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Exemplars in Maternal and Newborn Health India Study

State Report: Rajasthan

2024

EXEMPLARS IN GLOBAL HEALTH

Capacity Building for a Better Future

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Countdown to 2030
Women's Children's & Adolescent's Health

University of Manitoba




Exemplars in Maternal and Newborn Health India Study

State Report: Rajasthan





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ACRONYMS

AARC	Average Annual Rate of Change
AMTSL	Active Management of Third Stage of Labour
ANC	Antenatal Care
ANCq	Antenatal Care with Content
ANM	Auxiliary Nurse Midwife
ASHA	Accredited Social Health Activist
BEmOC	Basic Emergency Obstetric Care
BIMARU	Bihar, Madhya Pradesh, Rajasthan and Uttar Pradesh
BMI	Body Mass Index
CEmOC	Comprehensive Emergency Obstetric Care
CHC	Community Health Center
CSSM	Child Survival and Safe Motherhood
DLHS	District Level Household Survey
FOGSI	Federation of Obstetric and Gynecological Societies of India
FRU	First Referral Units
GBDS	Global Burden of Disease Study
GNM	General Nurse Midwife
HDSS	Health and Demographic Surveillance System
HIV	Human Immunodeficiency Virus
HMIS	Health Management Information System
HMS	Higher Mortality States
HSC	Health Sub-centre
ICDS	Integrated Child Development Scheme
IHAT	India Health Action Trust
IIPS	International Institute for Population Sciences
IMNCI	Integrated Management of Newborn and Childhood Illnesses
INR	Indian Rupee
IT	Information Technology
JSSK	Janani Shishu Suraksha Karyakaram
JSY	Janani Suraksha Yojana
KII	Key Informant Interviews
LMS	Lower Mortality States
LSAS	Life Saving Anaesthesia Skills
MCEE	Maternal and Child Epidemiology Estimation
MCH	Maternal and Child Health
MCTS	Mother and Child Tracking System
MDS	Million Death Study
MGIMS	Mahatma Gandhi Institute of Medical Sciences
MMR	Maternal Mortality Ratio
MNH	Maternal and Newborn Health

MO	Medical Officer
MOCP	Medical Officer Certificate Program
MoHFW	Ministry of Health and Family Welfare
MOU	Memorandum of Understanding
NFHS	National Family Health Survey
NHSRC	National Health Systems Resource Centre
NHM	National Health Mission
NICU	Neonatal Intensive Care Unit
NIPI	Norway India Partnership Initiative
NITI	National Institution for Transforming India
NMR	Neonatal Mortality Rate
NRHM	National Rural Health Mission
NQAS	National Quality Assurance Standards
NSSK	Navjaat Shishu Suraksha Karyakram
OOPE	Out-of-Pocket Expenditure
PCI	Per Capita Income
PCPNDT	Pre-Conception and Pre-Natal Diagnostic Techniques
PCTS	Pregnancy and Child Tracking System
PHC	Primary Health Centre
PIP	Project Implementation Plan
PNC	Postnatal Care
PPH	Post Partum Hemorrhage
PPIUCD	Post-Partum Intra-Uterine Contraceptive Device
PRI	Panchayati Raj Institution
RCH I	Reproductive and Child Health I
RCH II	Reproductive and Child Health II
RM-NCAH+N	Reproductive, Maternal, Newborn, Child and Adolescent Health plus Nutrition
RMNCH	Reproductive, Maternal, Newborn, and Child Health
RMNCH+A	Reproductive, Maternal, Newborn, and Vhild Health plus Adolescent Health
SBA	Skilled Birth Attendant
SNCU	Special Newborn Care Units
SRS	Sample Registration System
TFR	Total Fertility Rate
UoM	University of Manitoba
UNFPA	United Nations Fund for Population Activities
USP	Unique selling point
VHND	Village Health and Nutrition Day
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 Rajasthan sub-study and provides background information on the broader India study and research methodology. Key findings for the Rajasthan state are as follows:

- Rajasthan made major progress in reducing maternal and neonatal mortality during the period from 2000 to 2018, greater than most other higher mortality states (HMS). In 2018, Rajasthan had achieved a maternal mortality ratio (MMR) of 141 per 100,000 live births and a neonatal mortality rate (NMR) of 26 per 1,000 live births, respectively, which were lower than the MMR and NMR for the higher mortality states (145 and 28, respectively).
- All major causes of neonatal death have reduced (prematurity, birth asphyxia, infections, and others).
- The gains in intervention coverage – antenatal care (ANC) with contents, institutional deliveries notably in hospitals, and C-sections among rural and the poorest – have been marked and are greatest in the RCH II/NRHM period (2005-2012).
- The public sector has driven this increase, accounting for more than 70% of deliveries.
- Neonatal mortality rate among public sector institutional births was substantially reduced.
- Several health policies and system reforms have contributed to Rajasthan's success, including:
    - Rajasthan has increased the density of health facilities particularly Community Health Centres (CHCs), improved emergency medical transportation, and strengthened quality of care provided in public facilities (including clinician skills, labour room cleanliness and organization, and birth companionship). The state has increased the availability of tertiary care through maternal and child health wings in 38 hospitals and at the same time created sick newborn care units in each district.
    - Rajasthan has focused on improving the capacity of nurses through in-service training and implementing labour and delivery protocols and checklists. It also improved pre-service education for Auxiliary Nurse Midwives (ANMs) and general nurse midwives (GNMs) through creating skill labs, IT labs and libraries in ANM and GNM schools.
    - Accredited Social Health Activists (ASHA) Sahyogini training and support has been a priority in the state; ASHA Sahyoginis were central to community mobilization and demand generation in Rajasthan.
    - Rajasthan has been a leader in the use of digital services, including for (Janani Suraksha Yojana) JSY payments, ASHA payments, and Health Management Information System (HMIS) for monitoring and accountability.
    - The state has focused extensively on implementing quality assurance programs at scale and with sufficient monitoring and oversight, including the use of mentors, safe birth checklists, JSY case sheets, Kayakalp, and the National Quality Assurance Standards (NQAS).

- Leaders in the state government and within the Department of Health were very supportive of experimentation and adaptations suggested by program implementers.
- Rajasthan has encouraged diverse approaches to meet the distinct needs of its districts.
- The National Rural Health Mission (NRHM) was “catalytic” and enabled a “different level of intervention” through decentralization and financial flexibility.
- Accountability in government health service provision was emphasized by government leaders and supported by media interest.
- Janani Shishu Suraksha Karyakaram (JSSK) has supported demand for government health services through reducing out-of-pocket expenditure (OOPE).
- Rajasthan has benefited from technical expertise and support from international development partners, particularly in improving quality of care. The state government’s approach to these partnerships was characterized by active and equal engagement, rather than passivity.
- The national government, along with Rajasthan’s medical colleges, hospitals and academic institutions all provided valuable support through creating standards and guidelines and providing in-service training for health workers.

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.

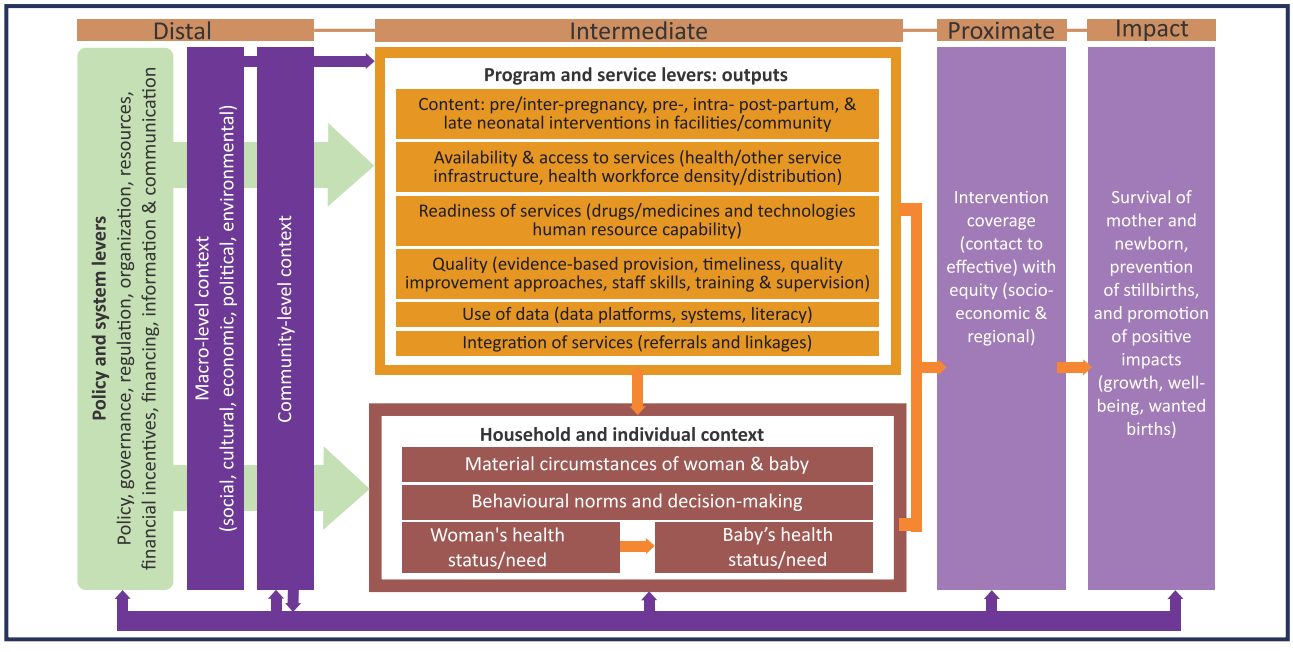
Macro- and community-level contextual factors (e.g., social, cultural, economic, political, or geographical) at the distal level may moderate the effects of health policy and system changes on program and service outputs for MNH and their impact on coverage of key MNH interventions and health outcomes. 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.

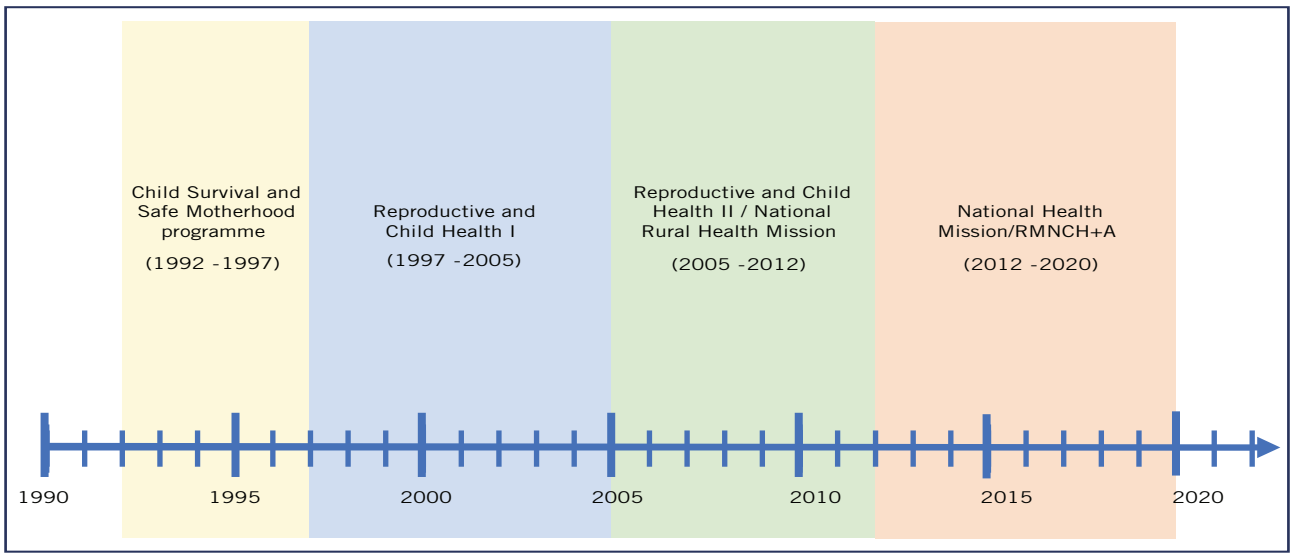
Figure 1: Conceptual framework for the study of drivers of the maternal and neonatal mortality decline, MNH Exemplars study



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

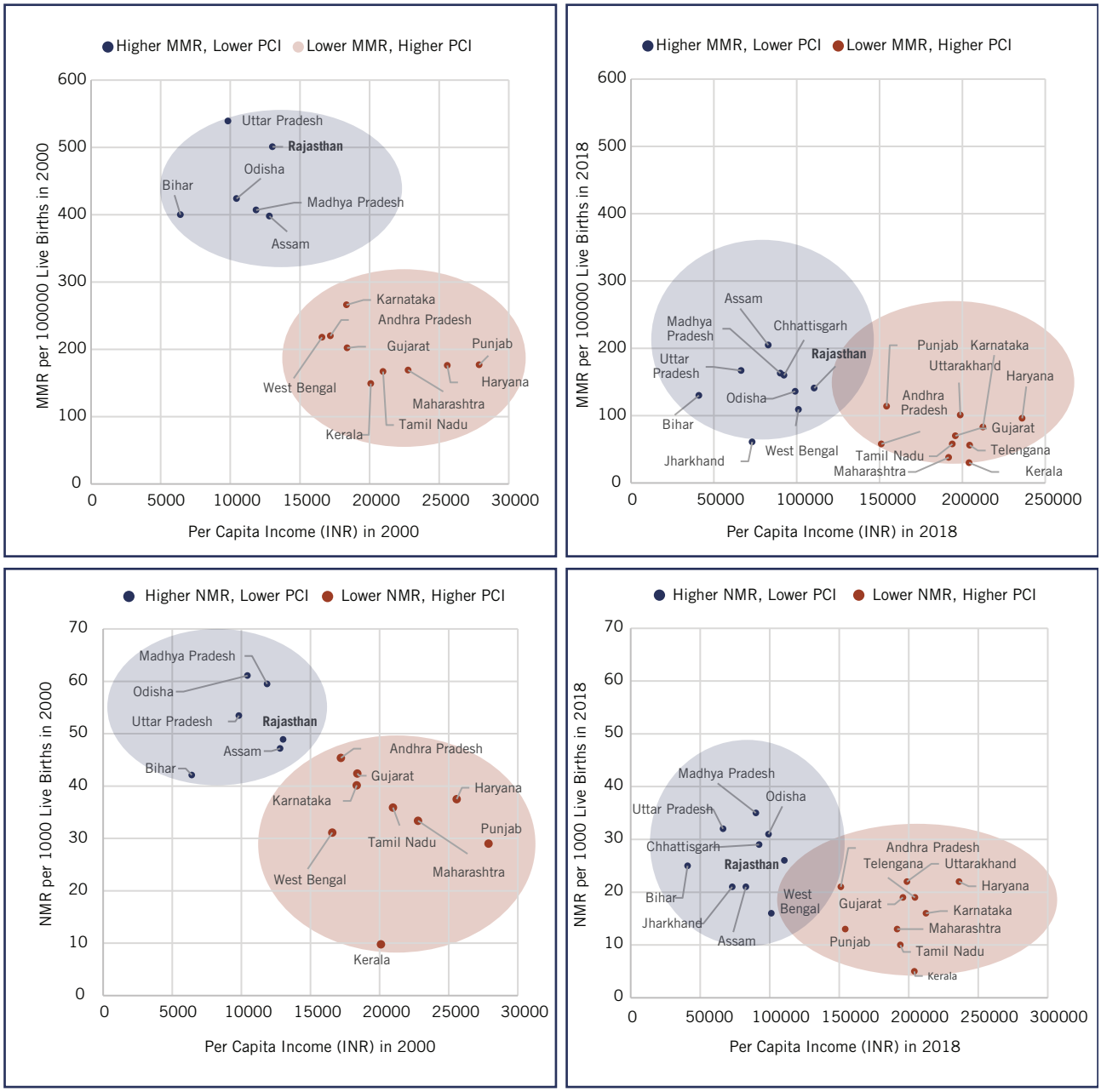


State clusters

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 2000-18, 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 for 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 Rajasthan (-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 mortality 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	-4.5	-8.1	5
Assam	398	215	-3.6	47.2	22.0	-2.4	-8.2	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 NFHS[4] (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 decline. 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) 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.

