In: Maternal Mortality
Editor: David A. Schwartz
ISBN: 978-1-63482-709-6

Chapter 4

MATERNAL HEALTH SITUATION IN INDIA: ISSUES AND OPTIONS

Kranti Suresh Vora*, MD, MPH, PhD,
Poonam Trivedi, BHMS, Sandul Yasobant, MPH and
Dileep V Mavalankar, MD, MPH, DrPH
Indian Institute of Public Health, Gandhinagar, India

ABSTRACT

India is the second most populous country and the highest contributor of maternal deaths globally. The maternal mortality ratio of India has been reduced from 400 in 1999 to 178 in 2012, a drop of more than 50% as per the Sample Registration System (SRS) of India report. Despite this decrease, India will not be able to achieve the fifth Millennium Development Goal (MDG 5) by 2015, and the magnitudeof decrease in maternal mortality has remained same for the past decade. India has implemented national level programs to improve maternal health starting with Child Survival Safe Motherhood (CSSM) in the 1990s, to the recent National Rural Health Mission (NRHM) implemented in 2005 which has led to some improvement in maternal healthcare utilization despite as documented in demographic surveys. The coverage of antenatal care has improved, with about 75% of all mothers receiving some antenatal care in 2007-08 compared to 65% in 1998-99. Similarly, institutional deliveries rose to 50% in 2008 from 34% in 1999.

This chapter analyses the trends in maternal mortality in India, the maternal healthcare-delivery system at different levels, and the implementation of national maternal health programmes, including recent innovative strategies. It identifies the causes for limited success in improving maternal health indicators and suggests future actions to improve the situation. Geographical vastness and enormous sociocultural diversity mean that maternal mortality and maternal health care utilization varies across India, and uniform implementation of health-sector reforms is not possible. Improved documentation of maternal healthcare utilization and maternal health indicators including maternal deaths is recommended. Implementation of evidence-based, focused strategies along with effective monitoring is important for making meaningful difference in

* Correspondence to Dr. Kranti Suresh Vora at kvora@iiphg.org.

improving maternal health care utilization along with building a strong health system to make sustainable progress in maternal mortality reduction.

Keywords: Maternal health, India, maternal mortality, safe motherhood initiatives

INTRODUCTION

The World Health Organization (WHO) estimates that, of 358,000 maternal deaths occurring globally each year, 63,000 occur in India - this represents approximately 18% of all maternal deaths worldwide. [1] Estimates of the global burden of disease show that India alone contributed 25% to disability-adjusted life-years lost due to maternal conditions. [2] India is making determined efforts to reduce maternal mortality and achieve the fifth Millennium Development Goal (MDG) of bringing down the maternal mortality ratio from 178 in 2012 to 100 maternal deaths per 100,000 live births by 2015. [2] For maternal and neonatal health, access to quality maternal health care especially institutional deliveries and emergency obstetric care (EmOC) play a pivotal role. The last two decades (1990-2010) have been noteworthy and consequential in terms of significant expansion of maternal and child health (MCH) programs, especially the infrastructure, across the country starting with the Child Survival & Safe Motherhood (CSSM) program in 1992. Reproductive Child Health I (RCH I) and National Rural Health Mission (NRHM) had the basic goal to improve the availability of and access to quality health care including maternal and child health care for people especially for those residing in rural areas. [3] NRHM defined the goal of access to maternal health care as availability skilled attendance at birth, timely access to emergency obstetric and newborn care (EmONC), and an efficient referral system. [4]

Major maternal health programs implemented in India during the post-independence era are CSSM, RCH I and NRHM. Various strategies were implemented in these programs such as First Referral Units (FRUs), training of various levels of providers for skilled birth attendance, establishing blood storage units, and demand-side financing programs, namely Janani Suraksha Yojana (JSY), to increase access to the institutional deliveries and EmOC for poor rural women and to reduce inequality. [5] Recently, public private partnership (PPP) schemes such as Rashtriya Swasthya Bima Yojana (RSBY) and Chiranjeevi Yojana (CY) have been launched in collaboration with private providers for improving access to institutional deliveries and EmONC. In collaboration with private entities such as Emergency Management and Research Institute (EMRI), 108 ambulance services were launched to improve emergency care management including obstetric care. [6]

Many government and independent agencies such as United Nations Population Fund (UNFPA), United States Agency for International Development (USAID), International Institute for Population Science (IIPS), and the United Nations Children's Fund (UNICEF) have carried out evaluations of different interventions to ascertain their impact on maternal health and access. [7, 8] Unfortunately there is a lack of review publications that collate the evidence and highlight the issues and lessons for maternal, child and neonatal health. As programs such as JSY are amongst the largest in the world, lessons learned from the evaluation of such interventions have global implications, especially for developing nations. In this chapter, the history of maternal mortality reduction and national level programs is traced along with novel strategies implemented by the state and national governments. The

current maternal health situation and issues are discussed, while recommending options for future.

METHODS

Various methods are used for collecting relevant information, including review of literature (i.e. published and unpublished reports of governmental and non-governmental agencies, peer-reviewed publications), secondary analysis of data from demographic surveys, the Management Information System (MIS), Sample Registration System (SRS) and Census. Demographic surveys included in this chapter include the National Family Health Survey (NFHS), District Level Household Surveys (DLHS) and Coverage Evaluation Survey (CES). Both NFHS and DLHS are conducted periodically at the national level by International Institute of Population Sciences (IIPS), Mumbai, which is an independent organization. These surveys have been conducted since 1992 and the latest NFHS-3 was conducted in 2005-06, followed by DLHS-3 which was conducted in 2007-08. The information regarding health infrastructure and human resources were collected from the Rural Health Statistics (RHS) bulletin from Census India,DLHS-3 facility surveys and national government documents. Some of the information was included from CES (2009), as it contains some of the latest data available on maternal healthcare utilization, but the data collection methods in demographic surveys were different from CES. The strategies and implementation of RCH (Reproductive and Child Health Phase I & II) were analyzed, which included the past efforts and the new initiatives to understand their effects on the performance indicators of maternal health. Reliable data on maternal mortality and morbidity in India is not available, and the present estimates vary considerably. Data gaps were also found in information on the process and input indicators, such as number of FRUs (First Referral Units) for EmOC and the availability of specialists.

This chapter also attempts to evaluate maternal health programs to understand current issues, and suggests recommendations to improve the maternal health situation. The data are scant and there is an urgent need to ensure reliable data on maternal health indicators including service indicators and outcome indicators. Also the data from the private sector, which is a major service provider for maternal health services in India, is almost nonexistent. Despite these data issues, this chapter attempts to use available information to understand the maternal health situation in India and propose potential options for the future.

RESULTS

History of Maternal Mortality Reduction in India

Periodic collection of data on fertility and mortality indicators in India is a recent event. Prior to the initiation of the SRS in 1970, there was no systematic collection and documentation of maternal mortality. [9] The first estimation and reporting of maternal mortality in modern India was done by The Government's Health Survey and Development Committee, known as the Bhore Committee, in 1946. After reviewing the available evidence, the Committee concluded that the MMR in the country was approximately 2,000 deaths per

100,000 livebirths. [10] In 1959, the Mudaliar Committee estimated that the MMR had decreased to 1,000. [11] 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. [10] During 1984-1985, the first community-based study on maternal mortality in Ananthapur district of Andhra Pradesh gave an estimate of 798 deaths per 100,000 live births for the district. [12]

Results of more recent nationwide studies suggest that a decrease in maternal mortality has been significant, but tardy. Since that time, a nationwide sample study in 1992 undertaken by the International Institute for Population Science (IIPS) found an MMR of 437. [13] Estimates from the National Sample Surveys (NSSs) and the SRS reveal that maternal mortality has declined from 1,300 deaths per 100,000 live births in 1957 to 301 in 2003. [11, 14] Yet, the SRS and the vital registration system are thought to be underestimates of the maternal mortality ratio, and an international experts group estimated the MMR of India to be 1.5 times greater, or approximately 450. [15] Regional estimates of maternal mortality based on small sample sizes, or estimates from the NFHS data, indicate that maternal mortality is much higher than the projected numbers from the vital registration system. The trend of maternal mortality decline is presented as a graph in Figure 1.

