.	with a medical team at a referral hospital for back-up support in the case of life-threatening complications.
Brugha & Pritze- Aliassime2005²³	observational	Doctors,nurses and midwives	Mothers	The present paper reviews evidence on health care from low- and middle-income countries (LMICs) in an attempt to assess the contribution of formal, professionally qualified private for-profit providers (doctors, midwives, nurses) to delivery care. The paper reviews the limited evidence on technical quality, appropriateness, and responsiveness of such services, and evaluates the potential of available mechanisms or leverages for policy-makers to work with the for-profit private sector	In poorer countries, notably Kenya and Indonesia, most of the professional care was from a nurse, with wealthier women more likely to receive such care than poorer women. In all countries wealthier women were far more likely than poorer women to have their infant delivered in a private facility. Studies from Brazil also showed higher C-section rates among wealthier women, despite these women being at a lower risk during childbirth than are poorer women. In Indonesia the training of professional midwives who were contracted with the Ministry of Health and deployed to villages resulted in a higher coverage of skilled attendance at childbirth. most of the avoidable maternal mortality and morbidity worldwide occur in poorer settings, due to the under provision of (often lack of access to) skilled birth attendants and emergency obstetrical care to women who need them.	Women living in rural Nigeria reported that they preferred private obstetric services to public services when private services were more accessible, because of their flexible payment schedules, and chose private services instead of the government hospital because a doctor was more frequently available	sometimes they provide what they know is unnecessary and unethical care to maximize income, knowing that regulatory controls are ineffective. Passivity of women and their inability to question or challenge the appropriateness of maternity care provided is common in poorer settings	A major challenge is to control overprovision and prevent unnecessary interventions, especially high rates of C-section in low-risk women. Macro-level mapping is also needed to identify the players operating at a national level who have an interest or stake in safer motherhood
Low and middle income countries (Indonesia, india, Kenya, Africa, Nigeria etc)								

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de Bernis et al. 2003 ²⁸ Dev eloping countries	observational	Skilled birth attendants	Mothers	This paper sets out the rationale for ensuring that all pregnant women have access to skilled health care practitioners during pregnancy and childbirth. It describes why increasing access to a skilled attendant, especially at birth, is not only based on legitimate demand and clinical common sense, but is also cost-effective and feasible in resource-poor countries	Maternal complications can be prevented and managed efficiently by skilled health care providers. interventions require a person with midwifery competencies and selective obstetric skills and back-up during the critical period of labor, birth and the immediate post-partum period. More educated and wealthier women are, the more likely they are to have their births attended by a professional health practitioner	training TBAs is not an effective strategy for reducing maternal mortality. To be effective, the skilled attendant has to work in close collaboration, not only with others in the obstetric team and other health care providers, but also with lay care-givers:	Lack of minimal life-saving skills and equipment at the first referral level, and inappropriate patient management combined with poor quality of care, can actively contribute to maternal mortality. Unhealthy rivalries can arise between the different health staff and these have an unhelpful and sometimes demoralizing effect on all concerned, as well as leading to poor quality of care	women with all types of complication need to be able to reach appropriate care in a timely manner. Educating women, families and communities to recognize when to seek medical care. Advocacy and action National commitment Improving quality of care Women's empowerment Skilled care for all requires increased coverage
Berer 2006 ⁶⁰ Bangladesh, Guatemala, Indonesia, Kenya, Lithuania, Mongolia, Morocco, Zambia, Malawi and South Africa	Journal issue?? What is the exact type?		Mothers	These papers speaks of the importance of health care providers to well functioning of health services, measured through their training and skills level, the extent of support they are given, the pay and benefits they receive, their career advancement opportunities, the conditions they are expected to work in and the resources available to them for their work.	The best minds and efforts go into describing the causes and parameters of problems, while the people and institutions on the ground that are responsible for implementing the solutions are constantly understaffed, under-funded and under-supported	More training, more staff and more skills are needed Added burden of HIV/AIDS Reluctant donors to undertake the significant investments. Adolescent sexual and reproductive health issues Ethical Guidelines on Conscientious Objection. One of the almost invisible aspects of the human resources issue is in	Lack of consensus between government and donor communities, competing health priorities and the Politicization of debates on issues such as fertility and abortion. The community, with its strong male bias, utilizes the health facilities, and education and employment programs, more for the benefit of	Countries must work together to address the global need for skilled health care providers on a global scale. Health must be allotted a greater proportion of national budgets. Health care providers need to come together in professional associations and trade unions to fight for better training and working conditions, and for strong public health systems, because their interests are also their patients'

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						relation to gender, the status of women is much lower than men's, not only are women patients more likely to be neglected and treated poorly, but women health workers are also likely to have a lower status	men and boys than for women and girls.	interests
Abe & Omo-Aghoja 2008⁵⁷ Nigeria	Retrospective review		records of patients that died in the obstetric unit of Central Hospital, Benin City from 1st of January 1994 to December 31st 2003	A study protocol was used to extract the following information – patient's socio-demographic profiles (age, parity, marital status of the patient, educational status of the patient and husband's occupation), booking status, identifiable causes of death, length of hospital stay and interventions in the hospital before death. The data were coded and fed into computer using the SPSSPC+ statistical package. Univariate tables were generated for assessment and comparisons.	This review demonstrated a trend of increasing yearly MMR from 1994 to 1999 when it peaked and thereafter it underwent a steady decline. MMR was higher at the extremes of parity.	The reduction in MMR coincided with the period when the department was restructured to respond to emergency obstetric needs with accompanying increase in the number of residents (senior and junior) and consultant. Low literacy and high poverty levels are major contributors to maternal mortality. Being un-booked or having not received antenatal care was an important correlate of maternal mortality	Documentations were grossly inadequate for meaningful data extraction. HIV/AIDS was not documented	There is need for Continued health education of the populace on the importance of antenatal care and skilled attendance at birth. A strategic plan should be put in place for public enlightenment campaign and advocacy activities aimed at mobilizing resources for reducing maternal mortality. Widespread use of partographic monitoring of labor Making maternal health care free will increase prompt utilization of these services. Female education and poverty alleviation programs will contribute to the reduction of the burden of maternal mortality
Adegoke & van den Broek 2009⁵⁸ Developing Countries	Narrative review	Skilled Health Attendants	Mothers and Newborns	This paper provides a narrative review of the literature on the skilled birth attendance strategy identifying key challenges and lessons learnt.	Ensuring skilled attendance during pregnancy, childbirth and immediately after is crucial to the achievement of MDG5.	Absence of sufficient numbers of health professionals is the most significant barrier. The barriers to	The skills of a 'skilled attendant' cannot be verified during a survey, the use of such data to estimate the percentage of	Urgent global action is therefore needed to promote the availability, access and utilization of skilled attendance. This should include a global human resource

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						recruitment, deployment and retention of skilled personnel should be assessed and urgently addressed. General lack of literature on supportive supervision of skilled birth attendants in developing countries. Need for an agreed framework to assess the impact of increasing coverage with SBA on reducing maternal mortality.	births assisted by skilled attendants assumes that all health professionals qualify as skilled attendants	strategy, the provision of effective supportive supervision as well as the availability of a validated and standardized monitoring and evaluation framework
Lawn et al. 2006⁷⁸ Developing countries again can you name them, if specified in that paper	Descriptive	CHW, SBA and TBA	Mothers, Neonates and children	<i>The Lancet</i> focuses on maternal health, providing an opportunity to assess progress, to review epidemiology and evidence to guide priority setting, and to analyze programmatic and financing options	MNCH is receiving more attention, but MNCH interventions are yet to receive adequate Investment Mothers competing with children for little attention and funding. Newborn babies lost in between Facility-based care, with focus on vertical solutions, patchy community approaches, competition between various programs Competing interests of many partners, donors and packages	Mothers, newborn babies and children all benefit from essential packages in a continuum of care		Integration between essential MNCH packages and with other programs such as HIV, malaria, and vaccine-preventable conditions. strengthening newborn health interventions is a catalyst for integration. Community-based approaches to promote healthy behaviors and demand for skilled care, and to deliver selected essential interventions to populations while skill-based care is being strengthened. Promoting accountability of governments& partners. Country-led action with support from donors

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Mbonye et al. 2007⁸¹ Uganda	Observational	Ugandan Ministry of Health, UNICEF and other partners	Three levels of Health facilities. HCIII, HCIV and Hospitals.	The survey, covering 54 districts and 553 health facilities, assessed availability of EmOC signal functions, documented maternal deaths and the related causes	Most health facilities – at all levels – in Uganda lack basic equipment and infrastructure necessary to provide quality of care. Most (97.2%) health facilities expected to offer basic EmOC services were not able to do so. HIV/AIDS may increase pregnancy related mortality directly (puerperal sepsis) or indirectly (anemia or tuberculosis). This study highlights the role of human resources especially the effect of staffing levels (midwives) on maternal mortality	unless resources are allocated to the development of health infrastructure and improving human resources, Uganda is unlikely to meet the MDG on maternal health.		harmonized to accelerate progress, and broader partner inputs, such as professional and non-governmental organizations. Policies need to be context specific To address the issue of high maternal mortality, HCIII and HCIV need to be operational as they are more likely than hospitals to be within the reach of most pregnant women. There is need to focus on integrating VCT into antenatal care to reduce high AIDS-related maternal mortality in Uganda. Health seeking behavior in conflict areas and how emergency care can be delivered under such circumstances needs further study and action the Ministry of Health, the Ministry of Finance and other development partners need to prioritize and allocate more resources to the development of infrastructure and human resources and to improve quality of care especially the availability of basic supplies and equipment.
Obaid 2009⁸⁴ Developed and	Observational		Mothers, newborns and adolescents	This article surveys the current situation and prospects for attaining the goals set by the International Conference on	Programs do not sufficiently address women's needs for family planning information and services at critical	Family planning currently prevents 187 million unintended	Poor working and living conditions, and inadequate equipment,	Improved access to family planning could avert one-third of maternal mortality and

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Developing countries				Population and Development (ICPD) held in 1994, and the health-related Millennium Development Goals (MDGs), set in 2000	points, for example after puberty, sexual initiation, pregnancy and prenatal care, a healthy birth, and STI infection including HIV/AIDS. Inequalities in accessing services— between rich and poor, urban and rural, the general population and ethnic minorities or other marginalized groups—are greater in sexual and reproductive health than for almost any other health indicator	pregnancies per annum Young people in almost all regions of the world find it harder than other age groups to access reproductive health services. empowerment of the individual with access to information and services for reproductive health, including voluntary family planning, was essential for sustainable development. Community-based approaches allow more equitable access to technology and resources, and can encourage behavior change.	drugs, supplies, and supervision make it difficult to deploy, motivate, and retain skilled birth attendants close to the community.	10% of child mortality. The ICPD agenda stressed the importance of advancing human rights, gender equality and the empowerment of women, and eliminating all kinds of violence against women
Anwar et al. 2009⁵⁹ Bangladesh	observational		Service providers anesthetists, nurses , FWVs , program managers (at the sub district-level Upazila Health and Family Planning Officers and at the district-level Civil Surgeons from the high- and low-performing areas, and one central-level program manager from the national EOC	The present study reviewed maternal health policies and programs at the national level through meetings and workshops of stakeholders and through a document review. The first review collected demographic and human-resource data from all the four study districts and quality-of-care data from only those facilities targeted by the Government to be upgraded as comprehensive EOC facilities. The second survey was conducted in all the public-sector EOC facilities (basic or	The quality of maternal health services, as measured by structure, process, and outcome, was relatively better in the Khulna region than in Sylhet, although the use of services was low in both the areas. Most respondents (both from Khulna and Sylhet) reported that the poor salary, uncertainty of promotion, absence of uniformity in application of existing rules and regulations in posting, transfer, and promotion are	Even at the low levels planned, deployment and retention of care providers, particularly the pair of specialists and nurses, in rural facilities, is the major problem for the supply-side. Study suggests that political commitment for maternal health is not just inadequate, it is counter-productive	A limitation of the study was that the skills of maternal healthcare providers were not explored in either area.	A pair, including a trained obstetrician and anesthetist (consultant or EOC-trained), is needed in each targeted rural comprehensive EOC facility. Multi sectoral involvement is required. Nurse-midwives are key to improved maternal health. The number of sanctioned posts for nurses should be increased with adequate training in maternal and neonatal health. Our

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			program office.	comprehensive) in the study districts—medical college hospitals, district hospitals, MCWCs (10-bed hospitals), and rural UHCs (31-bed hospitals)	the root causes of professional de-motivation The Government attempts to rectify the inadequacy of specialists by increasing their numbers through one-year training of medical officers on anesthesia or obstetrics and two-year bonding for rural service have failed to overcome the human resource barrier, particularly for Sylhet	Anesthetists present a special challenge. Constraints with nursing professionals are also serious in the Sylhet region Unavailability of blood in rural areas is another major supply-problem for EmOC as it is needed to manage		data suggest that there is a need to train all categories of EOC service providers on evidence-based techniques and a supportive supervisory monitoring system be implemented. Our data suggest that there is a need to train all categories of EOC service providers on evidence-based techniques and a supportive supervisory monitoring system be implemented. There is a need to strengthen the health system with proper decentralization, devolution, and delegation of authority. It is possible to give a special 'bonus' or a 'benefit package' for rural postings of specialists—an incentive that has worked in other settings
Bhuiya et al. 2008⁶¹ Bangladesh	Observational	Health Care Providers?? Can you name them	Population of Bangladesh	This paper presents the situation of equity in health in Bangladesh, innovations in monitoring equity in the use of health services in general and by the poor in particular, and impact of targeted non-health interventions on health outcomes of the poor.	The findings show that government services at the upazila level are used by the poor proportionately more than they are in the community, while at the private facilities, the situation is reverse more of the lowest quintiles are represented in the upazila health complex than these are in the community	Public-sector services, although officially free, actually are not There is an inadequate supply of medicines at the facility. Quality of care is perceived to be low, and patients are not treated with respect. There are cultural barriers Distance to the facility may be long.	Programs that attempt to target the poorest of the poor rarely reach these groups despite best intentions.	The Lot Quality Assurance Sampling methods which require relatively small sample sizes have the potential to provide such a pro-poor monitoring tool, but they need further evaluation to become institutionalized. Another technique, which has recently been promoted by the World Bank, is benefit-incidence ratio. This