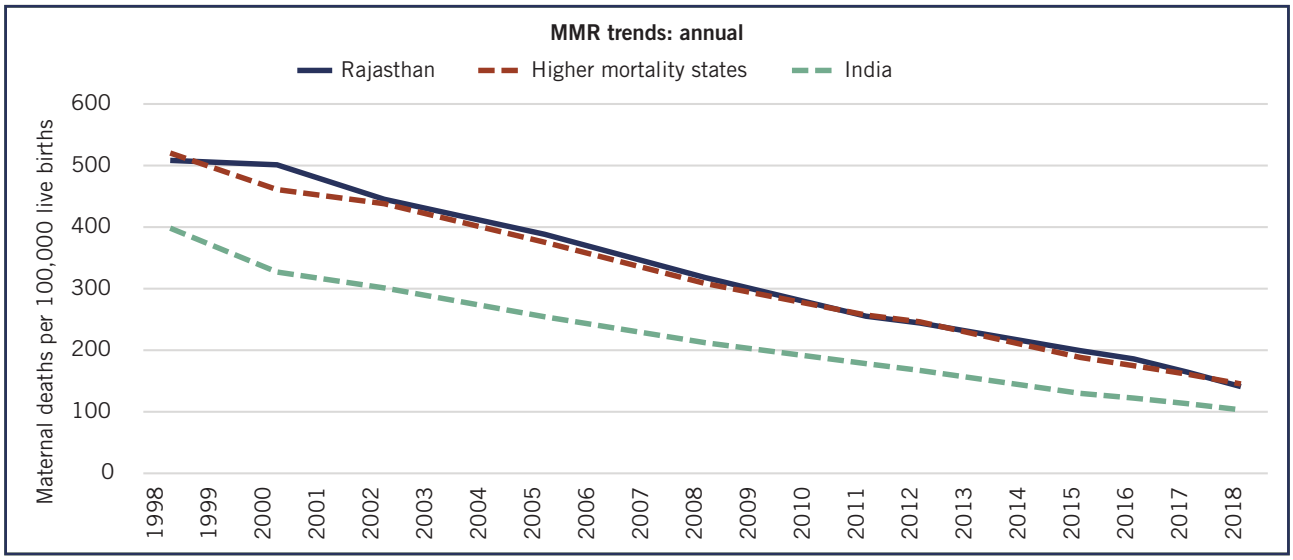
We coded the qualitative transcripts in Dedoose software using a codebook developed based on a priori topics, with additional emergent sub-codes. We shared synthesized results with key informants anonymously to finalize the results.

This report presents the results of these analyses for Rajasthan 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 Rajasthan over the last two decades. Then the study analyzed the linkages between drivers and outcomes to explain how major drivers combined to influence Rajasthan's maternal and neonatal mortality declines.

MATERNAL AND NEONATAL MORTALITY TRENDS

During 2000-18, Rajasthan recorded much faster reductions in maternal mortality ratio (MMR) than in neonatal mortality rate (NMR) (AARC of -7.0% versus -3.5%) (Figure 4, Table 2). In 2018, the MMR in the state was 141 maternal deaths per 100,000 live births (twice the 2030 SDG target of 70) and the NMR was 26 per 1000 live births (also twice the level of 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 -9.1% and -4.7%, respectively (Table 2).

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



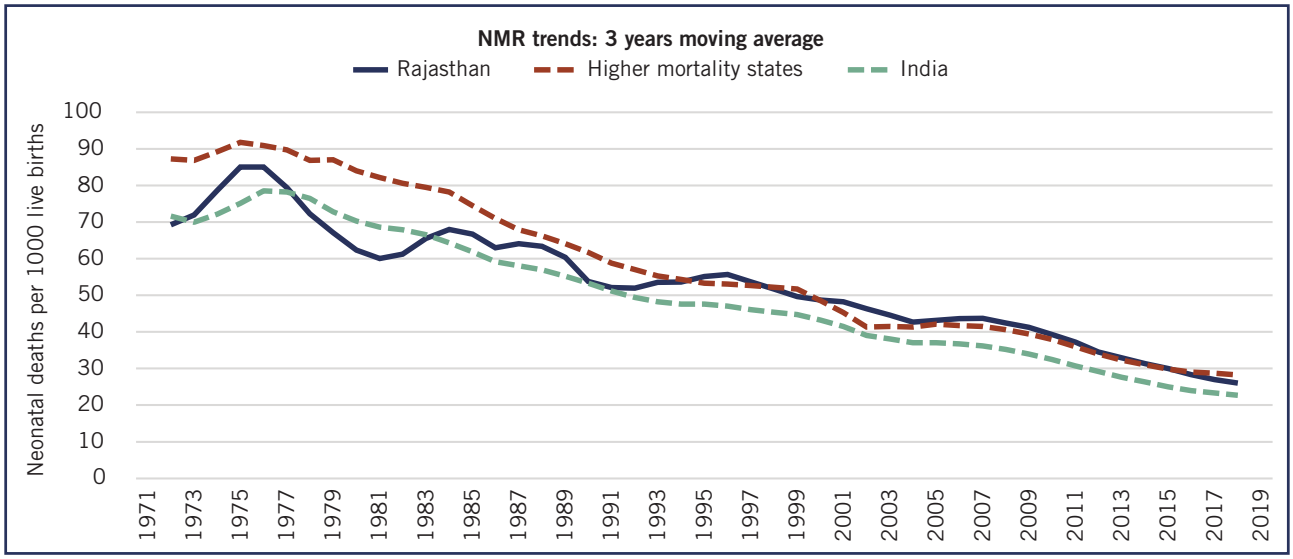


Table 2: Average annual rates of change (AARC) in MMR (1997-2018) and NMR (1971-2019), Rajasthan, higher mortality state cluster and all India (SRS)

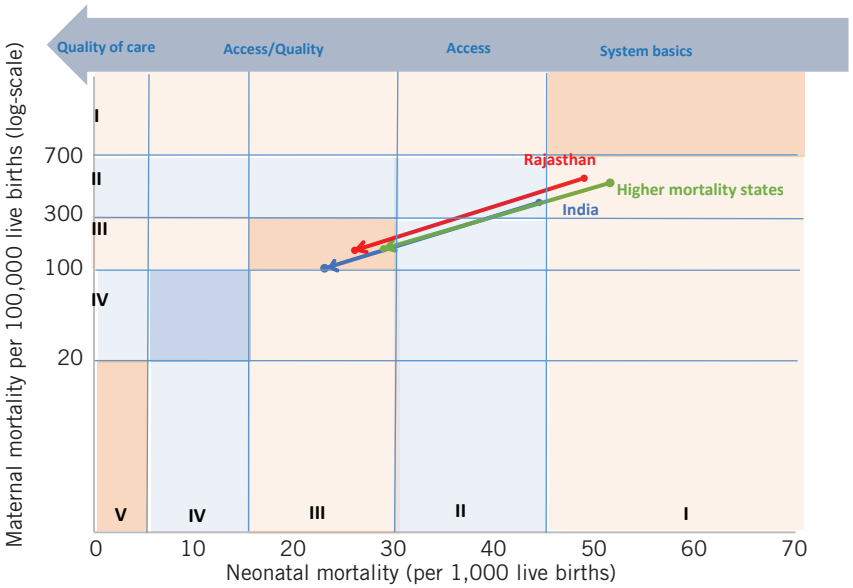
Policy period	Rajasthan	Higher mortality states	India
AARC in MMR (%)			
1997-2005 (RCH I)	-3.8	-4.7	-6.4
2005-12 (RCH-II/NRHM)	-6.6	-6.0	-6.0
2012-18 (NHM/RMNCH+A)	-9.1	-8.8	-8.1
2000-18	-7.0	-6.4	-6.4
1997-2018 (Overall)	-6.4	-6.4	-6.8
AARC in NMR (%)			
1992-97 (CSSM)	-0.3	-1.2	-1.6
1997-2005 (RCH I)	-3.2	-3.1	-2.8
2005-12 (RCH-II/NRHM)	-3.0	-2.9	-3.4
2012-19 (NHM/RMNCH+A)	-4.7	-3.1	-3.9
2000-18	-3.5	-3.2	-3.7
1971-2019 (Overall)	-3.0	-2.7	-3.0

Maternal and neonatal mortality transition

Rajasthan'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.[12] 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 care and (almost) all preventable deaths are eliminated.

During 2000-18, Rajasthan has transitioned from Stage I to Stage III, achieving a nearly four-fold reduction in maternal mortality and reducing the neonatal mortality by half (Figure 5).

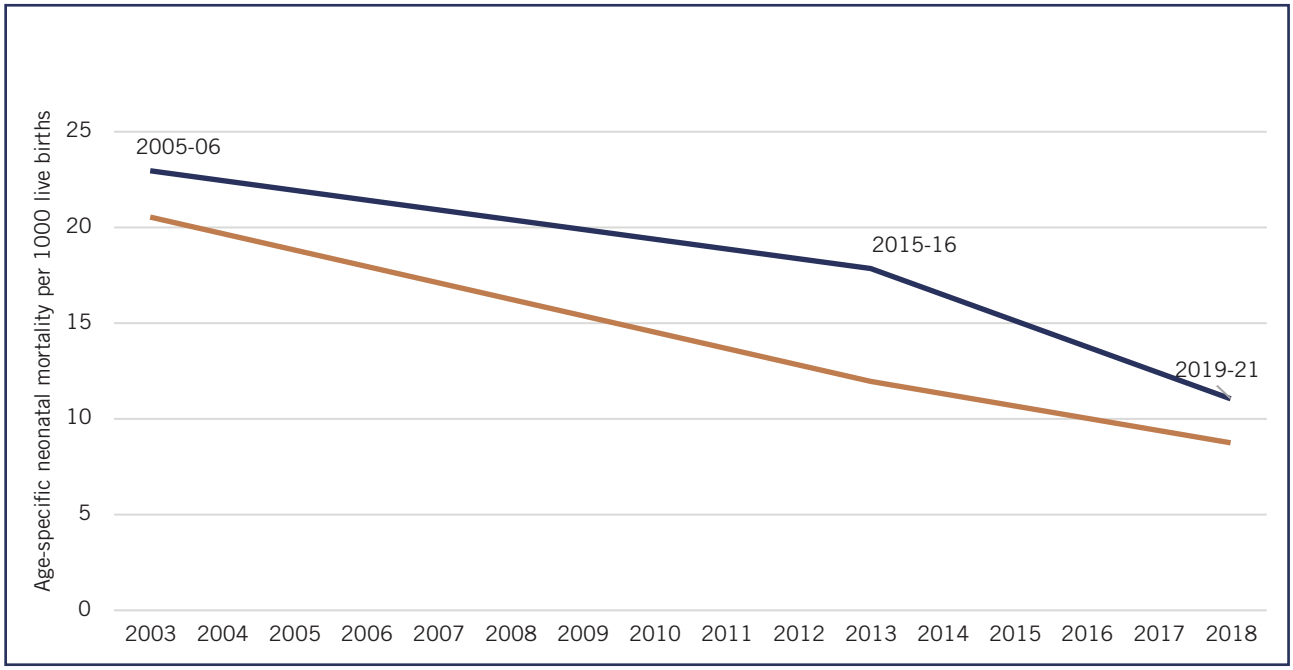
Figure 5: Mortality transition in Rajasthan, higher mortality state cluster and all India (SRS 2000-18)