SRS estimates for 2012 are 178 maternal deaths per 100,000 live births, a decrease from 212 maternal deaths in 2007. The decline is approximately 16% - this is one of the lowest since independence, and much slower than needed to achieve the MDG-5 goals. The decline in maternal deaths may be attributed to improvement in the infrastructure and overall expansion of maternal health services as a result of maternal health programs implemented at the national level.

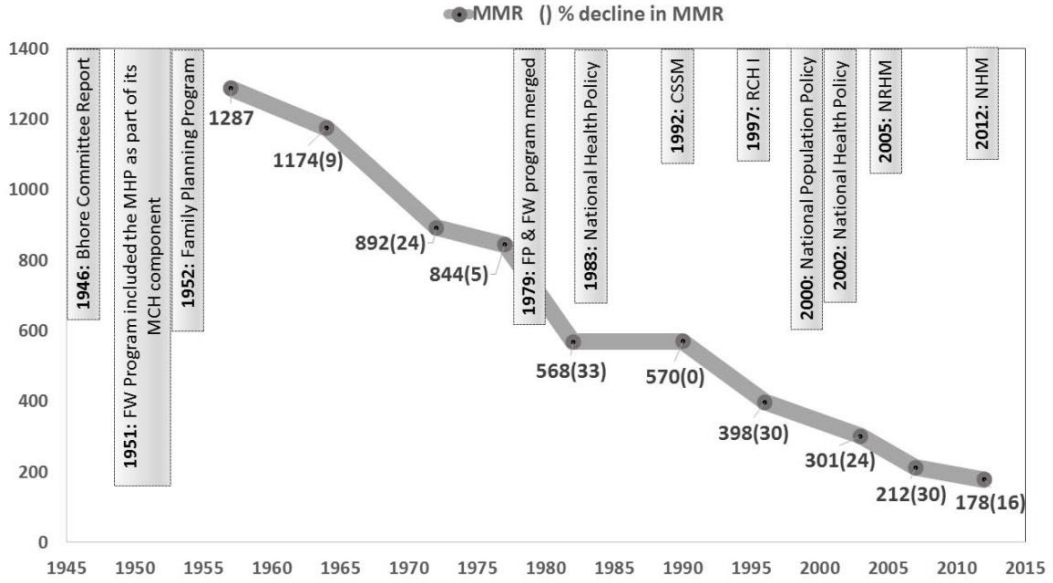

Figure 1. Trends of maternal mortality and evolution of national health programs in India. [14, 16]

Evolution of Maternal Healthcare Delivery System in India

The impact of all maternal health programs is reflected in current maternal healthcare indicators, and the current healthcare delivery system echoes the evolution of maternal health programs as depicted in Figure 1. Following independence in 1947, the Government of India took steps to strengthen maternal and child health services with the initial two Five Year Plans (1951-56 and 1956-61). MCH services were planned to be expanded by training of doctors, nurses and midwives. [16] In 1952, the national-level Family Planning program was started, which was followed by a merged and more comprehensive "Family Welfare & Family Planning" program in 1979 with an increased focus on maternal health. The first National Health Policy (1983) was a response to the Alma Ata Declaration. It had a focus on improving access to health services and reiterated the resolution of taking MCH services to the community. The World Bank-supported CSSM programme was launched in 1992 with the principal goals of training of traditional birth attendants, distribution of disposable delivery kits, and implementation of first referral units (FRU) for EmOC. The RCH Programme (RCH-I) was launched in 1997, aimed at integrated implementation of reproductive, maternal, child, adolescent health and family planning services through a participatory and decentralized "bottom-up" approach. [16] Under CSSM and RCH, the major activities were related to the supply-side, and resulted in significant expansion of maternal health services infrastructure. The National Population Policy (2000) and National Health Policy (2002) plans included the objective of reduction of MMR to less than 100 by 2010, but did not outline steps to achieve that objective.

The National Rural Health Mission (NRHM) was launched in 2005; it included novel initiatives such as demand-side financing (JSY) and public private partnership with EMRI to improve referral services. Initiatives under NRHM included Indira Gandhi Matritva Sahay Yojana (IGMSY) for improving maternal nutrition, and Janani Shishoo Suraksha Karyakram (JSSK) to reduce demand-side constraints, among others. Health system reforms included decentralized planning, appointment of managers with public health training at Sub-district levels, and more financial independence at the primary levels.

Improvement in the monitoring system focused on Maternal & Child Tracking (MCT) and Maternal Death Review (MDR). [3] National Urban Health Mission (NUHM) was supposed to improve healthcare for about 31% of urban poor – unfortunately, it was not well-implemented, and there is little data available on the program. [17] Table 1 summarizes the key elements of CSSM, RCH I and NRHM. The National Health Mission (NHM) is approved up to 2017 and is a convergence of NRHM and NUHM. As the NHM is still in a nascent stage, not many reports are available on differences between NRHM and NHM. [18]

Table 1. Key elements of maternal health of component of CSSM, RCH I & NRHM. [10] (Adapted from author's previous work)

Key elements	Child Survival Safe Motherhood (CSSM)	Reproductive Child Health I (RCH I)	National Rural Health Mission (NRHM)
	Duration: 1992-1996	**Duration: 1997-2004**	**Duration: 2005-2012**
	Funding: World Bank, UNICEF	**Funding:** World Bank & Other funding agencies	**Funding**: Government of India (GoI)
Strategies	• Upgrade existing CHCs to FRUs for providing EmOC • Convert village-level immunization sessions to mother and child-protection sessions • Train TBAs and raise gradation of skills of existing staff • Provide ANMs with subcentre medicine-kit • Educate people about the programme • Provide equipment/supplies for safe motherhood and neonatal care at the CHC level	• Make FRUs functional by providing contractual staff, building renovation • Increase availability of specialists in rural areas/FRUs • Ensure availability of blood at FRUs • Provide funds given to local governing bodies to provide emergency transport facilities • Improve quality of services • Provide additional honoraria to PHC and CHC staff for attending deliveries after office hours • Engage additional staff nurse for selected PHCs for 24 hours x 7-day delivery services • Provide mode of transportation for ANMs • Provide fixed drug and equipment-kit at each level as given in CSSM	• Increasing number of EmOC facilities • Operationalization of CHCs and at least 50% of PHCs to provide 24 hrs safe delivery by 2010 • Ensuring access to safe blood at all district hospitals & FRUs. • Training of medical officers in anesthesia & caesarean section • Providing EmOC services to BPL families at recognized private facilities • Use telecommunication systems to improve referral services • Provide incentives to doctors & other staff to work at PHCs/CHCs/FRUs providing 24 hrs services • Provide money to ANMs & MOs to run SCs/PHCs/CHCs/ FRUs smoothly
Service Package	• TT Immunization of pregnant women • Prevention and treatment of anaemia with IFA • Antenatal care and early identification of maternal complications • Delivery by trained personnel (including trained traditional birth attendants) • Promoting institutional delivery and management of obstetric emergencies	• Essential obstetric care • 24-hour deliveries at PHC and CHC • Referral transport • Blood storage at FRUs • Access to medical termination of pregnancy	• Providing skilled care to pregnant women at the community level • Safe medical termination of pregnancy • IMNCI plus programs/ strategy

CHC=Community Health Centre; IEC=Information, education & communication; IFA=Iron-folic acid; MOs=Medical officers; PHC=Primary Health Centre; RTI=Reproductive tract infection; STD=Sexually transmitted disease; TT=Tetanus toxoid

Current Maternal Healthcare Situation

India is the second most populous country in the world after China. India is expected to overtake China by 2050 as the decadal growth rate of India is higher than that of China. [19] Some of the reasons for higher population growth rate include an overall reduction in mortality and increased life expectancy that has nullified the effects of reduction in the birth rate. As seen in the Table 2, India is inching towards a replacement fertility rate, and the mean age of effective marriage has risen to 21 from 18, both leading to reduction in numbers of births. The poor status of women in India is reflected in comparatively lower literacy rates among women as compared to men.

