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Exemplars in Maternal and Newborn Health India Study

State Report: Madhya Pradesh

2024

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Exemplars in Maternal and Newborn Health India Study

State Report: Madhya Pradesh





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ACRONYMS

AARC	Average Annual Rate of Change
AIIMS	All India Institute of Medical Sciences
ANC	Antenatal Care
ANCq	Antenatal Care with Content
ANM	Auxiliary Nurse Midwife
ASHA	Accredited Social Health Activist
AWW	Anganwadi Worker
BMI	Body Mass Index
CDPO	Child Development Project Officer
CHC	Community Health Center
CM	Chief Minister
CMHO	Chief Medical Health Officer
CSSM	Child Survival and Safe Motherhood
CTPO	Chief Technical and Product Officer
DBT	Direct Benefit Transfer
DLHS	District Level Household Survey
DHS	Directorate of Health Services
EmOC	Emergency Obstetric Care
FRU	First Referral Unit
GBDS	Global Burden of Disease Study
HIV	Human Immunodeficiency Virus
HMIS	Health Management Information System
HMS	Higher Mortality States
ICU	Intensive Care Unit
IHAT	India Health Action Trust
IIPS	International Institute for Population Sciences
INR	Indian Rupee
JSSK	Janani Shishu Suraksha Karyakaram
JSY	Janani Suraksha Yojana
KII	Key Informant Interview
LB	Live Birth
LMS	Lower Mortality States
LPG	Liquefied Petroleum Gas
LSAS	Life-Saving Anesthesia Skills
MCEE	Maternal and Child Epidemiology Estimation
MCTS	Mother and Child Tracking System

MDNHM	Mission Director, National Health Mission
MDS	Million Death Study
MMR	Maternal Mortality Ratio
MNH	Maternal and Newborn Health
MPPHSCL	Madhya Pradesh Public Health Services Corporation Limited
MP	Madhya Pradesh
NFHS	National Family Health Survey
NGO	Non-governmental Organizations
NHM	National Health Mission
NHSRC	National Health System Resource Centre
NMR	Neonatal Mortality Rate
NRHM	National Rural Health Mission
NUHM	National Urban Health Mission
OOPE	Out-of-pocket Expenditure
PCI	Per Capita Income
PCPNDT	Preconception and Prenatal Diagnostics Technique
PHC	Primary Health Centre
PIA	Placental Implantation Abnormality
PMJAY	Pradhan Mantri Jan Arogya Yojana
PNC	Postnatal Care/Checkup
RCH I	Reproductive and Child Health I
RCH II	Reproductive and Child Health II
RKS	Rogi Kalyan Samiti
RMNCAH+N	Reproductive, Maternal, Newborn, Child and Adolescent Health plus Nutrition
RMNCH	Reproductive, Maternal, Newborn, and Child Health
RMNCH+A	Reproductive, Maternal, Newborn, and Child Health plus Adolescent Health
ROP	Record of Proceeding
SBA	Skilled Birth Attendant
SNCU	Special Newborn Care Units
SRS	Sample Registration System
SUMAN	Surakshit Matratva Ashwasan
TFR	Total Fertility Rate
UN	United Nations
UNFPA	United Nation Fund for Population Activity
UNICEF	United Nations Children's Fund
UoM	University of Manitoba
WCD	Women and Child Development
WHO	World Health Organization

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EXECUTIVE SUMMARY

The Exemplars in Maternal and Newborn Health Study documents factors associated with rapid reductions in maternal and neonatal mortality over the past two decades. This international effort aims to understand positive outliers and inform policy and practice. India was selected as one of seven "Exemplar" countries and within India the analysis was extended to examine high- and low-mortality state clusters separately, and to closely look at six exemplary states: Maharashtra, Tamil Nadu, Rajasthan, Odisha, Uttar Pradesh, and Madhya Pradesh. This report presents the Madhya Pradesh sub-study and provides background information on the broader India study and research methodology. Key findings for the Madhya Pradesh state are as follows:

- Madhya Pradesh made major progress in reducing maternal and newborn mortality during 2000-20, greater than most other higher mortality states of India.
- All major causes of neonatal death have reduced (infections, birth asphyxia, prematurity, and other).
- The gains in intervention coverage, antenatal care (ANC) with content, institutional deliveries, and c-section have been marked and are greatest during the NRHM/NHM periods (post 2005).
- The public sector has driven this increase in intervention coverage, accounting for nearly 90% of deliveries, and institutional neonatal mortality rates substantially reduced in lower-level health facilities.
- Several health policies and system reforms have contributed to Madhya Pradesh's success, including:
    - Madhya Pradesh has focused on mapping and identifying high need areas, and increased delivery points, including capacitating some health sub-centres to manage deliveries.
    - The state introduced free referral transportation and became the first state to create district level vehicle control cells.
    - Madhya Pradesh invested in improving the capacity of their human resources for health through in-service trainings, fellowship for medical officers to access diploma courses, and post training mentorship, supportive supervision, and skill labs.
    - The state was also the first to incentivize doctors to work in rural government facilities by posting medical students to primary health centres (PHCs) and reserving post graduate training seats for "in-service" government candidates.
    - While shortages of medical officers and specialists are a persistent issue in the state, the state created and filled additional staff nurse positions at delivery centres and tightened retention bonds for medical officers.
    - Madhya Pradesh focused on the "basics" of ANC, identifying high risk pregnancies, and improving timely referrals.

- The state implemented and benefited from the central government's quality improvement trainings, standards, and guidelines.
- The state pioneered their design approach to new maternal and child health (MCH) wings and special newborn care units (SNCUs) through involving technical experts as well as engineers and architects to ensure all design considerations contributed to high quality care provision.
- The state has improved blood transfusion availability through developing storage facilities at first referral units (FRUs) and hospitals.
- The state established Public Health Services Corporation Limited (PHSCL) and has streamlined drug and equipment procurement.
- The state has successfully adjusted financial policies to increase program officer flexibility in re-allocating funding and reduce use of maternal health funding for non-obstetric purposes.
- The state has sought to make "judicious" use of available funding by mapping expenditure and supply for drugs and equipment.
- Madhya Pradesh has instituted a time-bound grievance redressal system with strict hierarchical accountability.
- Routine reviews (maternal death review, state reviews, divisional reviews) have created a structure for accountability in the state.
- Data systems have been strengthened over time through adopting the Mother and child tracking system (MCTS) digital health records in the early 2000s and replacing it with the RCH system in 2016 that allows name-wise tracking; additional human resources for frontline data management have also been hired.

BACKGROUND AND STUDY DESIGN

The Exemplars in maternal and newborn health (MNH) study aims to systematically and comprehensively research and document factors associated with rapid reductions in maternal and neonatal mortality over the past two decades in select countries that have experienced more rapid declines than countries with similar socio-economic progress. This study contributes to a Gates Ventures initiative on Exemplars in Global Health, which includes other subject areas such as child mortality, stunting, community health worker programs, and vaccine delivery. The study is an international effort to learn from success and understand positive outliers to inform policy and practice.

India has made major progress in improving maternal and newborn health outcomes over the past two decades. According to India's Sample Registration System (SRS), between 2000 and 2018, the maternal mortality ratio dropped from 327 to 103 per 100,000 live births and the neonatal mortality rate from 44 to 23 per 1,000 live births. India's decline in mortality outpaced the global and regional decline, with or without adjustment for economic growth. In 2000, India accounted for 23% of maternal deaths and 31% of neonatal deaths globally. By 2017, these proportions had reduced to 12% of maternal deaths and 22% of neonatal deaths globally.[1,2] Therefore, important lessons can be learned from a systematic investigation of the drivers of India's progress, nationally and sub-nationally, for India to build on its success and for other countries seeking to accelerate progress in MNH.

The primary objective was to systematically investigate, document and compare the contribution of health policies and systems, programs, and services, as well as changes in coverage, quality, and equity of reproductive, maternal, newborn, and child health (RMNCH) interventions and contextual factors, to the reduction in maternal and neonatal mortality in India over the past two decades nationally and sub-nationally. The study was implemented by a team led by the National Health Systems Resource Centre (NHSRC) in collaboration with the International Institute for Population Sciences (IIPS), the University of Manitoba (UoM), and the India Health Action Trust (IHAT). The Ministry of Health and Family Welfare, Government of India supported the study under the guidance of a steering committee supported by a technical working group and a core implementation team.

The mixed methods study included the following components:

National macro-level analysis: Develop an understanding of India's levels and trends in maternal and neonatal mortality, and how these coincided with changes in health policies and systems, health programs and services, contextual factors, and MNH intervention coverage and equity, and identify clusters of states with varied contexts contributing most to India's national progress;

State-level in-depth analysis: Gain an in-depth understanding in six exemplar states within India of the pathways by which key drivers may have led to reductions in the states' neonatal mortality rate (NMR) and maternal mortality ratio (MMR);

Synthesis: Develop an analytical synthesis across the national and state-level research findings on the success factors contributing most to the reduction of maternal and neonatal mortality in India and exemplar states.

Study design

Conceptual framework for the Exemplars MNH study

The Exemplars in MNH study was guided by a conceptual framework that was developed to identify the drivers of change, dividing the interrelated factors hierarchically in distal, intermediate, and proximate drivers of maternal and neonatal mortality decline (Figure 1).[3]

On the far left of the framework, the health policy and system levers are the tools used by governments to improve MNH specifically, and non-MNH issues that may have an enormous impact on MNH. Government actions include changes in policy, services, and financial resources with direct or indirect linkages to MNH. Direct changes include strategies to strengthen the health system, while indirect changes include efforts to enhance gender equity or infrastructure in underserved parts of the country that would affect MNH outcomes.

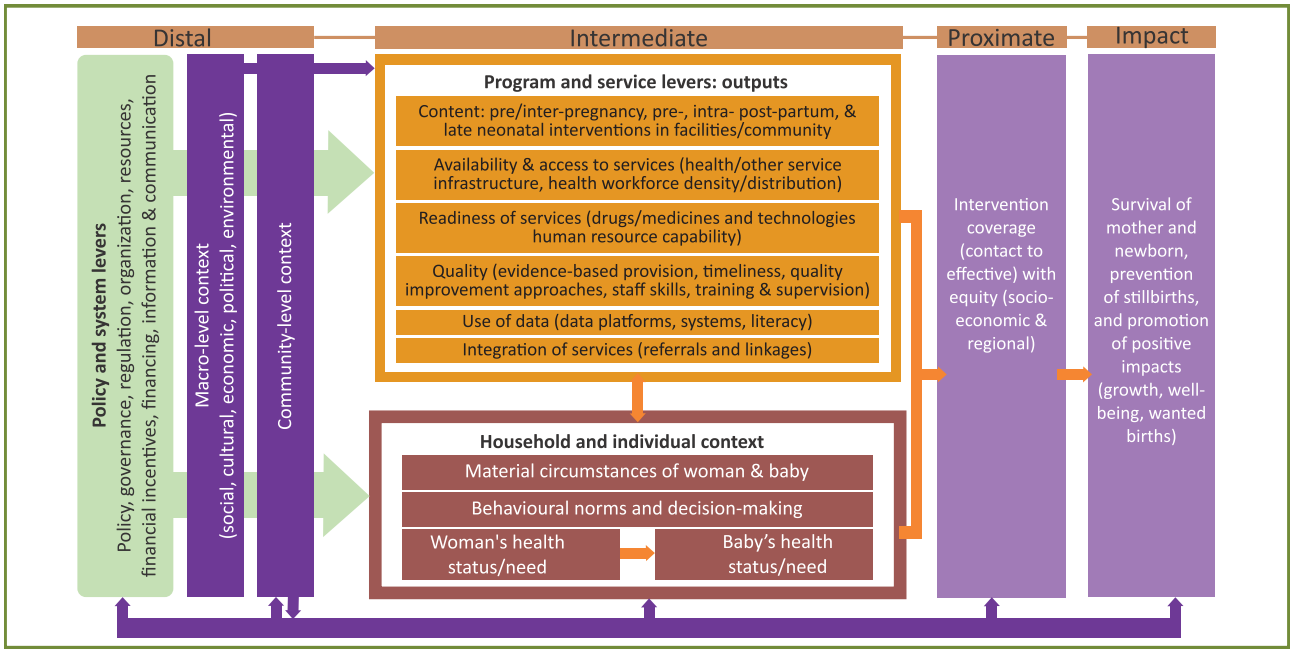
Macro- and community-level contextual factors (e.g., social, cultural, economic, political, or geographical) at the distal level may moderate the effects of health policy and system changes on program and service outputs for MNH and their impact on coverage of key MNH interventions and health outcomes. They can also directly influence the levels and equity of intervention coverage and/or maternal and newborn survival.

The health policy and system levers at the distal level aim to specifically influence program and service levers at the intermediate level, which are the concrete outputs of government actions in the health sector. These outputs include actual changes in service contents or program strategies, including access, readiness, quality, and integration of health services, necessary to increase intervention coverage and equity, and ultimately impact MNH.

Contextual factors at the intermediate level include the household and individual-level characteristics, including material circumstances (such as household assets and income), behavioural norms and decision-making, and health status/need of the women and babies concerned, which are seen to affect intervention coverage and mortality outcomes directly or indirectly.

These distal and intermediate factors are conceptualized as influencing the proximate factors, namely the coverage of interventions at promotive, preventive, and curative levels. This includes quality-adjusted coverage, and the degree that these are equitable between socio-economic groups and geographical regions. Coverage of interventions is considered most directly associated with a positive impact on maternal and newborn survival.

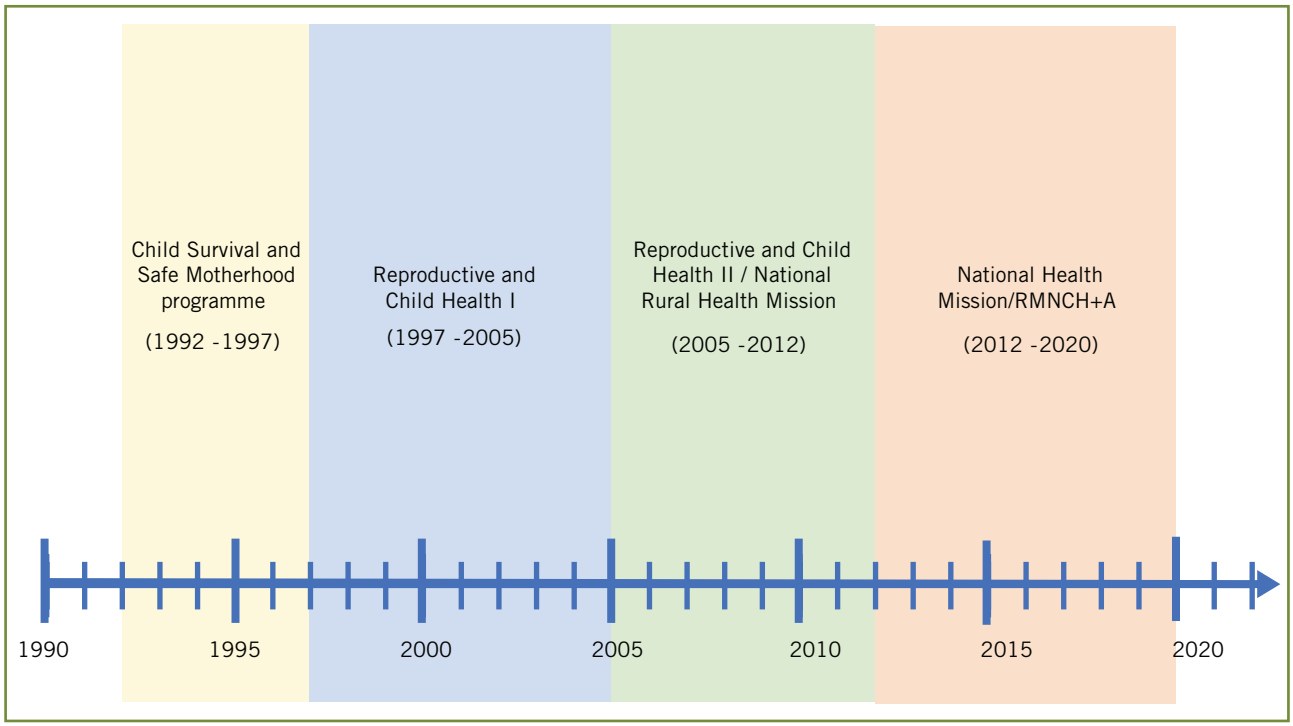
Figure 1: Conceptual framework for the study of drivers of the maternal and neonatal mortality decline, MNH Exemplars study



Identifying critical periods of policy change to guide analysis

The period of primary interest is 2000 to 2020, or the year the latest data was available. Levels and trends prior to 2000 are also relevant to understanding whether there were changes in pace of decline post-2000. To assess the possible impact of major policy and program changes implemented through the National Health Mission (NHM) to deliver services across the RMNCAH+N continuum of care across India, we divided the time period into four intervals to guide our mixed-methods analyses: the Child Survival and Safe Motherhood (CSSM) program from 1992 to 1997, the Reproductive and Child Health I (RCH I) program from 1997 to 2005, the Reproductive and Child Health II (RCH II) program and the National Rural Health Mission (NRHM) from 2005 to 2012; and the Reproductive, Maternal, Neonatal, Child and Adolescent Health (RMNCH+A) program and NHM from 2012 to 2020 (Figure 2). In addition, we assessed all annual or five-year time trends (depending on the indicator): periods of acceleration or deceleration of the decline in the relevant indicator (using the average annual rate of change).