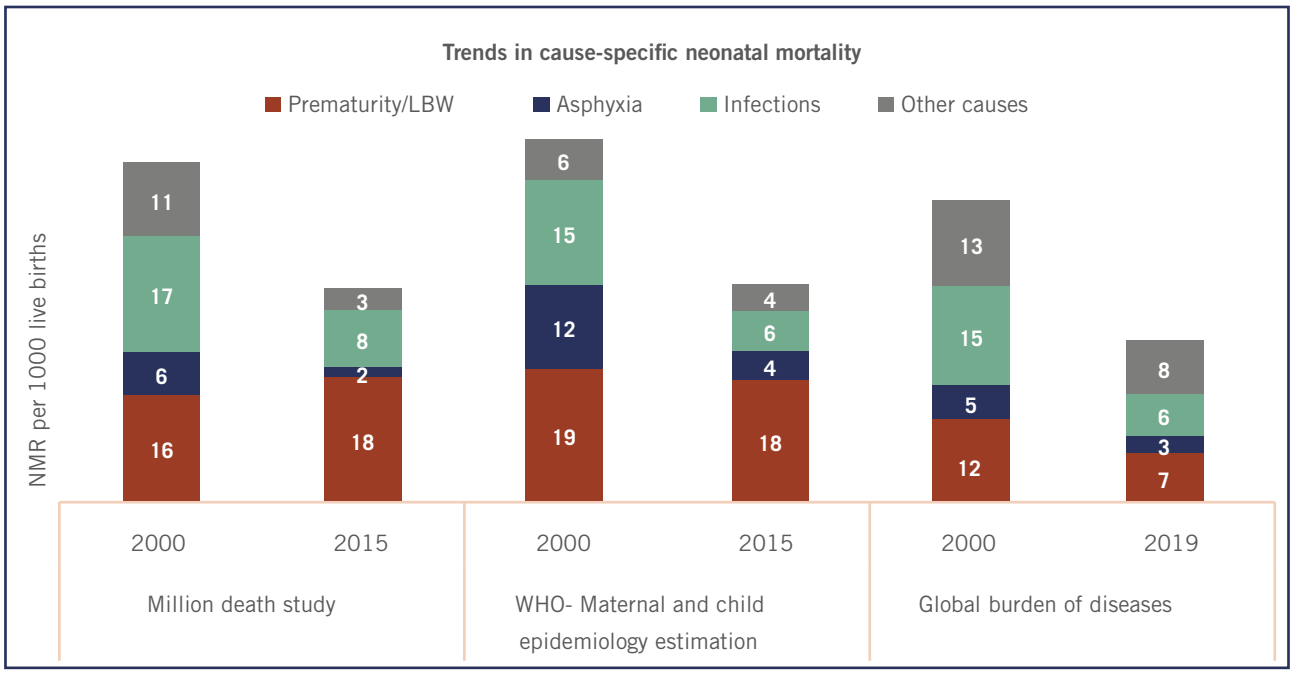
Age and cause-specific neonatal mortality

During 2003-18, Rajasthan 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). The estimates from GBDS indicate that the state has recorded major declines in all leading causes with preterm birth contributing 35% to the total decline, birth asphyxia 26% and newborn infections including lower respiratory infections another 17%. However, newborn infections, including lower respiratory infections, contributed most to the decline as per MDS and WHO/MCEE.

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), Rajasthan



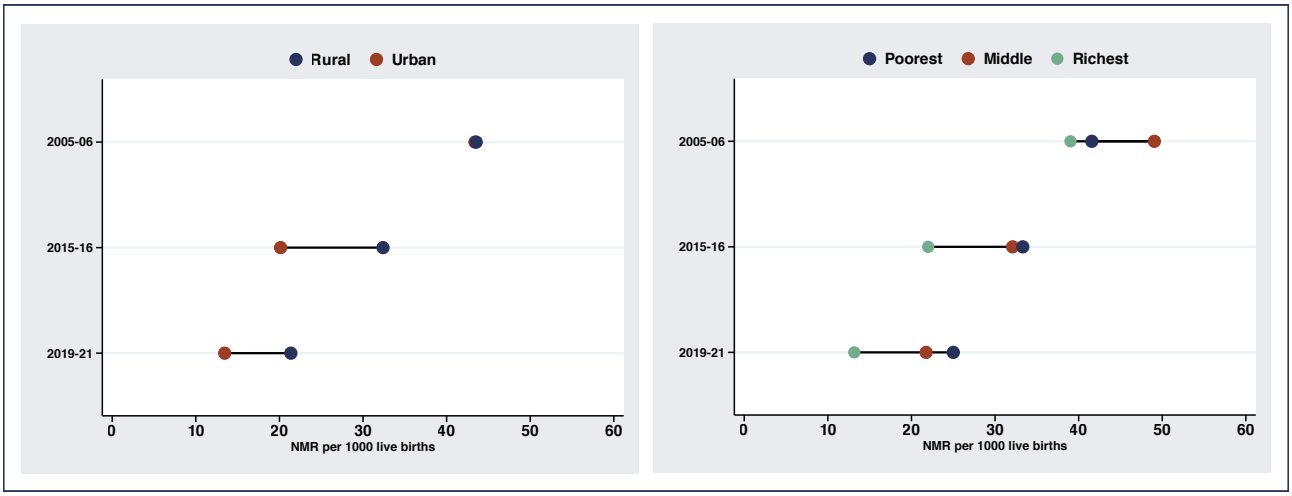
* We included mortality from births in the five years preceding each NFHS round and have taken 2003, 2013 and 2018 as the midpoints for the estimates from NFHS 2005-06, 2015-16 and 2019-21, respectively.



Equity in neonatal mortality

The NMR has reduced in both rural and urban areas and in recent times there is reduction in the differences between them as well. However, there is a slight increase in the difference of NMR by wealth tertile (Figure 7).

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



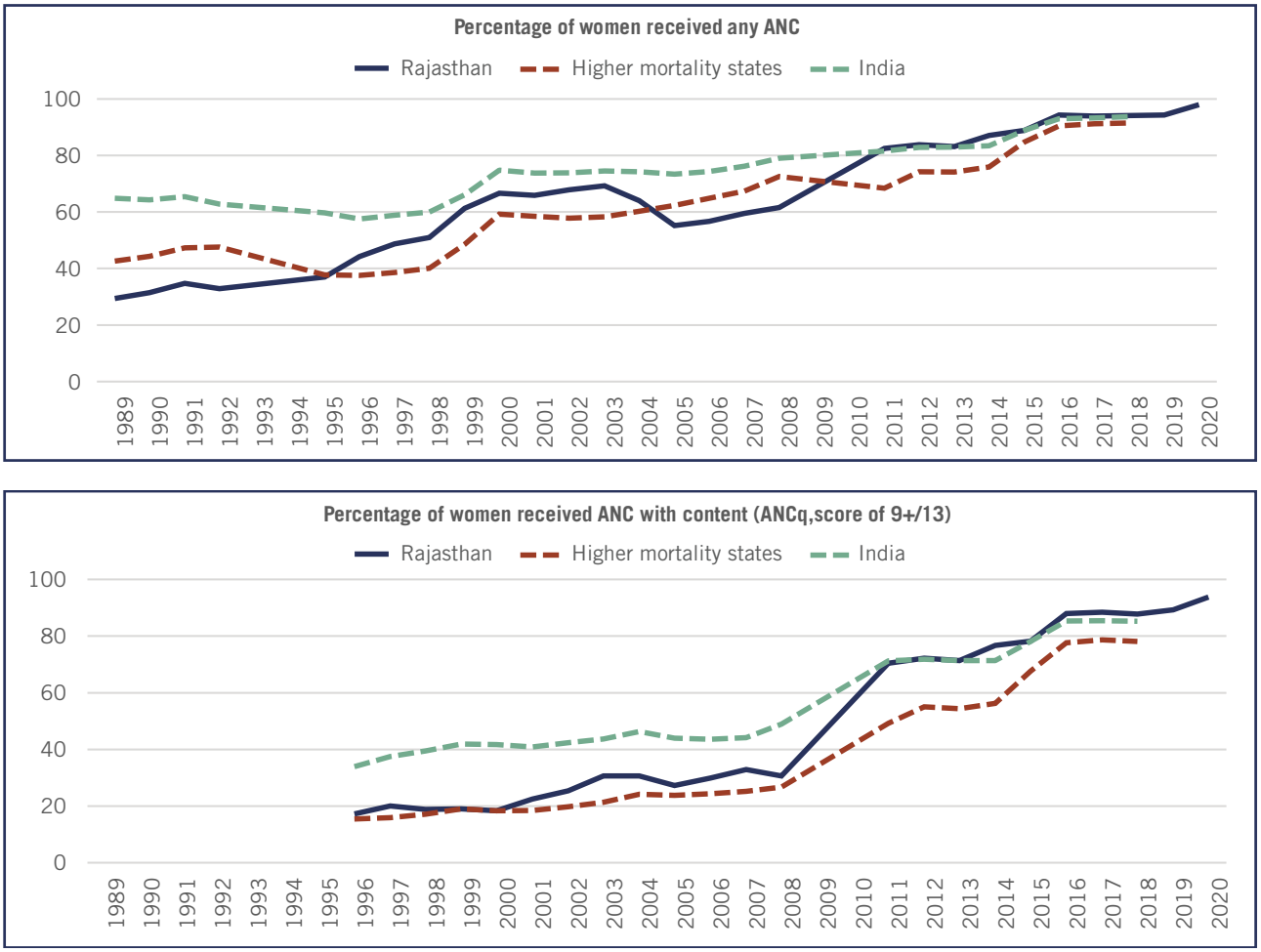
INTERVENTION COVERAGE AND EQUITY

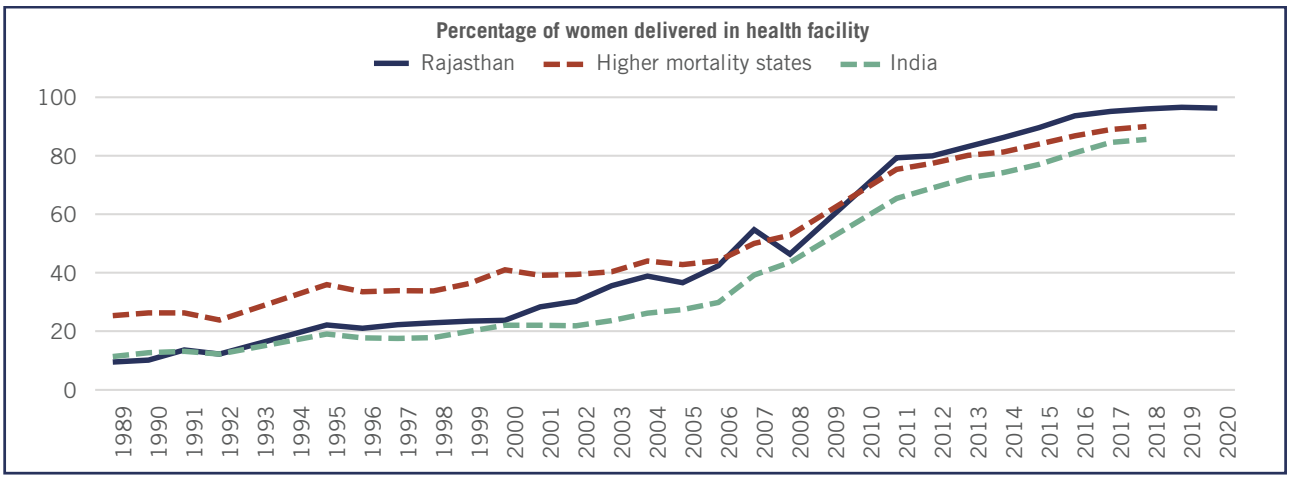
How did Rajasthan achieve these major mortality reductions since 2000? In this section, we analyse the trends and equity in the coverage of key interventions in the state against the backdrop of the various national health policy periods.

Antenatal and delivery care

The coverage of key interventions has improved drastically in Rajasthan according to the pooled NFHS and DLHS data (Figure 8). Rapid increases in antenatal and delivery care coverage were observed during the RCH-II/NRHM period (2005-12), with any ANC and institutional delivery each reaching over 96% by 2020. The coverage for ANC with most contents (ANCq) also increased rapidly during the RCH-II/NRHM period, reaching 98% in 2020.

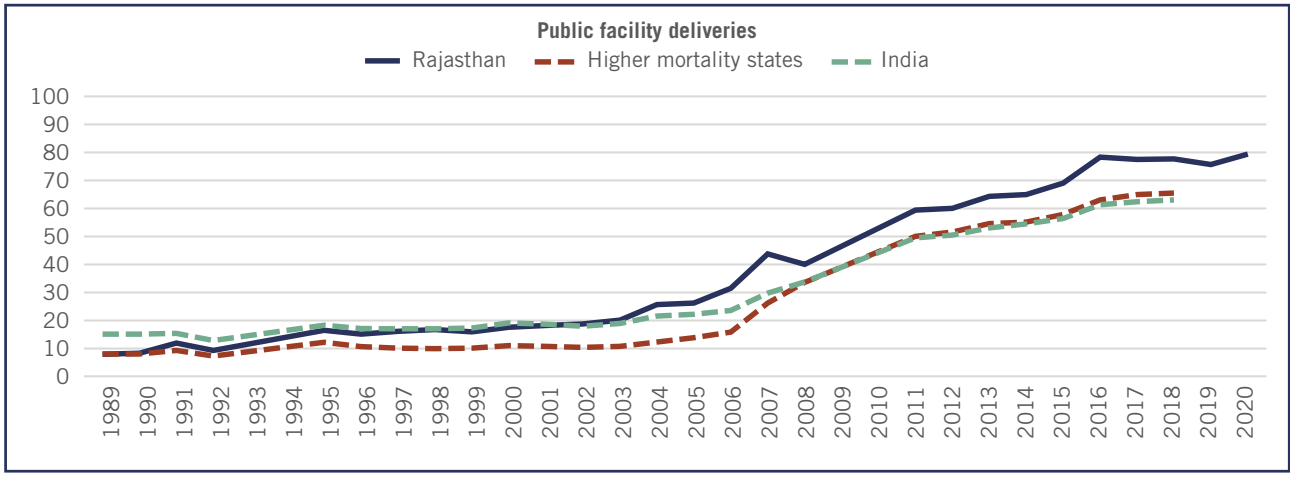
Figure 8: Trends in antenatal and delivery care coverage, Rajasthan, higher mortality state cluster and all India (NFHS and DLHS pooled data, 1989-2020)

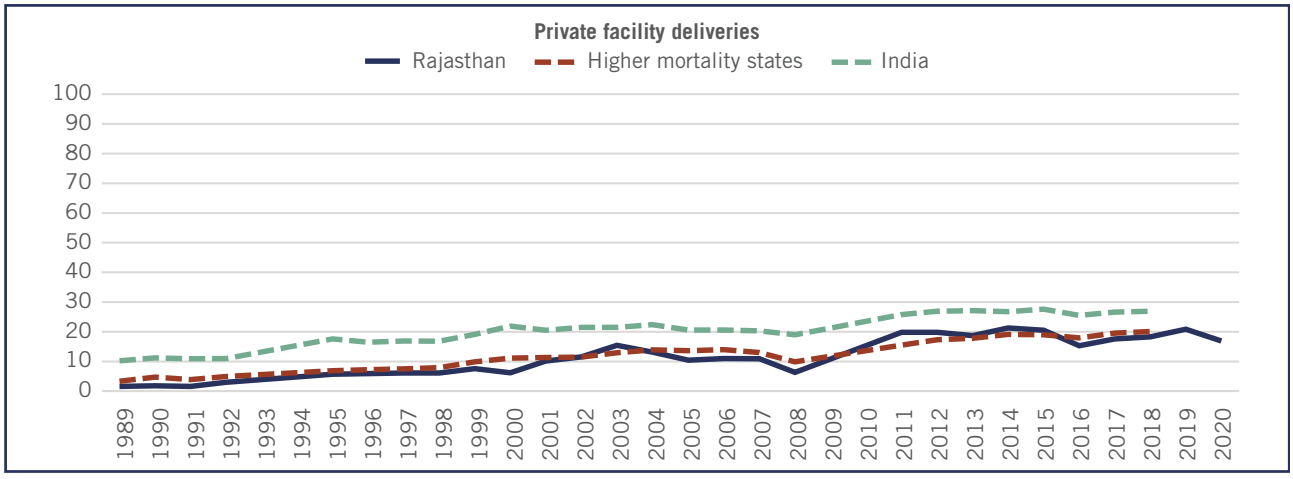




Increases in institutional deliveries were mainly driven by public facilities, however private facility deliveries also increased till 2014 and showed a mixed pattern thereafter (Figure 9).