Table 2. Demographic and health indicators of India [20, 21]

Indicator	Year		
	1991	2001	2011
Population (million)	843	1,028	1,210
Decadal growth rate	23	21	18
Population density per sq km	267	324	382
Birth rate	32.5	24	22
Death rate	11.4	7.5	7.1
Total fertility rate	3.6	3.2	2.4
Mean age of effective marriage of female (years)	19.5	20	21
Literacy rate Total Male Female	 52.2 64.1 39.3	 65.3 75.3 54.1	 74.0 82.1 65.5
Sex ratio (no. of females per 1,000 males)	927	933	940
Life expectancy at birth—females	61.2	66	68
Maternal mortality ratio (MMR) as per SRS	437	301	178

Reduction in births and increased institutional deliveries could be reasons for the reduction in the maternal mortality ratio in India from 212 per 100,000 live births in 2009 to 178 per 100,000 live births in 2012. There are significant regional differences in MMR within India - states such as Assam and Bihar have MMRs of more than 200 as compared to southern states such as Kerala and Tamil Nadu having very low MMRs of approximately 100. [1] As seen in Figure 2, maternal mortality is reduced, but implementation of newer initiatives under NRHM has not accelerated the trend of MMR decline. This is true for both the national average and also for high focus states such as Asam, Bihar and Uttar Pradesh. There is a need to re-examine strategies and ability of the health systems of high focus states to implement multiple strategies.

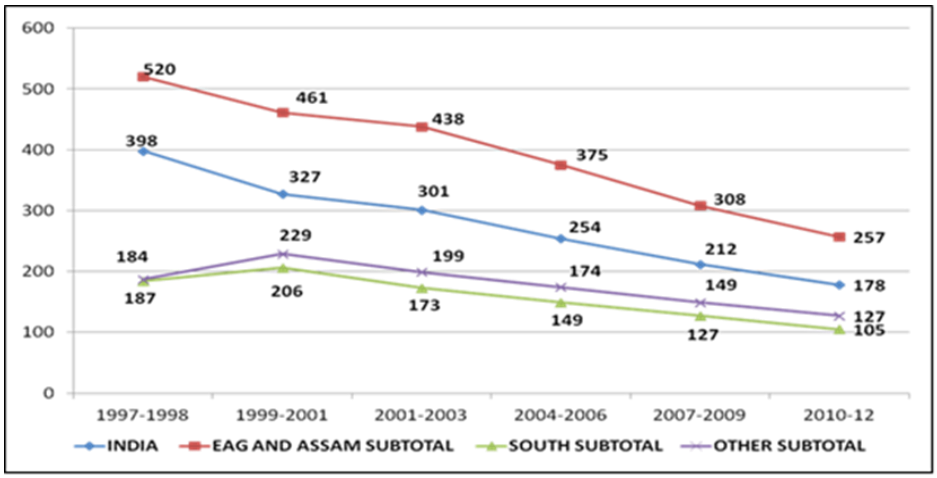

Figure 2. Regional differences in MMR [22]

Maternal Healthcare Services Utilization and Inequality in Access

Over the past decade, the utilization of maternal health care services has improved as a result of NRHM and innovative schemes launched by states. The proportion of mothers having an antenatal check-up in the first trimester has increased from 40% to 45%, while institutional deliveries have increased from about 40% to 47%, between DLHS-2 (2002-04) and DLHS-3 (2007-08). The Coverage Evaluation Survey done by UNICEF in 2009 shows even higher utilization with about 90% of mothers having at least one ANC visit and 73% institutional deliveries. As the sampling and the scope were different for DLHS and CES, one needs be careful when comparing data from both the surveys. Nevertheless, there is no doubt that utilization of all components of maternal healthcare services in India has increased.

One important reason for slow reduction of maternal mortality despite improved maternal healthcare utilization is inequality related to literacy status, economic situation, and geographic location of residence. Similar to other developing nations, women in rural areas in India are at higher risk of maternal death as a result of low utilization of maternal healthcare as seen in the DLHS-3 data. [23] The proportion of mothers having an antenatal check-up in the first trimester in rural areas is only about 38% compared to about 62% of the mothers in urban areas. Similarly, proportions of institutional deliveries among rural mothers are almost half (38%) of urban mothers (71%). [23] This geographic disparity is a result of health systems issues such as lack of infrastructure in rural areas and socioeconomic factors such as poverty. As seen in Figure 3, there is a huge disparity between the poorest and richest in access to all components of maternal healthcare services. The point differences in proportions of mothers having access range from 40 to 60% which shows that there is a significantly low access for poor mothers compared to the richest mothers. Unfortunately, the major disparity by wealth is seen in institutional deliveries, which is the most important component of maternal healthcare services for reduction of maternal mortality. Similar inequity is seen by literacy status in access to maternal healthcare utilization, with point differences in proportions ranging from 40-55% in Figure 4. Here, too, the major disparity is seen in

institutional deliveries (55%) and safe deliveries (54%) between non-literate mothers and mothers having more than 10 years of formal education.

Inequities in maternal healthcare utilization lead to higher unmet need for family planning among poor and non-literate women as seen in Figures 3 and 4. Disparities are higher for wealth than for literacy. Lack of access to family planning leads to higher risk of maternal deaths for poor women due to teenage pregnancies, repeated births in short period, and higher birth order. [24] In addition, Hill et al. noted that the majority of reduction in maternal deaths will be brought by family planning in India. [15] It is important to understand and address these inequities in order to improve maternal health in India and to bring about significant reduction in maternal mortality. To address these inequities, the knowledge of current maternal healthcare service delivery is vital.

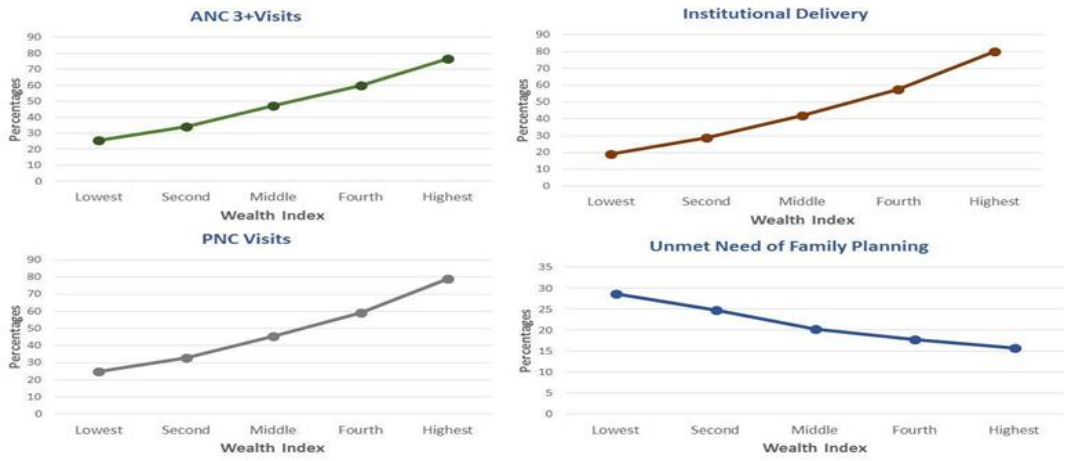

Figure 3. Maternal healthcare services utilization by wealth index [23]

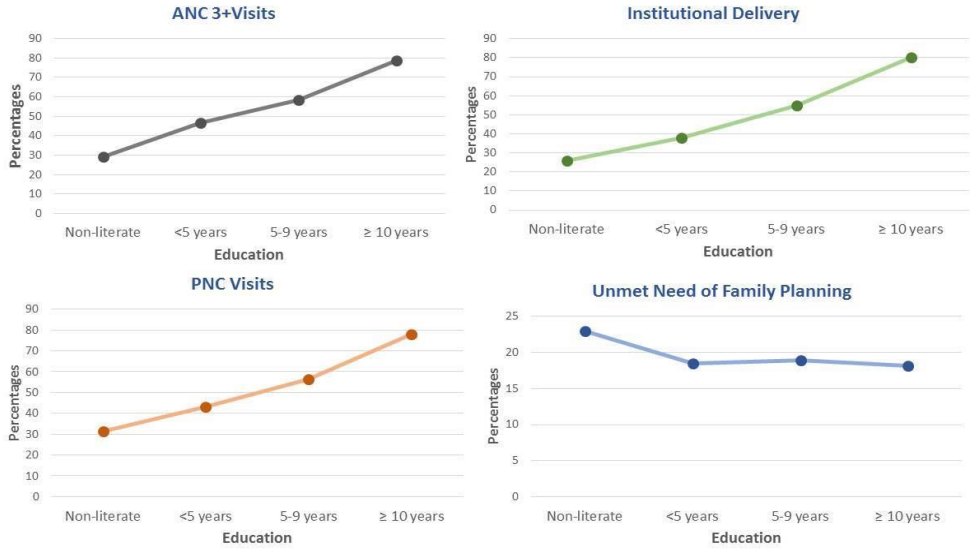

Figure 4. Maternal healthcare services utilization by literacy status [23]

Maternal Healthcare-Delivery System

Community-Level Maternal Healthcare

After independence in 1947, rural health services were established over time starting with primary health units (PHUs) serving a population of 100,000. Trained nurse-midwives were posted in hospitals or PHUs to provide maternal health services. Sub-Centres (SCs) were established below the PHUs to provide basic medical care and delivery care at the community level.