Figure 2: India's health policy periods



State clusters

We observed two distinct clusters of states based on the situation in 2000 and 2018: one of higher mortality states (HMS) with lower per capita income (PCI), and one of lower mortality states (LMS) with higher PCI (Figure 3). The two state clusters resulting from this approach were:

- Lower mortality with higher PCI (47% of India's population): Andhra Pradesh, Gujarat, Haryana, Karnataka, Kerala, Maharashtra, Punjab, Tamil Nadu, Telangana, and West Bengal
- Higher mortality with lower PCI (49% of India's population): Bihar, Chhattisgarh, Jharkhand, **Madhya Pradesh**, Odisha, Rajasthan, Uttar Pradesh, Uttarakhand (all of which were part of the Empowered Action Group), and Assam

Figure 3: Comparison of state-specific MMR and NMR levels in 2000 and 2018 by state per capita income

Note: West Bengal, with a similar MMR and NMR to the lower mortality states but lower per capita income in 2018 is included in the lower mortality/higher PCI cluster. Uttarakhand with a similar MMR and NMR to the higher mortality states, but higher PCI in 2018 is included in the higher mortality/lower PCI cluster.

Selection of six states for in-depth analyses

Many states in India experienced impressive declines in both maternal and neonatal mortality during 2000-17, and so it is valuable to comprehensively study how different states achieved success. At the time of state selection, we used available data and computed average annual pace of the decline in both maternal and neonatal mortality during 2000-17 and selected the six best performing states, to reflect the two main outcomes of the study. We also considered population size, and different dimensions of equity (available for the neonatal mortality outcome). However, the results provide variable conclusions on the six states with most progress, and there is more uncertainty because of larger sampling errors for disaggregated data. Hence, considering the key objective of selecting states that have achieved fastest declines in MMR and NMR since 2000, the strongest indicator is the sum of a state's NMR and MMR average annual rates of change (AARCs).

All major (large population) states were considered in the selection process. The AARCs in maternal and neonatal mortality during 2000-17 were used as the main statistics for selection. The selection was based on SRS data, with its high consistency over time and availability for both indicators. The National Family Health Survey (NFHS) also provides trend data on neonatal mortality. The NFHS mortality data are more limited as they are only available for neonatal mortality, and there are more data quality-related and sample size-related issues that affect state-level trends.

The contribution of the cluster of higher mortality states to the India's progress was over 70% for maternal mortality and over 60% for neonatal mortality. Therefore, four of the six states selected for in-depth analysis were from the higher mortality cluster of states, and two from the lower mortality cluster of states. Conducting in-depth analysis in diverse states also provides scope for analyzing the drivers of success within different health systems, socio-economic and demographic contexts over time.

The AARCs for maternal and neonatal mortality are measures of common unit and scale. Therefore, we added the two rates to obtain an overall score for ranking the states within the cluster. The sum of the maternal mortality and neonatal mortality AARCs is shown in Table 1 below. Based on the sum of the two AARCs, the top-ranking four states overall among the high mortality state cluster are Rajasthan (-10.1%), Odisha (-9.9%), Uttar Pradesh (-9.3%) and Madhya Pradesh (-8.5%), followed by Bihar and Assam. In the lower mortality state cluster, the top states overall are Maharashtra (-13.2%) and Tamil Nadu (13.0%), with Kerala and Andhra Pradesh slightly below (both around -11%).

Table 1: Average annual rate of change (AARC) for maternal and neonatal mortality by state (SRS, 2000-17) (states ranked within state cluster by total AARC)

	MMR			NMR			Sum of AARCs	Rank
State	1999-2001	2016-18	AARC	2000	2017	AARC		
Higher mortality states								
Rajasthan	501	164	-6.6	48.9	27.0	-3.5	-10.1	**1 (selected)**
Odisha	424	150	-6.1	61.1	32.0	-3.8	-9.9	**2 (selected)**
Uttar Pradesh	539	197	-5.9	53.5	30.0	-3.4	-9.3	**3 (selected)**
Madhya Pradesh	407	173	-5.0	59.5	33.0	-3.5	-8.5	**4 (selected)**
Bihar	400	149	-5.8	42.1	28.0	-2.4	-8.2	5
Assam	398	215	-3.6	47.2	22.0	-4.5	-8.1	6
Lower mortality states								
Maharashtra	169	46	-7.7	33.4	13.0	-5.5	-13.2	**1 (selected)**
Tamil Nadu	167	60	-6.0	35.9	11.0	-7.0	-13.0	**2 (selected)**
Kerala	149	43	-7.3	9.8	5.0	-3.9	-11.2	3
Andhra Pradesh	220	65	-7.2	45.4	23.0	-4.0	-11.2	4
Karnataka	266	92	-6.2	40.2	18.0	-4.7	-10.9	5
Gujarat	202	75	-5.8	42.4	21.0	-4.1	-9.9	6
West Bengal	218	98	-4.7	31.1	17.0	-3.6	-8.3	7
Haryana	176	91	-3.9	37.5	21.0	-3.4	-7.3	8
Punjab	177	129	-1.9	29.0	13.0	-4.7	-6.6	9

Data sources

We used the SRS for maternal and neonatal mortality and fertility trends. The national household surveys including the National Family Health Survey[4] (NFHS, 5 rounds: NFHS-1 1992-93; NFHS-2 1998-99; NFHS-3 2005-06; NFHS-4 2015-16; and NFHS-5 2019-21), and the District Level Household Survey[5] (DLHS, 3 rounds: DLHS-1 1998-99; DLHS-2 2002-04; and DLHS-3 2007-08) were pooled for the trends in intervention coverage and equity analyses. For causes of death trends, we used the Million Death Study (MDS) for 2005-06, [6,7] and reviewed estimates from WHO/Maternal and Child Epidemiology Estimation (MCEE),[8] and the Global Burden of Disease Study (GBDS).[9]

For the qualitative component, we organized a national stakeholder meeting (length: 2 hours and 10 minutes) with 14 experts in June 2021 to identify key drivers of mortality declines. Key informant interviews (KIIs), averaging 1.5 hours) were conducted during July-November 2021. We invited 21 experts active since 2000 in MNH policy and implementation from the government, donor organizations, private, civil society, and academic spheres, of which 13 consented. We held one round table discussion with state-level experts in the six selected exemplar states separately (n=11 each on average) in March-April 2022, to identify key policy and health system drivers of mortality declines (averaging 3.15 hours). All were conducted on Zoom in English, audio-recorded, and transcribed. Ethical approvals were obtained from the International Institute for Population Sciences [#33/2021] and University of Manitoba [#HS24416] review boards.

Analytical methods

We analysed quantitative trends by computing average annual rates of change (AARC) through using exponential growth rate[10] for the different national policy periods. To measure ANC with contents and intensity-related components, we computed a composite index called ANCq[11], which has a 13-point scale. After adaptation to India, our ANCq index consisted of the number of ANC visits, timing of ANC, at least one ANC by skilled provider, blood pressure checked, weight measured, abdomen examined, blood sample collected, urine sample collected, and the number of tetanus toxoid vaccinations during pregnancy.

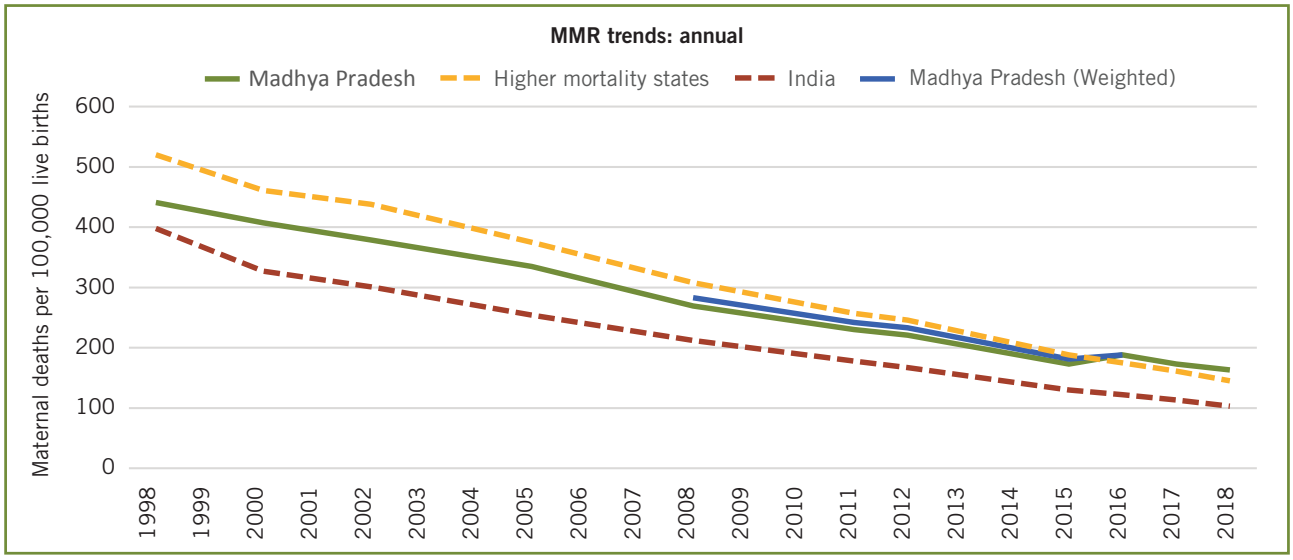
We coded the qualitative transcripts in Dedoose software using a codebook developed based on a priori topics, with additional emergent sub-codes. We shared synthesized results with key informants anonymously to finalize the results.

This report presents the results of these analyses for Madhya Pradesh according to the framework from right to left. This presentation order reflects the iterative approach to the analyses, working from observed trends in mortality outcomes and intervention coverage to describing hypothesized changes in health policy, systems, and service levers, as well as relevant contextual factors in Madhya Pradesh over the last two decades. Then the study analyzed the linkages between drivers and outcomes to explain how major drivers combined to influence Madhya Pradesh's maternal and neonatal mortality declines.

MATERNAL AND NEONATAL MORTALITY TRENDS

During 1997-2018, Madhya Pradesh recorded much faster reductions in maternal mortality ratio (MMR) than in neonatal mortality rate (NMR) (AARC of -5.1% versus -2.9%) (Figure 4 and Table 2). In 2018, the MMR for the state was 163 maternal deaths per 100,000 live births (more than twice the 2030 SDG goal of 70) and the NMR was 34 per 1000 live births (also more than twice the 2030 SDG goal of 12). The fastest decline in both the MMR and NMR was observed during the NHM/RMNCH+A period (2012-18/19), with an AARC of -5.1% and -2.4%, respectively (Table 2). Madhya Pradesh's NMR was higher than its state cluster except for years prior to 1986, while its MMR has been lower than its state cluster until after 2015 (Figure 4).

Figure 4: Madhya Pradesh's MMR (1998-2018) and NMR (1971-2019) levels and trends compared to higher mortality state cluster and all India (SRS)



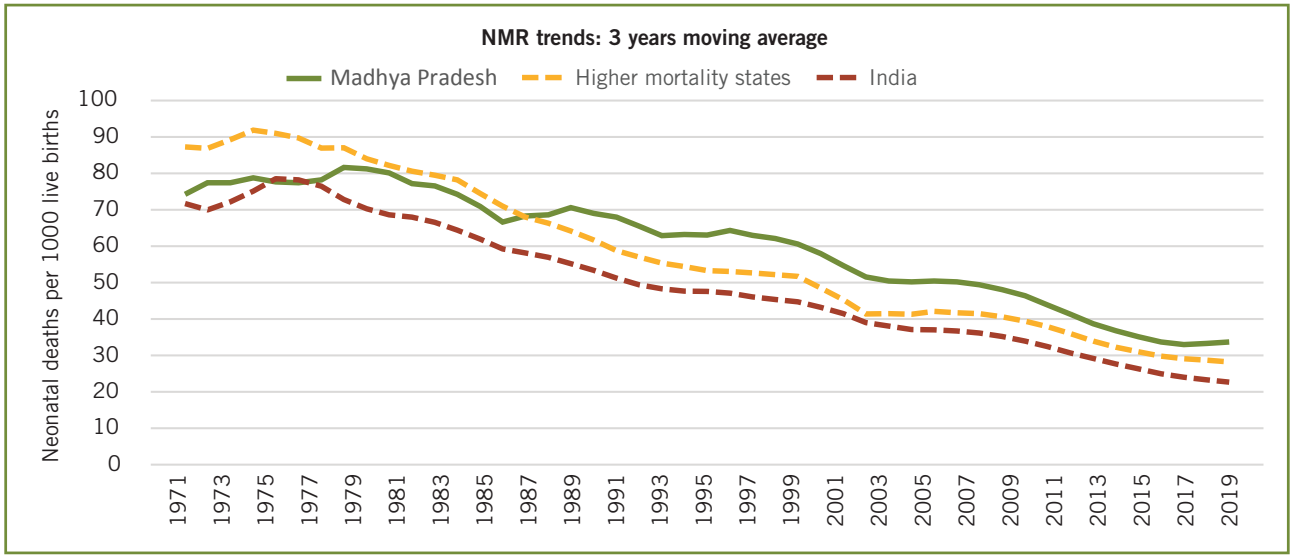


Table 2: Average annual rates of change (AARC) in unweighted MMR (1997-2018) and NMR (1971-2019), Madhya Pradesh, higher mortality state cluster and all India (SRS)

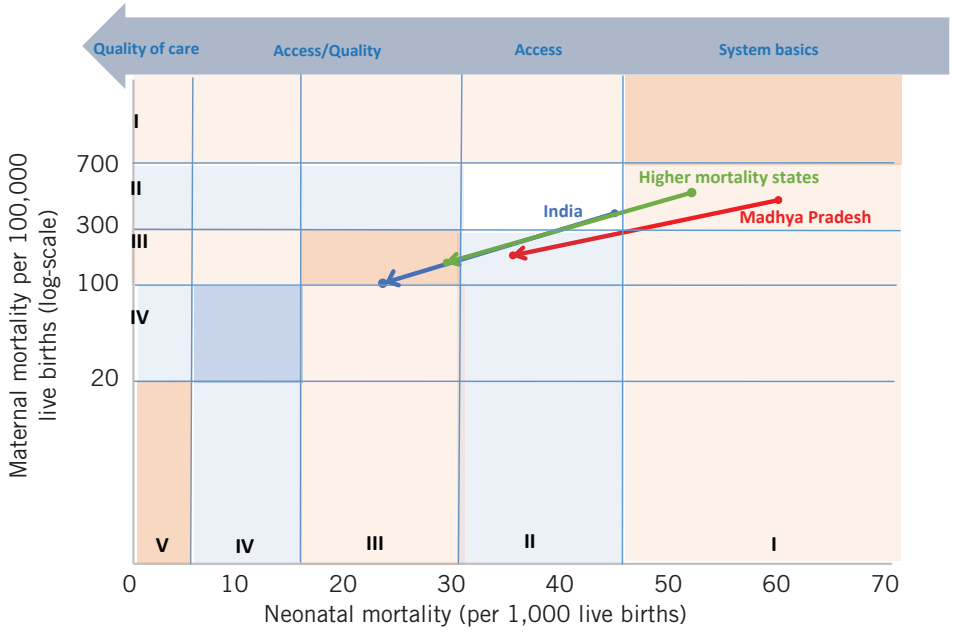
Policy period	Madhya Pradesh	Higher mortality states	India
AARC in MMR (%)			
1997-2005 (RCH I)	-3.9	-4.7	-6.4
2005-12 (RCH-II/NRHM)	-5.9	-6.0	-6.0
2012-18 (NHM/RMNCH+A)	-5.1	-8.8	-8.1
2000-18	-5.1	-6.4	-6.4
1997-2018 (Overall)	-5.0	-6.4	-6.8
AARC in NMR (%)			
1992-97 (CSSM)	0.0	-1.2	-1.6
1997-2005 (RCH I)	-2.9	-3.1	-2.8
2005-12 (RCH-II/NRHM)	-3.7	-2.9	-3.4
2012-19 (NHM/RMNCH+A)	-2.4	-3.1	-3.9
2000-18	-2.9	-3.2	-3.7
1971-2019 (Overall)	-2.4	-2.7	-3.0

Maternal and neonatal mortality transition

Madhya Pradesh's success in reducing maternal and neonatal mortality is presented (Figure 5) against a five-stage mortality transition model for maternal and neonatal mortality developed over the course of the Exemplars in MNH study. Stage I in this model indicates the highest levels of mortality, where access to services is extremely limited, inequalities are large, infectious diseases are a common cause of death, and fertility is high. Populations move across stages II, III and IV as access to health services increases, quality improves, inequality patterns change from top to bottom inequality, infectious diseases and peri-partum conditions decrease in importance as causes of death, and fertility decline. Stage V is the lowest possible maternal and neonatal mortality, wherein mothers and newborns have universal access to high quality are and (almost) all preventable deaths are eliminated.