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						There are additional indirect costs. Private-sector services are expensive and unaffordable for most poor patients preventive programs tend to be much more equitable than curative services		technique basically compares the proportion of poor in the community with those among facility users. Equity concerns must also take into account that some interventions, which are not directly related to health, may still have an important health outcome if they help improve equity
Marchie & Anyanwu 2009⁷⁹ Nigeria	Descriptive survey	Researchers and research assistants, note takers, guards(to prevent distractions)	Females of reproductive age, who were married all relatives of women who died, health workers	The study examined the extent of contributions of socio-cultural factors to maternal mortality (through survey method). Two thousand one hundred and fifty seven females of reproductive age were selected using multi-stage sampling technique. The instrument was a self developed structured and validated questionnaire with a reliability of 0.82. Focus Group Discussion (FGD) and In-depth interview guide were used to complement the instrument	All independent variables had positive contribution to the dependent variable of maternal mortality.	The result from the feeling of the women was that early marriage/ early child bearing was the most important variable in the prediction of maternal mortality in Edo South Senatorial District Early child bearing can lead to cephalo-pelvic disproportion and subsequently prolonged and obstructed labor. Another disadvantage of early child bearing includes girls losing out on schooling with few employment options		quality services like good antenatal care should be made available, accessible and affordable in both urban and rural areas. Women should be encouraged and sensitized to be personally involved with their health and should be empowered to take prompt/early decision to seek medical care in emergency. Government should consciously put in place policies aimed at achieving basic level of literacy especially among girls and women in general
Parada 2007⁸⁷ interior of São Paulo	Observational	Health care providers, managers	Mothers and neonates	This study aimed to evaluate care during childbirth and neonatal development in the interior of São Paulo in order to support managers	Very low rates were found for all items related to human resources. The use of nursing bottles and feeding bottles was very	According to the PNHP, all units integrating the SUS have the responsibility to	none of the hospitals in this study have an acting midwife-nurse in the	the need for effective multi professional action, reconsideration of on-calls, especially in larger maternities, and

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				responsible for formulating public policies on human development and allocating public resources to the women's healthcare. For the follow-up of UNDP goals oriented to improve maternal health, two indicators were adopted: maternal mortality rate and percentage of deliveries attended by a qualified healthcare professional	high and the development of systematic educational activity, infrequent. Most of the hospitals studied had delivery rooms equipped with compressed air, oxygen, surgical lamp, delivery table, emergency and anesthesia cart. However, the presence of basic instruments like a stethoscope/ sphygmomanometer and Pinard's stethoscope or Doppler sonar was not frequent.	have appropriate human resources for delivery care and, in line with WHO, the midwife-nurse seems to be the most appropriate professional, with better cost effectiveness, to be responsible for care in pregnancies and natural deliveries Practices markedly favorable to health, useful in natural delivery and advised by the PNHP, such as the presence of a companion, non pharmacological control of pain, skin-to-skin mother/baby contact, and the early start of breastfeeding, among others, are still little practiced in the maternities studied, while other clearly harmful or ineffective practices, such as fasting, venoclysis, trichotomy and episiotomy, are still frequently used	Delivery Room to attend natural deliveries 24 hours a day. None of the hospitals in this study have an acting midwife-nurse in the Delivery Room to attend natural deliveries 24 hours a day	the pertinence of the development of permanent educational activities must be considered. It is emphasized that the patient's feeling of pain must be respected as, for many women, delivery is a synonym of pain and suffering, involving the need for help and support

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Narchi 2009 ⁸³ Brazil	a descriptive and exploratory research design, using a quantitative approach	Researchers	Study population consisted of 272 nurses and/or midwives	to analyse the exercise of essential competencies for midwifery care by nurses and/or midwives in the public health system	The results showed that nurses and/or midwives providing care for women during pregnancy, labour, birth and the postnatal period did not put the essential competencies for midwifery care into practice, because they encountered institutional barriers and personal resistance, and lacked protocols based on best practice and on the exercise of essential competencies needed for effective midwifery care. most of the services had already implemented the family health program (government’s national primary health-care program) as a care mode	The model care in the public health services of Sao Paulo is based much more on hierarchical position then on professional competencies or on the recommendations of scientific communities Data show that most public hospitals providing obstetric care have a physical and institutional structure that prevents the implementation of humanized care and interventions that are based on scientific evidence of effectiveness	The work environment has become hostile and constrained for nurses and/or midwives operationalisation of care – reported difficulties in providing care to pregnant women and newborns due to a lack of knowledge, ability or training caused by institutional demands for productivity in the number of cases handled, by insufficient material resources or by inadequate facilities in the health units. reference and counter-reference system – reported a lack of adequate referral and counter-referral from the primary health units to hospital professional relationship – relates to the low quality of service provided by clinicians and the relationship between different professional categories	health authorities need to review their midwifery policies to improve maternal–infant care by nurses and/or midwives in order to ensure the implementation of best midwifery practice. Lack of personal preparation or knowledge, underscores the need for continuous education in these related professional areas, so that nurses may build confidence and acquire strong skills in midwifery. the study shows the undeniable need to put pressure for alterations in the structure of public hospitals, which require investment in the remodeling of existing environments or the construction of centers for normal birth

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							work process – stated the negative aspects of the process of providing basic care, specifically work overload caused by the precarious state of human resources and excessive administrative duties for nurses socio-economic and cultural context of the population – reported the precarious socio-economic, educational and cultural characteristics of the population. One of the region's largest problems in midwifery care is communication difficulties between basic health-care services, outpatient care and hospital care	
Mridha et al. 2009^{B2} Bangladesh	Observational	Health care providers	Health system and mothers	To review the evolution of maternal health services with the national public-health system, we reviewed the existing government policy and strategic documents, such as five-yearly development plans (1973-2000); a three-yearly development plan (2003-2006); the Maternal Health Strategy of 2001; the Poverty	Maternal health services in Bangladesh evolved over time, guided by global and national policies and plans and internal politics. The goal 'Health for All by the Year 2000' later was a major factor for the development of healthcare plans but maternal health received limited priority.	Integration of maternal health with family-planning care started receiving attention with the advent of the 1987 safe motherhood movement, but unification was short-lived. Their	The health sector attempted to nite family planning and population control but failed to do so. There is no sharing of performance and management information at any	Provide financial incentives to health service providers and mothers for providing and using selected maternal health services. Recruit more FWAs, train, and deploy them as CSBAs along with FWVs in the upgraded

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				Reduction Sector Paper of 2004; plan of the Health and Population Section Program of (HPSP) 1998-2003; and the revised plan of the Health, Nutrition and Population Sector Program (HNPS) 2003-2010	The rural areas, however, remain without adequate coverage of comprehensive EOC.	separation deterred further integration and left grassroots-level workers of both the wings in a state of confusion about their roles and responsibilities.	level, except at the national level MoHFW Due to the unavailability of skilled manpower and an inefficient retention strategy the number of functional UHCs providing comprehensive EOC in rural areas in insufficient. Poor selection of trainees, non-recognition by the professional associations of the one-year EOC and anesthesia training as post-graduate training, inefficient deployment, and lack of incentives for working in rural areas, are a few factors limiting success of the comprehensive EOC program	union-level HFWCs to provide facility-based delivery care close to women. The program to train MBBS doctors to perform caesarean sections and provide anesthesia needs to be strengthened to increase the numbers of functional upazila-level comprehensive EOC facilities. strategies to ensure access of the lower socioeconomic quintiles to key maternal health services, including caesarean delivery, need to be in place throughout the country
Mavalankar et al. 2009 ¹⁰⁶	Case study		Sources of data used by the Department of Health are (a) routine statistics from the health management information systems (HMISs), (b) population-based surveys, (c) facility surveys,	This case study identified several challenges for reducing the maternal mortality ratio, including lack of the managerial capacity, shortage of skilled human resources, non-availability of blood in rural areas, and infrastructural and supply bottlenecks	Lack of skilled staff, inadequate infrastructure, and poor monitoring have led to the under-use of the public-health system for delivery care	Without correct estimates and a good maternal death-registration system, it is difficult to gauge the severity of the problem and take corrective steps or to know the effectiveness of measures taken to	The key problems are inadequate infrastructure and equipment, shortage of human resources, lack of supplies and inadequate monitoring and supervision. The limited management	Management capacity should be improved Focus must be on ensuring that all the FRUs are made fully functional with comprehensive EmOC services, including blood Gujarat needs to establish a reliable vital registration system. A cadre of midwives

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			and (d) special studies/evaluation by external agencies			improve maternal health services	capacity at all levels is one of the major reasons for slow progress in maternal health in Gujarat despite ambitious program maternal health services of the public-Health system have changed from comprehensive care to only primary preventive care unlinked to referral services required to manage complications	should be developed to make skilled delivery care available to all women. Training general doctors for comprehensive EmOC, including caesarean section and anesthesia, Improvements and maintenance of the health infrastructure Gujarat needs to improve access to blood for obstetric cases
Mavalenkar & Sriram 2009⁸⁰ South Asia	Literature Review	Anesthetics	Mothers and neonates	Task shifting for provision of anesthesia has been implemented in public sector rural hospitals of South Asia in recent years because of significant shortages of anesthetists, but there has been limited research on this issue A review of the literature on task shifting in anesthesia was conducted using three electronic databases - PubMed, Medline and Google Scholar.	Availability and coverage of specialists in rural areas of South Asian countries is low compared to the huge populations of countries in this region. This review shows that task-shifting programs in anesthesia have been initiated in most South Asian countries and that coverage of anesthesia providers has expanded as a result.	The training cost and training period for mid-level providers are lower than those of anesthetists. A major factor contributing to the shortage of anesthetists in South Asia is the fact that most countries in the region have a low level of training slots for anesthesia specialists Political and administrative will is necessary, not only for the initiation of task shifting but its	there is limited documentation of task-shifting programs in anesthesia in South Asian countries There is no director or manager at the national or state level who is responsible for the availability of anesthesia services in rural areas. People in rural areas are getting no care, which is far worse, even though good quality services	

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						successful implementation Job descriptions and job clarity form an important part of human resources management	can be provided by a mid-level provider. There is also a lack of systems focusing on monitoring, evaluation or performance rewards. There has been no refresher training, continued mentoring or technical support for trained personnel Resistance to task shifting has come from two main channels – professional societies and government Policy makers.	
WHO 2004¹⁰⁹ Myanmar	Review article	Myanmar Ministry of Health	Mothers and children	Review Article	Various activities have been implemented, with particular emphasis on improving essential obstetric care and post-abortion care. Although there have been significant improvements in quality of MNH service delivery, current estimates indicate that maternal mortality ratio has not declined to the levels anticipated. Most daily health services are managed at the township level. Among basic health workers, lady health visitors and midwives provide the backbone of maternal health care service delivery, with the assistance	Complications following abortion make up a much larger proportion of maternal deaths than in neighboring countries. A large proportion of maternal mortality is found to be preventable	Much more work is still require to intensify efforts to increase the low proportion of births attended by a skilled health care provider – a skilled attendant, who can institute emergency measures to prevent and manage pregnancy complications leading to mortality Scarcity of supplies, equipment, live-	Improvement of the health status of children is one of the priority areas for Government, Major activities include training, provision of logistics and human resources, and supervision. Improving skills of health care providers. Strengthening the health system to deliver child health services Improving family and community practices Improving the enabling environment Improving the evidence-base for decision making.

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					of auxiliary midwives (AMWs)		saving drugs, and job-aids at the peripheral level. This is the most pressing constraint The cost of referral services and frequently delayed referral Inconsistencies in collection of routine data and other relevant information, turnover of basic health staff, increasing the availability of adequate supplies and equipment	
Penn-Kekana et al. 2007⁸⁸ Bangladesh, Russia, South Africa and Uganda	Observational	Health care providers ???	Mother, neonates and Skilled birth attendants\	The paper focuses on constraints to maternal survival.	A greater focus is required instead on the principle that strategies will not work if the component packages are not rendered effective and the means used for their distribution do not achieve high coverage of the intended group	A greater focus is required instead on the principle that strategies will not work if the component packages are not rendered effective and the means used for their distribution do not achieve high coverage of the intended group. Programmes and policies that aim to improve how maternal health care is delivered are social interventions, not only technical ones international agencies and	One factor that often contributes to the failure to deliver planned interventions effectively is the failure to invest sufficient resources. The critical importance of these factors to outcome is not reflected adequately in the policy advice currently being offered, or given the attention in official reports and publications that it deserves.	The first priority for low- and middle-income countries is to devise better strategies to implement effective interventions The simple conceptual model proposed seeks to put the strategic emphasis on managing implementation rather than devising and refining the content of intervention What works to happen is that strategies that have been evaluated as effective elsewhere are a starting point rather than an end point. a recruitment strategy, a consultation strategy, a training

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						technical advisors need to give “advice” more circumspectly, that it is necessary to capacitate local program managers to continuously make program-improving adjustments, and that when evaluating programs and learning lessons, the detail related to process, not just outcomes, must be documented		curriculum, a group of trainers and trainees, an incentive regime, a management team and an information system, among others – needs to be analyzed, defined and monitored. A crucial task of evaluation should be to include (via hypothesis-making and research design) investigation of the extent to which these pre-existing structures enable or disable the intended mechanisms of change
Price & Hawkins 2007⁹¹		Health care providers	Developing countries who were the participants	The dominant conceptual framework for understanding reproductive behavior is highly individualistic. In this article, it is demonstrated that such a conceptualization is flawed, as behavior is shaped by social relations and institutions. Using ethnographic evidence, the value of a social analysis of the local contexts of reproductive health is highlighted. A framework is set out for conducting such a social analysis, which is capable of generating data necessary to allow health programs to assess the appropriate means of improving the responsiveness of service-delivery structures to the needs of the most vulnerable	The rights-based approach to development is a core concept in current social policy discourse. Reproductive health programming is a messy and complex business, in which social actors (the so-called program beneficiaries) are continually trying to develop and negotiate strategies for dealing with competing interests and multiple perspectives in different social situations.	Reproductive health depends upon the extent to which poor and marginalized groups are able to realize their rights to economic and social resources. The identification of causes of poverty, social marginalization, and social exclusion is, therefore, essential in any social analysis. The most effective communication approaches are those in which behavior change is reinforced from within peer groups and in which information	People are unable to exercise their rights if their livelihoods are endangered, public-health and education systems are inadequate, and cultural diversity and ethnic identity are not respected	Creating and/or supporting social, political and physical environments that enable the poor and marginalized groups to realize their rights to access resources can provide an important basis for poverty elimination. Creating the supportive environments for behavior change at the local level may encompass a range of elements. Enabling environments need to be created to support and motivate peer educators and community agents. Capacity-building of the existing informal and formal community-based support networks