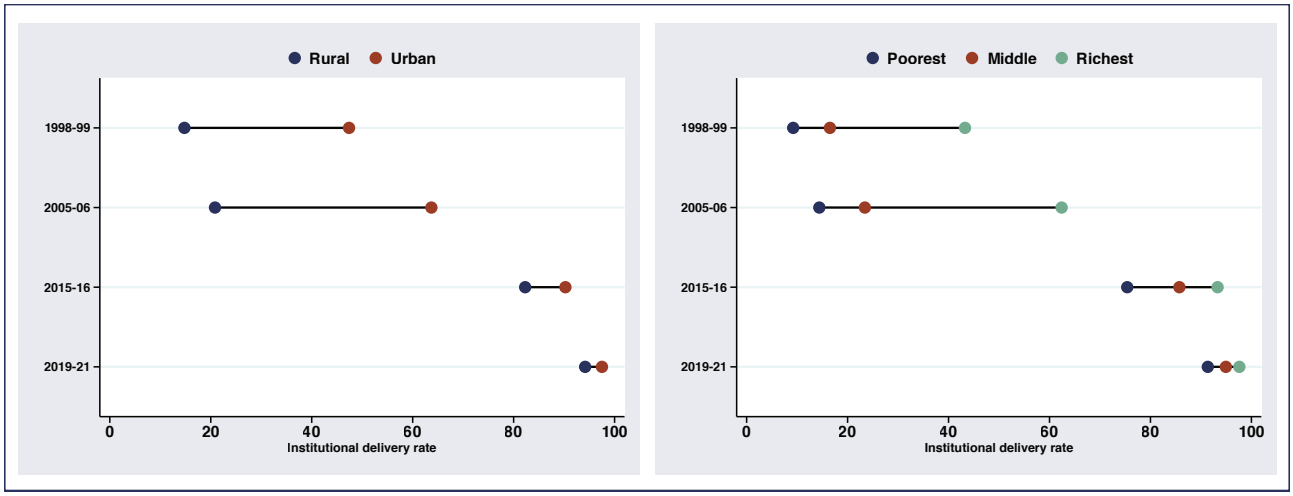
Figure 9: Trends in public and private health facility deliveries, Rajasthan, higher mortality state cluster and all India (NFHS and DLHS pooled data, 1989-2020)





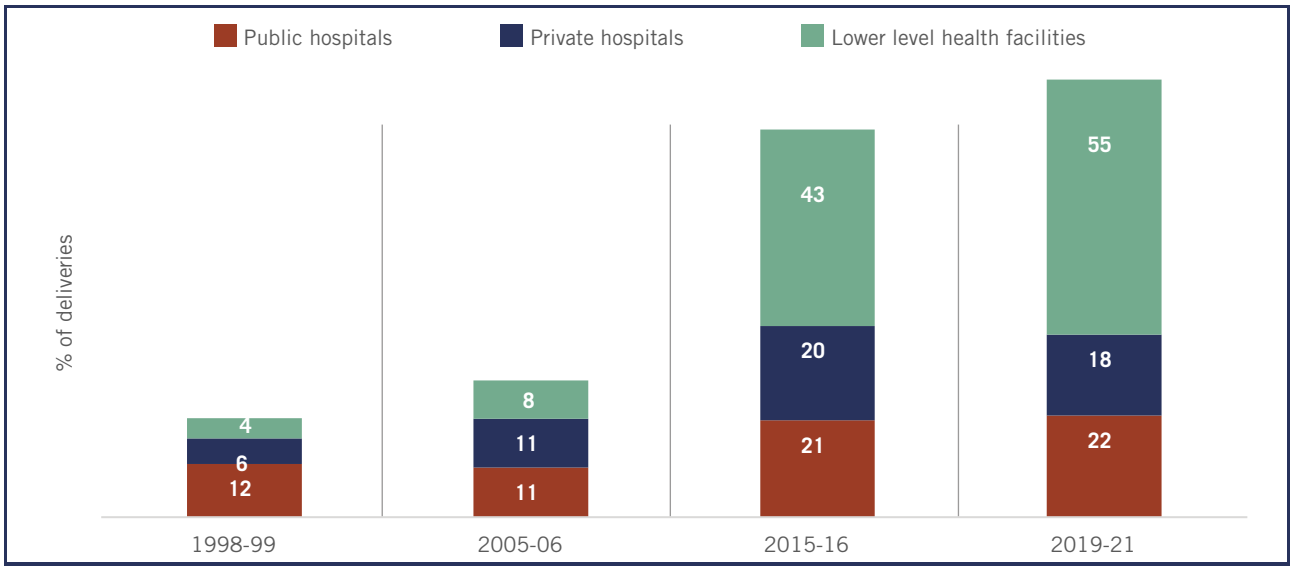
Rajasthan's major increases in institutional delivery was possible because the rural and poorest women were reached more, and disparities were reduced substantially (Figure 10).

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



Since 2015-16, majority of institutional deliveries in Rajasthan were conducted in lower-level health facilities (Figure 11). Hospital deliveries accounted for 40% of all deliveries in the state during 2019-21. The national analysis indicated that NMR decline is strongly associated with increases in hospital deliveries (MNH Exemplar Study, National Report). Overall, the share of public facility deliveries of all institutional deliveries was greater, with about 70-85% of deliveries occurring in public health facilities since 2005. The greatest increase in public facility deliveries was during the RCH-II/NRHM period (2005-12) with an AARC of 12% (data not shown).

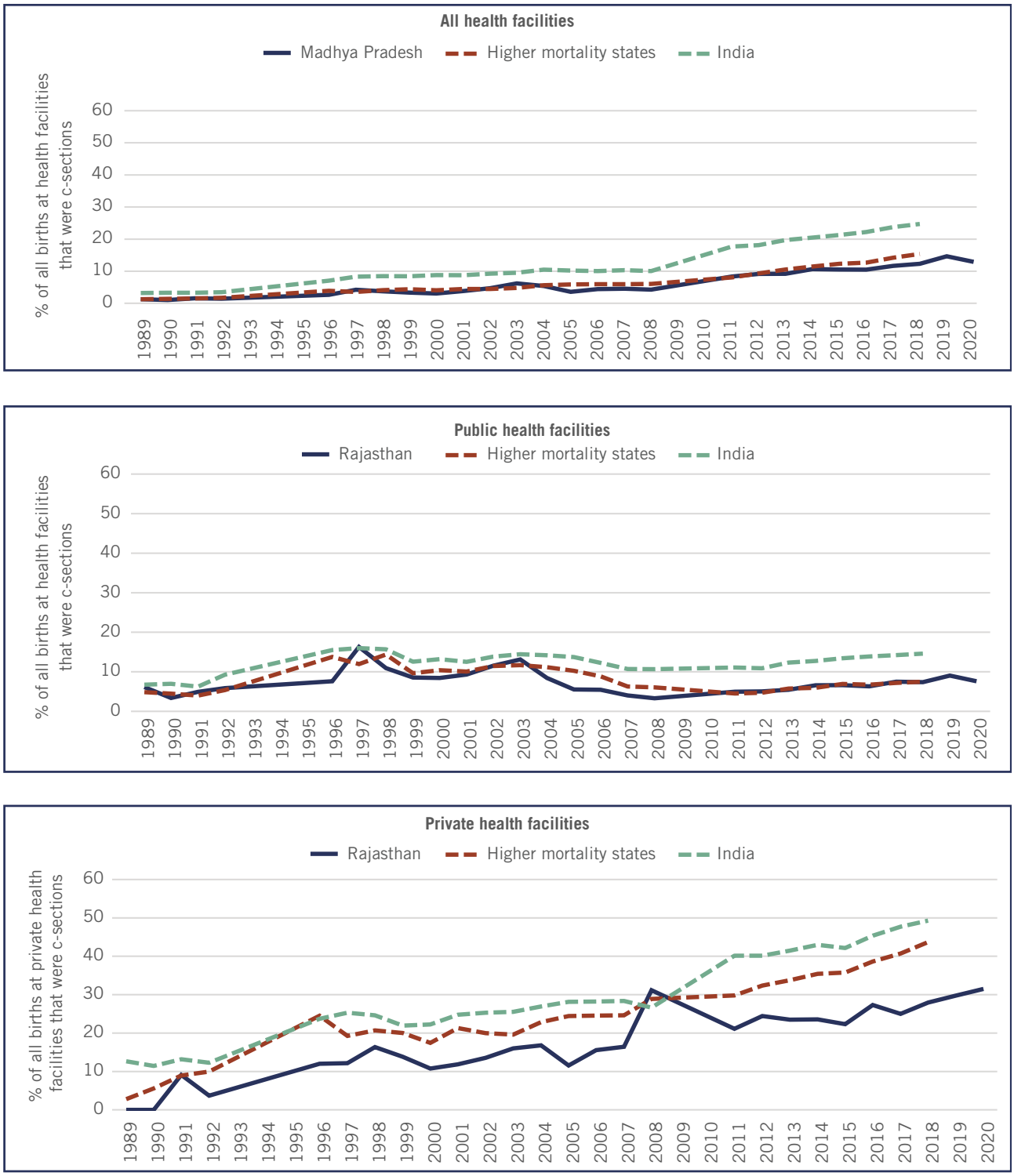
Figure 11: Trends in institutional delivery by health facility level, Rajasthan (NFHS 1998-99, 2005-06, 2015-16 and 2019-21)



C-sections

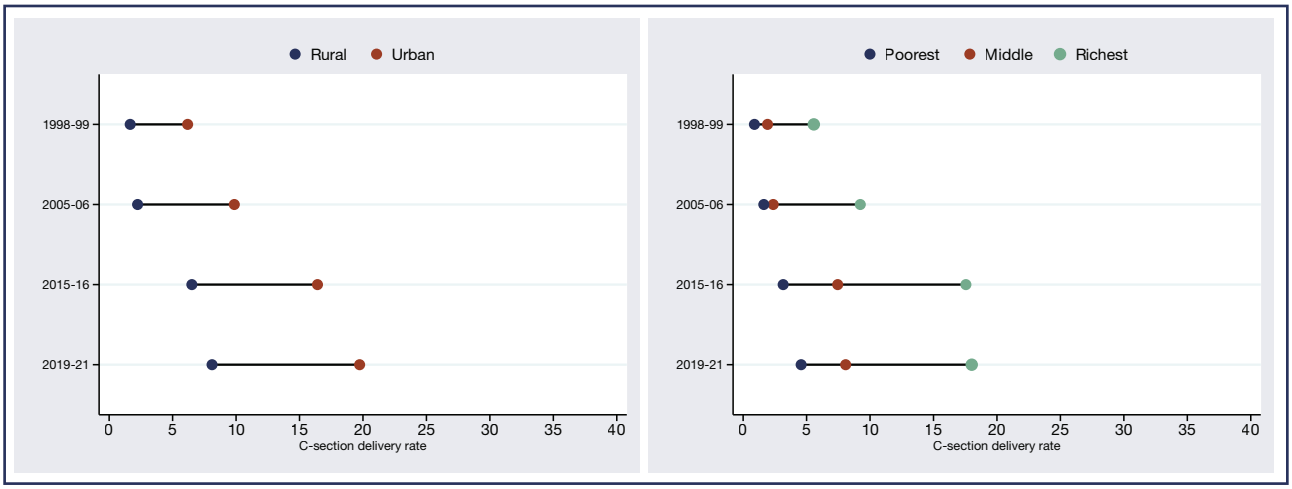
C-section rates have increased more than five-fold in Rajasthan from just about 2% in 2000 to a little over 11% in 2020 (Figure 12). During the past two decades, the greatest increase in c-section rates was observed in the RCH-II/NRHM period (2005-12; AARC of 15.6%, data not shown), primarily driven by the increase in private facility c-sections (AARC of 10.7%, data not shown). For the past decade, however, the share of private facilities in C-sections in the state has been declining. The share of private facilities in c-section deliveries was between 45%-62% during the RCH-II/NRHM period. During this period, the c-section rate was 2-4 times as high among private facility deliveries as among public facility deliveries.

Figure 12: Trends in c-section delivery rates by health facility type, Rajasthan, 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-section.[13,14] By 2019-21, Rajasthan recorded a five-fold increase in c-section rates among the rural population (reaching 8%) and among the poorest (reaching 5%), suggesting persistent and substantial unmet need in these population sub-groups (Figure 13). C-section rates among the urban and the wealthier groups have tripled to around 20%, going beyond recommended levels, indicating over-use.