During 2000-18, Madhya Pradesh has transitioned from stage I to late stage II, achieving a nearly two-fold reduction in maternal mortality and reducing the neonatal mortality by half (Figure 5).

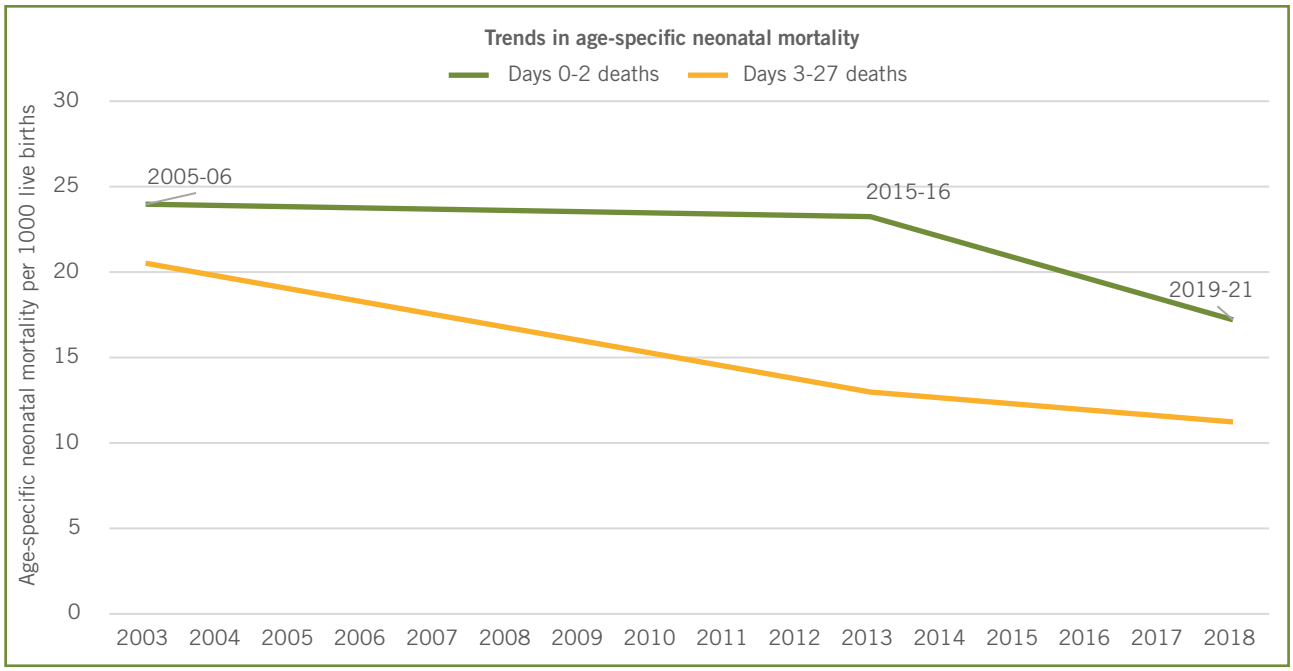
Figure 5: Mortality transition in Madhya Pradesh, higher mortality state cluster and all India (SRS 2000-18)



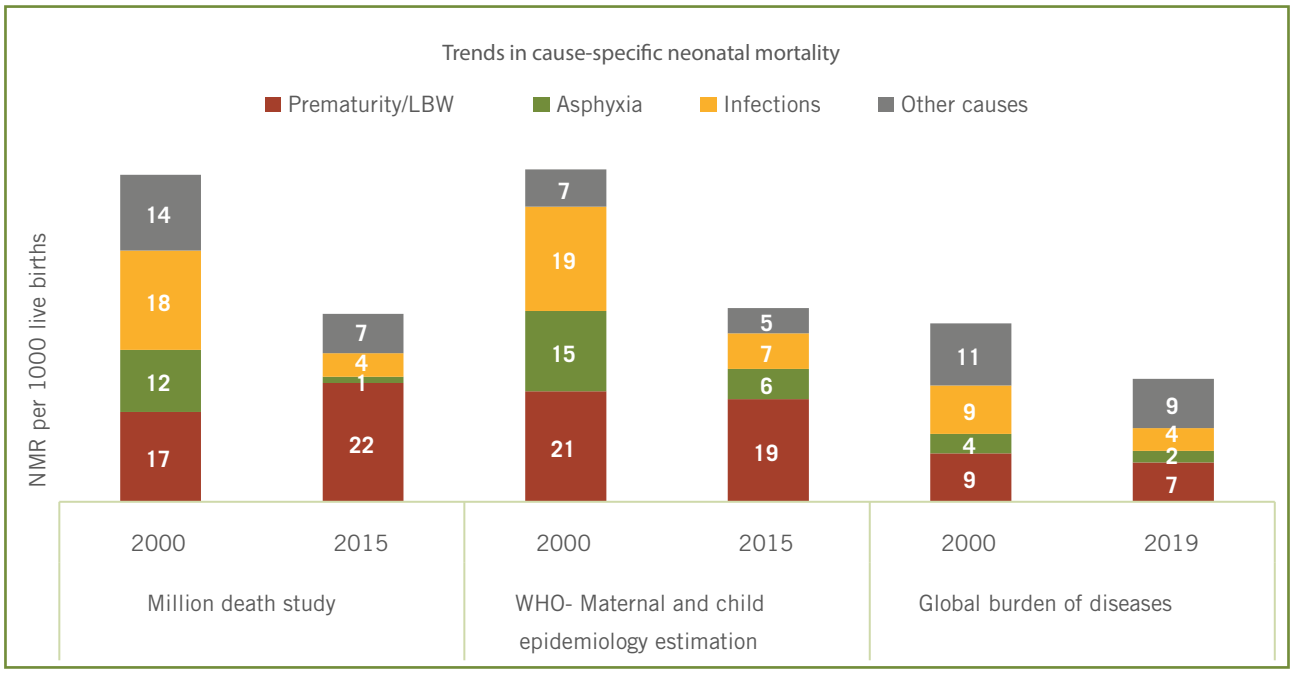
Age and cause-specific neonatal mortality

During 2003-18, Madhya Pradesh was successful in bringing down mortality both on days 0 to 2 and on days 3 to 27, with a greater decline in the latter (Figure 6). However, during 2013-18, the state recorded faster decline mortality on days 0-2 (AARC of -7.5%, data not shown), indicating improvements to quality of delivery care and newborn's health status in the recent times. The estimates from GBDS indicate that the state has recorded major declines in all leading causes with newborn infections including respiratory infections contributing 47% of total decline, followed by preterm birth contributing 16%, and birth asphyxia another 14%. Newborn infections contributed most to the decline in NMR as per MDS and WHO/MCEE data as well, followed by birth asphyxia. Slight increase in the NMR due to preterm birth was recorded by MDS between 2000 and 2015.

Figure 6: Trends in age-specific neonatal mortality during 2003-18 (NFHS 2005-06, 2015-16 and 2019-21*) and cause-specific neonatal mortality during 2000-19 (global data 2000, 2015 and 2019), Madhya Pradesh



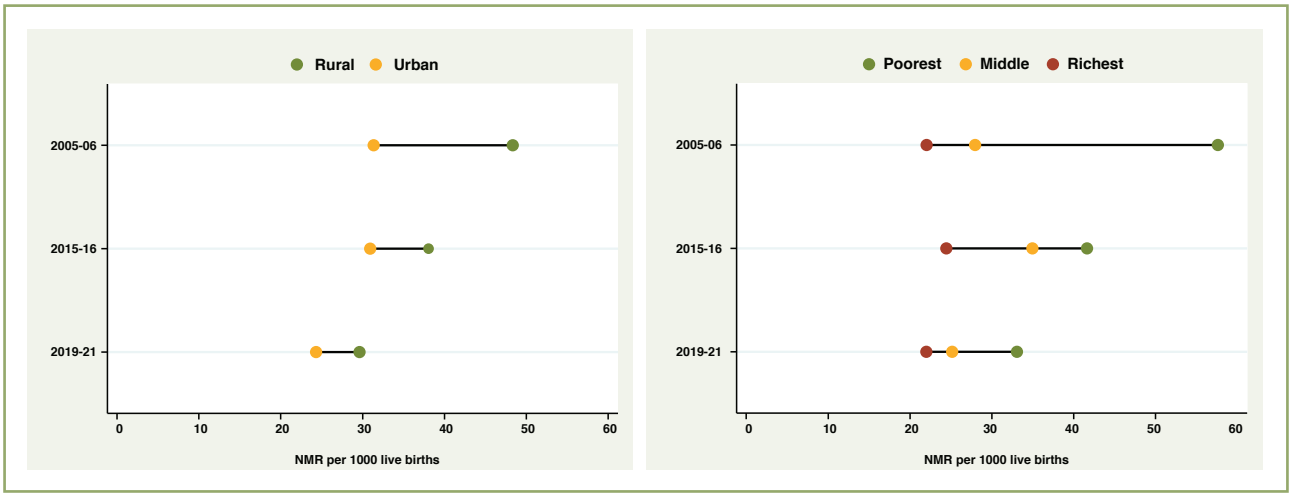
*We included mortality from births in the five years preceding each NFHS round and have taken 2003, 2013 and 2018 as the midpoints for the estimates from NFHS 2005-06, 2015-16 and 2019-21, respectively.



Equity in neonatal mortality

The state has succeeded in reducing the differences in NMR according to urban-rural residence and household wealth tertile considerably (Figure 7).

Figure 7: Trends in NMR by urban-rural residence and household wealth tertile, Madhya Pradesh (NFHS 2005-06, 2015-16 and 2019-21)



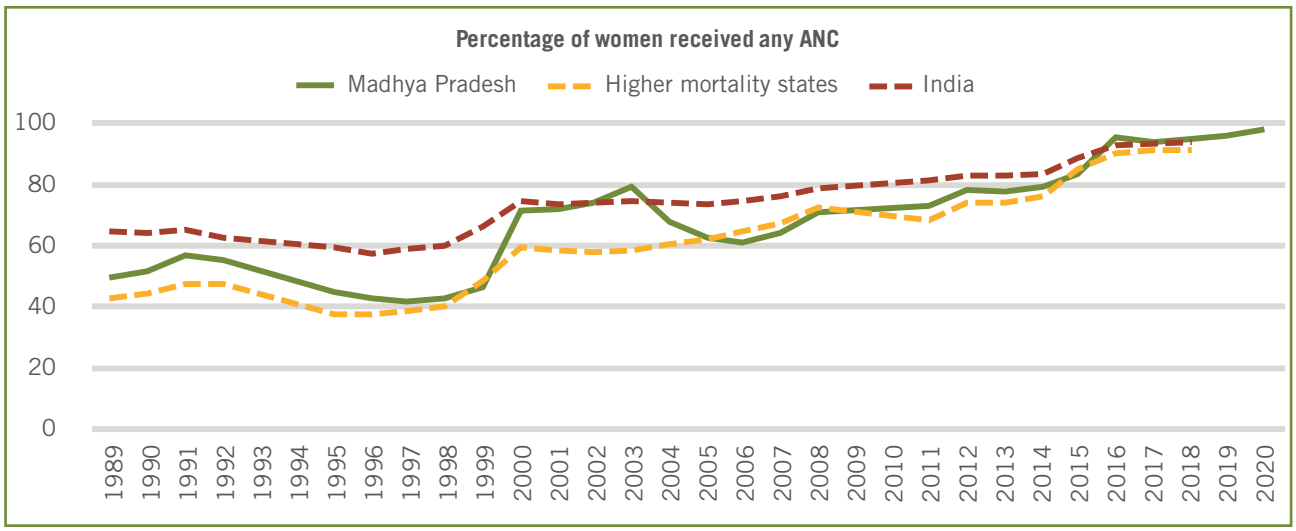
INTERVENTION COVERAGE AND EQUITY

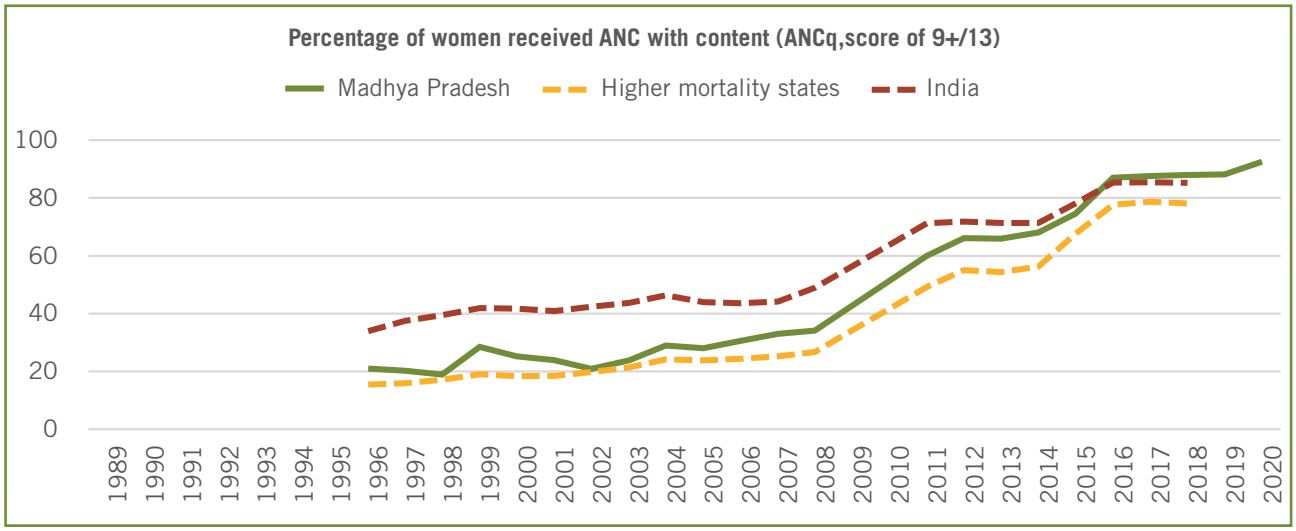
How did Madhya Pradesh achieve these major mortality reductions since 2000? In this section, we analyse the trends and equity in the coverage of key interventions in the state against the backdrop of the various national health policy periods.