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						is received and exchanged based on relationships of trust		and organizations is essential for enhancing social capital and for bringing about sustained behavior change. Approaches to increasing access for marginalized and vulnerable groups to healthcare and reproductive health services need to be based on an understanding of health seeking behavior and the needs of primary stakeholders Building mechanisms into programs to allow upward accountability in policy, institutional and service-delivery systems is essential to improve the responsiveness of services to the local realities of users and potential users.
Prakasmma 2009⁹⁰ Andhra Pradesh, India	Case study	Health care providers	Mothers, midwives and public-health staff	Andhra Pradesh, a large state in southern India, has a high maternal mortality ratio of 195 per 100,000 live births despite the improvements in social, demographic and health indicators over the last two decades. This contrary situation has been analyzed using findings of different studies on maternal mortality, and four factors have been presented for consistently-high maternal mortality in the state	Andhra Pradesh achieved great success in development and demographic fields in the last two decades. At the same time, the state has not been successful in overall development of women or in providing healthcare to women and children, indicating gross paradoxes in development of the state. Andhra Pradesh presents perplexities and paradoxes relating to social development, gender, and use of health services.	Andhra Pradesh presents perplexities and paradoxes relating to social development, gender, and use of health services. The relatively-slow decline in the MMR in Andhra Pradesh compared to the rapid decline in population growth is the result of skewed political priority setting and	Maternal health has not yet received the focus of the Government, except on an ad-hoc basis and on a very narrow level of promoting institutional deliveries. the disproportionately-high focus on family planning towards population stabilization	Regulatory mechanisms for anesthesia providers are the next step for sustainable task shifting Successful task shifting for anesthesia in EmOC also needs supportive managerial arrangements Ensure motivation of trained staff through recognition of good work and rewards. Good quality competency-based training is the foundation of successful programs and must be

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					The success of the family-planning program was due to political will and bureaucratic commitment at the highest level	selective program implementation. The Academy for Nursing Studies is collaborating with the Government to develop a model in Medak for operationalizing the PHCs as round-the-clock service centers for maternal and neonatal care by enhancing the midwifery of nurse-midwives in the periphery	reduced the emphasis on maternal health in the peripheral hospitals, resulting in low use of these facilities for childbirths. The growth of Primary Health Centres was not given adequate emphasis, resulting in the weakening of the peripheral health system. There was little emphasis on developing a cadre of midwives who would have primarily focused on maternal health. The low status of women in the state has hampered timely referral and access to services	given careful consideration before being implemented. It is important that governments support anesthesia providers in rural areas with functional equipment and a sustainable drug procurement system. Structured task shifting programs in anesthesia for EmOC must be scaled up in South Asia in order to provide the full range of services necessary to reduce maternal and neonatal deaths. Further systematic research must also be done on the effect of these task-shifting programs on indicators related to anesthesia complications, maternal mortality and neonatal mortality in order to fully assess their impact
Padmanaban et al. 2009⁶⁶ India	Case study	Health cre providers	Mothers, neonates and skilled health attendants	This case study was developed based on the personal observations of one (PP) of the authors and a review of available literature and secondary data for Tamil Nadu. Secondary data were drawn from various national surveys and service statistics compiled by the State Government. Various documents on policy and program and relevant literature were analyzed. Published and unpublished	The state has become one of the top performers in the country in terms of maternal health with its MMR now at 90 (2007) (1) compared to other states. Along with the deployment of community-level staff, the Government also strengthened the infrastructure of the Subcentres. The Government also strengthened Primary Health Centres (PHCs) and	Reasons behind the decline in maternal mortality in Tamil Nadu are assumed to be the increase in institutional deliveries, deliveries assisted by a skilled birth attendant (SBA) and use of emergency obstetric care (EmOC) when required.	high maternal mortality could be due to lack of access to high-quality skilled care and EmOC, poor nutritional status, including high levels of anemia, and improper referral in the case of emergency. major Challenges	There is a need to analyze the MMR district-wise and focus on those districts which have a high MMR.

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				reports of government and non-governmental agencies were reviewed to gain insights into the maternal health situation in Tamil Nadu	Community Health Centres (CHCs). Due to political commitment and proactive administration, the indicators of maternal health have improved over the years	Posting of female doctors at the periphery is assumed to have played a major role in the increased use of health services by rural women. Efforts to improve maternal health include improvements in availability of human resource, availability of drugs and supplies, improved management capacity, better monitoring of health services, and analysis of maternal deaths	remain in improving the quality of infrastructure and services in rural areas for maternal health	
Plainbangchang 2006 ⁸⁹ South East Asia Region		WHO		A vision for Health Development in South East Asia		Family and community behaviors, predicated by socio-cultural factors, profoundly impact the health status of mothers, newborns and children. Equitable access to effective interventions, with particular attention to quality of health services, produce the desired results even within resource-challenged settings. A desired reduction in maternal and child mortality depends,	In many countries, a very large percentage of newborns and mothers do not receive skilled attendance during birth and in the critical days and weeks thereafter. More appropriate strategies and approaches for our Region to reduce maternal and child mortality are yet to be developed. The continuum of care that the mother receives before and during pregnancy, as well	A health system approach, thus, needs to inherently include strategies for working with health services as well as individuals, families and communities to improve maternal and neonatal health. We have to advocate for political will, commitment and action in countries. We have the knowledge and technology to prevent a majority of maternal and child deaths. But, these are yet to be applied optimally, within the local context and framework in countries.

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						to a large extent, on multi sectoral & multi disciplinary efforts.	as during childbirth and the period soon after birth, is a critical determinant for the survival and well-being of the mother and baby	
Say & Raine 2009⁹³ Developing countries	Systematic review	Health care providers	Mother and skilled birth attendants	Four electronic databases (MEDLINE, EMBASE, CAB Direct and POPLINE) were searched by developing search strategies specific to their medical subject headings and text words with the help of an expert librarian.	urban or wealthier women were usually more likely to deliver with the help of a skilled health worker than were rural or poor women. Urban women were more likely to use medical settings for delivery than were rural women	The association between place of residence and receipt of early antenatal care was not consistent	Differences in women’s autonomy, gender relationships and social networks, which are influenced by embedded social structures, religion and cultural beliefs more subtle, but equally influential, context-specific individual level factors emerged, as did interactions between individual level and health service-related factors.	Need to thoroughly explore and address context-specific causes of variable use of maternal health care if safe motherhood is to become a reality in developing countries.
Rasch 2007¹ Developing countries	Observational	Health care providers	Mothers, CHWs, TBAs and skilled birth attendants		Increased access to skilled attendance with the backup of a well functioning health system has resulted in decreased maternal mortality. In spite of strong advocacy for facility based deliveries, some women will choose to deliver at home either with a skilled attendant, an CHW or an TBA	There is not a simple and straight-forward intervention, which by itself will bring maternal mortality significantly down; and it is commonly agreed that the high maternal mortality can only be addressed if the health system is	CHWs and TBAs were often just trained briefly and left without a well functioning backup system. Retention of workers, especially in the poorest countries, is a global concern, and there is a need of major	Efforts should aim at globally increasing the number of births assisted by skilled attendants to 80% in 2005 and 90% in 2015. Instead of excluding TBAs from providing maternity care, they may be considered as resource persons, who could be involved in maternity care programs, provided

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						strengthened. a well functioning health system with provision of equipment, drugs and other supplies is needed for the effective and timely management of delivery complications, which may lead to maternal death	investment in human resources to counter the present momentum of emigration of qualified personnel. As a result of the health facility based focus, community based interventions have been neglected and undervalued	they are working under close supervision from trained nurses/midwives. upgrading mid level staff to provide life saving obstetric surgery.
Shah and Say 2007¹⁰⁴ Developing countries	Observational	Skilled birth attendants	Mothers and neonates	Maternal mortality continues to be the major cause of death among women of reproductive age in many countries. Data from published studies and Demographic and Health Surveys show that gains in reducing maternal mortality between 1990 and 2005 have been modest overall	The progress in reducing maternal mortality has been modest. A general increase in the percentage of deliveries attended by skilled attendants was noticed where two surveys, generally five years apart, had been conducted. Increase in contraceptive use over the period resulted in decline in fertility and unplanned pregnancies	Skilled attendance at birth is a key indicator for monitoring a country's progress in achieving MDG 5. Also needed is access to referral facilities able to address obstetric complications. liberalisation of the abortion, control of infectious diseases, increased contraceptive use and expanding access to hospital care and midwifery has decreased maternal mortality in many developing countries.		WHO recommends at least four antenatal care visits with trained health personnel (doctor, nurse or midwife) during normal pregnancy Post partum care should be within 24 hours after delivery, and all women should receive it. Efforts will need to be redoubled and multifaceted.
Stanton et al. 2007¹¹⁰ Developing world	Observational	Skilled birth attendants	mothers	This paper assesses global progress in the use of skilled attendants at delivery and identifies factors that could	Weak negative relationship shown between developing country maternal mortality ratios and the percentage of	These increases in the use of a skilled attendant at birth are almost	Recently delivered women report the qualification of	Thus, expanding access to basic obstetric care by upgrading existing lower level facilities,

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				assist in achieving Millennium Development Goals for maternal health. National data covering a substantial proportion of all developing country births were used for the estimation of trends and key differentials in skilled assistance at delivery	births with skilled attendance. Skilled attendance at birth increased in the developing world from 45% to 54% between 1990 and 2000. Both the youngest and oldest mothers having low levels of skilled care at birth compared with those aged 20–29. Skilled attendance at delivery also varies according to parity. Women who are delivering their first births are most likely to deliver with a skilled attendant and coverage decreases as parity increases	exclusively the result of increases the use of doctors. There is a clear pattern of emphasis on higher level health institutions for skilled delivery. Antenatal care visits represent an important opportunity for health care providers to inform women about the advantages of delivering with a skilled attendant.	their birth attendant but do not report on provider skills. Women aged 45–49, who are at greatest risk of maternal mortality, are the least likely to deliver with skilled attendants in all regions.	increasing availability of such facilities, and improving referral systems may be more cost-effective in achieving widespread coverage than focusing on increasing hospital-based births. more careful attention needs to be paid in international survey programs to accurately classify the type of health care provider and type of health care facility used for delivery.
Unger et al. 2007¹¹¹ Developing countries	Observational	Skilled birth attendants	Mothers	This paper examines why progress towards Millennium Development Goal 5 on maternal health appears to have stagnated in much of the global south. This paper offers a critical perspective on the past 15 years of international health policies as a possible cofactor of high maternal mortality, because of their emphasis on disease control in public health services at the expense of access to comprehensive health care, and failures of contracting out and public-private partnerships in health care	The failure of progress on maternal health has been toned down by donors and national governments with claims of “uneven” achievement. Overall maternal health budgets remained substandard. Long-term public funding remains grossly insufficient. Verticalisation of services has particularly affected maternal health care. When it comes to training skilled birth attendants in LIC/MIC, the commercial sector has shown itself unable to substitute even for ailing public services.	In low-and middle-income countries, health care as a right is an issue of development and of political and economical stability. Without policies to make health systems in the global south more publicly-oriented and accountable, the current standards of maternal and child health care are likely to remain poor, and maternal deaths will continue to affect women and their families at an intolerably high level.	The World Bank dismissed as irrelevant “the provision of comprehensive health care in public services. The loss of clinical skills among doctors, nurses and midwives has been aggravated by the weakening of academic clinical teaching and curricula and by the multiplication of commercial, unregulated and uncontrolled medical schools in universities. Maternal health programs have simply been	Achieving maternal health requires a great deal from health systems, in particular the provision of comprehensive care, including effective health centres for antenatal care, treatment of complications and rapid referral. Sharing resources across facility boundaries for the sake of economies of scale is needed, as well as mutual support between providers. Policies that is adapted to the environment of low-and middle-income countries. Secure universal access to comprehensive Care

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Vora 2009 ⁹⁸ India	Case study	Health care providers	Mothers, stakeholders Health system	Various methods were used for collecting relevant information, including a review of literature (i.e. published and unpublished reports of government and non-government agencies), secondary analysis of data from the management information system of national programmes and from states, interviews with stakeholders, and a study of key institutional processes, roles and authorities of key actors, organizational structures and functions, and administrative support. Data were also drawn from the National Family Health Surveys (NFHSs) and District Level Household Survey (DLHS). Information regarding health infrastructure and human resources was collected from the DLHSs, facility surveys, and national government	A principal cause for the decline was thought to be the decrease in the incidence of malaria because pregnant women with malaria suffered higher fatalities. Nearly half of the women now have their births attended by health personnel. The educational and economic status of women influences the use of maternal care.	Hemorrhage is considered to be the major maternal killer in India. Deaths due to sepsis and obstructed labor may be attributed to the high proportion of deliveries at home.	unable to mobilize LIC/MIC public services to meet the MDG5 targets, despite numerous international conferences and initiatives. Funding agencies have set up an unintended competition between maternal and infant and child health and between skilled facility based care and community care. Postnatal care remains the most neglected area. The educational and economic status of women influences the use of maternal care. There is no system of accrediting health facilities or evaluating functionality of health facilities at the state or national level. Over 70% of the FRUs and CHCs do not have linkages with a district blood-bank. More than half of the CHCs, FRUs, and district hospitals do not have	Establishing a reliable vital registration system is a must to achieve low rates of maternal mortality. Addressing policy, program priorities, and governance issues Improved management capacity and human-resources <i>development</i> . Evidence-based and focused strategy for reducing MMR. Annual implementation plans and monitoring progress. Improvements in coordination. Improved public-private partnerships. Vital registration system and reporting of maternal deaths for quality services. Generating the political will and advocates for maternal