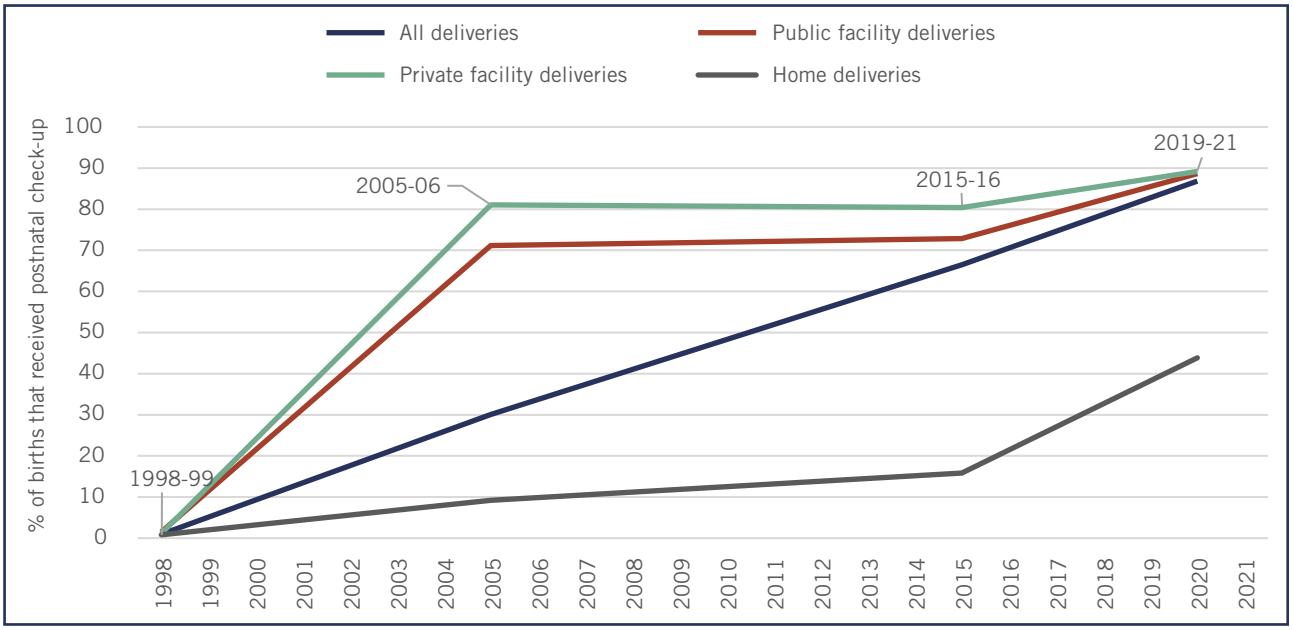
Figure 13: Trends in C-sections delivery rates by urban-rural residence and household wealth tertile, Rajasthan (NFHS 1998-99, 2005-06, 2015-16 and 2019-21)



Postnatal care and essential newborn care including early initiation of breastfeeding

Figure 14 presents the percentage of mothers/newborns in Rajasthan 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 increased from less than 1% for births during 1998-99 to 87% for births during 2019-21. The PNC coverage level in recent years has almost converged in both public and private health facilities reaching to almost 90% in 2019-21. However, coverage was much lower at 44% for home deliveries.

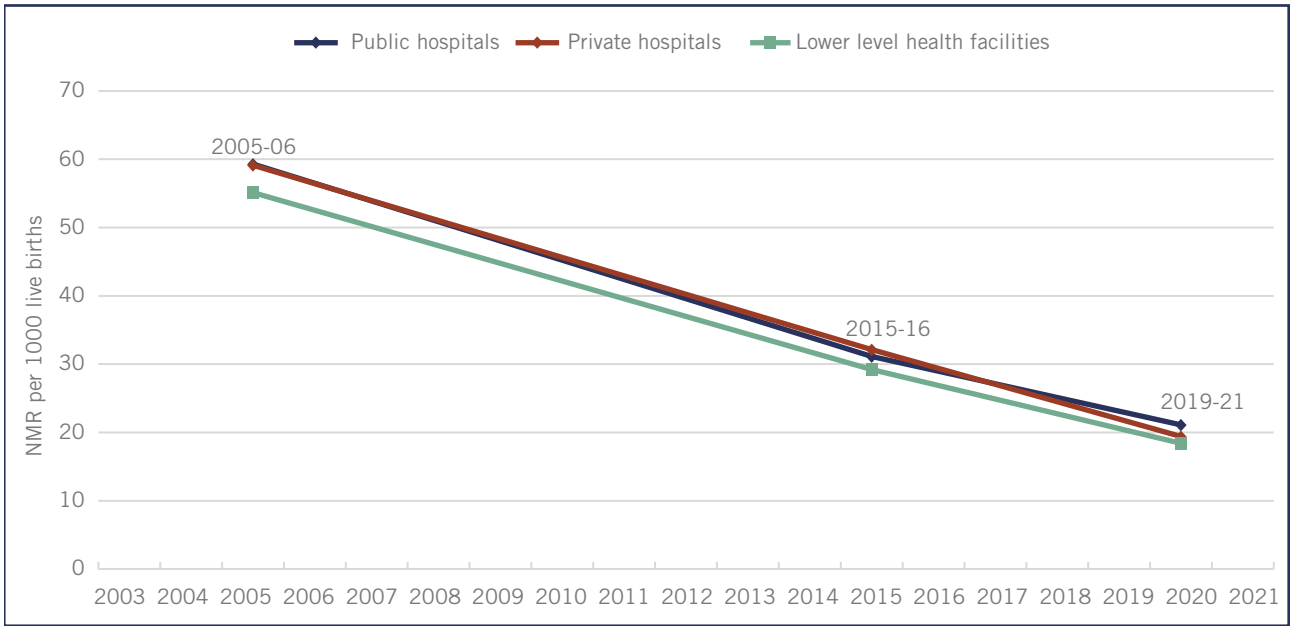
Figure 14: Postnatal care coverage for either the mother or the newborn within 0-2 days after delivery by place of delivery, Rajasthan (NFHS 1998-99, 2005-06, 2015-16 and 2019-21)



NMR by place of delivery

NMR in institutional deliveries declined substantially from 59 to 21 per 1000 live births in public hospitals from 2005-06 to 2019-21, and from 59 to 19 per 1000 live births in private hospitals during the same period (Figure 15). Similarly, neonatal mortality rates among deliveries in lower-level health facilities declined from 55 to 18 per 1000 live births. The rate of decline was slightly higher in private hospitals (AARC: -8.0%), followed by lower health facilities (AARC: -7.8%) and public hospitals (AARC: -7.4%) (data not shown). Lower health facilities include health facilities such as CHCs, PHCs, SHCs, and private non-hospitals.

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



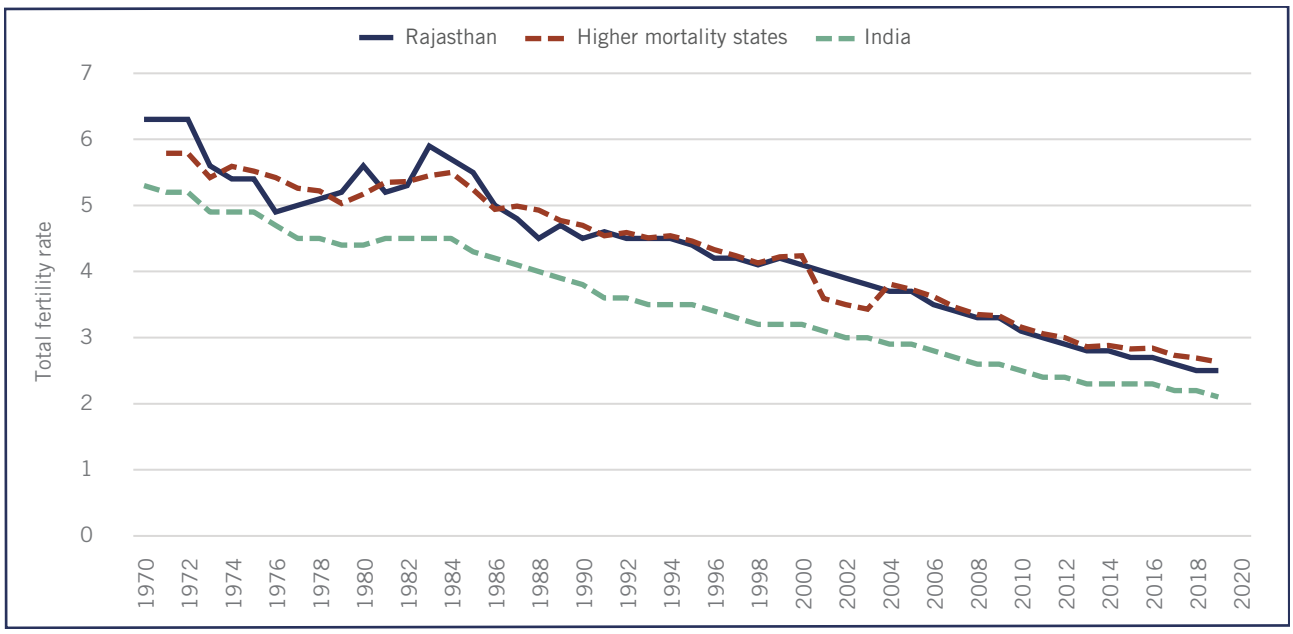
DEMOGRAPHIC AND SOCIO-ECONOMIC CONTEXTUAL SHIFTS

Household-level context

Fertility declines

Fertility in Rajasthan has been declining from a total fertility rate (TFR) of 5-6 children per woman during 1976-91 to less than 4 in 2002 and remained at 2.5 since 2018 (Figure 16). However, the number of live births increased from 1.7 to 1.8 million annually in past two decades, due to the population momentum (data not shown). Since 2000, the state has consistently recorded slightly lower TFR levels than the higher mortality state cluster average. Fertility rates were higher overall in rural areas. 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, Rajasthan, higher mortality state cluster and all India (SRS 1970-2019)

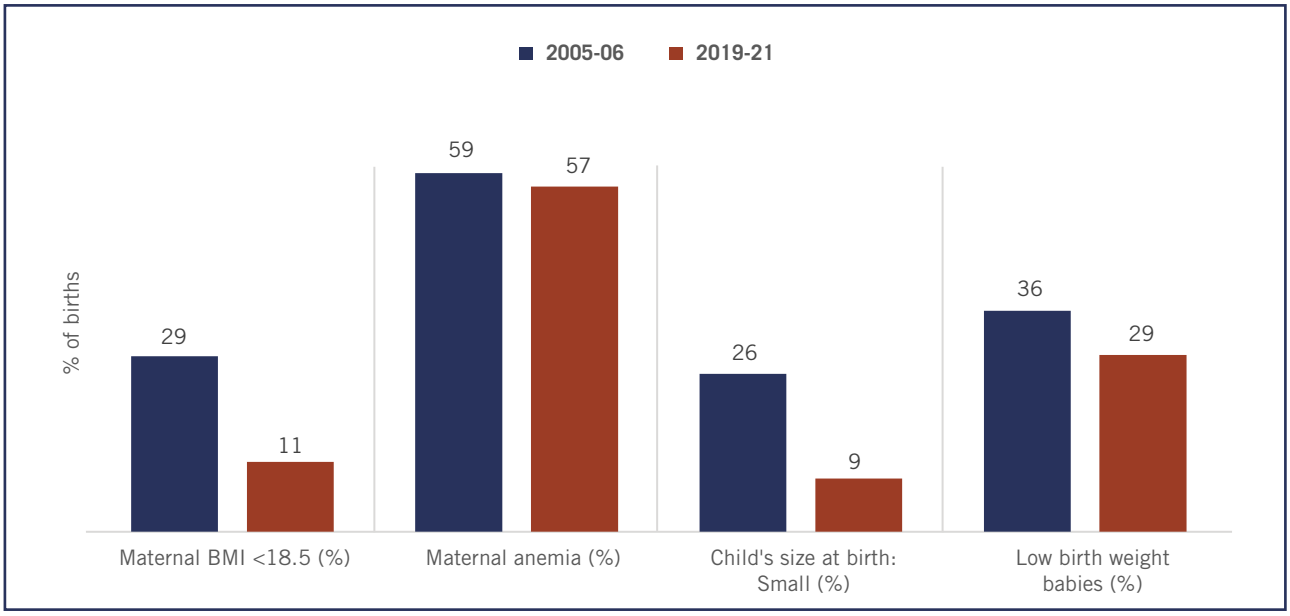


Our analyses using Jain's decomposition method[15] showed that Rajasthan's fertility declines during 2000-18 contributed 41% and 51% of the maternal and newborn lives saved and 33% of the reductions in both MMR and NMR reductions (data not shown).

Nutritional status

NFHS data showed that the proportion of births to women with a BMI lower than 18.5 (considered underweight) declined from over 29% to 11% between 2005-06 and 2019-21 (Figure 17). The state also observed a slight decline in the proportion of women with anemia during the same period. Child size at birth showed improvement; the proportion of newborns considered by their mothers to be small for gestational age declined from 26% to 9% during the same period. Proportion of low-birth-weight babies also showed a decline from 36% to 29%.

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



Women's empowerment and educational status

Age at first cohabitation (after marriage) in Rajasthan has increased from a median of 17 years to nearly 19 years between 2005-06 and 2019-21 (Table 3). The increase was similar in rural and urban areas, although the median age at first cohabitation was higher in urban areas in both the survey periods. The proportion of women with some education has also improved during this period, from 36% to 65% who were literate, and 26% to 56% 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. This was more dramatic in the case of the literacy: the absolute difference reduced from 43 to 20 percentage points between women in urban versus rural areas. The NMR was consistently lower and declined faster among births to women with some compared to no education (data not shown).

In terms of decision-making roles, the proportion of women reporting that their husbands solely decided on their healthcare reduced from 38% to 16%, while those reporting decisions about their healthcare jointly with their husbands increased markedly from 27% to 68% between 2005-06 and 2019-21 (which was somewhat similar in rural and urban areas).