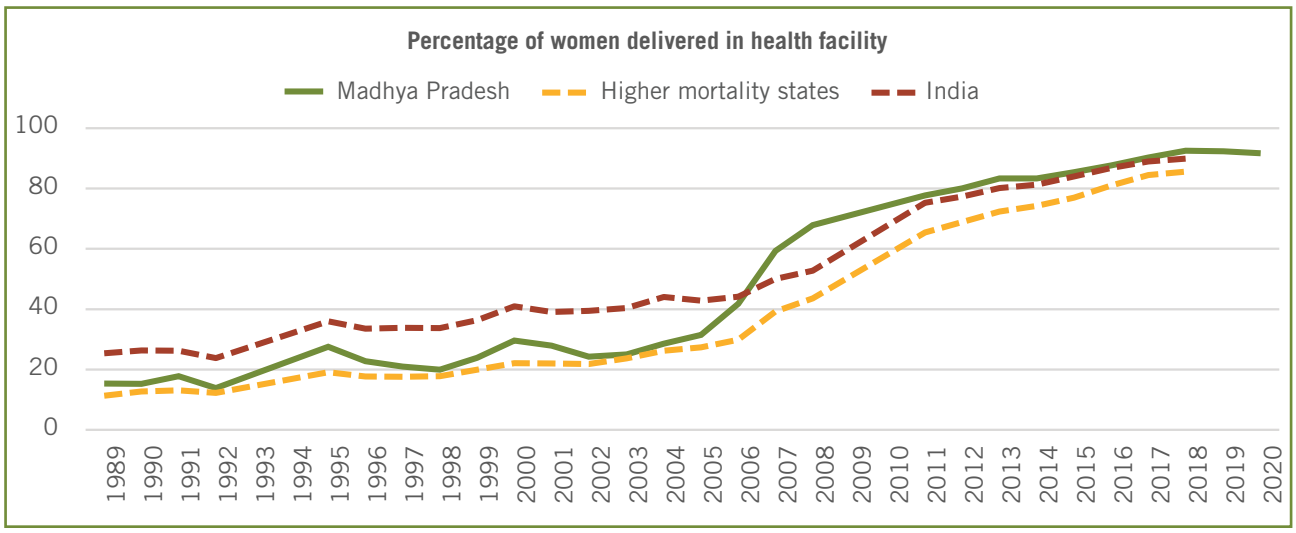
Antenatal and delivery care

The coverage of key interventions has improved in Madhya Pradesh according to the pooled NFHS and DLHS data (Figure 8). Fastest increase in 4 or more ANC coverage was during the RCH-I period (1997-2005), whereas the coverage for ANC with contents and institutional deliveries increased fastest during the RCH-II/ NRHM period (2005-12), all reaching over 90% by 2020.

Figure 8: Trends in antenatal and delivery care coverage, Madhya Pradesh, higher mortality state cluster and all India (NFHS and DLHS pooled data, 1989-2020)

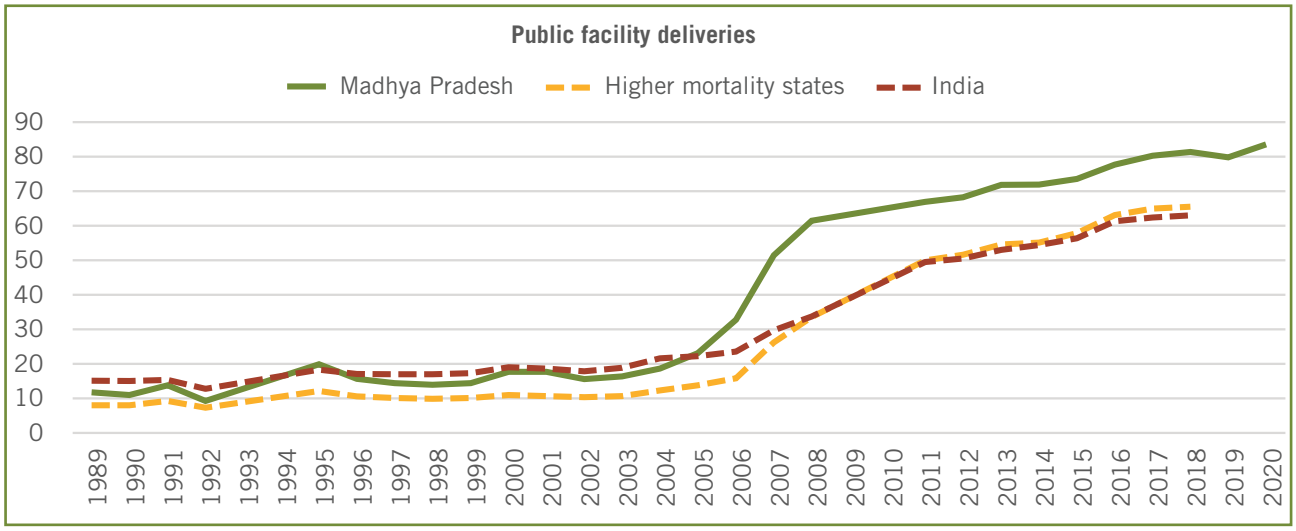


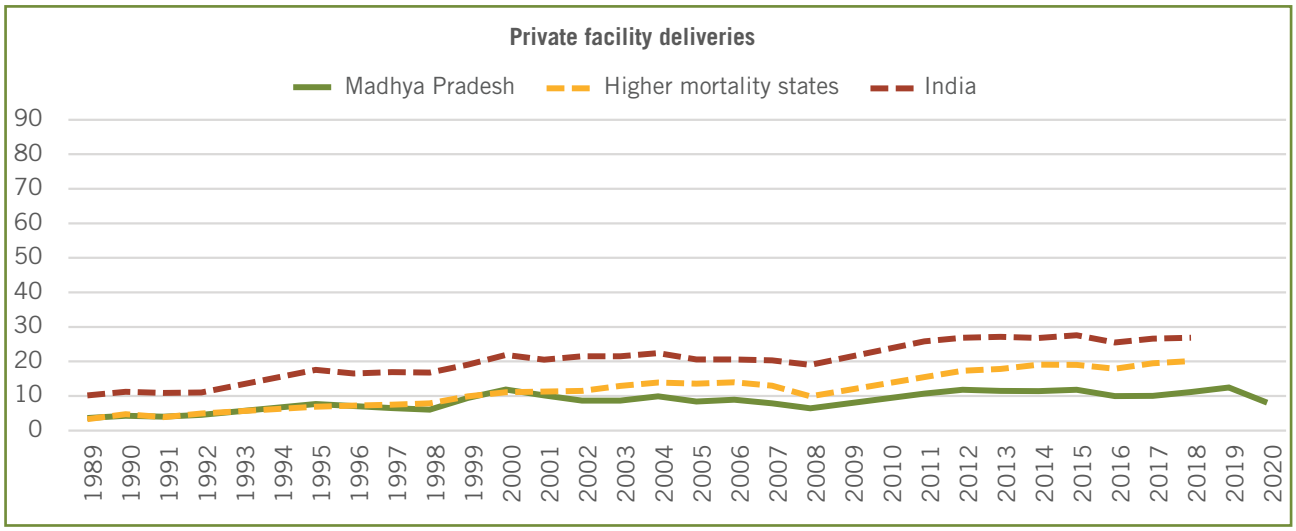




Increases in institutional deliveries was mainly driven by public facilities (Figure 9). The share of private facility deliveries in institutional deliveries increased until 2000 (contributing two-fifth of the institutional deliveries), and thereafter the share of public facilities has increased substantially, reaching up to 91% in 2020. The greatest increase in public facility deliveries was during the RCH-II/NRHM period (2005-12) with an AARC of 15.5% (data not shown).

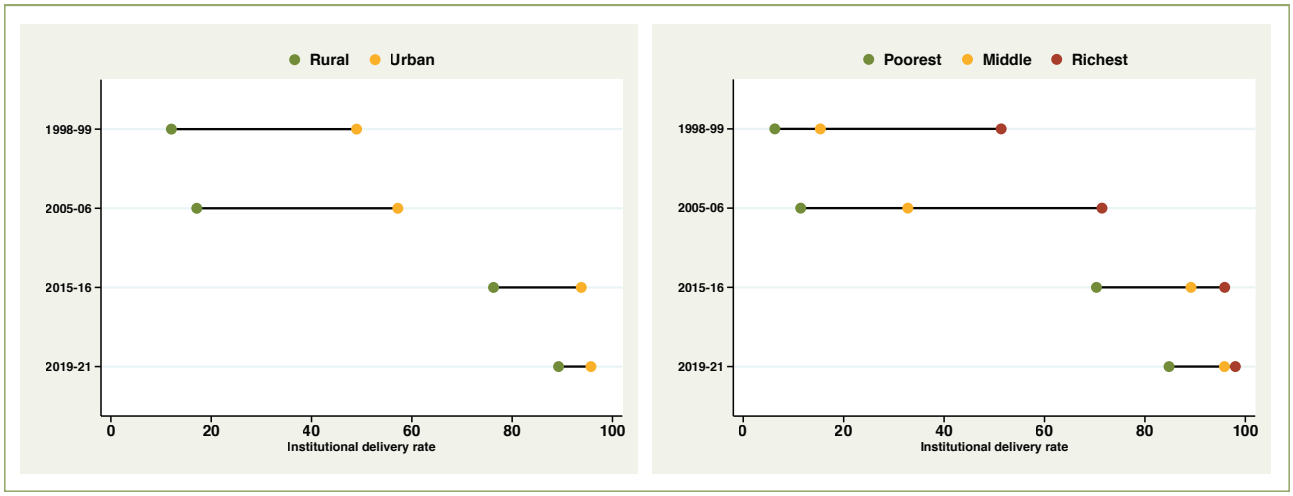
Figure 9: Trends in public and private health facility deliveries, Madhya Pradesh, higher mortality state cluster and all India (NFHS and DLHS pooled data, 1989-2020)





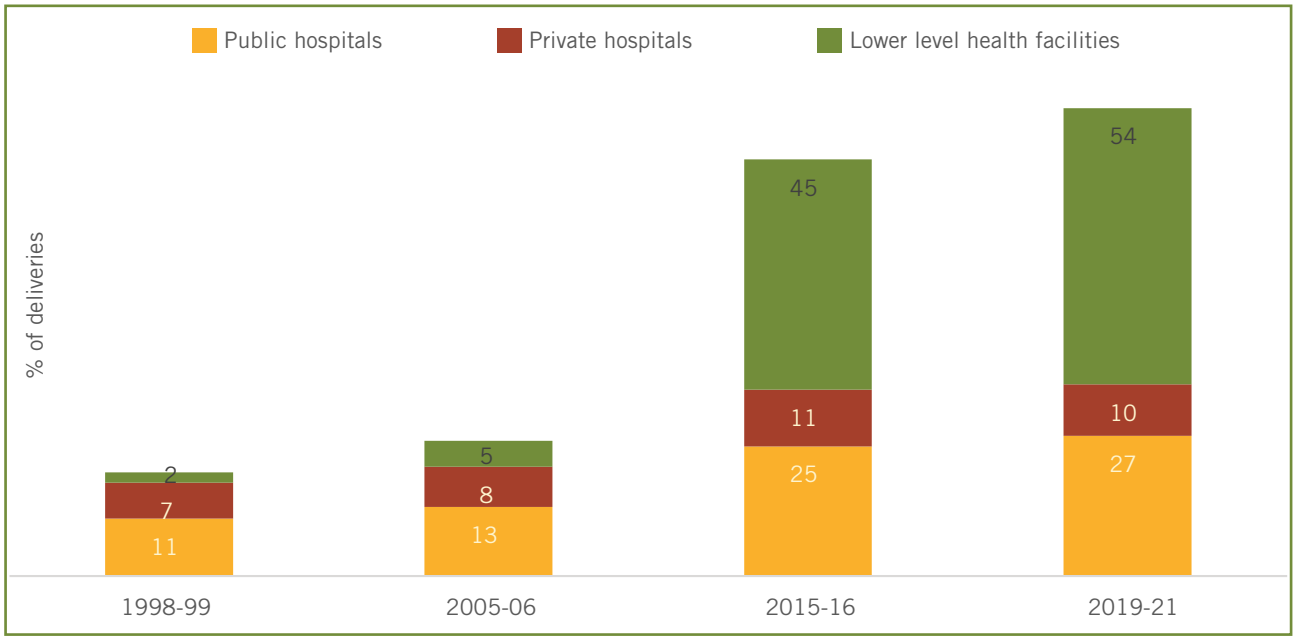
Madhya Pradesh's major increases in institutional delivery was possible because the rural and the poorest women were reached, and disparities were reduced substantially (Figure 10).

Figure 10: Trends in institutional delivery by urban-rural residence and household wealth tertile, Madhya Pradesh (NFHS 1998-99, 2005-06, 2015-16 and 2019-21)



More than half of the institutional deliveries in Madhya Pradesh were conducted in lower-level health facilities (Figure 11). The share of hospital deliveries in all deliveries has increased over time; doubled between 1998-99 and 2019-21 (from 18% to 37%). The national analysis indicated that NMR decline is strongly associated with increases in hospital deliveries (MNH Exemplar Study, National Report).

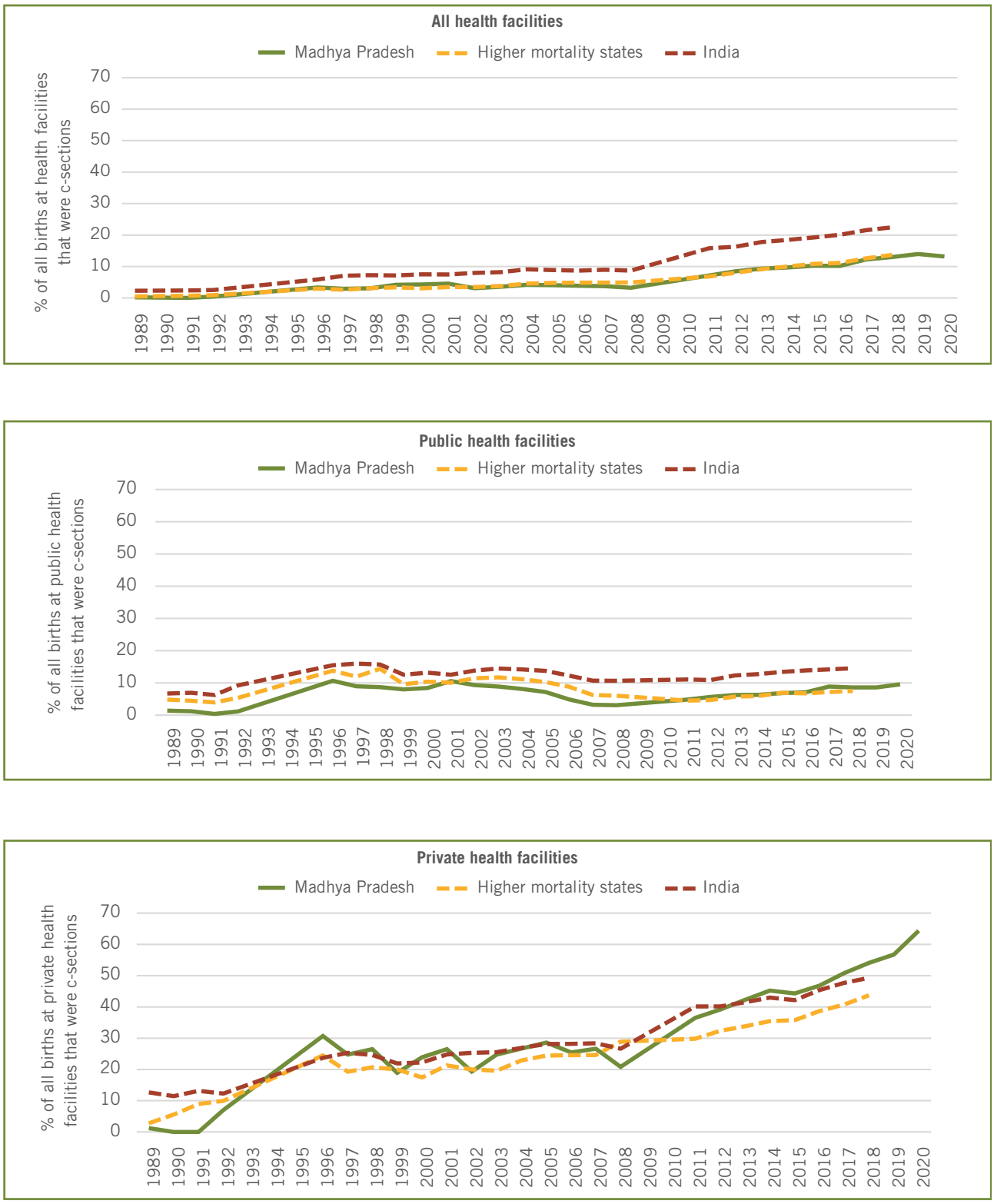
Figure 11: Trends in institutional delivery by health facility level, Madhya Pradesh (NFHS 1998-99, 2005-06, 2015-16 and 2019-21)