Temporary workers called Auxilliary Nurse Midwives (ANM) were local women with a primary education who were recruited and trained for a short period (24 months) to staff the SCs. [25] According to the World Health Organization (WHO), auxiliary workers are technical workers in a particular field with less than full qualifications. Over time, various committees, such as Mudaliar, suggested the continuation of auxiliary cadre to provide basic healthcare at the field level. [11] The ANMs gradually became permanent staff in the public-health system.

Under pressure from the Government, the Indian Nursing Council (INC) revised the ANM course and reduced its duration from 24 months to 18 months in 1977. Along with this dilution of training and weakening of skills, technical supervision also declined. These policy changes resulted in a drastic decline in the quality of the ANMs' midwifery training and practice in the country, changing ANM from MCH care providers to family-planning/immunization workers. [10]

Since ANMs are monitored only for family planning and immunization coverage, they have neglected delivery care. At present only 11% of deliveries in India are conducted by ANMs. To improve maternal healthcare, and especially delivery care, the ANM should be upgraded to Public Health Midwife as was done in Sri Lanka. Similar to Sweden and Sri Lanka, training young, highly motivated and healthy women from urban and rural areas, giving them quality midwifery training (of at least two to three years), and having strong regulations will help improve the access and availability of midwifery care at the community level.

Medical professionals should work as a team with midwives for increasing accessibility of quality delivery care. Providing care only through obstetricians for 70% of India's rural population is simply not possible. [26, 27]

The position of Accredited Social Health Activist (ASHA) was introduced in NRHM in 2006 to improve maternal healthcare utilization by acting as a bridge between the community and healthcare system at the village level. ASHA is usually a woman with at least 8 years of formal education, from the same village, who is incentivized to provide knowledge about various maternal health schemes to the mothers and facilitate comprehensive utilization of maternal health services. [3]

Gradually, ASHA has been allocated other health services such as tuberculosis prevention and malaria control which has diluted the maternal health services focus. [28]

Photograph 1. *Public Centers for Maternal Health services in India.* ***Left.*** *A community Health Centre in a rural area catering to 100,000-300,000 persons, and with a specialist situated in a town.* ***Right.*** *Primary Health Centre, a rural public health facility that provides service to a population of 30,000-50,000, and is usually located at a larger village level.*

Facility-level maternal healthcare

The Indian Government has focused on rural healthcare since independence, and has developed a three tier healthcare delivery system to improve access in remote areas by providing primary care at the village level, secondary care at the subdistrict and district levels, and tertiary care at the regional level. Medical colleges are developed as apex institutions with availability of medical specialities. Over the 50-year period since independence, India has expanded the public health infrastructure to include 148,366 Subcentres (SCs), 24,049 PHCs, and 4,833 CHCs (Table 3).

Even with this emphasis on infrastructure development, the Indian public health system is fraught with basic problems such as lack of quality care standards and absence of functional evaluation of health facilities at both the state and national level. Over half of the SCs and 30% of the PHCs do not have their own buildings. About a quarter of the FRUs do not have telephones, and 40% do not have a vehicle. 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 residential quarters for staff. [23] None of the national facility surveys mention the maternity ward; as a result, the numbers or condition of maternity wards is not known. There is a dearth of skilled staff, and particularly specialists, for providing EmOC. About

Table 3. Details of public health facilities, 2012 [28, 29]

Healthcare institution	Healthcare services provided	Population norms	Level	No in India (2012)	Highest medical services provider
Medical college hospital	CEmOC, Advanced lifesaving procedures	5-8 million	Apex	356	Super specialists
Sub Divisional Hospital (SDH)	CEmOC	5-6 million	III	987	Specialists, including obstetrician
District hospital	CEmOC	2-3 million	III	722	Specialists, including obstetrician, anaesthetist, paediatrician
First Referral Unit	CEmOC	300,000-500,000	II	2,891	Obstetrician, anaesthetist, paediatrician
Community Health Centre	BEmOC/ CEmOC	100,000-300,000	II	4,833	Medical officer/specialists
Primary Health Centre	ANC, PNC, BEmOC	30,000	I	24,049	Medical officer, staff nurse
Sub Centre	ANC, PNC, Delivery care	5,000	I	148,366	Auxiliary Nurse Midwife

50% of the CHCs and 30% of the FRUs do not have anaesthetists, and the same percentages do not have an obstetrician; it is not known at how many facilities the needed team of both an obstetrician and anaesthetist is available for emergency care. [23] As a result of poor infrastructure and lack of skilled human resources, the public healthcare system in India is unable to fullfill the demand and provide quality maternal healthcare. A weak public sector leads to a mixed and unregulated healthcare market.

Role of Private Sector

A mixed health care market of public and private providers is a reality for India. India is an under-resourced country with respect to human resources for health. [30] Amongst available allopathic doctors, it is more attractive to join the private sector with nearly three times as many working in private sector vis-à-vis public sector where again distribution is skewed to the urban area. The majority of alternative medicine graduates and paramedical personnel also work in the private sector. [31] Because of limited access in public sector, formal and informal private providers remain the main source for primary health care services including maternal healthcare in India. About 50% of all institutional deliveries occur in the private sector, and 36% of antenatal care is provided at the private facilities. More than 50% of mothers having post-delivery complications seek treatment from the private sector, and 48% of women utilize family planning services for spacing pregnancies from private providers. [23, 32] Relatively little is known about the private sector composition, the nature of clientele, the quantity and quality of services provided and the dynamics of the for-profit/not-for-profit private sector. [33] There is no information available on utilization of

services from informal providers. As the private sector provides a significant proportion of maternal health care, it is important to understand the quality of care provided by this sector.

The private sector in India can be divided into two subsets: a for-profit/commercial sector that comprises of organizations owned by individuals or shareholders whose primary objective is to earn a profit, and a non-profit/non-government (NGO) sector that is privately owned but defines its mission in terms of social goals rather than profitability. A variety of formally trained and licensed private health providers, including doctors, nurses, midwives and such paramedical staff including pharmacists serve communities along with an active informal sector including traditional healers ("quacks") and traditional birth attendants (TBAs). The informal sector is a significant but, unfortunately, not well-documented source of health care, especially for poor rural communities. [34] Variation in the format of practice is great with the majority of formal private providers operating in single specialty clinics, but who liaise with other specialties to ensure comprehensive care. Corporate hospitals and specialists are located in cities, while general practitioners, some with a medical degree but a large majority having no medical qualification, are found in rural areas. [35]

Lack of adequate infrastructure, unavailability of qualified support staff, absence of knowledge regarding recent clinical protocols, and discrepancies between provider knowledge and practice affects the quality of care in the formal private sector. [36] Approximately 64% of beds and 85% of doctors are in the private sector in India [33] and yet the information regarding service and output indicators such as number of surgical procedures done, patients seen, profile of patients, and treatment given is lacking. A dearth of data on service indicators makes it difficult gauge and regulate the quality of care in the Indian private sector. [36] Improving the quality of care in the private sector requires strong regulatory capacity of government and coalition involving civic society and professional organizations. Collecting data on input and service indicators for the private sector would help increase understanding the extent and the nature of quality of care issues. Accreditation, regular training of private providers, and mainstreaming the informal private sector will help improve access to quality care through private sector. [36]

Innovations

Many evidence-based new programs/innovations such as FRU in CSSM, and Tamil Nadu Medical Services Corporation Ltd. (TNMSC) and Dr. Muthulakshmi Reddy Scheme in Tamil Nadu for increasing institutional deliveries among poor mothers were implemented in RCH I. This section will discuss specifically innovations implemented in NRHM. As NRHM emphasized the decentralization and a "bottoms up" approach for planning, many more states piloted innovations to improve maternal health compared to previous programs. It should be noted that at the national and state level, the majority of innovations were directed towards promotion of institutional deliveries and improving emergency transport services. [37] Some of them are enumerated in Table 4, although there have been many more implemented across the country.