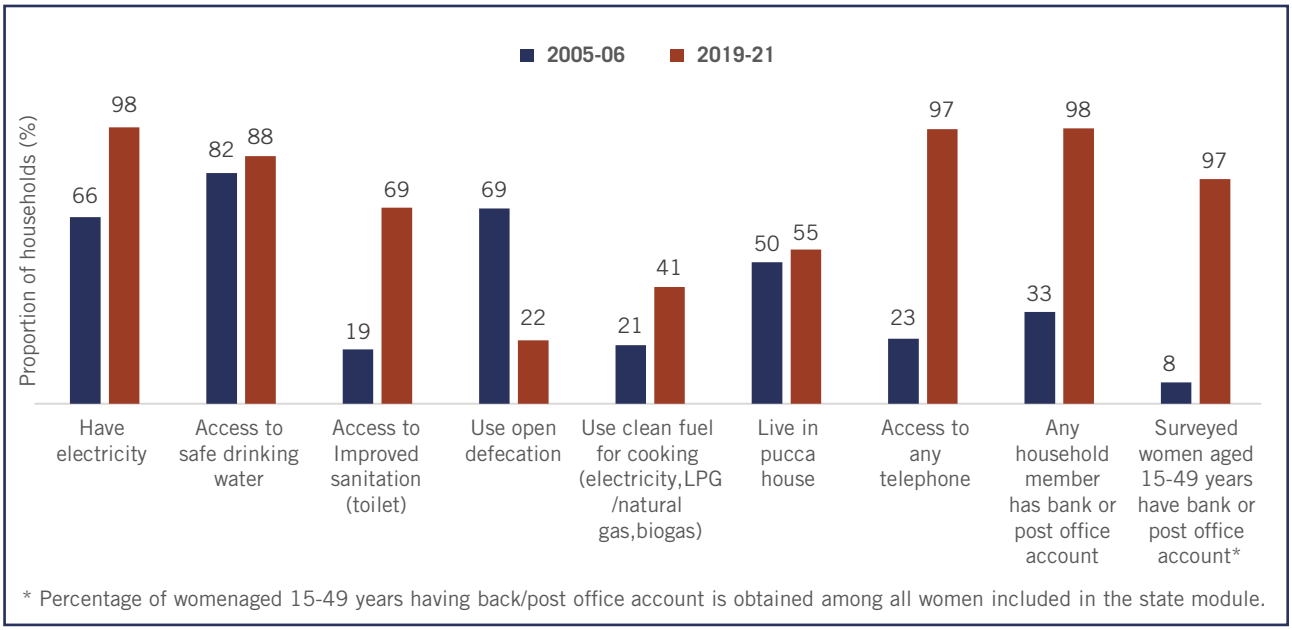
Table 3: Trends in selected indicators of women's empowerment, Rajasthan overall and place of residence (NFHS 2005-06 and 2019-21)

	Rajasthan		Rural		Urban	
	2005-06	2019-21	2005-06	2019-21	2005-06	2019-21
Median age at first cohabitation, women aged 25-49 (in years)	16.6	18.6	16.3	18.3	17.7	19.6
Women aged 15-49 who are literate (%)	36.2	64.7	23.6	59.9	66.7	80.1
Women aged 15-49 with secondary or more education (%)	26.0	55.6	14.3	50.3	54.3	72.4
Mainly husband decides on woman's health care (%)	38.2	16.3	42.5	16.6	26.5	15.7
Husband and wife jointly decide on woman's health care (%)	27.1	68.3	23.2	68.1	37.6	68.9

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 improved substantially in the state between 2005-06 and 2019-21 (Figure 18). Nearly 98% of the households now have electricity, and 88% have access to safe drinking water (up from 66% and 82% respectively). Percentage of households with access to improved sanitation more than tripled from 19% in 2005-06 to 69% in 2019-21. Concurrently, households reporting open defecation reduced markedly from 69% to 22%. Use of clean fuel for cooking nearly doubled from 21% in 2005-06 to 41% in 2019-21. More than half of the households in the state now live in pucca houses and 97% have a telephone. Percentage of households that reported any member having a bank or post office account increased more than three-folds from 33% to 98% during the same period. The corresponding rise was even sharper for women aged 15-49 years (from 8% to 80%).

Figure 18: Trends in selected indicators of community development, Rajasthan (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

Rajasthan has experienced substantial economic growth in the past two decades. The per capita net state domestic product has risen rapidly, from INR 13,619 in 1999-2000[16] (INR 47,036 in 2019 INR[a]) to INR 83,426 in 2015 (INR 1,01,297 in 2019 INR) and 1,15,492 in 2019-20 (in 2019 INR).[17] 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 0.25 in 1994 to 0.26 in 2012.[18] The percentage of the population below the poverty line has also reduced from 34% in 2004-05 to 15% in 2011-12.[19] From 2000 to 2019, the level of urbanization in the state has remained almost constant (25.2% in 1998-99 to 24.6% in 2019-21).

a We considered an average annual inflation rate of 6.39% from 1999-2019 and 4.97% from 2015-2019 (http://www.inflationtool.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) healthcare infrastructure and services, (2) human resource for health; (3) clinical and technical innovations and quality assurance; and (4) the role and regulation of the private sector. 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.

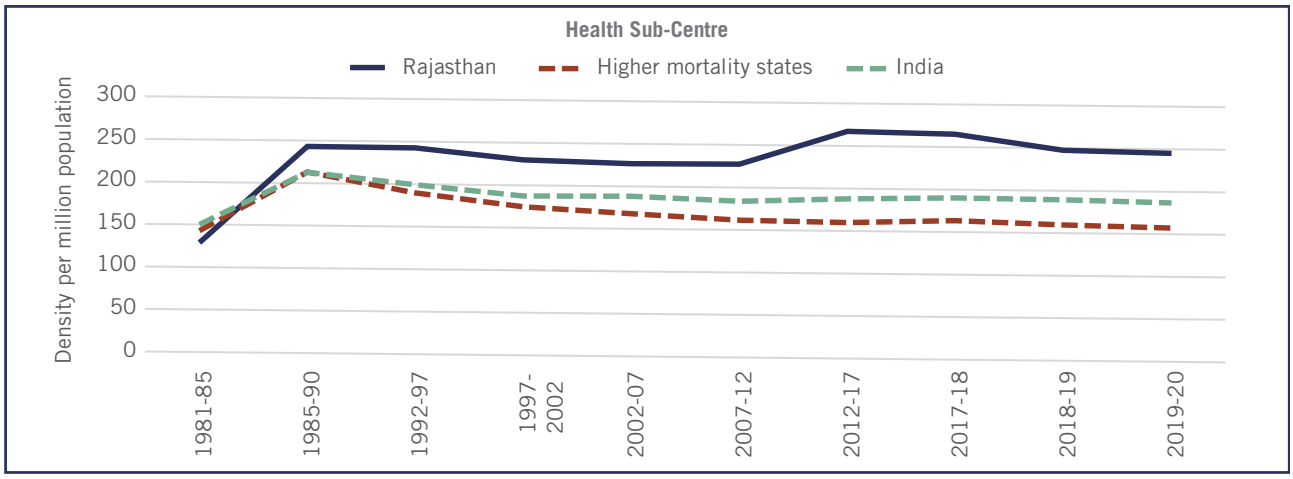
Transitions in MNH service availability and access to quality

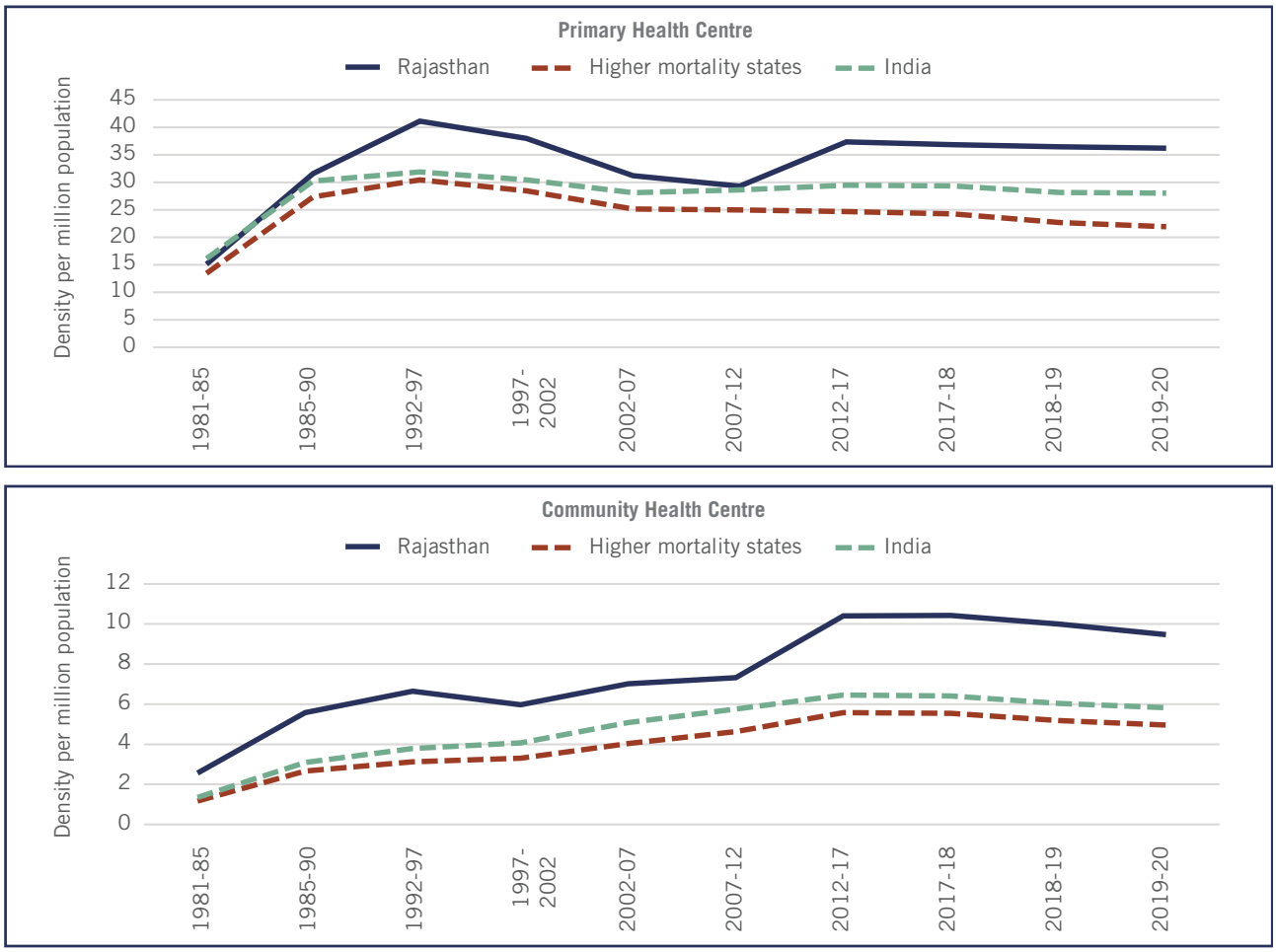
Expanding service availability, access, and integration

- Rajasthan has made some improvements in facility density (particularly CHCs) and larger improvements in emergency medical transportation and quality of care (including clinician skills, labour room cleanliness and organization, and birth companionship)
- The state has increased the availability of tertiary care through maternal and child health wings in 38 hospitals and created special newborn care units in each district
- Access to safe abortion in Rajasthan was facilitated by training medical officers in the manual vacuum aspiration syringe method

The density of rural health infrastructure in Rajasthan has increased since 2000, particularly for community health centres (Figure 19). The drop in PHC density likely correlates to an increase in CHCs, as some PHCs were upgraded into CHCs. Attention has increased over time to the quality of care provided in these facilities.

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





Low First Referral Unit (FRU) functionality and poor quality with absent ANC and PNC services have been persistent problems in Rajasthan. Staffing FRUs with specialists has not been achieved; many district hospitals also lack specialists. While access to c-sections and blood transfusions have not reached universality, the state has introduced basic evidence-based clinical practices, including active management of the third stage of labour (AMTSL), the use of partographs, and the balloon tamponade at lower-level health facilities to reduce post-partum hemorrhage (PPH) during referral transfer. Emergency transportation through the 108-ambulance service was considered a "very prominent and very strong" (development partner #1, Rajasthan) contributor to increased access to care. In 2015 the government introduced the Kushal Mangal Programme, which improved the identification of high-risk pregnancies, even at the health sub-centre level.

Despite limited success in FRU functionality, the state has focused on developing delivery points and improving quality of care. Delivery centres are PHCs and CHCs that can handle normal deliveries and can make timely referrals in cases of emergency. PHCs were capacitated to become delivery centres through the implementation of the national maternal and newborn health toolkit, designed by the Ministry of Health and Family Welfare (MoHFW). One expert noted that Rajasthan shifted deliveries from over-loaded district hospitals and CHCs to underused PHCs and HSCs by improving labour rooms at these lower-level health facilities. Quality of care improvements have also been introduced in district hospitals and medical colleges, using checklists, protocols, and the re-organization of labour rooms. Rajasthan is the state with the highest availability of maternal and child health (MCH) wings at district hospitals and medical colleges, with 38 MCH wings developed since 2006.

The state has made ongoing efforts to improve newborn care. At the primary care level, there has been strong emphasis on early breastfeeding. At the tertiary level, in partnership with UNICEF, the state developed special newborn care units, initially called facility born newborn care units, in a phased approach starting from five high-need districts in 2006 and scaling up to every district.