C-sections

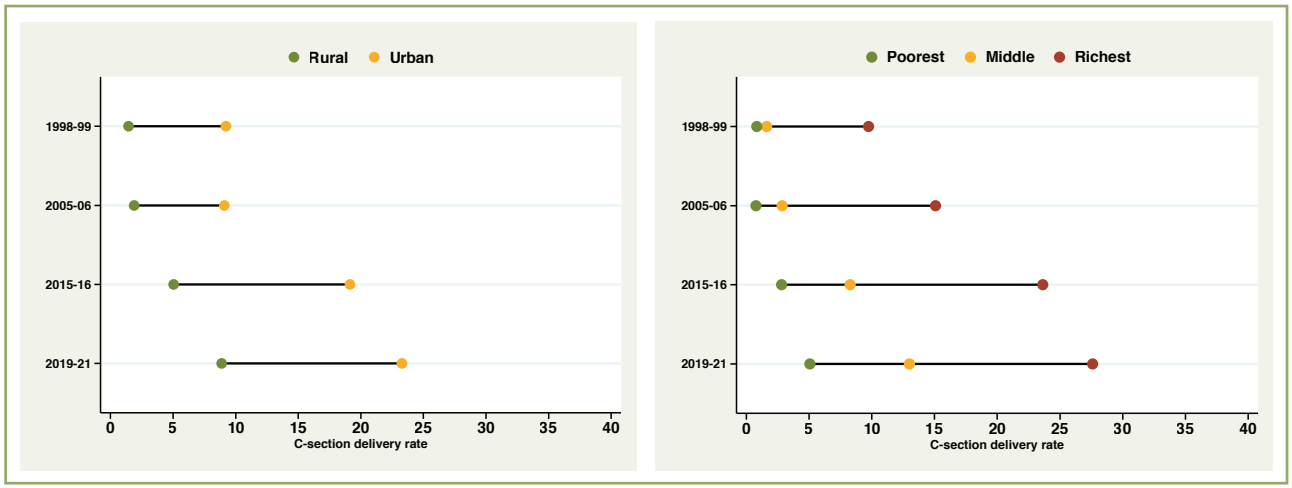
C-section rates have increased three-fold in Madhya Pradesh from about 4% in 2000 to 13% in 2020 (Figure 12). The greatest increase was in the RCH-II/NRHM period (2005-12; AARC of 10.6%, data not shown). The share of private facilities in c-section deliveries was between 54%-59% during the RCH-II/NRHM period. During this period, the c-section rate was 4-8 times as high among private facility deliveries as among public sector deliveries. The state has shown considerable rise in the c-section deliveries in the public health facilities during the recent years (2012-2020), faster than all India.

Figure 12: Trends in c-section delivery rates by health facility type, Madhya Pradesh, higher mortality state cluster and all India (NFHS and DLHS pooled data, 1989-2020)



About 10-15% of deliveries is considered an acceptable range for medically indicated c-sections.[12,13] By 2019-21, Madhya Pradesh recorded a six-fold increase in c-section rates among the rural (reaching 9%) and among the poorest (reaching 5%), suggesting substantial unmet need in these population sub-groups (Figure 13). C-section rates among the urban and the wealthy have almost tripled to 23% and 28% respectively, indicating over-use.

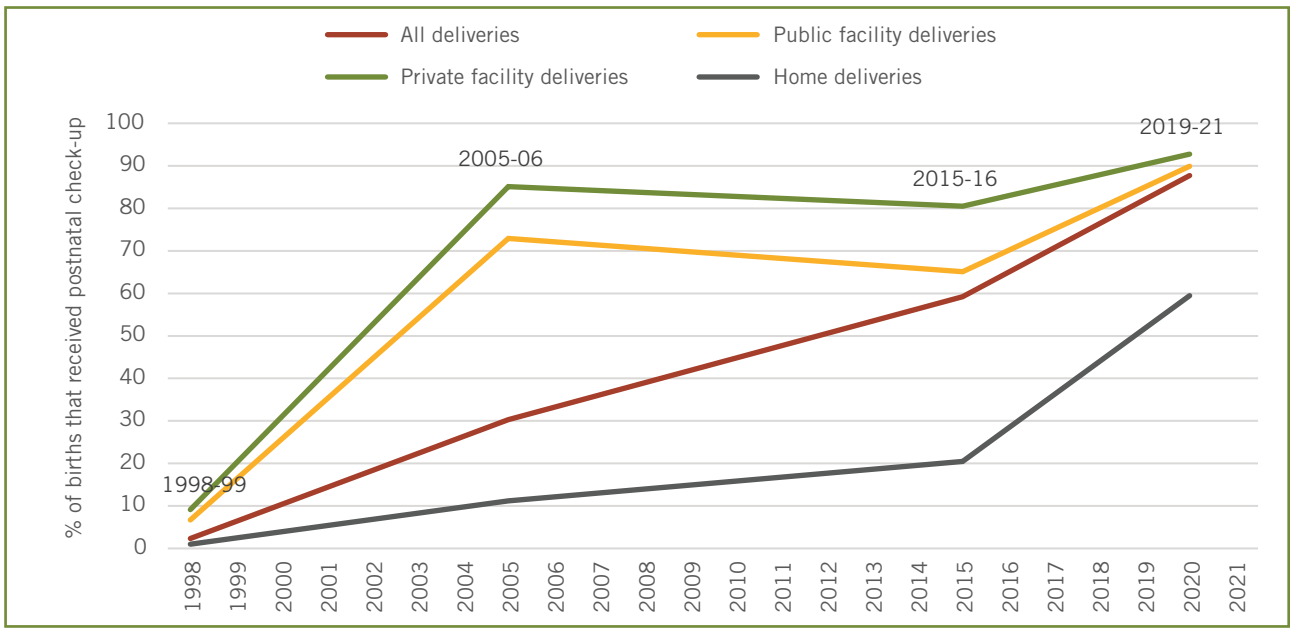
Figure 13: Trends in C-sections delivery rates by urban-rural residence and household wealth tertile, Madhya Pradesh (NFHS 1998-99, 2005-06, 2015-16 and 2019-21)



Postnatal care and essential newborn care including early initiation of breastfeeding

Figure 14 presents the percentage of mothers/newborns in Madhya Pradesh who had a postnatal check-up within 48 hours after delivery, either in the health facility or at home by either a trained professional such as a nurse, ANM or a doctor or a community health worker. Coverage of any postnatal check-up (PNC) increased from just 2% for all births during 1998-99 to 88% during 2019-21. The PNC coverage in the recent times has almost converged in both public and private health facilities reaching to 90% in 2019-21. However, coverage was lower at 60% for home deliveries.

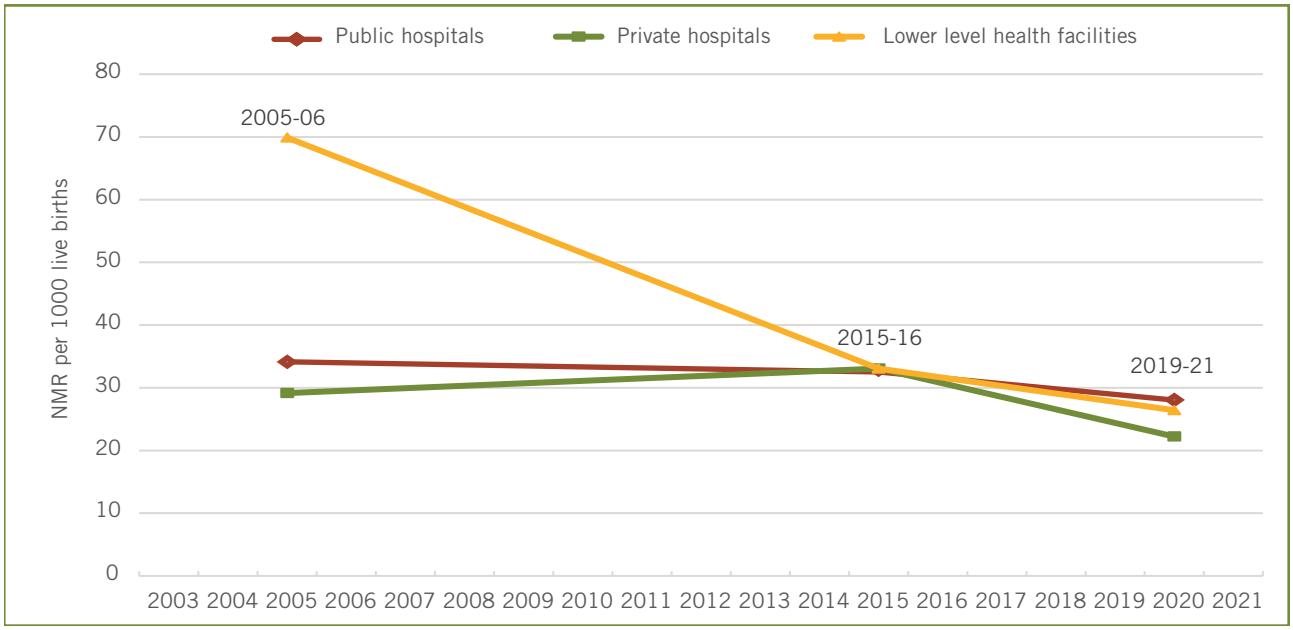
Figure 14: Postnatal care coverage for either the mother or the newborn within 0-2 days after delivery by place of delivery, Madhya Pradesh (NFHS 1998-99, 2005-06, 2015-16 and 2019-21)



NMR by place of delivery

NMR in institutional deliveries declined substantially from 34 per 1000 live births in 2005-06 to 28 in 2019-21 in public hospitals and from 29 to 22 in private hospitals during the same period (Figure 15). Similarly, neonatal mortality among deliveries in lower-level health facilities declined from 70 per 1000 live births to 26 during the same period. The rate of decline was the highest for other health facilities (AARC of -6.9%) followed by private hospitals (AARC of -1.9%) and public hospitals (AARC of -1.4%). The other health facilities include CHCs, PHCs, SHCs, and private non-hospitals.

Figure 15: Trends in NMR among institutional deliveries by health facility, Madhya Pradesh (NFHS 2005-06, 2015-16 and 2019-21)



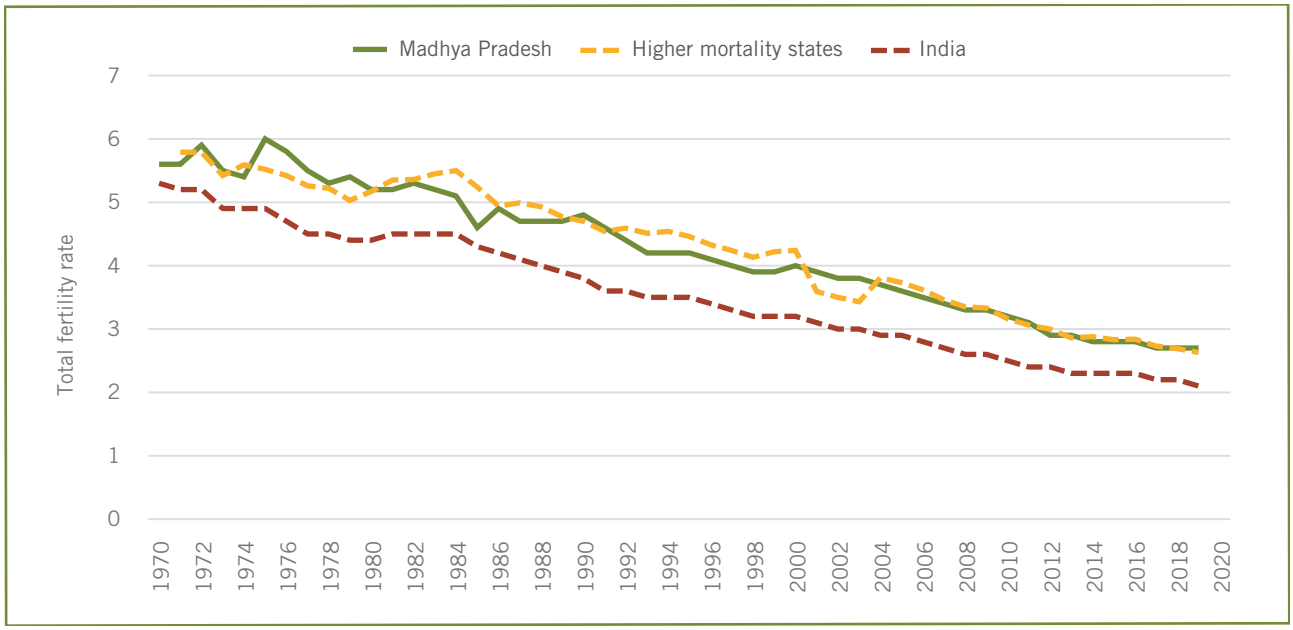
DEMOGRAPHIC AND SOCIO-ECONOMIC CONTEXTUAL SHIFTS

Household-level context

Fertility declines

Fertility in Madhya Pradesh has been declining from a total fertility rate (TFR) of 5-6 children per woman during 1976-91 to less than 3 since 2012 (Figure 16). However, the number of live births remained at 2 million annually in past two decades, due to the population momentum (data not shown). Since 2000, the state has consistently recorded almost similar TFR levels as the higher mortality state cluster average. Fertility rates were overall higher in rural areas of the state. However, the gap narrowed as the fertility rates declined faster in the rural than urban areas (data not shown).

Figure 16: Trends in total fertility rate, Madhya Pradesh, higher mortality state cluster and all India (SRS 1970-2019)

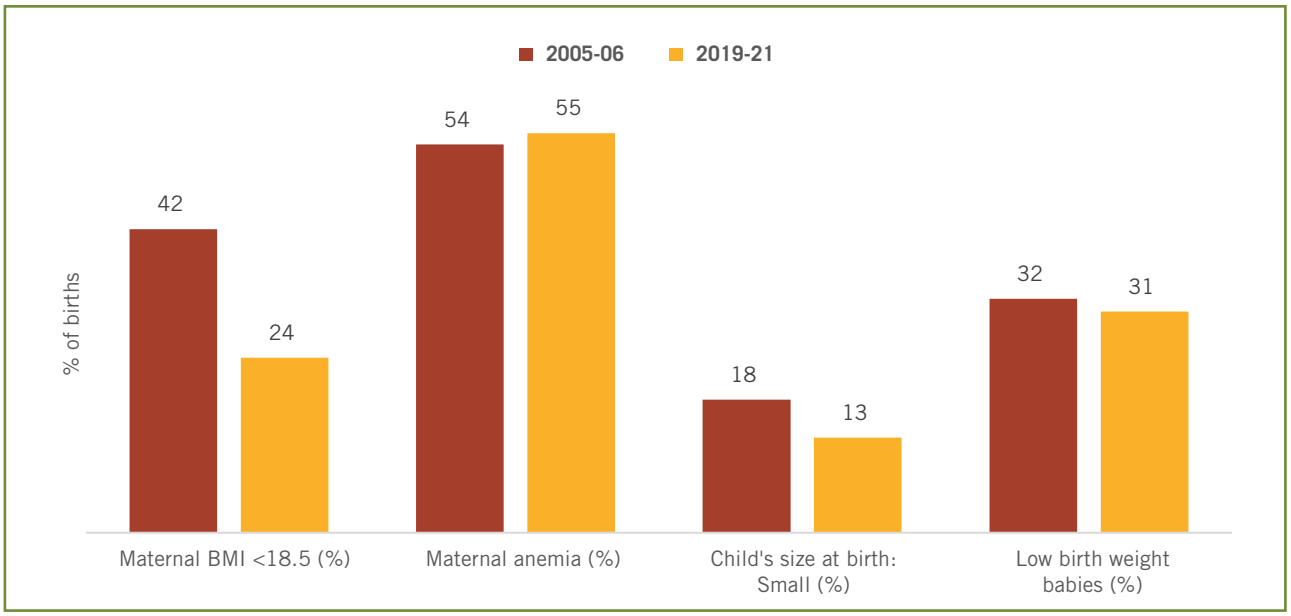


Our analyses using Jain's decomposition method[14] showed that Madhya Pradesh's fertility declines during 2000-2018 contributed 58% and 66% of the maternal and newborn lives saved and 45% of the reductions in both MMR and NMR (data not shown).