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				documents/website			residential quarters for staff. Managerial capacities at the state level for maternal health are also a major problem. Government of India never planned any systematic intervention to improve the use of the communication and emergency transportation system for healthcare in the country	health
World Health Report 2005⁵⁴	WHO report	Health care providers	Mothers neonates and children		Antenatal care is vital for both mother and baby. The countries that have successfully managed to make childbirth safer have one thing in common: they chose the path of providing access to professional skilled care before, at and after childbirth.	The irony behind this lack of progress is that most of the deaths could be avoided since the life saving interventions are well known and can be implemented on a large scale, including in resource poor settings. Large gains in maternal health can be made by improving care during the postpartum, a period that has traditionally been neglected	Services may simply be unavailable, or women may find it difficult to access them because of their gender or because of barriers generated by poverty, race, language and culture, uncertainty about what care will cost them, or the awareness that it will be too expensive, There remains a huge unmet need for investment in information, in education and in	Building the continuum of care. There continues to be a need for improving quality, responsiveness and coverage. Professional first level childbirth care has to be available 24 hours per day, every day, to attend to all mothers and newborns, with the back-up of a hospital that can provide referral level care 24 hours per day, every day for those who need it. The importance of bridging the postnatal and postpartum gap. Upgrade skills, delegate tasks and redefine responsibilities. Make skilled care the

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							access to family planning	centerpiece of the MNCH strategy. Reconcile MNCH programs with health system development. Take legal and regulatory measures to protect the rights of women and children.
Serour 2009⁹⁴ Developing countries	Review article	Skilled birth attendant	Maternal and child health	Brain drain of health workers has a negative effect on the reproductive and sexual health of the people in the source country, especially those who rely on public medical services in rural areas. Shortage and uneven distribution of healthcare workers, aggravated by the brain drain, has contributed to the high rate of maternal and newborn mortality and morbidity in the source countries compared with the recipient countries, causing the largest disparity of all public health measures.	When health professionals migrate to high-income countries the poor may be forced to seek medical treatment from traditional healers, while the wealthy may travel outside the country for their routine medical checkups; this aggravates the inequity in access to healthcare services in such countries.	A medical school with locally relevant orientation in Sub-Saharan Africa or South East Asia would assign the highest priority to endemic problems with significant mortality such as malaria, HIV, sexually transmitted infections, multidrug resistant tuberculosis, bilharzia, malnutrition, and childhood diarrhea. It would place special emphasis on clinical examination skills by training students to use evidence based locally-adapted guidelines, simplified diagnostic and therapeutic procedures, and generic medication for endemic and common diseases. There would be less emphasis on		In some countries, where the under production of health care workers is a major problem, initiatives have targeted task-shifting and the assembly of new cadres of workers. In Lusikisiki, South Africa, HIV/AIDS patients are attended by physicians only in complex cases, nurses prescribe antiretroviral drugs, and pharmacy assistants have filled gaps in care. A medical school with locally relevant orientation in Sub-Saharan Africa or South East Asia would assign the highest priority to endemic problems with significant mortality such as malaria, HIV, sexually transmitted infections, multidrug resistant tuberculosis, bilharzia, malnutrition, and childhood diarrhea. It would place special emphasis on clinical examination skills by training students to use evidencebased locally-

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						modern western expensive diagnostic and therapeutic tools. Graduates would be qualified doctors who are community oriented.		adapted guidelines, simplified diagnostic and therapeutic procedures, and generic medication for endemic and common diseases. There would be less emphasis on modern western expensive diagnostic &therapeutic tools. Graduates would be qualified doctors who are community oriented.
Naicker et al. 2009¹⁰⁷ Africa	Narrative review	Doctors and nurses		WHO recommends a minimum of 2 physicians per 10,000 population; 29 of the 46 sub-Saharan countries are below this level, and an additional 7 are at this bare minimum; only 10 are above. Interestingly, 4 of the 5 North African countries are well above the WHO minimum	There would be the cost of 5 years' undergraduate medical training as well as compensation for the loss of a fully trained health professional who would be a potential role model and teacher.	Train more doctors and other health professionals to meet the needs of developed countries; norms need to be established for doctors, nurses, and other health professionals. ¹⁸ -End active recruitment from developing countries. -Increase development aid and technical assistance. -Match visa to duration of training.		
Rolfe et al. 2008⁹² Tanzania	Case study	senior health planners and representatives	midwives	For each case study, health care provision was mapped. Qualitative and quantitative data were collected. Total 125 in-depth interviews and 58 focus group discussions (FGDs) were conducted, in English or Kiswahili according to respondent preferences.	Private midwifery practices were found concentrated in a 'new' workforce: retired, or approaching retirement, government-employed Nursing Officers who made the switch' to self-employment.	potential of the untapped pool of skilled health workers represented by retired workers is beginning to be recognized.	Extremely poor government sector salaries, inadequacy of pensions and fear of a decline into poverty after retirement	Health systems need to be understood within their local social and political contexts. Changes are needed at several levels and that supply and demand-side barriers need to be taken into consideration

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					Most of the maternity homes were in rural or peri-urban areas, distinguishing them from doctor-run clinics	Our findings do suggest that there may be scope, in this Tanzanian context at least, for encouraging retired nurse-midwives to develop independent practices in under-served areas within a network of coordinated and supported health services, although it is necessary to be cautious about extrapolations from a small group of early adopters to the wider workforce.		Reduce start-up costs and should allow private practitioners to tailor their services according to their skills and local needs, and open up a future possibility of domiciliary midwifery care. Increasing the size of the maternity workforce can only be part of the solution. Skilled attendance' requires at least two key components: a skilled attendant and an enabling environment that includes equipment, supplies, drugs and transport for referral, and backup emergency obstetric care. Needs of poor communities are to be properly addressed then on-going financing needs to be considered
Round up 2009 ⁵⁶ South Africa, Kenya, Zimbabwe, Nigeria, Tanzania, Poland Afghanistan , Bolivia, Indonesia and India	WHO report	Skilled health attendants	Mothers and neonates	WHO has revised the maternal death classification system to reduce inconsistencies and improve standard definitions for identifying severe maternal morbidity and near-miss cases.	Since 1998, HIV has been the leading contributor to maternal mortality in South Africa. Although HIV testing increased 1.4-fold each year and antiretroviral coverage for pregnant women reached 59% in 2007, levels remain suboptimal. The HIV/AIDS responses in maternal health programs was "very weak". Women seeking reproductive health services in Kenya suffer serious human rights violations. In many low-income countries, maternal	Most maternal deaths occurred at home as many women could not afford transport to facilities or the fees charged on arrival. Measures are not always taken to reduce HIV transmission during delivery, often due to lack of equipment, supplies and infrastructure. Misoprostol	repeat testing of seronegative women late in pregnancy is rarely offered, meaning that infection acquired during pregnancy may be missed pre and post-test counseling about HIV, as well as PMTCT counseling,	Barriers to integration of HIV treatment and care for women into maternal health services should be addressed

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					refusal of caesarean delivery, even in the case of absolute necessity, is a concern. Direct and indirect costs are an important barrier to women’s use of facility-based maternity care	is a cost-effective maternal mortality intervention for home births and could save the lives of tens of thousands of women each year		
Simkhada et al. 2007⁹⁵ Developing countries	Systematic review	Skilled birth attendants	Mothers	The aim of the review was to identify and analyse the main factors affecting the utilization of antenatal care in developing countries. Cross-sectional surveys, cohort studies, case-control studies, randomized controlled trials and qualitative studies carried out among women examining any aspect of the utilization of ANC in developing countries (using the United Nations’ definition) were reviewed.	In South Asian culture, for example, the use of preventive services such as routine ANC is alien as healthcare services are perceived as curative only. There is very limited qualitative research which would be beneficial for exploring women’s satisfaction, autonomy and decision making processes in relation to ANC. Most studies found that women’s education is the dominant factor in the utilization of ANC in developing countries, but husband’s education is also important. Many studies identified cost as a barrier for poor people in developing countries. Women with higher living standards may also have better access to mass media informing them of the benefits of ANC. Access and availability are key concerns in ANC utilization. It is unclear whether religion and caste/ethnicity play an important role in ANC utilization	Educated women are more likely to realize the benefits of using maternal healthcare services. Education increases female autonomy. Shortages of skilled attendants are common throughout developing countries	None of the selected studies examined women’s satisfaction with ANC and thus we do not know whether usage is related to satisfaction with the experience in developing countries. Only one study has looked at the effect of the quality of services on their uptake and reported negative attitudes of healthcare workers and poor relations between healthcare workers and women as major barriers	Adequate utilization of antenatal care cannot be achieved merely by establishing health centres; women’s overall (social, political and economic) status needs to be considered. Comprehensive health promotion through awareness-raising and appropriate education of healthcare workers could help to improve the uptake of ANC services. Midwives and nurses, as the main ANC providers should be aware of potential barriers to utilization in developing countries. They should be trained to be sensitive to women’s socio-economic situation and their cultural and traditional beliefs and their communication skills improved. Further (qualitative) research into women’s perceptions of, and satisfaction with ANC and other maternity services
Thompson	Jogann.	Health care	Mothers, girls,	Healthy, prosperous nations	Poverty, economic	The promotion of	Women in	Individual and group

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2007 ⁹⁷ Africa, south asia	Thoughts and opinions	providers	neonates	require healthy women and newborns. Young girls and women in resource-poor nations suffer the greatest ill-health consequences from low status, denial of basic human rights, and poverty. Poverty and poor health result in poor economic development. The Millennium Development Goals call for immediate efforts to reduce poverty, improve health, especially of girls and women, and foster development in the world ' s poorest nations.	development, and the poor health of women are a deadly combination of elements that, if left as is, will result in continued poor health of families, continued high rates of maternal and neonatal mortality and morbidity.	health, alleviation of poverty, and advances in economic development will only occur when women are viewed as fully human, are equally valued as persons, and are healthy. Health of girls and women is affected by low status, denial of human rights, and poverty. There is a global call to action to address the importance of women in health and development of nations.	resource-poor nations were prevented from attaining their fullest potential in health and well-being. Women denied their right to information and education are experimented on without their fully informed consent. Access to family planning counseling and services is difficult in many poor countries for a variety of reasons. Financing health services, especially modern contraception methods, remains a problem in the developing world	commitments to advocacy, political action, and financing. Policies and programs that enhance health equity and integrate pro-poor, gender responsive, and human rights Approaches. helping policy makers across sectors to work together and share responsibility for the health of its citizens. Building partnerships with communities, men and women, politicians, donors, and governments is the way forward to improving health & development. Listen to women's concerns and needs. Treat women with respect and dignity at all times. Promote self-care, knowledge, and understanding of how to be and stay healthy Recognize and change discriminatory practices against women. Take political action needed to eliminate gender discrimination. Give women voices and well as choices in their lives and their health. Promote basic human rights for all

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Wirth 2008 ⁴⁸ Ethiopia, Ghana, Malawi, Mozambique, and Tanzania	review	Doctors, nurses and midwives.	Mothers and neonates	The attainment of the fifth Millennium Development Goal requires adequate national reserves of skilled birth attendants. Nurses, midwives, and their equivalents form the frontline of the formal health system are a critical element of global efforts to reduce ill-health and poverty in the poorest areas of the world	Skilled birth attendants are a key to prevent maternal mortality. Equity and coverage are central to the ability of nations to reduce maternal mortality	Critical to the new focus on health systems are key strategic human resource questions. 24-hour presence of a well-trained professional highly skilled in managing labor and its complication is needed	Vacuum in political will in the context of poverty Lack of guarantees of basic livelihoods Insufficient supply of health workers in pipeline. A field in isolation amidst turf battles Gender inequity in training and in the field.	Harness political will backed up by sound metrics. Ensure livelihoods of frontline health workers Fill the nurse/midwife pipeline: make link to secondary school participation explicit. Seed networks and professional organizations Rapidly scale-up a robust cadre of delivery care Professionals. Countries must undertake a massive training and deployment of nurses and midwives
Anyangwe & Mtonga 2007 ²² Sub Saharan Africa	Descriptive		Health workers (doctors, nurses, and midwives)	This paper describes the extent of the global health workforce crisis and focuses on the reasons for, and the effects of the crisis in sub-Saharan Africa	The availability of health workers has now become an indicator that differentiates the “haves” from the “have-nots”, the developed countries from the developing, and the rich nations from the poor ones. In general, countries with higher per capita GDP and incomes have more health workers. In general, amidst the inter-country and inter-regional imbalances in the density of the health workforce, there are also intra-country inequities, with greater numbers and better trained health workers concentrated in urban areas, to the detriment of rural areas	Sub-Saharan Africa carries about 74% of the global burden of communicable diseases. The migration of skilled health workers, infamously known as the “brain drain”, is one of the most prevalent causes of the health workforce crisis in the region. Poor economic growth and successive fiscal difficulties appear to be the immediate causes of the crisis.	The most common factors that force health workers away from jobs in rural areas are the lack of incentives and amenities, as well as limited opportunities for career progression. There is simply insufficient adequately trained human capacity, of all cadres, in the region to absorb, apply and make efficient use of the interventions being offered by many new health initiatives. Presence of health workers with	Increase investment in pre-service training (intake and output) Improve income and living wage. Extend retirement ages Improve the Distribution of Human Resources

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							skills not suited for the health needs of their countries	
Blum et al. 2006⁶² Bangladesh	observational	Research investigators	Skilled attendants and managers	In an effort to make skilled attendance at birth more accessible, some countries in Asia have begun major initiatives to promote the option of home delivery with a midwife. Yet there is little empirical evidence from the region to suggest that home-based care is as safe or effective as care in medical facilities. Qualitative research involving key informant and in-depth interviews and group discussions was carried out in 2003 and 2004 in Matlab, a rural area of Bangladesh, to examine the feasibility of home- vs. facility-based delivery from the perspective of 13 skilled birth attendants.	The strong preference for home birth is commonly associated with restrictions on female mobility and cultural norms. The difficulties faced while assisting the home deliveries were, transport, lack of proper environment, Lack of acceptability of procedures: delivery position and episiotomies, Lack of necessary supplies and equipment, Resistance to referrals, Lack of training for home delivery and Medical supervision, social pressure, Scheduling difficulties	The rationale for instituting skilled attendance for home based deliveries was associated with cultural norms favoring home births	Major constraints encountered during home deliveries, including poor transportation, inappropriate environment for delivery, insufficient supplies and equipment, lack of security, and inadequate training and medical supervision, which may prevent the provision of skilled care. There remains an ongoing debate among national and international stakeholders about whether skilled birth attendants should be posted at the domiciliary or facility level	Global priority is to ensure skilled attendance for all births and access to emergency obstetric care for complications. National governments should be encouraged to clarify what their policies and aspirations are in terms of where women deliver, and either commit to a facility-based strategy or make explicit the rationale for choosing other alternatives
Costello et al. 2006⁶⁵ Bangladesh , Nepal	Lancet maternal Health series	Skilled birth attendants	Mothers	Discussion about alternative strategies to decrease maternal mortality	need for more investment, political commitment, and research to reduce the unacceptable annual burden of half a million maternal deaths. Vitamin A supplements in pregnancy reduced maternal deaths by 40% in	Intrapartum care based in health centres is appropriate for all as a longer-term strategy, but might not be the best option for reducing maternal	Traditional birth attendants are not a substitute for midwives but they are the main provider of care during delivery for millions of women, especially	Delivery attended by a skilled attendant in a health facility should be a woman's right if that is her choice. governments need to be held accountable for the comprehensive provision of facility-