Table 4. List of innovations in maternal health in India [37]

Categories	Innovation	Location	Brief Description/Outcomes
Antenatal care	Providing Antenatal Care with Indian Systems of Medicine	Tamil Nadu	Administration of ISM drugs for antenatal care and counselling to pregnant women on nutrition and ISM drugs
	Convergence Model	Karnataka	A convergence model between the NRHM and NACO for HIV-positive mothers
Intranatal (facility level)	Chiranjeevi Yojana	Gujarat & Assam	PPP for emergency obstetric care and transport services for BPL women
	Janani Suvidha Yojana	Haryana	PPP for increase access to institutional delivery for urban BPL women and referral arrangements with government institutions using vouchers
	Janani Sahayogi Yojana	Madhya Pradesh	PPP for MCH services for BPL
	Ayushmati Scheme	West Bengal	PPP initiative for improving institutional deliveries among BPL
	Mamta Friendly Hospital Initiative	Delhi	PPP for obstetrical care covering BPL, SC/ST women
	Delivery huts	Haryana	Build and equip delivery huts and referral money
	Birth companion program	Tamil Nadu	Ensuring the presence of a birth companion during delivery
ANC to PNC	Saubhagyawati Scheme	Uttar Pradesh	PPP for complete obstetric care package for BPL
Referral System	Janani Express Yojana	Madhya Pradesh	Free ambulance services with call centres for referral
	Obstetric Helpline	Rajasthan	NGO partnership for efficient referral
Capacity building	EQUIP	Chhattisgarh	Multiskilling doctors, particularly in Emergency Obstetric Care (EmOC) and anesthesia
Monitoring & MIS	MAPEDIR	Rajasthan, Orissa, Jharkhand, West Bengal, Bihar	Confidential enquiry into maternal deaths for action .
	Dashboard System for MIS	Tamil Nadu, West Bengal	To monitor performance of various indicators
Procurement & finance system	KMSCL, RMSC	Kerala, Rajasthan	Drug management system to ensure a regular supply of drugs
	E-banking	Kerala	Using customized software, the transaction of NRHM funds done online
	Debit Card for ASHAs	Kerala	Paying incentives using debit cards.

Analysis of these "innovations" shows that many of these are not exactly new strategies, but the reinvention of strategies implemented in earlier programs such as CSSM or RCH I. For example, FRUs in CSSM were established to provide EmOC, especially CEmOC, in rural areas which is reemphasized in some of the schemes implemented under NRHM. Training of

MBBS (MD in other nations) doctors for providing EmOC was proposed in all the programs which was renamed as "EQUIP" in Chhattisgarh and called "multiskilling of medical doctors".

JSY is based on the Dr. Muthulakshmi Reddy scheme implemented in 1989 in Tamil Nadu that provided cash incentive to poor mothers for institutional deliveries. [38]

As seen in the Table 4, the majority of the innovations are for improving institutional deliveries or intranatal care, while overlooking other aspects of maternal healthcare including antenatal and postnatal care.

Family planning services are an important part of maternal healthcare services - it reduces the lifetime risk of maternal death by reducing numbers of conceptions and by spacing births. [15] There is a dearth of innovations to address the issue of lower use of spacing methods and postponement of first birth, which can also reduce maternal deaths. Lack of comprehensive maternal healthcare services is a major drawback of all the maternal health programs implemented in India.

It is noteworthy that within a period of approximately 5 to10 years, many innovations have been implemented in India and in many states to improve maternal health. The ability of a weak health system to successfully implement new strategies is limited - too many new programs will lead to further deterioration of the system. The majority of Indian states with high maternal mortality such as Uttar Pradesh and Madhya Pradesh have weak maternal health systems with limited infrastructure, human resources, and management capacity. [5] There is an urgent need to strengthen the health system along with implementation of locally relevant evidence-based strategies to improve maternal health.

ISSUES & OPTIONS

Issues

Policy

The health system of India has been chronically underfunded for greater than the previous 40 years. The Government spends only about 1% of gross domestic product (GDP) on health services, including expenditure by the Central and State Governments. This is one of the lowest in the world. The CSSM and RCH programmes contributed an additional fund of US$600 million and about US$300 million of which was for maternal health, spread over a period of 12 years.

However, during these 12 years, there were about 300 million new births in India, giving an average of only an additional US$1 per birth, which is insufficient to change maternal care provided to pregnant women. Given the enormous size of India, it cannot hope to improve maternal health based only on donors' support. [10] Recently under NRHM, the government increased the spending from US$735 million in 2005-06 to US$2,829 million in 2012-13. Spending in the RCH flexipool which funds maternal health programs also increased from US$48 million to US$1,016 million in the same time period. [39] Estimated numbers of births in the year 2013 were about 27 million in India, which means that total public spending is less than US$38 per live birth.

There is a need to improve funding for health, and especially for maternal healthcare, as maternal and newborn mortality results in loss of US$15 billion globally every year. [40]

Policy making process is ad hoc in India and, at times, disregards the evidence available. For example, policy making is often a "knee jerk reaction" to a developing situation, such as the epidemic of HIV/AIDS. National AIDS Control Organization (NACO), the government body set up to reduce incidence of HIV in India, reformed blood banking policies in the early 1990s. These policies made the blood safer but more scarce, and even the decision to allow blood storage units where blood banks could not be established has not made blood accessible in rural areas.

As postpartum haemorrhage is one of the most common causes of maternal death, and anemia is endemic among Indian mothers, blood transfusion is an essential life-saving EmOC function. [41] There are many more examples such as lack of clear policies regarding posting of doctors trained in EmOC and anaesthesia, and legal provisions for allowing ANMs to administer basic EmOC including administration of magnesium sulphate, etc.

Under NRHM, institutional deliveries were promoted as a measure to reduce maternal mortality. The international evidence suggests that provision of skilled birth attendance for 100% births with access to EmOC can reduce maternal mortality in low resource settings. [42] The Indian government promoted institutional deliveries by incentivising them, but without strengthening the capacity of public health facilities to provide skilled birth attendance or manage emergency obstetric cases. Review of demographic surveys shows that despite significant increase in the institutional deliveries, maternal mortality has not been reduced significantly in India. [43] This observation is also reflected globally, [44] and shows that erroneous interpretation of evidence can mislead policymakers. Thus, without a robust and standardized policymaking process, India will not be able make significant progress in making maternity safer.

Also the policymaking and program implementation needs to be scientific and policymakers should learn from past mistakes. JSY incentives for institutional deliveries provide a flashback of incentives for family planning in 1970s. The emphasis on increasing service utilization without improving the ability of system to provide quality care can lead to disappointment and poor perception of quality among clients.

Unfortunately, there is no long term policy for improving maternal health in India. Unlike its neighbours, India has not invested time and efforts to prepare a long-term policy to reduce maternal mortality that also has documentation of strategies to achieve the target. [45] As indicated earlier, although both NHP and NPP do have goals of MMR reduction, they do not outline steps to bring about the change. Past experience has shown that attempting too many interventions with limited managerial capacity does not lead to success – this is especially true within a weak health system.

Future programmes should, therefore, focus on specific, evidence-based strategies, such as skilled birth attendance, referral, and EmOC. This, in itself, is a challenging task in the extensive and varied infrastructure of the Indian health system. [46]

Photograph 2. *Appearance of labour rooms in Primary Health Centers in India.* ***Left.*** *A labor room in a rural health facility. It lacks the basic supply of mackintosh and clean linen. Surgical drums are lying on the floor. Water seepage in the walls can be seen, which affect the quality of care provided and increase the probability of infection.* ***Right.*** *A clean labor room in a rural health facility. It is well-ventilated and well-organized. Tiled walls are easy to clean and disinfect for adequate infection control leading to higher quality of care.*

Photograph 3. *Surgical theatres for operative maternity care in India.* ***Left.*** *Operating theatre for maternity care from a rural health facility This photograph clearly illustrates the substandard equipment, potential open air access through sealed windows, and trash including used gloves littered on the floor. The nature of the room makes it difficult to thoroughly clean. Infrastructure issues such as peeling paint from the walls worsen infection control issues leading to maternal morbidity and mortality.* ***Right.*** *An up-to-date operating theatre for obstetrical care having modern appliances, and no immediate access to the outside environment. This room can easily be sanitized between patients.*

Processes

Lack of clear processes and protocols is an important barrier to improve maternal health in India. Even where protocols are available, they are not being followed in the field. The monitoring system does not evaluate quality of care and is not geared to foster good practices. There is no penalty for not following protocols in the public sector or private sector. There is no technical supervision of quality of care and outcomes. There is a void of relevant data for monitoring, planning and documentation. Although the private sector is a major service provider of maternal health care services in India, there is hardly any service data available from the private sector. Similarly, even for the public sector, functionality and service statistics of facilities is limited and intermittent, which makes it difficult to understand the trend of utilization and functionality.