Nutritional status

NFHS data showed that the proportion of births to women with a BMI lower than 18.5 (considered underweight) declined from 45% to 25% between 2005 and 2020 (Figure 17). Maternal anemia reduced marginally during the same period from 63% to 60%. Child size at birth showed improvement; the proportion of newborns considered by their mothers to be small for gestational age halved from 25% to 12% during the same period. However, the proportion of low-birth-weight babies declined only marginally from 36% to 32%.

Figure 17: Trends in maternal nutrition, maternal anemia and reported child's size at birth and low birth weight babies, Madhya Pradesh (NFHS 2005-06 and 2019-21)



Women's empowerment and educational status

Age at first cohabitation (after marriage) in Madhya Pradesh has increased by one year from a median of 17 years to 18 years between 2005-06 and 2019-21 (Table 3). The increase was faster in rural than in urban areas, where it was higher in both the survey periods. The proportion of women with some education has also improved during this period, from 44% to 65% who were literate, and 33% to 60% who had secondary or higher education. The gaps also closed between rural and urban areas in female literacy rates and the proportion with secondary education. Compared to the births to women with some education, the NMR was higher among births to women with no education in both the survey periods, and the NMR declined faster among the latter (data not shown).

In terms of decision-making roles, the proportion of women reporting that their husbands solely decided on their health care reduced by half from 40% to 19%, while those reporting decisions made jointly with their husbands about their health care increased markedly from 30% to 72% between 2005-06 and 2019-21 (which was somewhat similar in rural and urban areas).

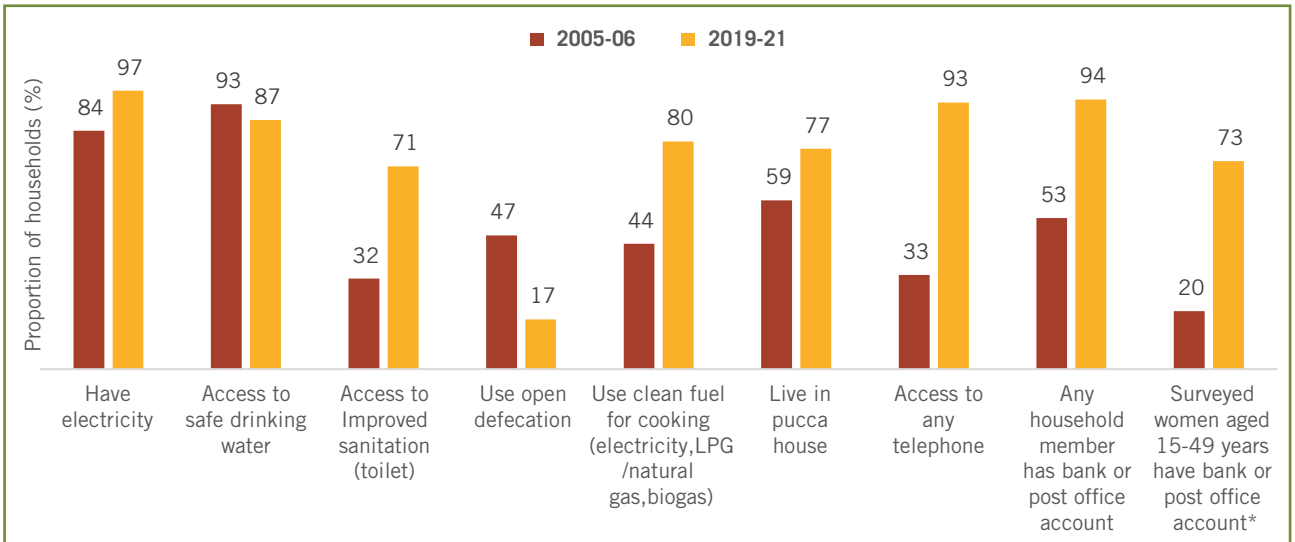
Table 3: Trends in selected indicators of women's empowerment, Madhya Pradesh overall and place of residence (NFHS 2005-06 and 2019-21)

	Madhya Pradesh		Rural		Urban	
	2005-06	2019-21	2005-06	2019-21	2005-06	2019-21
Median age at first cohabitation among women aged 25-49 (in years)	16.6	18.2	16.3	17.9	17.7	19.1
Women aged 15-49 who are literate (%)	44.4	65.4	34.8	59.2	68.5	81.5
Women aged 15-49 with secondary or higher education (%)	32.9	60.3	23.5	54.3	56.5	75.8
Mainly husband decides on woman's health care (%)	40.0	18.6	43.0	20.6	31.5	12.5
Husband and wife jointly decide on woman's health care (%)	30.1	71.7	28.9	70.2	33.5	76.3

Community-level context

Household's access to basic amenities such as electricity, safe drinking water, improved sanitation, clean fuel for cooking, telephone/mobile and bank account has improved substantially in the state between 2005-06 and 2019-21 (Figure 18). Nearly 98% of the households now have electricity and 87% have access to safe drinking water. Percentage of households having access to improved sanitation more than tripled from 19% in 2005-06 to 63% in 2019-21. Concurrently, households reporting open defecation reduced markedly from 73% to 26%. Use of clean fuel for cooking more than doubled from 18% in 2005-06 to 40% in 2019-21. Forty-six percent of the households now live in pucca houses and 90% have a telephone. Percentage of households that reported any member having a bank or post office account increased from 29% to 96% during the same period. The corresponding rise was even sharper for women aged 15-49 years (from 9% to 75%).

Figure 18: Trends in selected indicators of community development, Madhya Pradesh (NFHS 2005-06 and 2019-21)



* Percentage of womenaged 15-49 years having back/post office account is obtained among all women included in the state module.

Societal-level context

Economic growth and inequality reduction

Madhya Pradesh has experienced substantial economic growth in the past two decades. The per capita net state domestic product in Madhya Pradesh has risen rapidly, from INR 12,384 in 1999-2000[15] (INR 45,150 in 2020 INR[a]) to INR 62,080 in 2015 (INR 79,570 in 2020 INR) and 98,418 in 2020-21 (in 2020 INR).[16] However the state's Gini coefficient for consumption, a common measure of income inequality where '0' is perfect equality and '1' is total inequality, has increased slightly from 0.28 in 1994 to 0.30 in 2012.[17] The percentage of the population below the poverty line has reduced from 49% in 2004-05 to 32% in 2011-12.[18] Between 2000 and 2015, the state has also experienced marginal increase in urbanization, with the proportion of the population that lives in urban areas increasing from 25% to 27%.

a We considered an average annual inflation rate of 6.35% from 1999-2020 and 5.09% from 2015-2020 (http://www.inflation-tool.com/indian-rupee)

MAJOR HEALTH POLICY AND SYSTEMS DRIVERS

This section draws from consultations with policy experts, as well as policy document and literature review, to present major health policies and health system drivers of improved maternal and newborn survival. We first present the state's efforts to increase MNH service availability and quality including (1) health care infrastructure and services, (2) human resources for health; and (3) clinical and technical innovations and quality assurance. We then present the broader policy implementation and administrative reforms underpinning these changes to service availability and quality, including: (1) political will and leadership for MNH; (2) decentralized governance and financial flexibility; (3) accountability, progress review and data systems; (4) community participation and demand generation; and (5) partnerships.

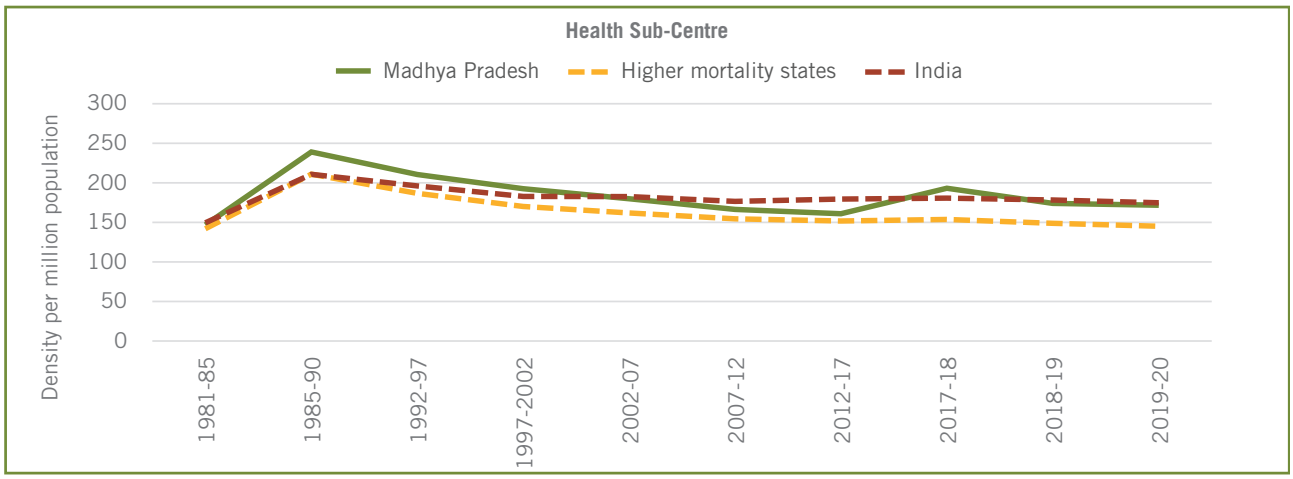
Transitions in MNH service availability and access to quality

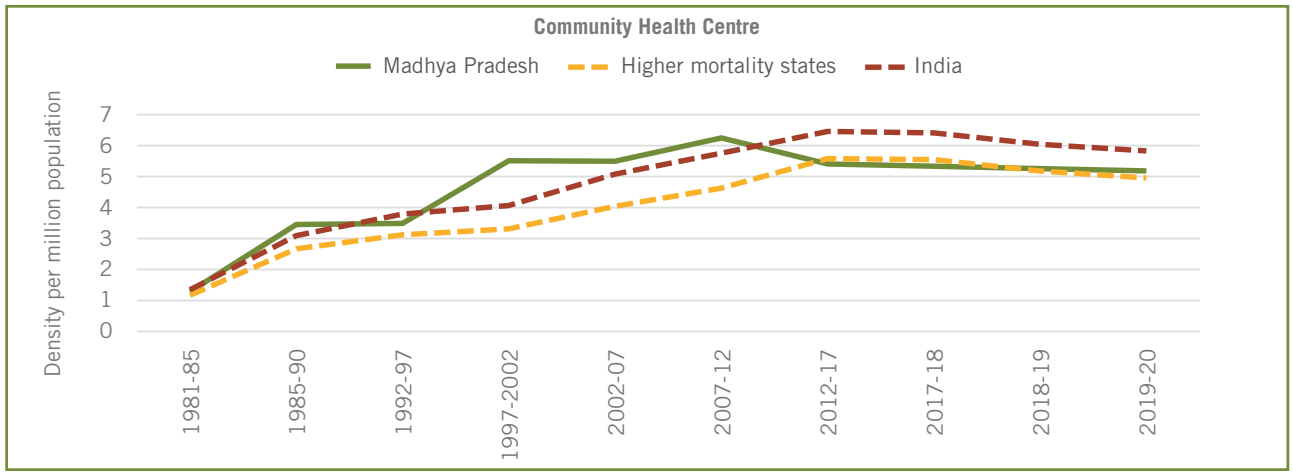
Expanding service availability, access, and integration

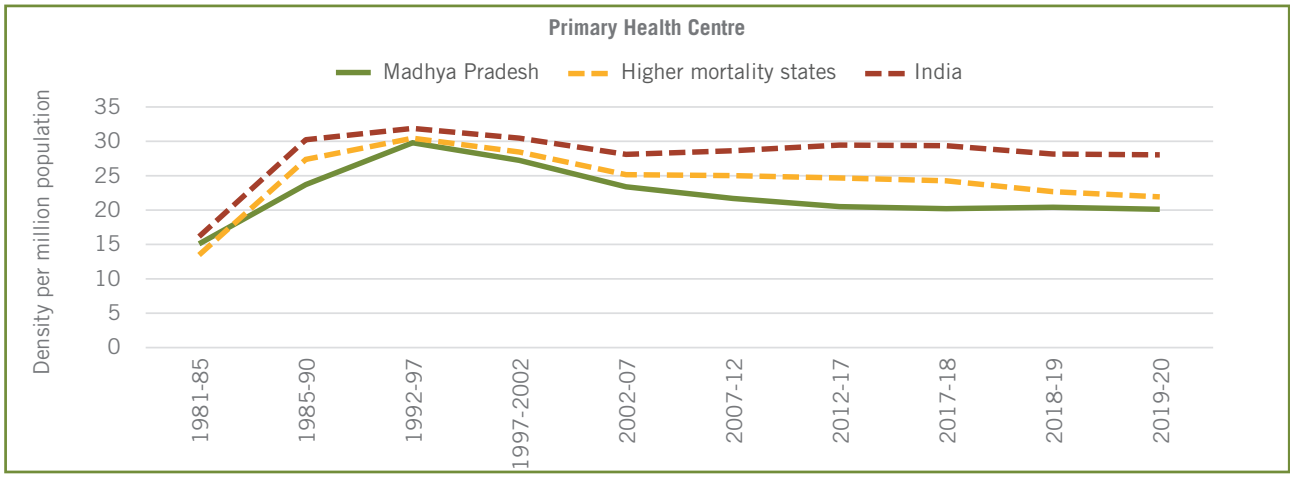
- Madhya Pradesh has seen little improvement in the density of rural health infrastructure, although there has been some progress for CHCs
- The state has focused on mapping and identifying high need areas, and then increasing delivery points, including capacitating some health sub-centres to handle deliveries
- Madhya Pradesh introduced free referral transportation and was the first state to create district level vehicle control cells

There has been little change in the density of rural health infrastructure in Madhya Pradesh since 2000 (Figure 19). The state has focused on increasing the density of the community health centres, bringing the density from 1 CHCs to 6 CHCs per 1 million population from 1981-85 to 2007-12. However, the number of CHCs per million population has slightly increased in recent years.

Figure 19: Trends in the density of and health sub-centres, primary health centres and community health centres, per million population, Madhya Pradesh (Rural Health Statistics 1981-85 to 2019-20)







Madhya Pradesh has focused on increasing delivery points within the existing health facilities in "high home birth areas" (government health expert #3) using needs-based planning and improving access to ANC to identify high risk pregnancies using a combination of NHM and state funding. Efforts have been made to create additional health sub-centres, since these facilities are also considered delivery points. At the district hospital level, Madhya Pradesh had sought to build MCH wings and obstetric ICUs.