Table 4: descriptive studies

Author/ Year / Country	Study Design	Worker Involved	Participants	Description	Outcome	Lessons	Gaps /Limitations	Recommendation
					Nepal, Fertility reduction was undoubtedly an important factor in reducing maternal mortality in Bangladesh	mortality in all contexts in the shorter term. infection is seriously underestimated as a contributing factor to maternal deaths	in settings where mortality rates are high. Inadequate assessment of the effect and cost effectiveness of the strategies	based midwifery and obstetrical care. central focus of safer Motherhood programs, and a primary responsibility of government, is that women and communities are empowered to demand their rights to pregnancy, childbirth, and newborn care. Hemorrhage might be prevented or treated in the community if oral misoprostol was provided to government-based outreach health workers
Carr & Reisco 2007¹¹² Brazil	Observational	Skilled birth attendants (doctors nurses and midwives)	mothers	In the last decade, nurse-midwifery in Brazil has experienced many changes both professionally and politically. In the 1990s, Brazil's Ministry of Health generated policies to improve childbirth services. Included in these policy initiatives was legislation for the reimbursement of nurse-midwifery services and a substantial increase in financing of nurse-midwifery schools throughout the country	The factors associated with Brazil's high cesarean section rates have been described as economic and socio cultural. Specific variables that impact maternal mortality in Brazil, including geographic region and race. Socioeconomic factors result in Afro-Brazilians and Asian Brazilians having higher MMRs than whites. Another important factor is the role of abortion, which is illegal in Brazil, and the third leading cause of MMR. Recognition and reimbursement of nurse-midwifery services, and the financing of the expansion of nurse-midwifery programs throughout the country	In the private sector, cesarean section and sterilization are offered as a package, which is financially advantageous for the provider of the service	The re introduction of nurse-midwives and professional midwives in Brazil has generated predictable conflict between nurses, nurse-midwives, professional midwives, and physician. There is confusion about the definition of roles between the various health care providers, and the protocols related to practice. A common scenario in Brazilian health policy is the lack	Formal mechanism to measure the impact on practice or health indicators, the political power of the midwifery profession to influence policy. Civil society needs to take a more active role in demanding reproductive rights, choices, and access to quality health care

Table 4: descriptive studies

Author/ Year / Country	Study Design	Worker Involved	Participants	Description	Outcome	Lessons	Gaps /Limitations	Recommendation
Falconer et al. 2009 ⁶⁷	Observational	Skilled birth attendants	mothers	Maternal Mortality Campaigns shows in its list of objectives for 2009, improving women’s health in poorer countries requires more funding, more health workers and the better application of what we know works	Women’s health is badly affected by all the problems associated with poverty and “failing states”: from lack of education and public services to conflict and the breakup of communities. Global shortage of health workers is critical to further improvement in all aspects of health	Sexually transmitted diseases require diagnostic and therapeutic skills that can be imparted to a variety of health care workers. Different countries will adopt different models, need different types of staff and resources and be influenced by different geographical, demographic and social factors.	of continuity from 1 administration to the next Low levels of training, high rates of migration to richer countries and by poor retention of trainees and staff.	Need for a multi sectoral approach to women’s health that goes far beyond the purely clinical. Training of staff, their employment and retention, improved management practices and better management of the impact of health worker migration. Good clinical practice, additional resources and social change need to go hand in hand. creating a central facility with strong clinical leadership, supported by effective Information systems. Improvement requires many leaders – clinical, political and social - to work together on a common program to build new models of healthcare and new workforces suited to the needs of the country
Fernando et al. 2003 ⁶⁸ Sri Lanka	observational	Killed birth attendants (doctors nurses and midwives)	mothers	Expansion of both field-based and institutional services through the past decades contributed to improved geographical access and provision of ‘free’ services improved economic access. These led to increased use of antenatal and natal services provided by trained midwives and other personnel followed by improvements in the	Facilities available at the institutions were improved with access to specialized services in the higher level of hospitals, which served as referral centres. Antenatal services through clinics held at government institutions. Expansion of the health unit system which provided assistance from trained midwives in	Empowerment of women and education have been two key factors that have influenced the utilization of health services which contributed to the decline in the MMR	Several circumstances have led to a deterioration of coverage of maternal deaths	It is necessary to pay attention to ‘within country’ variations, with several districts reporting high values. necessary to consider improving the current system of maternal death audit by establishing a system for confidential inquiry into maternal deaths.

Table 4: descriptive studies

Author/ Year / Country	Study Design	Worker Involved	Participants	Description	Outcome	Lessons	Gaps /Limitations	Recommendation
				availability of specialized care and emergency obstetric care.	home-based deliveries and by increasing the availability of facilities for institutional deliveries. The family planning (FP) program was gradually integrated into the MCH services of the Department of Health Services. Training of personnel. Contribution by international organizations towards the national strategies ranged from support for development of physical facilities, provision of supplies and equipment to supporting training programs locally and overseas and consultancy services			
FIGO 2008⁶⁹ Kenya, Africa , Pakistan, India	FIGO committee report	Skilled birth attendants	mothers	This article was prepared by the FIGO Safe Motherhood and Newborn Health Committee	There is a lack of population level data to show the impact on maternal and neonatal health and mortality of different human resource strategies. In urban and peri-urban areas with good transport infrastructure and available medical staff, the issue is to assure control of quality within the health system.	Recruiting and retaining doctors in rural areas remains a tremendous challenge both in terms of provision of an acceptable practice environment, but also considerations of family needs and lifestyle aspirations	Lack of trained and skilled clinical staff who can provide timely and high-quality care to mothers with pregnancy complications. Few specialists who are deployed in the government system are overloaded with clinical or administrative responsibilities. The lack of access to surgery in the Sub-Saharan Africa region is well illustrated by the population level data. there has been little	Patient (and family) centered consulting, probabilistic diagnosis, continuity of care, and the management of chronic disease in partnership with nurses. Participation in training of midwives, clinical officers, and medical officer/family medicine doctors in obstetric competencies. Providing clinical expertise and professional space for maternal mortality reviews, audits and service evaluations. Advocacy for empowerment of practitioners (midwives, COs, and MOs)

Table 4: descriptive studies

Author/ Year / Country	Study Design	Worker Involved	Participants	Description	Outcome	Lessons	Gaps /Limitations	Recommendation
							attention paid to performance appraisal and assurance of the quality of service provided by medical staff	
Fillipi et al. 2006⁷⁰ Sub sharan African and south asia	Lancet series	Skilled birth attendants	Mothers and neonates	In this paper, we take a broad perspective on maternal health and place it in its wider context. We draw attention to the economic and social vulnerability of pregnant women, and stress the importance of concomitant broader strategies, including poverty reduction and women's empowerment	Pregnant women are economically and socially vulnerable. Pregnancy interacts with other disorders (for example, malaria, HIV, heart disease, and diabetes) to which women are both more susceptible and more vulnerable to severe manifestations	All women should have access to skilled attendants at birth and immediately after, and to timely referral for emergency care. Good maternal health is crucial for the welfare of the whole household, especially children who are dependent on their mothers	Women in many developing countries have less freedom to act, less personal autonomy, and less access to information than their male partners or husbands	Will need to increase financial contributions for maternal health in low-income countries to help overcome the resource gap. improvement of women's education, income, or status. Political sensitisation is needed at local level, particularly with local policy makers
Gerein et al. 2009⁷¹ Sub Saharan Africa	observational	Doctors nurses and midwives	mothers	This paper discusses the implications of shortages of midwives, nurses and doctors for maternal health and health services in sub-Saharan Africa, and inequitable distribution of maternal health professionals between geographic areas and health facilities	The largest gaps between requirements and availability of staff were for nurses and midwives. Absenteeism resulting from burnout due to the excessive workload related to HIV/AIDS can be substantial. Doctor, nurse and midwife densities were significantly related to maternal mortality rates, when per capita income. shortages of health professionals reduced the number of facilities equipped to offer emergency obstetric care	MM results from the inability of a health system to deal effectively with complications, especially during or shortly after childbirth. Distribution of staff between geographic areas and health facilities is as important. War, civil unrest and economic deterioration can be "push" factors. Teamwork is an essential component of high quality maternal health care, and loss of team members	health staff are more likely to seek employment internationally. Movement of health professionals from public to private. professional qualification does not necessarily mean the provider is actually skilled, and the environment in which the professional is working may or may not be enabling,	Enhancement of the roles and skills of a lower-level cadre, may increase the efficiency and quality of services. Make sure that all women use skilled care during pregnancy, delivery and the post-natal period. Managers can provide financial incentives (soft loans for housing, bonuses for overtime work), allow part-time work and flexible work schedules for nurses & midwives, contract retired staff, and pay student nurses and midwives to work during their holiday. rethink of health sector reforms and overall

Table 4: descriptive studies

Author/ Year / Country	Study Design	Worker Involved	Participants	Description	Outcome	Lessons	Gaps /Limitations	Recommendation
						can also reduce job satisfaction and lower morale.		macro-economic development policies is needed, to focus on equity, participation by the poor &strengthening the role of the state
Campbell 2001⁶³ developing countries	narrative reviews	skilled birth attendants	policy makers	This section of the paper considers the main types of national health systems through which specific services can be delivered and characterizes specific features relating to maternity care, particularly delivery services. It aims to provide a backdrop for interpreting policies and policy shifts.	National health systems comprise five main interacting components are resources, organization, management, economic support, and, delivery of services (e.g. maternity care)	When a professional (midwife or doctor) linked up with a strong referral system carries out deliveries, maternal mortality ratios can be reduced to 50 per 100,000 or below, irrespective of whether births takes place at home, in health centers or maternity homes, or in hospitals.		
Chowdhury et al. 2009⁶⁴ Matlab, Bangladesh	observational	Skilled birth attendants	mothers	The current study investigated the possible causes of the maternal mortality decline in Matlab. The study analyzed 769 maternal deaths and 215,779 pregnancy records from the Health and Demographic Surveillance System (HDSS) and other sources of safe motherhood data in the ICDDR,B and government service areas in Matlab during 1976-2005	Resulting lowered maternal mortality rates in both ICDDR,B and government service areas are result of multiple factors that differ in their contribution in each area. Comprehensive EmOC contributed to reduction in the number of maternal deaths. More women sought skilled care at birth. More and more women with complications are now bypassing the IDDR,B's basic EmOC program and heading directly to the comprehensive EmOC facilities. The increased use of comprehensive EmOC and the easy availability of antibiotics most likely contributed to reductions in	Motivating factor for increased referrals may be because the village doctors have developed relations with specific facilities where they refer complicated cases. those with complications are now more aware of and deliver with a skilled attendant. The decline of fertility contributed to the reduction in maternal mortality in both ICDDR,B and government service areas	Arranging money was and is still a barrier to accessing maternal service. Blood is still not easily available	Investment in further strengthening the comprehensive EmOC and the family-planning program is clearly important and need to be pursued. Additional policies that bring expansion of female education, later childbearing, better financial access to the poor, and poverty alleviation are also essential to sustain the success achieved to date.

Table 4: descriptive studies

Author/ Year / Country	Study Design	Worker Involved	Participants	Description	Outcome	Lessons	Gaps /Limitations	Recommendation
					the number of death due to obstructed labour and infections. Other factors that have likely impacted both the service areas include increased education of women and female literacy			
Gill et al. 2007⁷² Sub Saharan Africa and south Asia	Lancet review	Doctors, nurses and midwives	Mothers and neonates	This Review analyses the evidence from the past 20 years on the links between maternal health and development to examine maternal health within a development framework	Progress in maternal health has been uneven, inequitable, and unsatisfactory. Women’s status and empowerment, in spheres such as education, employment, decision making, intimate partner violence, and reproductive health, affect their maternal health. Maternal death and illness is costly for families because of high direct health costs, loss of income, loss of other economic contributions, disturbed family relationships, and social stresses. employment is associated with reduced maternal mortality and morbidity and increased use of maternal- services	Research suggests that the MDGs will not be reached without addressing poverty and gender inequality. Women’s education increases the use of maternal health services, and is independent of related factors such as urban or rural residence or socioeconomic status. Violence is associated with many negative outcomes for maternal and fetal health	Uneven and inequitable improvement in the use of Maternal-health services. Low status and empowerment of women affects their access to and use of these services. Postpartum care has not improved much	Investments in improving the availability and quality of maternal care services
Iyengar & Iyengar 2009⁷⁷ Rajasthan, India	Retrospective cross-sectional survey	Skilled birth attendants and TBAs	Mothers	A retrospective cross-sectional survey The investigators took verbal consent for case interviews after providing detailed information on the study objectives and the likely time required. Interviews were conducted in private, unless the respondent was comfortable with the presence of family members. Responses were not shared across families or respondents.	even in the presence of a professionally-qualified birth attendant, women and newborns were subjected to a range of ‘unskilled’ practices in both homes and facilities. Actions to prevent postpartum hemorrhage were not up to the standard level	It appears that practices to speed up labor might suit the convenience of health staff, families, and transport operators	care providers might want to hasten labor so as to ‘free up’ labor-tables, maternity beds, &unburden the staff on duty. Premature discharge after institutional deliveries would not allow the monitoring of the maternal and	Serious measures to strengthen its stewardship role by monitoring and regulating delivery-care practices and assesses their likely maternal and perinatal outcomes. It is essential that hidden costs of services at government facilities are minimized if not eliminated so that poor rural families can gain

Table 4: descriptive studies

Author/ Year / Country	Study Design	Worker Involved	Participants	Description	Outcome	Lessons	Gaps /Limitations	Recommendation
							neonatal condition in the crucial first 24 hours. Families typically had to raise funds for delivery, often by taking loans at high rates of interest	better access.
Goldman & Gleib 2003 ⁷³ Guatemala	Observational	Doctors ,nurses and midwives	mothers	In this paper, we examine the content of pregnancy related care in Guatemala, one of the poorest countries in Latin America and one characterized by some of the highest maternal and infant mortality rates in the region.	Midwives who have not received formal training are legally prohibited from practicing Three-quarters of midwives attended formal training and presumably were encouraged to refer their clients for biomedical care. The training programs appear to have had a substantial positive impact on the frequency of referrals	most infant and maternal deaths and disabilities are preventable through high quality care, detection and efficient referral for complications, and effective access to the essential elements of obstetric care if needed	Little information on the efficacy of the midwife training program. Guidelines regarding care and practices during pregnancy are often not consistent across countries. fewer than half of the midwives had actually been to the hospital designated for their referrals and hence they felt uneasy about making referrals	Successful integration of midwives into the formal health care system must involve more than the modification of midwife practices to make these practices consistent with biomedical standards. The collection of detailed information on the content of pregnancy related care offered by both traditional and biomedical providers would be an appropriate starting point
Harvey et al. 2004 ¹¹³ Benin, Ecuador, Jamaica and Rwanda	Observational	Skilled birth attendants		Evaluate the competence of health professionals who typically attend hospital and clinic-based births in Benin, Ecuador, Jamaica, and Rwanda. Measured competence against World Health Organization’s (WHO) Integrated Management of Pregnancy and Childbirth guidelines	A wide gap exists between current evidence-based standards and current levels of provider competence. Score differences between doctors and midwives were not significant. policy also plays an important role in outcome. Pre-service and in-service training, work environment, and pregnant women’s health status all vary significantly.	The partograph is a basic low-cost tool for management of labor and opportune diagnosis of complications.	But many of participants demonstrated inadequate competence at even basic preventive and lifesaving procedures. MgSO4 was unavailable in Benin’s public hospitals	Need more evidence for the efficacy of active management in non-industrialized settings.