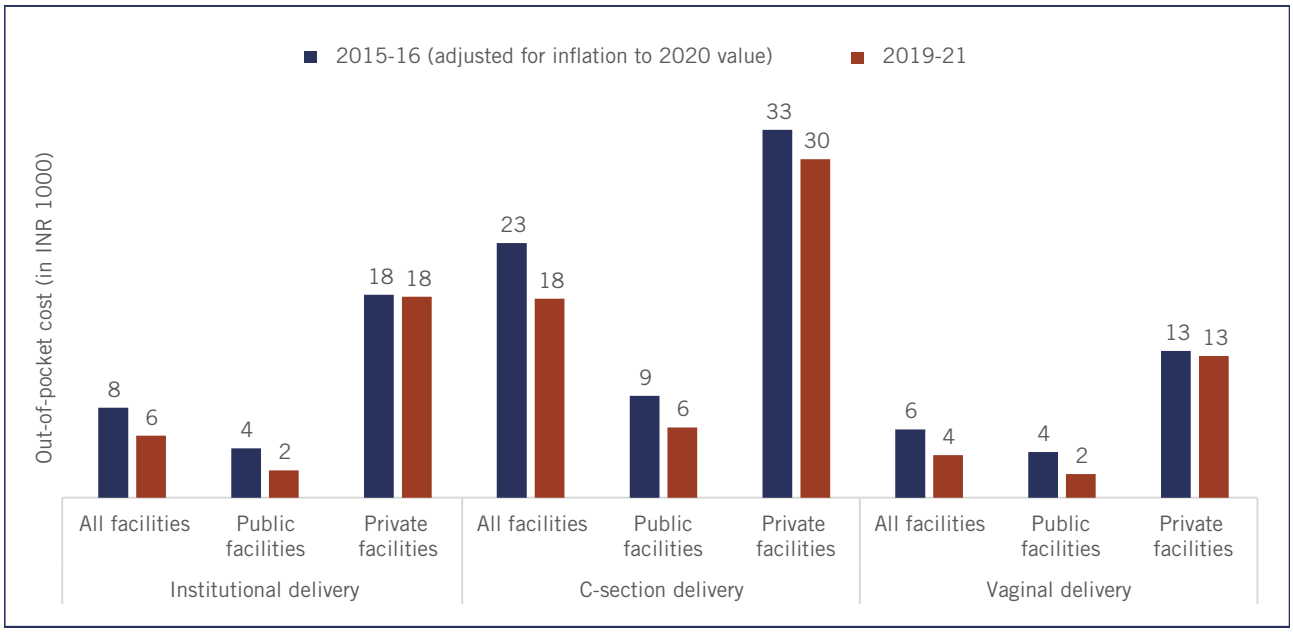
> *Since 2008, 2007 onwards the focus around newborn also, be it facility based or home-based care, has also given us an opportunity to reduce neonatal mortality as well. (Development partner #2)*

The expert further pointed out that NMR did not decline in step with the increase in institutional delivery; instead, NMR declined once the *quality* of institutional delivery care improved from around 2011 onward.

In terms of family planning, Rajasthan did well in increasing access to safe abortions through training medical officers (MOs) in using the manual vacuum aspiration syringe. This training was supported by Ipas Development Foundation. They also increased access to the post-partum intrauterine device and the Antara injectable contraceptive.

Analysis of NFHS data suggests that the average out-of-pocket expenditure (OOPE) for delivery (including for transport, hospital stay, drugs, diagnostics, and other) in Rajasthan in constant 2020 rupees (i.e., 2015-16 cost adjusted for inflation to the 2020 value[b]) decreased from INR 8074 to INR 5557 in 2019-21 (Figure 20). The average out-of-pocket costs paid for c-section deliveries has been three times higher than that for a vaginal delivery. The average costs for both vaginal and c-section deliveries in the state decreased by 38% and 22% during 2015-16 and 2019-21, respectively. The OOPE for public facility deliveries for both c-sectional and vaginal deliveries decreased. The OOPEs were 3 to 4 times higher in private than public facilities.

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



Human resources for health

- Rajasthan has focused on improving the capacity of nurses through in-service training and implementing labour and delivery protocols and checklists
- Rajasthan also improved pre-service education for ANMs and general nurse midwives (GNM) through creating skill labs, IT labs and libraries in ANM and GNM schools
- ASHA Sahyogini training and support has been a priority in the state; the award-winning ASHASoft program has increased timely payment, thereby increasing ASHA motivation

Rajasthan has focused on skills upgrades for nurses, based on the reality that this cadre performs most deliveries in the state. The national policy of Skilled Birth Attendant (SBA) training for ANMs and staff nurses was essential for improving intrapartum care in these remote PHCs. The medical officers in PHCs and CHCs then wanted access to their own upgrade training and were offered training in basic emergency obstetric care (BEmOC). Focusing on the capacity for nurses and ANMs to provide BEmOC has been a vital mechanism to avert maternal and neonatal mortality in a system with limited availability of medical officers and specialists.

b We considered an 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)

So if that first point of contact [the nurse] is competent and confident, I think he or she can handle majority of cases who are coming there. Leave alone the referrals and the distances and other complications which take place en route. And there have been numerous success stories in the past decade where this has happened, that the trained labour room staff has managed that delivery well. And averted probably any complication there. So, I think that is another important point [on] working with limited staff, which I think the state has been able to do. (Academic and health expert #1)

At the FRU level, there were major issues in recruiting specialists (anaesthesiologists, obstetrician-gynecologists, and pediatricians), and particularly in ensuring anaesthesiologists and obstetrician-gynecologists were both at the same facility, which is required for the facility to offer c-sections. To help fill the anaesthesiologist gap, the state introduced the national Life Saving Anaesthesia Skills (LSAS) program, a four and a half months training for medical officers to anaesthesia. However, obstetrician-gynecologists were often hesitant to work with a medical officer who had received LSAS because this training was far shorter than anesthesiology training.

So this training, Skilled Birth Attendant, was started in all the districts, and the follow-up was also very nicely taken care. But at the same time, Medical Officers, they were not very much involved in the deliveries, but we wanted them to also get involved. So, the Basic Emergency Obstetric Care training was imparted to the medical officers who were working at PHCs or CHCs. (Government health expert #1)

In the mid 2000s, there was growing recognition that maternal health care was being improved through skills upgrade, but that nurses and medical officers struggled to manage sick newborns. The state then implemented the national government Navjaat Shishu Suraksha Karyakram (NSSK) to teach newborn survival skills, such as taking the neonate's temperature, initiating breastfeeding immediately (in the delivery room), assessing feeding, and kangaroo mother care. During the same period (around 2007) the state rolled out integrated management of newborn and childhood illnesses (IMNCI) for ANMs.

Rajasthan also did "exceptionally well" (academic and health expert #1) in improving pre-service education for ANMs and general nurse midwives using skill labs in ANM and GNM schools. These schools were in "really bad condition initially" but Rajasthan strengthened them through building "turnkey" skill labs with hands on manikin training, IT labs and libraries (academic and health expert #1).

Rajasthan has sought to improve the capacity and motivation of the ASHA Sahyoginis. ASHAs received successive trainings to improve their capacity and skills, and team building exercises, provided by a ground level task force. Improving the timeliness of their payments through ASHASoft (an online platform) was emphasized by multiple experts as a major driver of success in the state.

First of all, I concentrated on the field functionary, that is at the lowest level, that is ASHA Sahyogini. There are, there were 50,000 ASHAs and the problem was, they were expected to do many awareness things, but they were not getting their payments on time. So, our first IT intervention was to make ASHASoft, which won the National Award also, for the e-Governance initiative, in 2016. And which was replicated by many states. Which was included by NITI Aayog as one of the best practices. And it also I think won hearts of, so many Asha Sahoyoginis, which was more important. (Government health expert #2)

In addition to improving the timeliness of payments, Rajasthan also introduced a monthly payment for ASHAs. This approach brought greater transparency and predictability to the program, which again improved ASHA motivation and satisfaction.

Procurement, clinical/technical innovations, and quality assurance

- Rajasthan has been a leader in the use of digital services, including for JSY payments, the ASHA payments, and HMIS for monitoring and accountability
- The state has focused extensively on implementing quality assurance programs at scale and with sufficient monitoring and oversight, including through the use of mentors, safe birth checklists, JSY case sheets, Kayakalp, and the National Quality Assurance Standards

Rajasthan has been at the forefront of digital and health management information system innovation. It was the first state to introduce direct bank transfer for JSY and Shubhlaxmi payments (through the Online JSY and Shubhlaxmi Payment System, OJAS). The JSY system was harnessed to generate "by-product information" about labour room practices and health outcomes that was analysed for quality improvement. As mentioned above, the introduction of ASHASoft streamlined ASHA outcome-based remuneration, thereby improving the timeliness of ASHA payment and improving the data tracking of ASHA performance. ASHASoft data was analyzed to assess areas for ASHA skill development.

Experts reflected that one of Rajasthan's unique strengths was how much focus and energy the state placed on quality improvement: not just implementing national quality improvement programs but doing so at scale and with sufficient monitoring and oversight to succeed. Mentors to help clinicians retain and implement their new skills were considered a particularly important intervention.

> *I think I must highlight one of the USPs [unique selling points] which the Quality Improvement initiatives that have been brought in. […] We see Dakshata has been implemented across in many states. But probably we have very few examples of few states who could do it at scale, and all the districts. And in Dakshata Rajasthan has recruited Dakshata mentors at the district level. (Academic and health expert #1)*

> *Yes, mentoring, as many of the colleagues have said, mentoring, both external and internal mentoring. So, the mentoring concept is that, you know, the internal officials, they were trained, and they mentored their own institutions and institutions other than their own. So, they had that ownership. So that is one major area. (Development partner #1)*

Rajasthan has struggled to staff facilities, but took an attitude of making the best use of the staff available: "So whatever limited staff we have, how we can make them efficient and continue with them?" (Academic and health expert #1). Since the mid-2000s, quality improvement has become a focus, particularly through introducing a safe birth checklist, Kayakalp and National Quality Assurance Standards (NQAS), improving obstetric skills through a "JSY case sheet", Dakshata trainings and skill labs, and allowing birth companions.

> *The focus which was there throughout in last 15 years and more so in the last 12 years is quality of care during, around childbirth. And which was also highlighted during Call to Action and Renewed Commitment for Child Survival, and that's where the entire state machinery was pushing for improving the quality of care around childbirth. (Development partner #2)*

Rajasthan introduced the Safe Birth Checklist in partnership with Jhpiego, which included the requirement that women remain in the hospital for 48 hours after delivery. Kayakalp and the National Quality Assurance Standards introduced standards for exactly what supplies should be in the facility, how the facility should be arranged, and how and cleanliness should be maintained: "If there's a bulb, what is the lux meter of that bulb? If you have a table, how should it be placed? Where it should be placed? Where the posters should be pasted." (Government health expert #1) Kayakalp was noted for reducing postpartum infection (purpureal sepsis).

The "JSY case sheet," a 20-page checklist (which is being converted to a digital form in the "Prasav Watch" software), sought to improve nurses' intrapartum skills (in recognition that nurses, not medical officers, handled most deliveries in the government health facilities). Dakshata quality improvement (in partnership with Jhpiego) has been implemented recently in Rajasthan to improve intrapartum care through re-organizing labour rooms, improving practice and logistics, and focusing on respectful care. The state has taken the attitude that a "satisfied client is the best ambassador for us [intrapartum care in a government facility]" (Government health expert # 4). It has seen a steady increase in public facility deliveries in part due to improved quality of care, including improved provider behavior, and the near elimination of out-of-pocket fees through JSSK. Since 2015, the state has developed 50 skill labs at the district level to improve clinician (especially nurse) capacity, using training manikins, in key practice area of the labour room, neonatal resuscitation, PPH management, and timely referral. The state introduced Prasav Sakhi, a policy allowing all women to have a birth companion with them. A woman in labour can choose any woman who has already experienced childbirth to be their birth companion. The Prasav Sakhi policy provides the companion with infection prevention protocols (gown and mask) so that she can be present for the delivery.

Although not directly linked to neonatal survival, Rajasthan's success with developing an integrated software system for monitoring the Pre-Conception and Pre-Natal Diagnostic Techniques (PCPNDT) Act showcases the digital leadership of the state. This software, which digitizes surveillance of sonography centres, has won awards and is being implemented in other states now too.

The state's family planning logistic management information system has been completely operationalised, which has improved the availability of contraceptives.

Role and regulation of private sector

- Rajasthan's private sector has been poorly regulated, offering variable quality of care, and generally serving wealthier groups; its contribution to improved maternal and newborn survival was not highlighted by experts.

Rajasthan's private sector in poorly regulated and offers variable quality of care. The private sector is thought to have continued serving the same, more affluent, segment of the population, and it has quadrupled their use of c-sections over time. Rajasthan is the only state with a PCPNDT Bureau of Investigation, which has shut down illegal (private) abortion providers in the state. Experts suggested that this reduced unsafe abortion and saved maternal lives.

Policy implementation and administrative reforms

Political will and leadership for MNH

- Leaders in the state government and within the Department of Health were very supportive of experimentation and adaptations suggested by program implementers
- Good governance and ambitious leadership in health underpinned Rajasthan's progress

Rajasthan was previously known as a 'BIMARU' state – one of India's states with poor health and social services, and was then classified as an Empowered Action Group states. However, experts said that the Chief Ministers of Rajasthan placed a lot of focus on improving health. When implementing nationally developed health programs, Rajasthan took an "implementation science" approach wherein they learned and adapted as they implemented.

> *What Rajasthan has demonstrated, we should emphasise that, [..] is Implementation Science on ground. What the state team has done, probably inputs to be consolidated, and mixed with various innovations and ideas, and then do it at scale, and sustain it, has been I think one of the learnings [...] So, I think one of the commendable efforts has been to sustain that, and institute mechanisms to try and sustain that, once the pilot goes off, or probably the development agency goes off. [...] So, Rajasthan has always pitched for doing that (academic and health expert #1)*

Examples of the implementation science approach included "breaking down" (academic #4) ASHA incentives to directly incentivize early registration of pregnancies and more effective ANC, developing a comprehensive ANC training package (called Vatsalya), introducing the multi reagent urine dipsticks for maternal infections, introducing HIV-syphilis testing at VHNDs, using the whole blood finger prick test kits, and overall strengthening VHNDs. Most recently, Rajasthan has become one of the first places in the world to experiment with group ANC.

Rajasthan's success was partially credited to the state's leadership providing "good governance" (government health expert #4) and "great leadership" (development partner #1), being "go getters", and giving the health department authorities a "free hand" (government health expert #4) to implement programs as they saw fit.

Within the Health Directorate, the Mission Directors and Principal Health Secretaries were "very supportive to carry out the programs" (government health expert #1).

> *Whenever we were there to add on something, they [Mission Directors, Principal Secretaries] were always ready to hear from us, and they were always like, 'Okay, we will do like this, the ANM will do like this', or, 'This work can't be done by the ANM, we have to involve the Medical officer also'. (Government health expert #1)*

The project implementation plan (PIP) processes were highlighted as important opportunities for the state to share their vision, receive support from the national government, strengthen their teamwork, and hold themselves accountable. The NHM leadership took a proactive approach during the PIP processes, pointing out that rather than being "scared" of the national government's questions, the national government was afraid of Rajasthan's demands for more support to enable their rapid progress.