> *So initially we mapped some 1400 delivery points. Then with the time to care approach we mapped some sub centres also, which were far off and, in their vicinity, there was no delivery point within 10 to 15 km radius. So, some 360 sub centres were also identified as delivery points. We placed one additional ANM there and SBA*

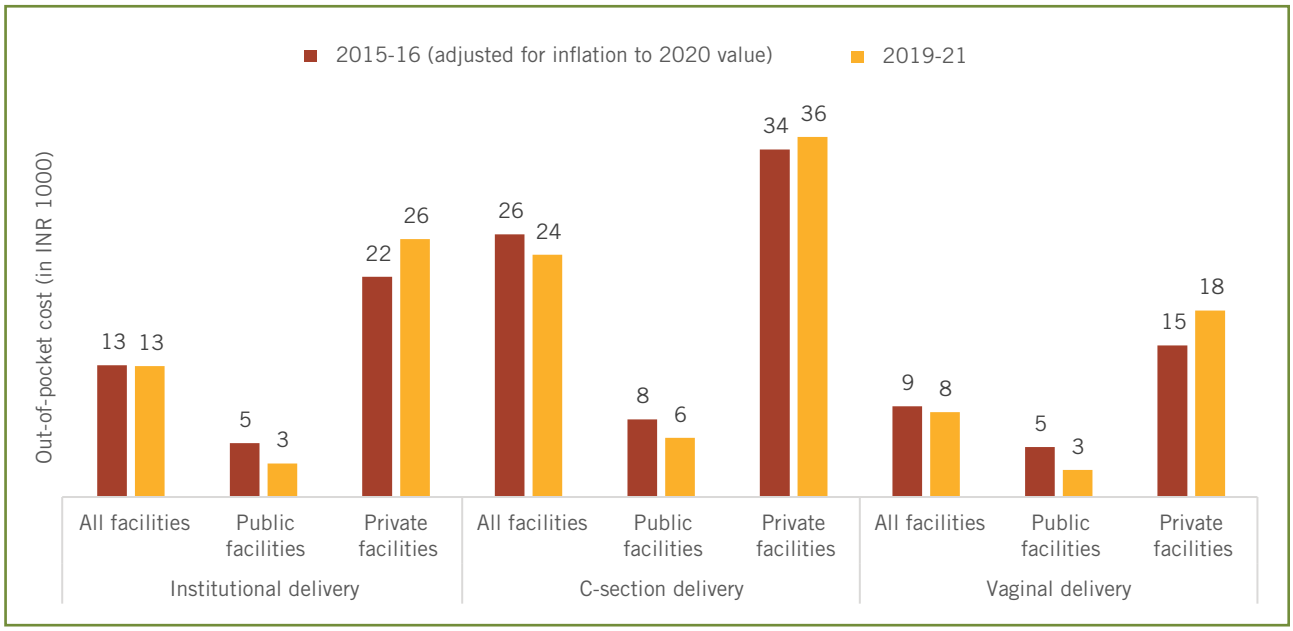
training was given to her, how to use misoprostol and these things. So out of the total deliveries, some 2-5% deliveries started happening in sub centres. (Government health expert #2)

In the early 2000s, deliveries tended to concentrate at the district hospital level, since lower-level facilities were ill-equipped to provide intrapartum care. With the ASHA program and Janani Suraksha Yojana (JSY) increasing demand for instituxtional delivery, the state sought to equip lower-level facilities to handle these births. The state also "pioneered" (Government health expert #2) the development of SNCUs in all district hospitals.

In 2013 Madhya Pradesh introduced free referral transportation with the support of UNICEF. Madhya Pradesh was the first state to introduce a district level call centre that controlled a fleet of vehicles. Subsequently, the state added an integrated call centre at the state level.

Analysis of NFHS data suggests that the average out-of-pocket expenditure (OOPE) for delivery (including the OOPE for transport, hospital stay, drugs, diagnostics, and other) in Madhya Pradesh in constant 2020 rupees (i.e., 2015-16 cost adjusted for inflation to the 2020 value[b]) decreased marginally from INR. 5857 to INR 5460 in 2020-21 (Figure 20). The average out-of-pocket costs paid for c-section deliveries was nearly seven times higher than that for a vaginal delivery, and the average costs for vaginal deliveries in the state decreased by 28% during 2015-16 and 2019-21, while the costs for c-section deliveries remained unchanged. The OOPE for public facility deliveries for both c-sectional and vaginal deliveries decreased. OOPE was 5 to 10 times higher in private than public facilities, and the increase from 2015-16 was 27% in private facilities.

Figure 20: Trends in average out-of-pocket cost (in INR 1000) paid for delivery by type of delivery and health facility type, Madhya Pradesh (NFHS 2015-16 and 2019-21)



Human resources for health

- Madhya Pradesh invested in improving the capacity of their human resources for health through in-service trainings, fellowships for medical officers to access diploma courses, and post training mentorship, supportive supervision, and skill labs
- The state was also the first to incentivize doctors to work in rural government facilities by posting medical students to PHCs and reserving post graduate training seats for "in-service" government candidates
- While shortages of medical officers and specialists are a persistent issue in the state, the state created and largely filled additional staff nurse positions at delivery centres and tightened retention bonds for medical officers

b We considered a average annual inflation rate of 5.09% from 2015)to 2020 (https://www.inflationtool.com/indian-rupee?amount=7124&year1=2015&year2=2020&frequency=yearly)

Madhya Pradesh invested in improving the capacity of their human resources for health – not only medical officers and nurses through clinical trainings, but also technicians such as those in laboratories, radiology, and ultrasound. The state scaled up skilled birth attendant (SBA) training and skill labs for ANMs and staff nurses. They assessed the capacity of the faculty at General Nurse Midwife and Auxiliary Nurse Midwife training schools, and then provided upgrade training through skills labs for these teachers. When SBA trained nurses were assessed in the field, their skills were still found to be too weak. The SBA training curriculum was modified, and nurse mentors were introduced and funded by the state to visit delivery points, provide supportive supervision, and help move labour rooms and maternity wings towards LaQshya certification. Training frontline workers (ANMs, AWWs, ASHAs) was also a major focus, including through setting up seven skill labs. The state developed a common training platform for frontline health workers involved in child health, nutrition, and maternal health behavioral counselling using an integrated counselling training package. The national government adopted this approach.

The state offered a fellowship to enable medical officers to take the All India Institute of Medical Sciences (AIIMS) Jodhpur public health course and enabled medical officers to access College of Physician and Surgeon and Diplomate of National Board[c] diploma courses for specific skills, such as in conducting ultrasounds. These diploma courses were more popular than the life-saving anesthesia skills (LSAS) and EmOC training that was initially offered because medical officers received promotions upon completing of a diploma course and did not receive promotion after LSAS. The state also used NHM support to establish Centres of Excellence in Obstetric Care and ICU. These Centres trained health workers in the multidisciplinary skills required to run a critical care unit.

> *The NHM did a lot of handholding for establishing the Centre of Excellence in Obstetric and ICU. That gives a lot of impetus to a much higher, better way in which the services are required for the critical care patients. And, running an ICU is not so easy, again it is a multi-disciplinary aspect. Even the laboratory services, transfusion medicine department, ultrasound, radiology department, because these are the areas which really contribute to decision-making and managing the cases in obstetric department. (Academic health expert #2)*

While shortages of medical officers and specialists are a persistent issue in the state, they did create and largely fill additional staff nurse positions at delivery centres.

> *Positions of staff nurse were increased, and because, as per MNH toolkit we keep on insisting that we need 24 nurses in district hospitals where delivery is more than 600. And that has helped us a lot, and the position of staff nurse were created and now we have sufficient staff nurses in all the district hospitals. And up to FRU level, we have enough staff nurses. (Government health expert #2)*

The state made efforts to improve rural posting and retention, although vacancies remain a major issue. The Directorate of Health controlled postings and transfers and was willing to sit down in planning meetings with the National Health Mission administration to re-allocate human resources based on need. The terms of bonds requiring newly graduated doctors to work at rural facilities were tightened, meaning that more doctors completed rural service.

Clinical/technical innovations, quality assurance, and procurement

- Madhya Pradesh focused on the "basics" of ANC, identifying high risk pregnancies, and improving timely referrals
- The state implemented and benefited from the central government's quality improvement trainings, standards, and guidelines
- The state pioneered their design approach to new MCH wings and SNCUs through involving technical experts as well as engineers and architects to ensure all design considerations contributed to high quality care provision

c Diplomate of National Board is a post-graduate master's degree same as MD/MS degree awarded to the Specialist doctors after completion of three-year residence.

- Blood transfusion availability has been improved in the state through developing storage facilities at FRUs and hospitals
- The Madhya Pradesh Public Health Services Corporation Limited (MPPHSCL) was set up and has streamlined drug and equipment procurement

Madhya Pradesh has focused on the "basics" (government health expert #1) in terms of improving ANC, and particularly in identifying high risk pregnancies, and improving the timeliness of referrals. Mahila Swasthya Divas were screening camps introduced to identify high risk pregnancies and offer gynecological check ups. One expert noted that mortality in the early 2000s was driven by post-partum hemorrhage, which was linked to anemia, and issues with intrapartum care and referral. Over time, pre-eclampsia and eclampsia have become more prominent causes of death. ANC that can detect and monitor anemia and hypertension is vital to addressing both causes of mortality and have been a major focus for the state. ANMs are increasingly trained and equipped to assess blood pressure and hemoglobin and have the logistical support to reach women and supply them with iron sucralose for anemia. In tribal blocks women are also receiving double-fortified salt through the public distribution system. The state conducted research to identify which hemoglobin instrument was best for ANC. In high-need areas, screening for sickle cell anemia has increased in partnership with civil society organizations.

One aspect of improved ANC in Madhya Pradesh was the policy of offering ultrasounds for all pregnant women: at least one between weeks 18 and 20, and ideally three. Clinicians were incentivized to provide ultrasound. This change required some facilities to overcome health care providers' "fear" (academic health expert #2) of ultrasound during ANC: the Preconception and Prenatal Diagnostics Techniques (Prohibition of Sex Determination) Act 2003 (PCPNDT Act) made clinicians afraid to use ultrasound in case they were accused of facilitating sex selective abortion. However, through training, the state strengthened providers' ultrasound skills and confidence to enable better antenatal care.

The NHM introduced a major effort to standardize the quality of government health services, and Madhya Pradesh has implemented them: "the guidelines of government of India has been very useful for us" (government health expert #2). National training programs and guidelines have been central to improving clinical care in Madhya Pradesh. National quality of care programs has been "extremely important" (civil society #1) in Madhya Pradesh, including the National Quality Assurance Programs, LaQshya, the Indian Public Health Standards, Skilled Birth Attendant training and Dakshata, as well as guidelines for gestational diabetes, calcium and prevention of placental implantation abnormality (PIA), hyperthyroidism, syphilis and HIV screening. LaQshya, which set norms for facilities, has raised a "competitive spirit" (Government health expert #2) among CHCs to seek certification. Community health officers and mid-level care providers have gained capacity as well, particularly through the move towards comprehensive primary health care in 2017.

At the tertiary level, Madhya Pradesh implemented the national program of dedicated maternal and child health (MCH) wings in hospitals and developed skill labs in all seven divisions. It was the first state in India to organize collaborative technical design sessions for expanding hospitals. These sessions involved not only high ranking technical and clinical actors in government (Principal Secretary, Additional Chief Secretary, Mission Director, Health Commissioner), but also design engineers and architects. Involvement of these non-clinician experts ensured that hospital protocols and clinical needs for new MCH wings and delivery units were integrated into the hospital's design and planning. The maternity care provided at AIIMS Bhopal was strengthened and a Centre of Excellence was established there. AIIMS Bhopal facility began to offer 24 x 7 blood availability, free food, intrapartum care, transfusion, ultrasound, and laboratory tests.

The state introduced an initiative to increase blood transfusion availability through creating blood storage units at 152 FRUs and district hospitals.[19]

> *Then this whole exercise was done in a very professional manner so that availability of blood, and the type of blood availability where it is available and in what quantity it is available, what is the requirement, those things were worked out and state blood cells started functioning fully. (Government health administration #4)*

Access to safe abortion was strengthened, in partnership with Ipas, through training district hospital medical officers (including in a specially developed module on medical vacuum abortion) and increasing access to medical abortion pills.

Madhya Pradesh made major strides in improving their health system's procurement process. In 2014 the state set up Madhya Pradesh Public Health Services Corporation Limited (MPPHSCL), a public state government company that acts as the central procurement agency for all essential drugs and health care equipment for health centres, hospitals, pathological labs, diagnostic centers, x-ray and scanning facilities. Prior to setting up the corporation, the Chief Medical Health Officer (CMHO) of each district was responsible for procurement, which resulted in uneven drug availability and inefficient supply chain management. The corporation introduced a single supply chain and regularly updated inventory, usage, and requirement, greatly reducing stock outs.

Madhya Pradesh focused on outreach equipment and transparency in medicine supply. The state had all auxiliary nurse midwives (ANMs) use their Rs. 10,000 untied fund to buy equipment (blood pressure instrument, weighing machine, heuristics) for antenatal care provision during village health and nutrition days. This frontline-level purchasing is noteworthy because government employees are often "fearful of purchasing" (Government health expert #5) using government money due to potential audits and questions about their decision. Madhya Pradesh was able to build confidence among their frontline workers that the government supported their purchasing decisions and gave flexibility to buy what was required.

Madhya Pradesh introduced standardized drug lists for each facility type and instituted a policy that facilities always keep one month of medicine stock. Purchases and supplies could be checked through an online system. The state also streamlined purchasing for higher resolution ultrasound machines at all CHCs and PHCs with a radiology-trained clinician.

Policy implementation and administrative reforms

Political will and leadership for MNH

- Madhya Pradesh benefitted from strong and passionate leaders at the state level
- The state benefitted from national programs and guidelines and also contributed to these guidelines through developing and piloting innovative approaches to maternal, newborn and child health
- The state leadership was open to new ideas emerging from frontline implementation experiences

Experts identified strong leadership in the government health sector to have been a major driver of Madhya Pradesh's success. They noted that the bureaucrats and officers posted to the Directorate of Health Services (DHS) and National Health Mission (NHM) were "stalwarts" (government health expert #1) who had genuine passion and interest in health. The government of Madhya Pradesh also sought to recognize and promote passionate people and protect them from being transferred. These leaders took a "systems strengthening" approach that sought to standardize and strengthen the functionality of each facility "from security to cleaning services" to the doctors (government health administration #4).

While implementing national programs and using national guidelines was core to Madhya Pradesh's success, the state also developed and piloted several innovations that were taken up as national policy. This included identifying appropriate equipment for anemia assessment during ANC, integrated training on health counselling for frontline workers, and their leadership in setting up SNCUs. Madhya Pradesh could play this role because the state administration had "an openness to ideas" and "learning from the field" (civil society #1). The expert recounted that the state-level administration was deeply interesting in hearing about field level experiences and taking seriously any ideas about what could be improved.

Collaboration was very high within the Department of Health and Family Welfare with the Directorate of Health Services and the NHM was working well together.

Decentralized governance and financial flexibility

- District-level administrators (District Collectors) are held responsible for aspects of the government health system
- The state has taken a needs-based mapping and targeting approach to developing delivery points to address geographic inequities
- Financial policies have been adjusted to increase program officer flexibility in re-allocating funding and reduce use of maternal health funding for non-obstetric purposes
- The state has sought to make "judicious" use of available funding by mapping expenditure and supply for drugs and equipment

Madhya Pradesh has encouraged district-level leadership in health by making the District Collector and District Magistrate responsible for the performance of social services. This district leadership also facilitated coordination between health and women and child development, since the District Collector and District Magistrate would oversee programs under both departments. The District Collector was made responsible for encouraging year-round blood donations.

> *To do something in the health sector, you have a very important partner in the form of WCD (Department of Women and Child Development). So, the coordination that needs to happen at the district level, say between a block medical officer, and the CDPO [Child Development Project Officer], is sorted out by the District Magistrate. (Government health expert #1, Madhya Pradesh)*

Madhya Pradesh took a geographically targeted approach to strengthening maternal health care. The state implemented the national government's aspirational districts approach, "in order to ensure the most disadvantaged have the greater focus in terms of equity" (civil society #1). Under the targeted approach, the state mapped delivery points, their functionality, and population clusters, then introduced additional facilities based on patient loads and distances. This type of needs-based planning was a departure from earlier planning, which often involved political influence or a more unsystematic approach.