Table 4: descriptive studies

Author/ Year / Country	Study Design	Worker Involved	Participants	Description	Outcome	Lessons	Gaps /Limitations	Recommendation
Hoope-Bender et al. 2006 ⁹⁶ Sub Saharan Africa, Asia Sri Lanka, Bolivia	observational	Skilled birth attendants	mothers	This paper provides an overview of the most important challenges of providing the human resources necessary to reach the Millennium Development Goal on maternal health	Skilled staff is needed for both circumstances, as unskilled staff cannot cope effectively with either severe complications or pending, potentially life-threatening conditions. Increasing access to major surgery for maternal survival requires innovative solutions in countries where specialized or skilled doctors are scarce. The involvement of a professional organization and the commitment and leadership of individual health care providers are hugely important in all of the above matters	The road to improve maternal health is clearly through skilled human resources within the formal health system. Fall in maternal deaths after midwifery skills became available on a wide basis is persuasive. Health care professionals have an important role to play in the strengthening of human resources.	delivery suites in hospitals are overloaded with physiological births and the staff in those facilities cannot cope with the large numbers of patients	High-level political commitment. Investment in social and economic development with emphasis on achieving gender equity. Investment in developing, deploying and supporting a cadre of health providers with midwifery skills. Supervisory systems and working conditions also require attention if skilled attendants are to achieve their potential
Houweling et al. 2007 ⁷⁵ Developing countries	Comparative study	Skilled health workers	mothers	This paper describes poor–rich inequalities in the use of maternity care and seeks to understand these inequalities through comparisons with other types of health care. Demographic and Health Survey (DHS) data from 45 developing countries were used to describe poor–rich inequalities by wealth quintiles in maternity care	Poor–rich inequalities in professional delivery care are much larger than those in the other forms of care. Reducing poor–rich inequalities in professional delivery care is essential to achieving the MDGs for maternal health. Very few of the poorest mothers get professional delivery care irrespective of where they live, although some get antenatal care.	higher use of public facilities among the poor. The absolute poor–rich gap is largest in the public sector, in part because private facility use is low in all groups	Wealth and maternity care are linked across the entire wealth hierarchy within countries, with each progressively poorer group having progressively lower use. A combination of the supply and demand factors and the nature of the service probably explains the much larger inequalities seen	The huge inequalities in maternity care underline the need for effective provision of services. Improving the availability of a narrow range of maternity care services (home-based midwifery in particular). improving average levels of professional delivery care, and their differential effects often have not been adequately studied. A concerted effort of equity-oriented research, policy-making and monitoring is needed to reduce the huge poor–rich inequalities in delivery care

Table 4: descriptive studies

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Ingenbenerbor 2007 ⁷⁶ Nigeria	observational	Skilled birth attendants	Mothers	This study was designed to find out if the number and variety of workers in the primary health centers, as presently constituted, were adequate to meet the maternity needs of communities. It was also designed to explore the problems encountered by midwives and other workers in their bid to refer emergency cases to district and tertiary hospitals with the aim of developing a model for maternal mortality reduction in Nigeria.	most of the primary health centers had no doctor coverage. It was concluded that lack of commitment on the part of all tiers of government was the reason behind the high mortality rates,	Prevention of maternal death is dependent on prompt diagnosis and treatment of its causative factors.	it was found that doctors and midwives who can be referred to as skilled attendants are not available when they are needed most – at night. Traditional birth attendants are not capable of recognizing and treating complications	Need for policies at state and national levels and for local governments to agree to employ at least one doctor to serve in each primary health centre as a resident doctor. Need for local governments to employ more midwives, with the aim of meeting the target of at least four per primary health centre. Ambulance services should be made available in each local government area of Nigeria
Cotter et al. 2006 ⁶⁶ Kenya	observational	Skilled birth attendants	mothers	The aim of the study was to estimate the use of skilled attendants' delivery services among users of antenatal care and the coverage of skilled attendants' delivery services in the general population in Kikoni location, Kenya.	The current coverage of skilled attendant-assisted delivery falls far below the current Kenyan national average of 40.1% (6) and drastically below the Kenyan national goal of the coverage of 80% by 2010.	Most notable is the low use of skilled attendants' services among women who use antenatal care.	Accessible and affordable transportation is nearly non-existent. Lack of sensitization among women regarding the importance of skilled attendance at delivery. The value women place on delivery by a traditional birth attendant. The perception that the health facility is a harsh setting for childbirth.	Training healthcare providers to emphasize the importance of clean, safe delivery in reducing maternal mortality may be a key starting point

Discussion

Our review embarked to explore the how HRH interventions lead to improved maternal health outcomes. Our findings, although mostly from training interventions, showed that HRM interventions can contribute positively to health worker's performance and improved maternal outcome. However, we still feel that HR interventions in relation to maternal health are not widely researched as evidence by the result of the literature search.

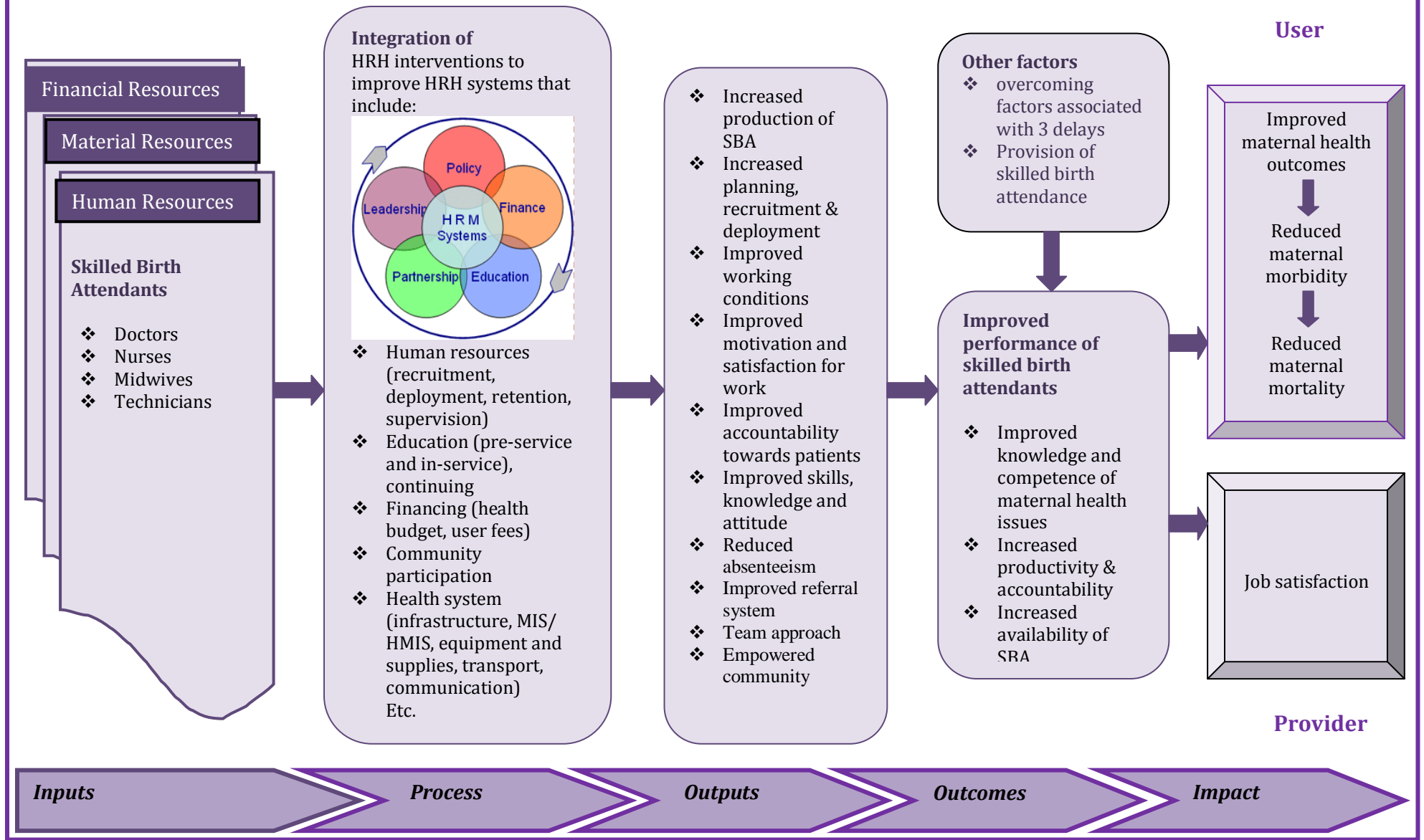
As the framework provided by WHO (**figure1**) shows the steps required for betterment in the health in general, we developed a framework to facilitate understanding of mechanisms, which is based upon dimensions of health worker performance (**Figure 4**), to explain the effect on maternal mortality specifically when the HRH interventions are implemented. It shows that there are varieties of interrelated mechanisms which can lead to improved health worker performance and improved maternal health outcomes provided other associated or confounding factors are addressed at the same time. Implementation of HRH management system to improve the availability, training education and retention of doctors, nurses, midwives and technicians is one of the factors contributing to improved maternal health. It was observed from our review that increasing the availability of the human resources in the form of skilled health workers by training those adequately in recognizing and managing obstetric complications can decrease maternal mortality significantly. Other HRH intervention components that were included in the studies were supervision and partnerships which improved the health system effectiveness and hence maternal health. Still more work needs to be done in the other areas of HRH interventions especially recruitment, deployment and retention of the health care workers in the rural areas, improvement in the work environment and conditions as well as HRH information system needs to be developed.

Implementations of these interventions can lead to improved knowledge and skill of SBAs, increased production recruitment and deployment of health care providers along with better working conditions resulting in motivation and job satisfaction. The increase in knowledge and competence with concomitant increase in accountability and productivity of SBAs will lead to better health outcomes resulting in decrease in maternal mortality and morbidity.

Lessons learned

The review of 83 studies revealed certain reasons why maternal mortality is still high in developing countries despite the efforts and policies implemented throughout these years. It is observed that in many developing countries some components of the HRH management intervention are applied with positive effects on the maternal mortality and health care delivery to the rural areas. Increasing the availability of skilled health care

Figure 4: Conceptual Framework of HRH Interventions for Improved Maternal Outcomes



professionals in these areas has decreased case fatality rate significantly. Some countries have also started training surgical technicians and assistant medical officers to deal with the human force crisis and have managed to retain them in the rural areas where there is shortage of health workers. Efforts have also been made to provide drugs, equipments and other supplies to the health facilities to improve the emergency obstetric care in rural areas. We observed that the implementation of these components at all levels improved maternal health and decreased maternal mortality in all the countries. We also observed that combining the various components of HRH management system significantly decreases CFR. Thus we see that increasing the number of skilled health workers, training and educating them with proper supervision management and retention by providing them with facilities and incentives and improving the infrastructure with supply of equipments is what needs to be done in all the developing countries to achieve the MDG 5.

1. **Availability of skilled birth care attendants:** Most maternal death can be prevented by having access to skilled attendants at birth and immediately after.⁷⁰ They are the key indicators in monitoring a country's progress towards attaining the MDG 5.¹⁰⁴ In most of the developing countries the cultural norm favours home births thus the rationale for instituting skilled attendants for home based deliveries was used in Bangladesh to improve maternal mortality.⁶² Migration of skilled health workers is one of the main causes of health work crisis in developing countries.
2. **Task Shifting:** In the countries where there is lack of health personnel to perform emergency obstetric procedures, a new approach has been implemented with some success.¹⁰³ Surgical technicians and AMOs with some prior surgical experience are trained and allowed to perform surgeries where there is shortage of obstetricians. Studies have shown that there is no difference in the outcome of the surgeries performed by the two group.¹⁰²
3. **Provision of skilled birth attendance:** Complimenting skilled birth attendants with necessary skills, and proper equipment to work can further reduce maternal mortality no matter the place of delivery is the home, health centre, or hospital. Provision of enabling environment at various levels of the health system, including a supportive policy and regulatory framework; adequate supplies, equipment, and infrastructure; and an efficient and effective system of communication and referral/transport are the key indicators.