Under NRHM, the modified management information system is more focused on preventive care than on curative care, and the data on morbidity or mortality is not collected and analyzed systematically. There is a large-scale inflation of service statistics by field functionaries as the monitoring is based purely on numbers. Systematic comprehensive evaluations of programs including innovations are not performed, and program managers have a limited ability to the use of data for planning at regional level. There are inconsistencies in recording formats and lack of integration of electronic maternal child tracking system with routine HMIS. There are duplication of efforts and inefficient implementation of newer electronic monitoring systems. The HMIS system lacks the ability to integrate, synthesize and analyze the data to ensure a timely response. The focus is on requirement of top level officers, and not on the need of lower level healthcare providers, to improve patient management. Here, also, the lack of penalty or reward leads to no incentive to improve the quality of data. Despite the progress in technology, data entry takes place manually at multiple levels leading to duplication of work and wastage of skilled human resources. The majority of health programs have their own MIS, leading to collection of as many as 3,000 data points for a health worker in order to fulfill the divergent requirements of local, state and national government. [47]

Human Resources

India has significant shortage of skilled human resources for healthcare, similar to any other developing country. As per Rural Health Statistics report of 2012, there is a 65% shortfall of obstetricians in the public health sector. This limits access to maternity care in rural areas. Training of medical doctors for providing maternity care including EmOC was either not implemented or poorly implemented in many states in spite of national health policies. Practical training for all the levels, from ANMs to medical doctors, is too short and not geared towards skill building, and refresher trainings have the same issues. [10] The majority of training programs have not been evaluated for either content, methodology or effectiveness. As pointed out earlier in the chapter, there is a lack of management training and short-term duration trainings are not sufficient to improve the management capacity of maternal health system.

At both the national level and state level there is lack of clear HR policies for posting, transfer and promotions. [30] The career path of a public health care provider is not clear irrespective of the level. This leads to job dissatisfaction and demotivation among the providers. Absenteeism is rampant in the public health sector - a majority of staff do not stay at the headquarters and thus are not available for emergency obstetric care. [48] Posting of

contractual staff has been a strategy to improve service delivery since RCH I, but there is no consensus or clarity on the role of these staff. Contractual staff includes a staff nurse and AYUSH doctor to staff a PHC, as well as a district level program manager to manage maternal health in the district, and a state maternal health consultant. As there is no clarity as to their roles, the decision-making power of these staff members vary in different states, and their day-to-day activities also vary. Lack of parity regarding work allocation and remuneration between contractual and regular staff has led to high turnover and demotivation among contractual staff. Human resources issues are important for the public sector as the majority of new medical graduates prefer to work in the private sector. Despite substantial numbers of new doctors graduating every year, there is a huge shortfall in the availability of skilled providers in the public health sector.

Logistics and Finance

Compounding the problem of the low level of government funding, the financial systems of public health sector are highly bureaucratic, slow-reacting, and procedure-oriented, resulting in non-availability of funds at peripheral locations where needed. This occurs even when money is centrally available – with the result that unused funds are unavailable after the financial year is concluded. The financial and accounting regulations require much procedural and paper work for using money which has been specifically budgeted, with the result that non-budgeted essential activities cannot be performed. Under the NRHM, the Government is trying to streamline this process. Many states in India are in a severe financial crisis due to reluctance to collect taxes and profligacy of expenditure in the Government - as a consequence, there are diminished funds available for maternal health. Before NRHM, there was no flexibility of spending at the grass root level which affected the availability of locally-required equipment, drugs, and frequently the maintaining/repairing of available equipment. Despite improvement in the financial system within the NRHM, financials other than NRHM such as state treasuries still follow the same bureaucratic processes. This leads to a delay in the supply of equipment, shortages of drugs and disposables at all levels, and lack of equipment maintenance. [49] Following the example of Tamil Nadu, many states have developed similar mechanisms for logistics management such as TNMSC to improve logistics management. Unfortunately, the majority of the Indian states still have wasteful and inefficient logistics and financial management systems which have not been substantially reformed.

Limited Management Capacity of Maternal Health Services

At the national level, there are two major divisions within the Ministry of Health and Family Welfare - the Department of Family Welfare (DFW) and the Department of Health (DH). MCH, reproductive health, rural health, primary healthcare, and family planning come under the DFW; medical colleges, national institutes, and disease-control programmes come under the DH. The Maternal Health Division within the DFW is responsible for all technical and administrative aspects of maternal health activities throughout India (Table 5). These findings are based on interviews done with the officers from maternal health divisions. [50]

Table 5. Functions of the Maternal Health Division, Department of Family Welfare, India. (Extracted from Reference 10)

i.	Provision of technical advice to the Minister (democratically elected) and the Secretary of Health and Family Welfare (Indian Administrative Services officer) who are non-technical officials
ii.	Designing new evidence-based maternal health programmes
iii.	Setting technical standards and developing guidelines
iv.	Reviewing research and developing new evidence-based strategies
v.	Reviewing training content and tailoring it to emerging needs
vi.	Monitoring programme, implementation, and performance, including quality and evaluation of outcomes
vii.	Providing information to address questions in the parliament
viii.	Providing technical information on policy, legal and other issues
ix.	Commissioning special studies and reviewing data
x.	Dealing with professional organizations, non- governmental organizations, consumer groups, etc.
xi.	Interacting with donors, international agencies, and development partners
xii.	Planning and implementing national information, education, and communication
xiii.	Preparing budgets and funding programmes

Given its multiple functions, it is clear that the Maternal Health Division needs a high level of technical and managerial capacity. Yet, the Division is composed of only four officers—one Deputy Director General (DDG) of Maternal Health, and three Assistant Commissioners of Maternal Health (one of these Assistant Commissioner posts has been vacant for more than 15 years). This structure does not seem to have changed over time as the annual reports of the Ministry for 1998-1999 show the same structure. The present structure of the Maternal Health Division with only three officers is highly inadequate, not just in terms of numbers but also in terms of training and skills. These officers have no decision-making or financial powers, and it is not compulsory to have public health training or specific qualifications in maternal health to be appointed to these top maternal health positions. Any officer from the Central Government Health Services (a healthcare system for curative services established for Central Government employees) can be assigned to the Maternal Health Division. As all technical officers come from the Central Government Health Services that are mainly in Delhi and other small union territories, the officers typically do not have much field experience of implementing programmes at the state level. [50] They can be transferred in a short time as they do not have a fixed tenure in the Maternal Health Division; this affects their performance as there is a learning period in every new position. The officers of the Maternal Health Division reported that they spend about 40-50% of their time on non-technical issues; more time is used in administrative work because the lower-level administrative support is very weak. [10]

Managerial capacities at the state level for maternal health are also a major problem. No state has a dedicated officer for maternal health, and most states have only 2-3 officers looking after all activities of MCH/RCH. [51] The situation has improved at the state level with reforms under NRHM, and with the appointment of MD (NRHM) at the state level, who is usually an Indian Administrative Services member, and the formation of State (SPMU) and District Project Management Unit (DPMU). SPMU and DPMU are manned by personnel who are trained in health management. Although the premise was to have individuals with better

management skills to implement NRHM, the situation differs across states. This is because the decision making power of the SPMU and DPMU varies from state to state - in some states they have limited decision-making power and young recent public health graduates are hired who have no idea or experience of the health system and are usually looking for better career opportunities. The state and national governments have piloted many innovative strategies to increase maternal healthcare services utilization and to improve maternal health system in India.

As discussed earlier in the chapter, India has come long way in reduction of maternal mortality since the independence of 1947, yet it is still struggling to make motherhood safer. The Indian maternal health system is constrained by many issues including deficient policy making, inefficient implementation, and a weak health system. It is important to note at this stage that the geographic vastness and enormous cultural diversity in India makes it difficult to implement any program uniformly. Also, the maternal health indicators of Indian states reflect a wide range of maternal health care - from those similar to developed countries such as in Kerala and Tamil Nadu, to those states comparable to nations with the highest maternal mortality rates such as in Bihar, Uttar Pradesh and Odisha.