In terms of financial flexibility, the state implemented a "global budget" system (Government health administration #4) to increase access to allocated funds. Earlier, money was provided by the state to the district, then to the facility. Yet facilities often faced delays in receiving their budgeted money. Under the global budget system, the money is available at a common location and can be accessed online. Program officers were given greater flexibility to re-allocated budgets based on need, and monitoring of expenditure was improved through an electronic dashboard system.

> *Now we don't have to take the approvals for each and every activity. Once it gets approved in ROP [Record of Proceeding], we have been given the flexibility to allot the budget to district. Suppose a district falls short of budget in, like, hiring of specialists. And the other districts have not spent anything, so we can take out the budget from that district and give budget to this district. Unless it is under the guidance note of ROP, that we take approval from MDNHM or state health society. If it is required, the re-appropriation. Otherwise, we do it ourselves. So, we, we have been empowered to allot the budget, monitor our expenses, and we have got a dashboard where we can do a proper monitoring. Up to block level. (Government health expert #2)*

The state also reduced some budgetary flexibility to retain resources for maternal and child health: money allocated to the maternal health budget was being used for anti-rabies vaccines and other medicines not related to obstetric services. Ultimately a separate Janani Shishu Suraksha Karyakaram (JSSK) budget line was created that could only be used for drugs related to maternal health. Madhya Pradesh's Equipment Management and Maintenance System software has enabled the government to map facility equipment needs. Through mapping expenditure and supply for drugs and equipment, Madhya Pradesh took a "judicious" (government health expert #5) approach to making the best use of available funding.

Madhya Pradesh engaged with the Project Implementation Plan process and monthly district-level review meetings involving Chief Medical Health Officers, Regional Directors, and Block Program Managers (BPMs)

to identify unused funds and modify their allocation so that they could be spent. This process benefitted from flexibility to re-allocate funding and support from finance to help government health system actors gain the skills and confidence to spend their allocated funds. As mentioned above, ANMs were given access to a flexible fund of Rs 10,000 to buy the equipment required for them to provide antenatal care.

Accountability, progress review and data systems

- Madhya Pradesh has instituted a time-bound grievance redressal system with strict hierarchical accountability
- Routine reviews (maternal death review, state reviews, divisional reviews) have created a structure for accountability
- Data systems have been strengthened over time through adopting the MCTS digital health records in the early 2000s and replacing it with the RCH system in 2016 that allows name-wise tracking; additional human resources for frontline data management have also been hired

Madhya Pradesh has instituted a time-bound grievance redressal system with strict hierarchical accountability. The toll-free 181 CM [Chief Minister] helpline (also made available on WhatsApp) allows citizens to lodge complaints, including about government health care services. Health-related complaints were first passed to the Block Medical Officer; if they could not resolve it, the Chief Medical Health Officer was expected to step in. The complaint could then be further escalated to the Joint Director for Health Services, and finally the Health Commissioner. Each level of the hierarchy has seven days to resolve the complaint before it is escalated. Furthermore, the Chief Minister would randomly select a sample of unresolved complaints from each sector, including health, and personally follow up with the responsible party – frequently the district collector – to ask why the issue had not been resolved. Not only did this personal follow up from the Chief Minister resolve outstanding issues, but it also "sent signals down the line" that government services must be accountable to citizens.

> *From all the unresolved complaints […] the CM [Chief Minister] randomly picks up cases. For every sector. […] Which, trust me, is the biggest workload stress for even the [District] Collector. Because every first Tuesday, the Collector will have to answer the Chief Minister, why that particular DBT [Direct Benefits Transfer] is not made and has not been made on time. […] So once the case has been escalated, you just have to present the facts and a post-mortem is done: Where our system was weak? Did the ASHA did not collect the bank account number, was there a banking problem where the transaction failed, was it genuine, because the payment is to be made for only 2 live births. So, if it's a third child when the complaint is unwarranted. So, whatever the case is, uh, the reply has to be given by the Collector. And that obviously sends a lot of signals down the line. (Government health expert #1, Madhya Pradesh)*

Recently, a Surakshit Matratva Ashwasan (SUMAN) help desk has been set up, which enables outreach and follow up by phone to assess whether women are following treatment and to counsel them on maternal and child health. This help desk even called women who delivered at home to find out why. These calls have found that women need better access to affordable emergency transportation, particularly in tribal areas. As a result, the state contracted additional ambulance vehicles and encouraged district collectors in these areas to work with communities to increase access to emergency transportation.

The state instituted monthly maternal death review meetings that involved all clinical stakeholders and took a problem-solving rather than blame-oriented approach.

> *The state has always wanted to learn why things are not what they should be. It has taken active interest in maternal death reviews. And we [civil society organizations] kept reporting our findings from the maternal death reviews in the districts that we were working in eastern Madhya Pradesh. And then the state also decided that they would like to do the state level maternal death reviews in a similar manner, which were*

basically focused on... the facility level deaths of mothers. And, also, you know looking at, diving deep into the causes rather than just a superficial thing. So, and it was not a blame and shame game, but it was essentially about how to improve the system to be able to, uh, prevent these unnecessary deaths. (Civil society #1)

In addition to maternal death reviews, state- and divisional-level reviews were also very important to supporting Madhya Pradesh's administration in improving the health system.

Reviews were very important and were a very regular feature. I would credit the then Principal Secretary [name] who was there. We used to have regular state reviews, we used to have divisional reviews, and then the maternal death reviews that were very important and it was not fault finding, it was more of learning from each other, identifying the faults, not exactly faults but identifying the problems, then, uh, trying to work at solutions. (Government health administration #4)

Data was used to support these reviews. Health Management Information System (HMIS) was initially used, but it was considered "just a number game" (government health expert #2) because it was considered rife with duplication and lacked sufficient quality control. Mother and Child Tracking System (MCTS) was introduced in 2009 and was monitored for trends and data quality issues. In 2016, MCTS was customized for Madhya Pradesh to become the MP Reproductive and Child Health (RCH) Portal, which allowed name-wise tracking of all high-risk pregnancies. Madhya Pradesh's RCH included detailed data fields generating comprehensive information about women's treatment, including on blood transfusion, iron sucrose and other interventions. Issues with HMIS and MCTS, then RCH data quality and timeliness were addressed by providing more human resources for data entry.

The state had done additional examination of data from tribal areas. For instance, they have mapped 940 villages with institutional delivery rates below 70% to identify barriers.

Community participation and demand generation

- Community level awareness about maternity benefit entitlements is especially high in Madhya Pradesh
- Complaint grievance redressal systems have created pathways for women to demand access to their maternity benefit and to raise complaints about health care
- The communitization features of the NRHM/NHM, particularly the ASHA program, have been essential to Madhya Pradesh's progress

Madhya Pradesh's motto and a founding principle for their approach to health is: "Jan Bhagidari" or "the responsibility of the people." This ethos has been interpreted by political leaders to mean that all health issues, from vaccination to maternal health, require community education and buy in. Showcasing widespread awareness of entitlements, in 2009 Madhya Pradesh was found to have the highest level of maternal access to the Janani Suraksha Yojana (JSY) conditional cash transfer for institutional delivery.[20] In 2018, Madhya Pradesh added a state-specific cash transfer to the NRHM's centrally funded JSY cash transfer. Under the new scheme, Mukhya Mantri Shramik Seva (Prasuti Sahayata) Yojna, women were entitled to Rs. 16,000 for accessing antenatal care, having an institutional delivery, and ensuring the newborn access early breastfeeding and the first vaccination.[21] Government health experts highlighted the role of women's awareness of their entitlements, and their ability to access complaints redressal if their cash transfer is not debited to their account through the state's direct benefit transfer (DBT) system.

And it's an entitlement. That consciousness is there as part of the Jan Bhagidari model, amongst our people. So, they know that once the institutional delivery is done, uh, I should get that DBT. (Government health expert #1)

The state sought to engage its panchayats and village health and sanitation committees to improve community level participation in health. It also introduced Rogi Kalyan Samiti (RKS, a hospital management committees) to bring community engagement to hospital level care. Madhya Pradesh's success in improving ANC and detecting high risk pregnancies was partially attributed to the implementation of village health and nutrition days. By having ANMs reach out to the villages monthly, and providing them with technical skills, equipment, and logistics (drug supply), they have been able to identify anemia and hypertension, provide iron sucralose and monitor blood pressure.

The communitization features of the NRHM and continuation as the NHM, including its introduction of the ASHA program, has been very important to Madhya Pradesh's progress.

> *With the launch of NRHM, the focus was on community participation, and that is why ASHA was identified as a link worker between the service provider and community. (Government health expert #2)*

> *I mean, many of us skipped a beat when there were talks about the National Health Mission, the possibility that it may not be renewed or something [chuckles]. So, I think this is one of the major things that has driven a reduction in maternal mortality across the country and I think it is something which needs to stay for a long period for the gains to be consolidated and also improved further. Then, of course there have been several hallmark programmes at the national level which have helped in this, including the ASHA program. (Civil society #1)*

The ASHAs role in demand generation for ANC and institutional delivery was particularly emphasized in tribal areas. ASHA provision of home-based newborn care played a role in reducing NMR: "there is a great contribution of our ASHA support system also in bringing down the MMR and, neonatal mortality rate" (government health expert #2). Under the NRHM, Madhya Pradesh also built a robust system of community mobilisers: the block community mobiliser, district community mobiliser, district programme managers, and block programme managers. This new managerial system served as the "extended hands" (government health expert #2) of the Chief Medical Health Officer (CMHO) in the district, since the CMHO already had enormous administrative workload.

The state has also developed an innovative decentralized ambulance system for areas without any internet connectivity. The centralized 108 ambulance system was not appropriate for these remote areas, so a block level ambulance service was implemented instead: "So one can call for these ambulances much more easily as compared to the centralised ambulances" (civil society #1).

Community demand has been further cultivated through reduction to OOPE. Pradhan Mantri Jan Arogya Yojana (PMJAY) was credited with helping reduce this expenditure.

Partnerships

- Partnerships between Health and other departments, with development partners, academic institutions, and civil society organizations were identified as a major driver in Madhya Pradesh
- Development partners provided both technical support for a wide range of programs and a vital extra set of eyes for monitoring progress on the ground
- Madhya Pradesh managed multiple development partners by assigning them districts, thereby avoiding overlap and duplication

Madhya Pradesh benefitted from "convergence" between the "trio of departments" consisting of Health and Family Welfare, Women and Child Development, and Rural Development (government health expert #1). For instance, Tejasvini groups, which fell under Women and Child Development and were supported by Rural Development, improved women's health through supporting kitchen gardens, food millets and protein supplementation. It was striking that in Madhya Pradesh, these other departments showed initiative on health. For example, a former leader in Madhya Pradesh's Department of Health and Family Welfare recalled the Department of Rural Development asked that women's health and reproductive health be major agenda items at Gram Sabhas (major political events within the Panchayat Raj Institution of local governance).

We also have days, there are times when even rural development seeks out and says that we want to do exclusive campaigns for your mothers. Not the other way round. It usually, in other states I would feel that the health department will request the other two departments to do, the other way round also happens in our state. (Government health expert #1)

Civil society organizations have contributed to maternal and child survival in the state. Jan Swasthya Seva has supported sickle cell anemia screening in tribal areas. Chhattisgarh, which was part of Madhya Pradesh until 2000, provided the country with an exemplary model of community-driven health improvements.

Partnership between the Department of Health and Family Welfare and medical colleges (AIIMS Bhopal, Gandhi Medical College, the Liverpool School of Tropical Medical) supported capacity building initiatives for government health workers. Private sector clinicians were mentioned as another source of support for government health programs.

Development partners including UNICEF, Jhpiego, UNFPA, Ipas, and Wish Foundation, were considered essential providers of accountability and technical support.

So, this [NGOs and UN bodies] was a kind of a third eye which was visiting districts, visiting facilities and giving you real time actual feedback. […] They would bring in their global pool and their national pool of talent and what is happening, what is good with us, and at meetings they would give us ideas and we would look at them and analyse them and implement whatever was good. So, a lot of things were implemented because of that. (Government health administration #4)

The state managed their large "pool" (government health administration #4) of non-governmental organizations (NGOs) and United Nations bodies by allocating them to specific districts. UNICEF was central to the development of the state's SNCUs, "handholding" the government through clinical audits, and checking the night shifts: "they have been with us since the beginning" (Government health expert #1). Finally, the central government has provided Madhya Pradesh with important support, particularly the NHSRC as technical resources and mentors, including on how to scale up training activities.

IMPLICATIONS FOR STRATEGIC PLANNING

As part of the Exemplars study, a five-stage integrated framework for maternal and neonatal mortality transition was developed. This framework encapsulates key factors associated with reducing mortality using data from nearly 150 countries over the past two decades, including cause-of-death patterns, fertility, health service coverage and inequalities.[22] We used the transition framework as a tool to understand change in these interrelated factors, benchmark current situations, and inform strategy development in Madhya Pradesh and nationally.

Comparing Madhya Pradesh's indicators at stage III (2017) against the median values for India's low mortality states and countries in stage IV in 2017 (Table 4), it highlights the following key policy considerations:

- Moving towards India's lower mortality state (LMS) average requires substantial reduction in MMR, from 163 to 73 deaths per 100,000 live births, and NMR, from 35 to 16 deaths per 1000 live births.
- The total fertility rate in Madhya Pradesh remains substantially higher than the LMS average (2.7 versus 1.7), suggesting that substantial gains in maternal and neonatal survival could be achieved through continued fertility reduction including increased use of family planning.
- Madhya Pradesh will make gains in maternal and neonatal survival by addressing coverage gaps particularly in 4 or more ANC visits (57% versus 75% LMS average), delivery in a hospital (38%[d] versus 71% LMS average) and C-section access (12% versus 34% LMS average).
- Inequalities in access require further attention: rural delivery care was 88% compared to 95% in the LMS average, and delivery care was 15 percentage points lower for the poorest than the richest tertile. (compared to 12 percentage points in LMS), while C-section access among the poorest tertile was particularly low, at only 4% in 2017 (compared with 15% in the LMS).
- Despite these inequalities, NMR wealth differences were very similar to the LMS average: there were 16 more neonatal deaths per 1000 live births among the poorest than richest (compared to 18 in LMS), but this still must reduce further to reach the median of 7 in Stage IV countries.

d The hospital delivery percentage here and in Table 4 is different from the percentage in Figure 11 due to differences in data sources (Table 4 uses the NFHS and DLHS pooled data whereas Figure 11 used only the NFHS data) as well as differences in the reference period (Table 4 uses the annual rates whereas Figure 11 used estimates for the births in the three years before NFHS-2).

Table 4: Summary of key indicators in 2000 and 2017 for Madhya Pradesh, and common characteristics of lower mortality states and countries in stage IV in 2017

Indicator	Madhya Pradesh		Lower mortality state cluster stage IV values, 2017	Median values for countries in stage IV in 2017
Year	2000	2017		
Stage	I	III		
Mortality				
Maternal mortality per 100,000 LB (SRS 2000-18)	407	163	73	43
Neonatal mortality per 1,000 LB (SRS 2000-18)	60	35	16	9
Neonatal mortality, home births (2005-06 and 2019-21)	45	45	33	NA
Stillbirth rate per 1,000 births (SRS)	8	6	5	9
Cause pattern (neonatal) (MCEE 2000 & 2015)				
Infections (Group 1)	31	18	21	14
Health status[1] (Group 2)	37	61	57	70
Peri-partum (Group 3)	31	21	22	17
Fertility (SRS)				
Total fertility rate	4.0	2.7	1.7	2.2
Adolescent fertility (per 1000)	75	18	15	44
Coverage of interventions (NFHS+DLHS)				
ANC four or more visits (%)	18	57	75	89
Delivery in health facility (%)	30	90	96	95
Delivery in hospital (%)	25	38	71	78
C-sections (%)	4	12	34	26
Inequalities				
Neonatal mortality poor-rich gap (abs) (NFHS 2005-06 and 2019-21)	4	16	18	7
Delivery care, rural (%) (NFHS+DLHS)	17	88	95	91
Delivery care, poor-rich gap (abs) (NFHS 2005-06 and 2019-21)	-75	-15	-12	-12
C-section, poorest quintile (%) (NFHS 2005-06 and 2019-21)	1	4	15	17

[1] Includes prematurity, small for gestational age and congenital anomalies.

NA: Not available.

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