Apart from these lessons that we learned from the analysis of the twenty three studies few other lessons were identified from the narrative/descriptive studies. These include the other factors which effect maternal mortality indirectly, but when combined with the HRH management interventions significantly improve maternal health. They are:

- 1 **Recognition of complications and strong referral system:** The most crucial component for preventing maternal deaths is prompt recognition of complications during and after delivery and referring such mothers to higher health care facilities. When a professional (doctor or midwife) is linked up with strong referral system maternal mortality decreases significantly irrespective of whether the birth took place at home or in a health facility.⁶³
- 2 **Combining maternal health and family planning:** Integration of maternal health and family planning can decrease maternal mortality significantly. Studies have shown that decline in fertility has contributed to decline in maternal mortality.⁶⁴
- 3 **Women education and empowerment:** Educating women about their health and complications during pregnancy has shown to effect maternal mortality. Those with complications are more aware and seek skilled attendant.⁶⁴ Women education increases the use of maternal health services.⁷²
- 4 **Addressing poverty and gender equality:** Poverty is one of the main factors affecting the access to maternal health care in rural areas. The absolute poor –rich gap in highest in the public sector.⁷⁵ Studies show that it is necessary to address gender inequalities in order to improve maternal mortality.⁷²
- 5 **Skilled birth attendants cannot be replaced by unskilled birth attendants:** Though unskilled birth attendants are main providers of care for millions of deliveries⁶⁵ they are not capable of recognizing and treating complications.⁷⁶

Gaps identified

In the review of 23 studies using HRH interventions to improve maternal health we found that only few components of the HRH management system were investigated. Most of the studies explored the impact of training and continuing education of the health care providers on maternal health. We found some studies with combined approach in which training, management, supervision and policy were implemented together and the combined outcome was studied. However no publications or reviews were found on other areas of HRH interventions which can improve maternal mortality.

Less or no work was found on the HRH personnel system which studies the impact of recruitment, employment, hiring, deployment, migration, health safety and retirement on maternal health outcomes. Though few studies have mentioned that migration of skilled birth attendants is one of the main causes of workforce crisis in developing countries.²² But that is a complete separate entity and dealing of this issues requires a different sets of

interventional strategies. Similarly no study was found on the financial component addressing the budget allocation for salaries and allowances, education and training and HRH expenditure data.

Gaps were identified in other HRH interventions regarding staff motivations such as job satisfaction, appraisals, workplace safety and career development. The impact of each of this component was not studied individually and no publications were found regarding the outcomes of these components on maternal health care.

Along with these HRH interventions it was also seen that availability, retention and training of the skilled birth attendants was a major issue in all the developing countries. Professional qualification does not necessarily means that the provider is actually skilled.⁷¹ Gaps were found in the guidelines regarding care and practices during pregnancy and little information was available regarding the efficacy of midwife training program in developing countries.⁷³ It was seen that in most places doctors and midwives were not available at the time they were most needed i.e. at night.⁷⁶ Recruiting and retaining doctors in rural areas remains the biggest challenge. The few doctors who are deployed to these areas are over burdened with clinical as well as administrative work load.⁶⁹ Low level of training and high rate of migration of workers to richer countries has affected the developing world in meeting the MDG 5.⁶⁷

There are other factors which indirectly effect maternal health, deficit in these factors was also identified. It was observed that transportation still remains a constant barrier to maternal health in all the rural areas. Accessible and affordable transport system is almost nonexistent.⁶⁶ Lack of transportation, resources emergency funds and unclear referral system at the community level has effected maternal mortality adversely.¹¹⁴ Cultural and social barriers in seeking obstetric care were identified at all levels.

On the demand side financial constrains was recognised as one of the main issue to be resolved in most of the developing countries to work towards the MDG5. Most of the families typically have to raise funds for delivery often by taking loans.⁷⁷ These gaps are further affected by low education and literacy rate among women. It is difficult to establish practices and improve understanding of safe motherhood issues.³⁴ Women are unable to question or challenge the appropriateness of maternal health provided in poor setting due to lack of knowledge.²³

Similarly on the supply side inadequate equipments, drugs, supplies and supervision also remains a gap that needs to be filled by the governments of the developing countries.⁸⁴ Ensuring adequate supply of reagents including blood to the EmOC facilities remains a

challenge.³⁵ The main constraints at all levels were low government budgets, unreliable donors and poor resource allocation which resulted in unpredictability of funding.⁴⁷

Recommendations:

Improvements are required to be made by the developing countries at both the supply and demand level to reach the MDG 5. The need for multi-sectoral approach to women health is emphasized. This includes training of staff, their employment and retention, and improved management systems in the formal health care.⁶⁷ The training and education programs implemented by some of the countries which improved maternal mortality needs to be taken on the larger scale and implemented throughout the developing countries and policies are needed to be made to combine various HRH management interventions and apply them in these countries. Government, partners stakeholders and donors need to work together to form these policies for education and finance and make models of health care to suit the needs of the countries in managing emergency obstetric care and decreasing maternal mortality.

We recommend that more studies need to be conducted focusing on the other HRH management system components such as supervision, partnership and proper HRH information system development, and their impact on the maternal health care in developing countries. Specific interventions for recruitment, retention and deployment of skilled health care workers need to be implemented and followed to see how these affect the outcome of maternal health.

Financial constraint remain the most important barrier in developing countries to reach the target of reduced maternal mortality. Interventions targeting the budget allocations for the salaries and education of the health care providers and coordination mechanism with donors, stakeholders and ministries need to be implemented and their impact on maternal mortality needs to be studied. Financial contribution towards maternal health in low income countries remains the area least worked upon. Major steps are needed to overcome the resources gaps in this area. Political sensitization is needed at local level, particularly with local policy makers to improve the financial situation.⁷⁰ Investments at all levels to strengthen the comprehensive EmOC and family planning programme is required.⁶⁴ Political parties, stakeholders and donors need to work together to invest in improving the availability and quality of maternal care services.⁷² High level of political commitment is required in investing in developing, deploying and supporting a cadre of health providers with midwifery skills.⁹⁶

It is seen that HRH interventions alone cannot improve the functioning and availability of the skilled health workers. There are many other areas which need to be worked upon

together with the strategy implementations to gain the best outcome regarding maternal health. Female education and empowerment and gender equality are few things which need emphasis and governments need to focus on the betterment of these to reach the MDG 5. Female education and empowerment has shown to play a major role in decreasing maternal mortality and emphasis needs to be laid on the primary responsibility of the government to empower women to demand their rights to pregnancy, childbirth and newborn care.⁶⁵ Effective provision of services can only be made possible when huge inequalities in maternal care are removed from the community. The poor–rich inequalities in delivery care can be reduced by rigorous efforts made towards equity oriented research, policy making and implementation and proper monitoring of the services provided.⁷⁵ Investment in social and economic development with emphasis on achieving gender equality should be our goal.⁹⁶

Similarly access and availability of affordable transportation in rural areas so that health care can be reached in time in emergency situations as well as appropriate supply of drugs to manage the complications should be arranged. Emphasis needs to be laid on the equipments and infrastructure of the health facilities to improve emergency obstetric care and reduce maternal mortality.

Conclusion

Few research articles were found covering the HRH interventions for maternal health meeting the criteria for this paper. This review suggested an urgent and immediate need for formative evidence based research on effective HR interventions for improved maternal health in low and middle income countries. The studies showed that all the HRH interventions which were implemented individually or in combination had a positive impact on the maternal mortality and significant decrease in crude fatality rate was observed in many countries. We also found that strategy implementation alone is not enough to bring about this change, other steps like educating and empowering women, alleviating poverty, establishing gender equality and providing infrastructure, equipments drugs and supplies, are all integral parts working towards the achievement of MDG 5 and reducing maternal mortality. Time, efforts and money can be invested towards training of assistant medical officers to do emergency obstetric surgeries and fill the human resources gap in most of the developing countries as the implementation of this intervention has clearly shown to affect the health system positively in the areas of Tanzania and Mozambique. All the leaders from clinical, political and social areas are required to work together as a team to construct new models of health care which would suit to the needs of the countries individually.

References

1. Rasch V. Maternal death and the millennium development goals. *Danish Medical Bulletin*. 2007;54(2):167-169.
2. Simwaka BN, Theobald S, Amekudzi YP, Tolhurst R. Meeting millennium development goals 3 and 5. *British Medical Journal*. 2005;331(7519):708.
3. Chen L, Evans T, Anand S, et al. Human resources for health: overcoming the crisis. *The Lancet*. 2004;364(9449):1984-1990.
4. Ozgediz D, Riviello R. The “other” neglected diseases in global public health: Surgical conditions in sub-Saharan Africa. *PLoS Med*. 2008;5(6):e121.
5. Travis P, Bennett S, Haines A, et al. Overcoming health-systems constraints to achieve the Millennium Development Goals. *The Lancet*. 2004;364(9437):900-906.
6. Haines A, Cassels A. Can the Millennium Development Goals be attained? *British Medical Journal*. 2004;329:394-397.
7. Loudon I. *Death in childbirth: an international study of maternal care and maternal mortality, 1800-1950*: Oxford University Press, USA; 1992.
8. Graham W, Bell JS, Bullough CHW. Can skilled attendance at delivery reduce maternal mortality in developing countries? *Safe motherhood strategies: A review of the evidence*. 2001;17:97-130.
9. Van Lerberghe W, De Brouwere V. Of blind alleys and things that have worked: history’s lessons on reducing maternal mortality. *Studies in Health Services Organisation and Policy*. 2001;17:7-34.
10. Speybroeck N, Ebener S, Sousa A, Paraje G, Evans DB, Prasad A. Inequality in access to human resources for health: measurement issues: Geneva, World Health Organization; 2006.
11. Sousa A, Tandon A, Dal Poz MR, Prasad A, Evans DB. Measuring the efficiency of human resources for health in attaining health outcomes across sub national units in Brazil: Geneva, World Health Organization; 2006.
12. World Health Organization. *The World Health Report: working together for health*. 2006.
13. Zurn P, Dal Poz MR, Stilwell B, Adams O. Imbalance in the health workforce. *Human Resources for Health*. 2004;2(1):13.

14. Lehmann U, Dieleman M, Martineau T. Staffing remote rural areas in middle- and low-income countries: A literature review of attraction and retention. *BMC health services research*. 2008;8(1):19.
15. Kirigia JM, Gbary AR, Muthuri LK, Nyoni J, Seddoh A. The cost of health professionals' brain drain in Kenya. *BMC health services research*. 2006;6(1):89.
16. Ferrinho P, Van Lerberghe W, da Cruz Gomes A. Public and private practice: a balancing act for health staff. *Bulletin of the World Health Organization*. 1999;77(3):209.
17. Traditional Birth Attendants in Maternal Health Programmes. *Safe Motherhood Policy Alert* November 2003(4).
18. Berer M. Traditional birth attendants in developing countries cannot be expected to carry out HIV/AIDS prevention and treatment activities *Reproductive Health Matters*. 2003;11(22):36-39.
19. Sibley L, Sipe A. What can a meta-analysis tell us about traditional birth attendant training and pregnancy outcomes? *Midwifery*. 2004;20(1):51-60.
20. Sibley LM, Sipe TA, Brown CM, Diallo MM, McNatt K, Habarta N. Traditional birth attendant training for improving health behaviours and pregnancy outcomes. 2007.
21. Berer M. Maternal Mortality and Morbidity: Is Pregnancy Getting Safer for Women? *Reproductive Health Matters*. 2007;15(30):6-16.
22. Anyangwe SC, Mtonga C. Inequities in the global health workforce: The greatest impediment to health in sub-Saharan Africa. *Int J Environ Res Public Health*. 2007;4(2):93-100.
23. Brugha R, Pritze-Aliassime S. Promoting safe motherhood through the private sector in low-and middle-income countries. *Bulletin of the World Health Organization*. 2003;81:616-623.
24. *World Health Organization. Making pregnancy safer: the critical role of the skilled attendant*. Geneva: A joint statement by WHO, ICM & FIGO. WHO; 2004.
25. Graham W. *Can skilled attendance at delivery reduce maternal mortality in developing countries? Safe Motherhood Strategies: A review of the evidence*. Antwerp: Studies in Health Services Organization & Policy; 2001.
26. McDonald, Starr. *Saving Women's Lives, Improving Newborn Health*. Washington: Family Care International; 2002.

27. MacDonagh S. *Achieving skilled attendance for all; a synthesis of current knowledge and recommended actions for scaling up*. London: DFID Health Resource Centre; August 2005.
28. de Bernis L, Sherratt DR, AbouZahr C, Van Lerberghe W. Skilled attendants for pregnancy, childbirth and postnatal care. *British medical bulletin*. 2003;67(1):39.
29. Barker CE, Bird CE, Pradhan A, Shakya G. Support to the Safe Motherhood Programme in Nepal: An integrated approach. *Reproductive Health Matters*. 2007;15(30):81-90.
30. World Bank. Geographic classification and data reported for geographic regions are for low income and middle income economies as defined by the World Bank. <http://www.icce2010.org/docs/developingCountries.pdf>.
31. HRH Action Framework Capacity Project, Global Health Workforce Alliance, United States Agency for International Development, World Health Organization 2007. Updated Last Updated Date.
32. Kayongo M, Butera J, Mboninyibuka D, Nyiransabimana B, Ntezimana A, Mukangamuje V. Improving availability of EmOC services in Rwanda—CARE's experiences and lessons learned at Kabgayi Referral Hospital. *International Journal of Gynecology and Obstetrics*. 2006;92(3):291-298.
33. Kayongo M, Esquiche E, Luna MR, Frias G, Vega-Centeno L, Bailey P. Strengthening emergency obstetric care in Ayacucho, Peru. *International Journal of Gynecology and Obstetrics*. 2006;92(3):299-307.
34. Rath AD, Basnett I, Cole M, Subedi HN, Thomas D, Murray SF. Improving Emergency Obstetric Care in a Context of Very High Maternal Mortality: The Nepal Safer Motherhood Project 1997–2004. *Reproductive Health Matters*. 2007;15(30):72-80.
35. Islam MT, Haque YA, Waxman R, Bhuiyan AB. Implementation of emergency obstetric care training in Bangladesh: lessons learned. *Reproductive Health Matters*. 2006;14(27):61-72.
36. Santos C, Diante D, Baptista A, Matediane E, Bique C, Bailey P. Improving emergency obstetric care in Mozambique: The story of Sofala. *International Journal of Gynecology and Obstetrics*. 2006;94(2):190-201.
37. Mekbib T, Kassaye E, Getachew A, Tadesse T, Debebe A. The FIGO save the mothers initiative: the Ethiopia–Sweden collaboration. *International Journal of Gynecology and Obstetrics*. 2003;81(1):93-102.