Options

The Indian health system must be understood not only as a mechanism for delivering technical interventions, but also as core social institutions that are indispensable for reducing poverty, social exclusion and inequity. Based on the above analysis of issues the following are some recommendations to improve the maternal health situation to the level that is comparable with middle-income countries such as China and Brazil.

1. There is a need for long-term policy for safe motherhood in India. All research in the field of maternal and child health should be embedded within the policy making by decision-makers. This process of policy-making must be systematic and standardized for all strategies. Attention should be paid that all the policies are implemented efficiently and understood by the grass root level workers accurately. The policy documents should also outline the steps to achieve the outcomes and have clear strategies for each goal. Policy-making should not be individual driven or donor-agency driven. As India is a diverse country, there should be scope for modifying the policy to suit local needs while keeping the goals and general direction of strategies standard.
2. Health System reforms are urgently required to ensure maternity is safer in India. Increasing public spending to improve quality of infrastructure and seamless service provision is the key to reverse public opinion about government health facilities. Improving financial and management capacity of state, district and subdistrict level officers and providers would lead to efficient use of available resources. Enhanced planning ability and use of data will optimize resource utilization. Better decision-making powers along with financial flexibility will empower local managers. Appropriate measures need to be taken to train, post and retain skilled providers for delivery care and EmOC. Streamlined logistics management will ensure supply of essential medicines and equipment.

3. It is difficult to measure the progress and evaluate the impact of maternal health programs or newer initiatives without robust HMIS. There is a need to collect and analyze outcomes and service indicators of public and private sector to know the utilization, quality and health status of mothers. Data collection and the analytic system can be improved by streamlining the collection and by reducing the data points to the minimal required. Integration and automation of HMIS with other data collection systems such as MCTS would make the monitoring and evaluation efficient. Validation of the data by triangulation and using standard tools for data collection would improve the quality of data. Timely and regular analysis of HMIS data at all the levels will allow the stakeholders to see and understand maternal health trends and formulate effective policies.
4. Quality maternal healthcare services are vital for improving maternal healthcare indicators. Quality and preparedness audits along with maternal death reviews would provide a comprehensive scenario for appropriate actions by various stakeholders. Maternal death review (MDR) provides a complete insight to social and health system issues including community level and facility levels. Quality and preparedness audits are useful to not only improve the quality of emergency obstetric care but also for maintaining the improved standards of care. Regulation of private sector and implementation of standard guidelines and protocols will improve the quality of care.
5. Maternal health needs to be a priority issue for politicians, who must help to build a strong health system. Leading politicians at the state and the national level should periodically review maternal health services to assess progress. Women's organizations need to take up the issue of high maternal mortality as an important issue to ensure that the Government is focused in its efforts. International and national level organizations need to join hands with professional organizations to make maternity safer in India. Improved political will and sustained advocacy for improving maternal health indicators will help to bring about the health systems and policy changes needed to accelerate the maternal mortality reduction.

India has progressed rapidly on the socioeconomic front, but progress in the improvement of maternal health has been slow. Review of safe motherhood efforts in India shows that, despite major initiatives taken in the last decades, maternity has not become significantly safer as the MMR still remains at approximately 200. The challenge is how to make safe motherhood strategies in the future more successful. Strengthening EmOC should be the focus of the safe motherhood strategy, along with ensuring skilled care at all births. Policy and programmes designed to implement evidence-based strategies and detailed micro-level programme planning are needed. Monitoring effective implementation and measuring progress is essential for success. It will take at least 10-15 years of consistent, concerted and committed efforts towards improving maternal health to show results.

Photograph 4. *The situation of maternity wards in India.* ***Left.*** *A modern, well ventilated and brightly lighted maternity ward that is clean.* ***Right.*** *A maternity ward with mosquito nets for mothers and their infants used to prevent comorbidity including insect-borne infectious disease among pregnant women.*

LIST OF ABBREVIATIONS

ANC	Antenatal Care
ASHA	Accredited Social Health Activist
CES	Coverage Evaluation Survey
CHC	Community Health Centre
CSSM	Child Survival & Safe Motherhood
CY	Chiranjeevi Yojana
DDG	Deputy Director General
DFW	Department of Family Welfare
DH	Department of Health
DLHS	District Level Household Survey
DPMU	District Project Management Unit
EmOC	Emergency Obstetric Care
EmONC	Emergency Obstetric and Newborn Care
EMRI	Emergency Management Research Institute
FRUs	First Referral Units
IEC	Information, education & communication
IFA	Iron-folic acid

IGMSY	Indira Gandhi Matritva Sahay Yojana
IIPS	International Institute for Population Science
INC	Indian Nursing Council
JSSK	Janani Shishoo Suraksha Karyakram
JSY	Janani Suraksha Yojana
MBBS	Medical school degree (Bachelor of Medicine, Bachelor of Surgery)
MCH	Maternal and Child Health
MCT	Maternal & Child Tracking
MD	Medical school degree (Doctor of Medicine)
MDG	Millennium Development Goals
MDR	Maternal Death Review
MIS	Management Information System
MMR	Maternal Mortality Ratio
MO	Medical Officer
NACO	National AIDS Control Organization
NFHS	National Family Health Survey
NGO	Non-profit/Non-Government Organization
NHM	National Health Mission
NRHM	National Rural Health Mission
NSS	National Sample Survey
NUHM	National Urban Health Mission
PHC	Primary Health Centre
PNC	Post Natal Care
PPP	Public Private Partnership
RCH	Reproductive Child Health
RHS	Rural Health Statistics
RSBY	Rashtriya Swasthya Bima Yojana
RTI	Reproductive Tract Infection
SC	Sub Centre
SPMU	State Program Management Unit
SRS	Sample Registration System
STD	Sexually transmitted disease
TNMSC	Tamil Nadu Medical Services Corporation
TT	Tetanus Toxoid
UNFPA	United Nations Population Fund
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
WHO	World Health Organization

REFERENCES

[1] World Health Organization. Trends in maternal mortality: 1990 to 2010 WHO, UNICEF, UNFPA and The World Bank estimates. WHO Library Cataloguing-in-Publication Data; 2012.

[2] World Health Organization. Maternal mortality in 2005: Estimates developed by WHO, UNICEF, UNFPA, and the World Bank. WHO Library Cataloguing-in-Publication Data; 2007.

[3] National Rural Health Mission. National Rural Health Mission Document (2005-2012). New Delhi: Ministry of Health and Family Welfare: Government of India; 2005.

[4] Bhattacharyya, S; Srivastava, A; Avan, BI; Graham, W. Quality care at childbirth in the context of Health Sector Reform Program in India: Contributing factors, Challenges and Implementation Lesson. *iMedPub Journals.* 2012, 1(1:2), 1-8.

[5] National Health Systems Resource Centre. NRHM in the Eleventh Five Year Plan (2007-2012). New Delhi: Ministry of Health and Family Welfare: Government of India, 2007.

[6] Emergency Management and Research Institute. 108 Emergency Response Services [homepage on the Internet]. No date [cited 2014 June 7]. Available from: http://healthmarketinnovations.org/program/emri-108-emergency-response-services

[7] Wang, H; Juyal, RK; Sara, AM; Fischer, E. Performance-Based Payment System for ASHAs in India: What Does International Experience Tell Us? Bethesda, MD: The Vistaar Project, Intra Health International Inc., *Abt Associates Inc*., 2012.

[8] United Nations Population Fund. Concurrent Assessment of Janani Suraksha Yojana (JSY) in Selected States: Bihar, Madhya Pradesh, Orissa, Rajasthan, Uttar Pradesh. Draft Report. New Delhi: UNFPA, India; 2009.

[9] Prasanta M. An Overview of the Sample Registration System in India. Paper presented at: Prince Mahidol Award Conference & Global Health Information Forum*;* 2010 January 27-30; Bangkok, Thailand, 2010. session 1.4 p.1-13.

[10] 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), 184-201.

[11] Ministry of Health and Family Welfare. Report of the Health Survey and Planning Committee. New Delhi: Manager of Publications: Government of India; 1961.

[12] Bhatia, JC. Levels and Causes of Maternal Mortality in Southern India**.** *Studies in Family Planning*. 1993, 24(5), 310-318.