> *Whenever I went to Government of India for my PIP, I was not afraid. I was not scared, it was they who were scared, that you know, this team will come from Rajasthan, and they will just plunder everything, and they will convince everybody. (Government health expert #2)*

Rajasthan was an "early acceptor of any good idea" (academic and health expert #5) since the 1990s; however, the implementation of new ideas and the quality assurance of these programs was often poor. Nonetheless, experts highlighted the value of Rajasthan's willingness to innovate, including at the district levels: "Another important thing has been to introduce various innovations, at lower levels" (academic and health expert #1). These innovations included: the Kushal Mangal Karyakram (2015) to identify high risk pregnancies, Prasuti Niyojan Diwas (2017), a monthly birth planning program, and Surakshit Matritva Diwas specialist gynecological camps, which facilitate line listing of high-risk pregnancies and those requiring iron sucrose. While all programs had implementation challenges, experts noted that specific leaders in the Rajasthan health department showed political will in "driving" them, providing "sustained effort," and ensuring programmatic accountability.

There was said to have been strong political will to post the nurses and medical officers after training in the optimal facilities for their skills, although challenges persisted.

Individual leaders were mentioned as particularly champions of initiatives. For example, a Mission Director was acknowledged as pushing the Post-Partum Intra-Uterine Contraceptive Device (PPIUCD) initiative.

The administration improved collaboration and work satisfaction of frontline functionaries. ASHA payments were streamlined (as mentioned above, through ASHASoft) and the roles for NHM consultants at the PHC, block and district levels were more clearly defined.

> *I came to know that, my god, so many people in NHM work at PHC level! At block level! There are 7 to 8 consultants at district level. And at state level, you have a team of 40 to 50 people. So, we defined role of everybody. And I think this is the most difficult work in government structure. You know, defining the role. Who is your subordinate, and under whom you are subordinate? (Government health expert #2)*

The NHM leadership in Rajasthan also introduced "strategic convergence" (government health expert #2) between 104 and 108 ambulance services and between clinicians and frontline administrators, specifically data entry operators and computer operators. Earlier, 104 ambulances were only serving pregnant women and 108 ambulances were only serving people who were involved in accidents and other emergencies. Then the two systems were combined so that whichever ambulance was available could serve whomever required it.

> *When you compute any data, doctor has done very well, ANM has done very well, consultant has done very well. But if computer operator has not entered the data, how you will come to know we are doing better [chuckles] or we are not doing at all. So, you have to involve not only ASHA and ANM, even, you have to involve computer operators. (Government health expert #2)*

Decentralized governance and financial flexibility

- Rajasthan has encouraged diverse approaches to meet the diverse needs of the districts
- The NRHM was "catalytic" and enabled a "different level of intervention" through decentralization and financial flexibility

Rajasthan is a diverse state with tribal areas, deserts, and plains. The state government has taken an approach recognizing that "one size doesn't fit throughout the state" (development partner #1). Districts have been encouraged and expected to develop different strategies. While Rajasthan has had successive health programs and policies for decades, "NRHM definitely was a different level of intervention" (academic #5) because it brought decentralized planning, a "catalytic approach to funding programmes" (Government health expert #4), openness to innovations, the PIP process, and much more rapid release of funds.

> *NRHM definitely was a different level of intervention. This is first time in the country, a very sincere effort was initiated for decentralised planning. So, starting from the block level, plans, to district level plans and then state level plans, where, it was a participatory process, providers and even the community participated in the process to identify their needs, identify the gaps, and they got additional support not only financial support but technical support through NRHM. And which continued through NHM. So that is definitely a thing which was done differently. And this has definitely shown these results which we are talking about and are proud of. (Academic #5)*

> *So I think that the [NRHM's] catalytic approach, along with permissiveness to innovation, was one of the game changers. (Government health expert #4)*

> *Post NRHM, the approach by the system is more focused, more towards the solving the problem and providing support to penetration of services. Service reaches to the most, towards the end of the queue, so the people standing last is now also having the service, so that's very good game changer. The concept of NRH, the fruit, is now ripening. Another thing is NRHM is also bringing not only quantity to the system but also working simultaneously on improving the quality of the services. (Development partner #3)*

> *Apart from you know investment in facilities, investment in human resources, investment in drugs, equipment, logistics, and even transport systems, you know, it also provided space for innovations (development partner #1)*

The decentralized planning made possible by the NRHM was exemplified in the state's decision to increase access to misoprostol for home delivery in areas with high incidence of home deliveries; other areas focused on AMTSL in health facilities.

The NRHM increased overall resource availability and enabled districts, blocks and health facilities to use the funding to fill important gaps, including small but meaningful improvements such as providing doctors with proper prescription pads and chairs. These investments in frontline providers improved morale.

> *So the availability of basic amenities which are needed to function better and deliver quality were provided by NHM. But also, people's perception of their own situation and status have changed over the years. Earlier, medical officer would not think of even, his self-esteem and today if you look at the self-esteem of an ANM and ASHA, you will find a mammoth, a great difference. So, these are non-tangible. (Development partner #2)*

Rajasthan introduced the Chirayu program in 2017, which brought increased focus on newborn care in eight districts with the highest neonatal mortality. Each district was expected to prepare an action plan on how to prevent neonatal deaths and to implement stillbirth and neonatal death reviews. The program also sought to strengthen Special Newborn Care Units (SNCUs), c-section capabilities at FRUs, referral transport, and birth tracking in these districts, and introduced greater oversight to the performance of ANMs.

> *Chirayu programme we have started. The 10 districts which are having almost highest infant mortality, we have intensified visits and [are] working on the gaps. We worked for 2-3 years, things have been changed in a good manner. (Government health expert #4)*

During the 2000s, Rajasthan identified districts with poor indicators on family planning. The RMNCH+A policy (2012) brought a more a comprehensive approach to strengthening maternal and child health as well as family planning services at the same time.

> *Then came into RMNCH+A. A variety of districts were identified which were having poor indicators, the family planning, everyone realised that the things in compartmentalisation can't work. The maternal health, the child health, the family planning, they must work together. (Government health expert #1)*

State leadership negotiated with the national government to provide additional funding for improving the functionality of delivery points.

Accountability, progress review and data systems

- Accountability in government health service provision was emphasized by government leaders, and supported by media interest

Regular monitoring was noted as an important driver of progress in Rajasthan. Regardless of who the Director, Project Director, Principal Secretary or Mission Directors were, they have focused on accountability. The media has also pushed for accountability.

> *…They have been asking questions, 'What is happening in your labour rooms?' And whether we take it negatively or positively, these opportunities, through these negative media reports, also have alerted and brought the attention of the top leadership towards the labour room. (Development partner #2)*

District level reviews have been conducted by teams involving state level administrators and development partners. These "intense" reviews involved questioning district leadership about their programs and indicators and examining district level data.

> *So there are many instances where district level review has been undertaken at the highest level, with a team of colleagues, government colleagues and development partners. […] There has been close review of the programmes by the senior officials. Questions were asked to the district level officials in terms of why it's not functioning. […] All the programme officers were, especially the district officials, the block officials, they were told to look at the data. So that sort of, intense review happened. So that is very key. (Development partner #2)*

The Common Review Mission was introduced in low performing states and districts; these areas were visited by review teams who identified gaps and suggested resolutions. These review visits were considered helpful, especially in "empowering" and "encouraging" the field-level functionaries (government health expert # 4).

The 20-page JSY case sheets were monitored by district and state level staff to assess the performance of key practices. As mentioned above, the use of digital technology has strengthened accountability and progress review in the state. Rajasthan's Pregnancy, Child Tracking System (PCTS) was identified as an important data system. The PCTS is an online software to maintain data from government health institutions, which collates many data fields from pregnancy to childbirth into the state's HMIS. Prasav Watch is being scaled up to 360 high load facilities to track performance against key performance indicators for labour and delivery and to track outcomes (stillbirth, neonatal mortality, birth asphyxia and infection).

Maternal death review has been scaled up in Rajasthan, from initially covering fewer than 10% of all maternal deaths to now capturing 80%.

Community participation and demand generation

- The ASHA Sahyogini was credited as central to community mobilization and demand generation for maternal and child health in Rajasthan
- JSSK has supported demand for government health services through reducing OOPE in public facilities

The ASHA Sahyogini in Rajasthan played a central role in increasing demand for institutional delivery and in following up with neonates in the community. Rajasthan was also proactive in "kicking out" inactive ASHAs, as identified through ASHAsoft (government health expert #1).

> *ASHA was the major tool for us because she was going to houses and doing counselling as well as convincing people that you come to hospital. (Government health expert #1)*

> *Our ASHAs are quite trained, and they are motivated, and they are really having good rapport in the community. (Academic #4)*

Rajasthan's implementation of JSSK has considerably reduced OOPE for public facility births. The state focused on bringing ANC and Prasuti Niyojan Divas birth planning to the village level by ensuring that Village Health and Nutrition Days (VHNDs) occurred in each village rather than only at the sub-health centre serving multiple villages (academic #1).

Partnerships

- Rajasthan has benefited from technical expertise and support from international development partners, particularly in improving quality of care
- The state government's approach to these partnerships was characterized by active and equal engagement, rather than passivity
- The national government, along with Rajasthan's medical colleges, hospitals and academic institutions all provided valuable support through creating standards and guidelines, and providing in-service training for health workers

Development partners, particularly UNICEF, the United Nations Fund for Population Activities (UNFPA), the Norway-India Partnership Initiative (NIPI), the World Health Organization (WHO) and Jhpiego, were important partners to the government in improving the quality of maternal and newborn health services.

> *Development partners, they are like brothers of me and my programme - we discussed some, many things, like UNICEF, UNFPA, Jhpiego, or sit together, and working for the good initiatives and they are constantly with me, to introduce the good things and all the perfect services to be provided. (Government expert #4)*

> *All the development partners roped into it, to improve the condition of the labour rooms, to see the follow-up of the already trained people, to see how the gaps can be removed or resolved by placing the doctors here and there, if the FRU can be made functional. (Government expert #1)*

Rajasthan's NHM leadership approached partnerships in an active manner, wherein they signed memorandums of understanding (MOUs) with partners and then engaged with them continuously as equals to support and follow up on their progress.

> *All partners were very fair to us, because we never said them, 'Just enter into an MOU with us, and then we will forget you.' No. […] You have to convince your partners that you are not just making them to enter in MOU, you have to convince them you are there, and you will be there every time. Not only at the time of MOU when pictures are clicked. So, partnership should be equal, on equal grounds. (Government health expert #2)*

In this spirit of equality and opening, the Rajasthan government accepted critical feedback from partners and remained open to suggestions on how to improve: "we were always open to criticism, we were always open to suggestions" (Government health expert #). Ipas was identified as an important partner to the government in training medical officers in the use of the manual vacuum aspiration syringe for abortion. National level stakeholders were noted for their guidance and for creating standards that the state then implemented. Medical colleges and hospitals, such as Janana Hospital, JK Lawn, and SMS Medical College, Jaipur, were valued partners in implementing hands-on trainings for government clinicians (such as LSAS, SBA training). The state government collaborated with IHMR to strengthen the capacities of functionaries in the use of data for decision making.

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.[20] We used the transition framework as a tool to understand change in these interrelated factors, benchmark current situations, and inform strategy development in Rajasthan and nationally.

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

- Moving towards India's lower mortality states (LMS) average requires steady reductions in MMR, from 141 to 73 deaths per 100,000 live births, and in NMR, from 26 to 16 deaths per 1000 live births in the state.
- The total fertility rate in Rajasthan remains considerably higher than the LMS average (2.6 versus 1.7), suggesting that substantial gains in survival could be achieved through continued reductions in fertility including family planning and shifts in family sizes.
- In terms of intervention coverage, Rajasthan has already achieved LMS levels of coverage for health facility deliveries (95% versus the LMS average of 96%) but can now focus on shifting deliveries to hospital-level facilities from low levels in 2017 (39%[c]), compared to the LMS average of 71%.
- Major gains can be made through improving access to c-sections when needed, which remained low overall (10% compared to the LMS average of 34%), and particularly for the poor (4% compared to the LMS average of 15%).
- Except for c-section access, Rajasthan is a high-achiever in reducing inequalities: the state has already achieved high rural access to delivery care (94%) on par with LMS 2017 values (95%) and has less inequality than the LMS in delivery care (-7 vs -12 points of absolute inequality) and neonatal mortality (a difference of 16 versus 18 deaths) between the rich and poor.
- However, the state has a long way to achieve the median rich-poor difference of 7 neonatal deaths per 1000 live births among the countries at Stage IV of the transition.

c 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 Rajasthan and common characteristics of lower mortality states and countries in stage IV in 2017

Indicator	Rajasthan		Lower mortality state cluster stage IV values, 2017	Median values for countries in stage IV, 2017
Year	2000	2017		
Stage	I	III		
Mortality				
Maternal mortality per 100,000 LB (SRS 2000-18)	501	141	73	43
Neonatal mortality per 1,000 LB (SRS 2000-18)	49	26	16	9
Neonatal mortality, home births (NFHS 2005-06 and 2019-21)	37	23	33	NA
Stillbirth rate per 1,000 births (SRS)	6	8	5	9
Cause pattern (neonatal) (MCEE 2000 & 2015)				
Infections (Group 1)	29	19	21	14
Health status[1] (Group 2)	41	63	57	70
Peri-partum (Group 3)	30	18	22	17
Fertility (SRS)				
Total fertility rate	4.1	2.6	1.7	2.2
Adolescent fertility (per 1000)	65	15	15	44
Coverage of interventions (NFHS+DLHS)				
ANC four or more visits (%)	12	54	75	89
Delivery in health facility (%)	24	95	96	95
Delivery in hospital (%)	12	39	71	78
C-sections (%)	2	10	34	26
Inequalities				
Neonatal mortality poor-rich gap (abs) (NFHS 2005-06 and 2019-21)	15	15	18	7
Delivery care, rural (%) (NFHS+DLHS)	17	94	95	91
Delivery care, poor-rich gap (abs) (NFHS 2005-06 and 2019-21)	-63	-7	-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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