38. Djan JO, Kyei-Faried S, Twum S, et al. Upgrading obstetric care at the health center level, Juaben, Ghana. *International Journal of Gynecology and Obstetrics*. 1997;59:83-90.
39. Ifenne D, Essien E, Golji N, et al. Improving the quality of obstetric care at the teaching hospital, Zaria, Nigeria. *International Journal of Gynecology and Obstetrics*. 1997;59:37-46.
40. Jamisse L, Songane F, Libombo A, Bique C, Faúndes A. Reducing maternal mortality in Mozambique: challenges, failures, successes and lessons learned. *International Journal of Gynecology and Obstetrics*. 2004;85(2):203-212.
41. Koblinsky M, Anwar I, Mridha MK, Chowdhury ME, Botlero R. Reducing maternal mortality and improving maternal health: Bangladesh and MDG 5. *Journal of Health, Population and Nutrition*. 2009;26(3):280.
42. da Luz VM, Bergström S. Mozambique--delegation of responsibility in the area of maternal care. *International journal of gynaecology and obstetrics: the official organ of the International Federation of Gynaecology and Obstetrics*. 1992;38:S37.
43. *Combine learning approaches to improve maternal health* Washington D.C.: Population Council; 2006.
44. Akashi H, Yamada T, Huot E, Kanal K, Sugimoto T. User fees at a public hospital in Cambodia: effects on hospital performance and provider attitudes. *Social Science & Medicine*. 2004;58(3):553-564.
45. *Country Case Study: Bangladesh trains health workers to reduce maternal mortality* Global Health Workforce Alliance 2006.
46. Ohnishi M, Nakamura K, Takano T. Training of healthcare personnel to improve performance of community-based antenatal care program. *Advances in Health Sciences Education*. 2007;12(2):147-156.
47. Witter S, Kusi A, Aikins M. Working practices and incomes of health workers: evidence from an evaluation of a delivery fee exemption scheme in Ghana. *Human Resources for Health*. 2007;5(1):2.
48. Wirth M. Professionals with Delivery Skills: Backbone of the Health System and Key to Reaching the Maternal Health Millennium Development Goal. *Croatian medical journal*. 2008;49(3):318.
49. Iyengar SD, Iyengar K, Suhalka V, Agarwal K. Comparison of domiciliary and institutional delivery-care practices in rural Rajasthan, India. *J Health Popul Nutr*. 2009;27:303-312.

50. Pereira C, Cumbi A, Malalane R, et al. Meeting the need for emergency obstetric care in Mozambique: work performance and histories of medical doctors and assistant medical officers trained for surgery. *Bjog*. 2007;114(12):1530-1533.
51. Pereira C, Bugalho A, Bergström S, Vaz F, Cotiro M. A comparative study of caesarean deliveries by assistant medical officers and obstetricians in Mozambique. *BJOG: An International Journal of Obstetrics & Gynaecology*. 2005;103(6):508-512.
52. Kruk ME, Pereira C, Vaz F, Bergstrom S, Galea S. Economic evaluation of surgically trained assistant medical officers in performing major obstetric surgery in Mozambique. *Bjog*. 2007;114(10):1253-1260.
53. McCord C, Mbaruku G, Pereira C, Nzabuhakwa C, Bergstrom S. The quality of emergency obstetrical surgery by assistant medical officers in Tanzanian district hospitals. *Health Affairs*. 2009;28(5):w876.
54. *The World Health Report. Integrating maternal, newborn and child health programmes* World Health Organization 2005.
55. *Investing in midwives and others with midwifery skills to save the lives of mothers and newborns and improve their health* UNFPA 2006.
56. Round Up. Maternity care and maternal mortality *Reproductive Health Matters* 2009;17(34):205-211.
57. Abe E, Omo-Aghoja LO. Maternal mortality at the Central Hospital, Benin City Nigeria: a ten year review. *African Journal of Reproductive Health*. 2008;12(3):17-26.
58. Adegoke AA, van den Broek N. Skilled birth attendance-lessons learnt. *BJOG: An International Journal of Obstetrics & Gynaecology*. 2009;116(s1 International Reviews):33-40.
59. Anwar I, Kalim N, Koblinsky M. Quality of obstetric care in public-sector facilities and constraints to implementing emergency obstetric care services: evidence from high-and low-performing districts of Bangladesh. *J Health Popul Nutr*. 2009;27:139-155.
60. Berer M. Human resources: an impersonal term for the people providing health care. *Reproductive Health Matters*. 2006;14(27):6-11.
61. Bhuiya A, Hanifi SMA, Mahmood SS. Action Monitoring for Equity and Gender in Health. *Journal of Health, Population and Nutrition*. 2009;26(3):378.

62. Blum LS, Sharmin T, Ronsmans C. Attending home vs. clinic-based deliveries: perspectives of skilled birth attendants in Matlab, Bangladesh. *Reproductive Health Matters*. 2006;14(27):51-60.
63. Campbell OMR. What are maternal health policies in developing countries and who drives them? A review of the last half-century. *Safe motherhood strategies: A review of the evidence*.
64. Chowdhury ME, Ahmed A, Kalim N, Koblinsky M. Causes of Maternal Mortality Decline in Matlab, Bangladesh. *Journal of Health, Population and Nutrition*. 2009;27(2):108.
65. Costello A, Azad K, Barnett S. An alternative strategy to reduce maternal mortality. *The Lancet*. 2006;368(9546):1477-1479.
66. Cotter K, Hawken M, Temmerman M. Low use of skilled attendants' delivery services in rural Kenya. *Journal of Health Population and Nutrition*. 2006;24(4):467.
67. Falconer A, Crisp E, Warick C, Day-Strik F. Scaling up human resources for women's health. *BJOG: An International Journal of Obstetrics & Gynaecology*. 2009;116 (Suppl. 1):11-14.
68. Fernando D, Jayatileka A, Karunaratna V. Pregnancy--reducing maternal deaths and disability in Sri Lanka: national strategies. *British medical bulletin*. 2003;67(1):85.
69. Figo SM. Human resources for health in the low-resource world: Collaborative practice and task shifting in maternal and neonatal care. *International journal of gynaecology and obstetrics: the official organ of the International Federation of Gynaecology and Obstetrics*. 2009.
70. Filippi V, Ronsmans C, Campbell OMR, et al. Maternal health in poor countries: the broader context and a call for action. *The Lancet*. 2006;368(9546):1535-1541.
71. Gerein N, Green A, Pearson S. The implications of shortages of health professionals for maternal health in sub-saharan Africa. *Reproductive Health Matters*. 2006;14(27):40-50.
72. Gill K, Pande R, Malhotra A. Women deliver for development. *The Lancet*. 2007;370(9595):1347-1357.
73. Goldman N, Gleit DA. Evaluation of midwifery care: results from a survey in rural Guatemala. *Social Science & Medicine*. 2003;56(4):685-700.
74. Gupta M, Mavalankar D, Trivedi P. A Study of Referral System for EmOC in Gujarat.

75. Houweling TAJ, Ronsmans C, Campbell OMR, Kunst AE. Huge poor-rich inequalities in maternity care: an international comparative study of maternity and child care in developing countries. *Bulletin of the World Health Organization*. 2007;85:745-754.
76. Inegbenebor U. Conceptual model for the prevention of maternal mortality in Nigeria. *Tropical doctor*. 2007;37(2):104.
77. Iyengar K, Iyengar SD. Emergency obstetric care and referral: experience of two midwife-led health centres in rural Rajasthan, India. *Reproductive Health Matters*. 2009;17(33):9-20.
78. Lawn JE, Tinker A, Munjanja SP, Cousens S. Where is maternal and child health now? *The Lancet*. 2006;368(9546):1474-1477.
79. Marchie CL, Anyanwu FC. Relative Contributions of Socio-Cultural Variables to the Prediction of Maternal Mortality in Edo South Senatorial District, Nigeria. *Health*. 2009;13(2):109-115.
80. Mavalankar D, Sriram V. Provision of anaesthesia services for emergency obstetric care through task shifting in South Asia. *Reproductive Health Matters*. 2009;17(33):21-31.
81. Mbonye AK, Mutabazi MG, Asimwe JB, et al. Declining maternal mortality ratio in Uganda: priority interventions to achieve the Millennium Development Goal. *International Journal of Gynecology and Obstetrics*. 2007;98(3):285-290.
82. Mridha MK, Anwar I, Koblinsky M. Public-sector maternal health programmes and services for rural Bangladesh. *Journal of Health, Population and Nutrition*. 2009;27(2):124.
83. Narchi NZ. Exercise of essential competencies for midwifery care by nurses in São Paulo, Brazil. *Midwifery*. 2009.
84. Obaid TA. Fifteen years after the International Conference on Population and Development: What have we achieved and how do we move forward? *International Journal of Gynecology and Obstetrics*. 2009;106(2):102-105.
85. Olenja J, Godia P, Kibaru J, Egondi T. Influence of Provider Training on Quality of Emergency Obstetric Care in Kenya.
86. Padmanaban P, Raman PS, Mavalankar DV. Innovations and challenges in reducing maternal mortality in Tamil Nadu, India. *Journal of Health, Population and Nutrition*. 2009;27(2):202.

87. Parada C, Carvalhaes M. Childbirth care: contributing to the debate on human development. *Revista latino-americana de enfermagem*. 2007;15:792-798.
88. Penn-Kekana L, McPake B, Parkhurst J. Improving maternal health: getting what works to happen. *Reproductive Health Matters*. 2007;15(30):28-37.
89. Plainabngchnag S. A vision for health development in South-East Asia New Delhi World Health Organization 2006.
90. Prakasamma M. Maternal mortality-reduction programme in Andhra Pradesh. *Journal of Health, Population and Nutrition*. 2009;27(2):220.
91. Price NL, Hawkins K. A conceptual framework for the social analysis of reproductive health. *Journal of Health Population and Nutrition*. 2007;25(1):24.
92. Rolfe B, Leshabari S, Rutta F, Murray SF. The crisis in human resources for health care and the potential of a 'retired' workforce: case study of the independent midwifery sector in Tanzania. *Health Policy and Planning*. 2008;23(2):137.
93. Say L, Raine R. A systematic review of inequalities in the use of maternal health care in developing countries: examining the scale of the problem and the importance of context. *Bulletin of the World Health Organization*. 2007;85:812-819.
94. Serour GI. Healthcare workers and the brain drain. *International Journal of Gynecology and Obstetrics*. 2009;106(2):175-178.
95. Simkhada B, Teijlingen ER, Porter M, Simkhada P. Factors affecting the utilization of antenatal care in developing countries: systematic review of the literature. *Journal of Advanced Nursing*. 2008;61(3):244-260.
96. ten Hoop-Bender P, Liljestrand J, MacDonagh S. Human resources and access to maternal health care. *International Journal of Gynecology and Obstetrics*. 2006;94(3):226-233.
97. Thompson JE. Poverty, development, and women: Why should we care? *Journal of Obstetric, Gynecologic, & Neonatal Nursing*. 2007;36(6):523-530.
98. Vora KS, Mavalankar DV, Ramani KV, et al. Maternal health situation in India: a case study. *Journal of Health, Population and Nutrition*. 2009;27(2):184.
99. Rana TG, Chataut BD, Shakya G, Nanda G, Pratt A, Sakai S. Strengthening emergency obstetric care in Nepal: The Women's Right to Life and Health Project (WRLHP). *International Journal of Gynecology and Obstetrics*. 2007;98(3):271-277.

100. Kruk ME, Pereira C, Vaz F, Bergstrom S, S G. Economic evaluation of surgically trained assistant medical officers in performing major obstetric surgery in Mozambique. . *Bjog*. 2007;114(10):1253-1260.
101. Pereira C, Mbaruku G, Nzabuhakwa C, Bergström S, McCord C. Emergency obstetrical surgery by non-physician clinicians in Tanzania: an inventory of 38,758 deliveries. [In press]. *International Journal of Gynaecology and Obstetrics*. 2010.
102. Vaz F, Cotiro M. A comparative study of caesarean deliveries by assistant medical officers and obstetricians in Mozambique. *British journal of obstetrics and gynaecology*. 1996;103:508-512.
103. da Luz Vaz M, Bergström S. Mozambique--delegation of responsibility in the area of maternal care. *International Journal of Gynecology & Obstetrics*. 1992;38:S37-S39.
104. Shah IH, Say L. Maternal mortality and maternity care from 1990 to 2005: uneven but important gains. *Reproductive Health Matters*. 2007;15(30):17-27.
105. Koblinsky M, Kureshy N. Safe Motherhood Case Studies: Learning with Stakeholders in South Asia—An Introduction. *J Health Popul Nutr*. 2009;27(2):89-92.
106. Mavalankar DV, Vora KS, Ramani KV, Raman P, Sharma B, Upadhyaya M. Maternal health in Gujarat, India: a case study. *Journal of Health, Population and Nutrition*. 2009;27(2):235.
107. Naicker S, Plange-Rhule J, Tutt RC, Eastwood JB. SHORTAGE OF HEALTHCARE WORKERS IN DEVELOPING COUNTRIES—AFRICA. *nation*. 2009;19(1):60-S61.
108. Thaddeus S, Maine D. Too far to walk: maternal mortality in context *Social Science & Medicine*. April 1994;38(8):1091-1110.
109. *Myanmar: Improving Maternal, Newborn and Child Health in the South-East Asia Region*: World Health Organization
110. Stanton C, Blanc AK, Croft T, Choi Y. Skilled care at birth in the developing world: progress to date and strategies for expanding coverage. *Journal of Biosocial Science*. 2006;39(01):109-120.
111. Unger JP, Van Dessel P, Sen K, De Paepe P. International health policy and stagnating maternal mortality: is there a causal link? *Reproductive Health Matters*. 2009;17(33):91-104.
112. Marylou Carr CNM, Riesco MLG. Rekindling of Nurse-Midwifery in Brazil: Public Policy and Childbirth Trends.

- 113.** Harvey SA, Ayabaca P, Bucagu M, et al. Skilled birth attendant competence: an initial assessment in four countries, and implications for the Safe Motherhood movement. *International Journal of Gynecology and Obstetrics*. 2004;87(2):203-210.
- 114.** Carlough M, McCall M. Skilled birth attendance: What does it mean and how can it be measured? A clinical skills assessment of maternal and child health workers in Nepal. *International Journal of Gynecology and Obstetrics*. 2005;89(2):200-208.