[13] International Institute of Population Sciences. National Family Health Survey (MCH and Family Planning), India, 1992-93. Mumbai: IIPS; 1995.

[14] Registrar General of India. Maternal Mortality in India:1997-2003:Trends, Causes and Risk factors. New Delhi: Office of Registrar General: Government of India, 2006.

[15] Hill, K; Thomas, K; AbouZahr, C; Walker, N; et al. Estimates of maternal mortality worldwide between 1990 and 2005: An assessment of available data. *The Lancet.*, 2007, 370(9595), 1311-1319.

[16] Srivastava, A; Bhattacharyya, S; Clar, C; Avan, BI. Evolution of quality in maternal health in India: Lessons and priorities. *International Journal of Medicine and Public Health.*, 2014, 4(1), 33-39.

[17] Ministry of Health and Family Welfare. National Urban Health Mission: Framework for Implementation. New Delhi: Ministry of Health and Family Welfare: Government of India; 2013.

[18] Ministry of Health and Family Welfare. Framework for Implementation: National Health Mission; 2012-2017. New Delhi: Ministry of Health and Family Welfare: Government of India; Undated.

[19] Census of India. Size, Growth Rate and distribution of Population. Provisional Population Trial. Volume 1. Draft Report. New Delhi:Office of Registrar General: Government of India; 2001.
[20] Ministry of Health and Family Welfare. Family Welfare Statistics in India. New Delhi: Statistics Division, Ministry of Health and Family Welfare: Government of India; 2011.
[21] Sample Registration System. Volume 48. Draft Report. New Delhi: Office of Registrar General: Government of India; 2013.
[22] Sample Registration System. Maternal Mortality in India 2010-2012. New Delhi: Office of Registrar General: Government of India; 2013.
[23] International Institute of Population Sciences (IIPS). District Level Household and Facility Survey (DLHS-3), 2007-08. Mumbai: IIPS; 2010.
[24] Goldie, SJ; Sweet, S; Carvalho, N; Natchu, UCM; Delphine, H. Alternative Strategies to Reduce Maternal Mortality in India: A Cost-Effectiveness Analysis. *PLoS Med*., 2010, 7(4), e1000264.
[25] Mavalankar, DV; Vora, KS. The Changing Role of Auxiliary Nurse Midwife (ANM) in India: Implications for Maternal and Child Health (MCH). Indian Institute of Management, Ahmedabad [serial online]. 2008 [cited 2014 July 13]; W.P. No.2008-03-01. Available from: http://www.iimahd.ernet.in/publications/data/2008-03-01 Mavalankar.pdf
[26] Mavalankar, DV; Raman, PS; Vora, KS. Midwives of India: missing in action. *Midwifery*., 2011, 27(5), 700-706.
[27] Sharma, CD. Various aspects of domiciliary midwifery. *The Nursing Journal of India*., 1969, 60(7), 243-244.
[28] National Rural Health Mission. Reproductive & Child Health Programme-Phase II: 8th Joint Review Mission. New Delhi: Ministry of Health & Family Welfare: Government of India; 2011.
[29] Ministry of Health and Family Welfare. Rural Health Statistics in India 2012. New Delhi: Ministry of Health and Family Welfare: Government of India; 2012.
[30] Rao, DT. Human Resources for Universal Health Coverage. In: Edited by Chapter-4: Public Health Foundation of India Press, 2011; p. 1-36. Available from: http://uhc-india.org/uploads/ThammaRaoD_ HumanResourcesforUniversalHealthCoverage.pdf
[31] Jahan, BI. Public Private Partnership in Uttar Pradesh Health Care Delivery System-UPHSDP as an Initiative. Working Papers id:2330 e; 2009. Available from: http://www.cehat.org/go/uploads/ PPP/ bibisratpaper.pdf
[32] International Institute for Population Sciences (IIPS) and Macro International. National Family Health Survey (NFHS-3): Fact Sheet. Mumbai: IIPS; 2007.
[33] Raman, AV. Public Private Partnership in Health Care: Context, Models and Lessons. Faculty of Management Studies: University of Delhi, India; 2012.
[34] United State Agency for International Development. The Vital Role of the Private Sector in Reproductive Health. Office of Population and Reproductive Health, Bureau for Global Health: Private Sector Partnerships-One [PSP-One], 2009 Feb. 8 p. (Policy Brief; USAID Contract No. GPO-I-00-04-00007-00); 2009.
[35] Planning Commission. Clinical Establishments, Professional Services Regulation and Accreditation of Health Care Infrastructure: For the 11th Five-Year Plan. New Delhi: Government of India; 2006. Available from: http://planningcommission.nic.in/ aboutus/committee/wrkgrp11/wg11_hclinic.pdf

[36] Vora, KS; Mavalankar, DV. Quality of Reproductive and Child Health Care in the Private Sector in India: Issues and Options. *International Journal of Science and Research.*, 2014, 3(8), 181-186.

[37] National Rural Health Mission. Directory of Innovations Implemented in Health Sector. New Delhi: Ministry of Health and Family Welfare: Government of India; 2008.

[38] 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), 202-219.

[39] Mulagund, VD; Honakeri, P. Fund Allocations and Utilization under NRHM in India. *Indian Streams Research Journal.*, 2014, 4(5),1-8.

[40] World Health Organization. Investing in Maternal, New Born and Child Health: The case for Asia and the Pacific. WHO Library Cataloguing-in-Publication Data, 2009.

[41] Ramani, KV; Mavalankar, DV; Govil, D. Study of blood-transfusion services in Maharashtra and Gujarat States, India. *Journal of Health, Population, and Nutrition.*, 2009, 27(2), 259-270.

[42] Maine, D; Rosenfield, A. The AMDD program: history, focus and structure. *International Journal of Gynaecology and Obstetrics: the official organ of the International Federation of Gynaecology and Obstetrics.*, 2001, 74(2), 99-103.

[43] Randive, B; Diwan, V; De Costa, A. India's Conditional Cash Transfer Programme (the JSY) to Promote Institutional Birth: Is There an Association between Institutional Birth Proportion and Maternal Mortality?. *PloS one.* 2013, 8(6), e67452.

[44] Campbell, OM; Graham, WJ. Strategies for reducing maternal mortality: getting on with what works. *Lancet.*, 2006, 368(9543), 1284-1299.

[45] Barker, CE; Bird, CE; Pradhan, A; Shakya, G. **S**upport to the Safe Motherhood Programme in Nepal: an integrated approach. *Reproductive Health Matters*., 2007, 15(30), 81-90.

[46] Freedman, LP; Waldman, RJ; Pinho, HD; Wirth, M; Chaudhary, A; Rosenfield, A. Who's got the power? Transforming health systems for women and children. Summary Version of the report of the Task Force on Child Health and Maternal Health, UN Millennium Project, New York, USA; 2005. Available from: http://www.unmillenniumproject.org/documents/TF4Childandmaternalhealth.pdf

[47] Vital Wave Consulting. Health Information Systems in Developing Countries: A Landscape Analysis. Vital Wave Consulting HIS [serial online]. 2009 [cited 2014 September 13] 2009: 120. Available from: http://www.minsa.gob.pe/ogei/conferenciaops/Recursos/43.pdf

[48] Maheshwari, S; Bhat, R; Saha, S. Commitment among state health officials & its implications for health sector reform: lessons from Gujarat. *The Indian Journal of Medical Research.*, 2008, 127(2), 148-153.

[49] Iyengar, S; Dholakia, RH. Access of the Rural Poor to Primary Healthcare in India. Indian Institute of Management, Ahmedabad India [serial online]. 2011 [cited 2014 July 30]; W.P. No. 2011-05-03. Available from: http://www.iimahd.ernet.in/assets/snippets/workingpaperpdf/3937368102011-05-03.pdf

[50] Ramani, KV; Mavalankar, DV. Management capacity assessment for national health programs: a study of RCH program in India. *Journal of Health Organization and Management.*, 2009, 23(1), 133-142.

[51] Ramani, KV; Mavalankar, DV. Management Capacity Assessment for National Health Programs: A study of RCH Program in Gujarat State. Indian Institute of Management, Ahmedabad India [serial online]. 2007 [cited 2014 August 11]; W.P. No. 2007-03-02. Available from: http://www.iimahd.ernet.in/publications/data/2007-03-02_kvramani.pdf?origin=publication_detail