



National Health mission: Impact and Learnings for future

A NITI Aayog Study

Conducted by

**Department of Community Medicine & School of Public Health
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DISCLAIMER

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LIST OF ABBREVIATIONS

ANC	Antenatal Care
ANM	Auxiliary Nurse Midwife
ARI	Acute Respiratory Infections
ARSH	Adolescent Reproductive Sexual Health
AFHCs	Adolescent Friendly Health Clinics
ASHA	Accredited Social Health Activist
AYUSH	Ayurveda Yoga Unani Siddha and Homeopathy
BCC	Behaviour Change Communication
CPR	Contraceptive Prevalence Rate
DLHS	District Level Household Survey
ENMR	Early Neonatal Mortality Rate
EBF	Exclusive Breast Feeding
FBNC	Facility Based Newborn Care
FLWs	Frontline Health Workers
FP	Family Planning
HBPNC	Home based Post Neonatal Care
GDP	Gross Domestic Product
ICDS	Integrated Child Development Scheme
IMR	Infant Mortality Rate
IMNCI	Integrated Management of Neonatal and Childhood Illness
JSY	<i>Janani Suraksha Yojana</i>
JSSK	<i>Janani Shishu Suraksha Karyakram</i>
LBW	Low Birth Weight
MCH	Maternal and Child Health
MDM	Mid Day Meal
MHS	Menstrual Hygiene Scheme
MMR	Maternal Mortality Ratio

MMUs	Mobile Medical Units
MOs	Medical Officers
MOHFW	Ministry of Health and Family Welfare
NFHS	National Family Health Survey
NHM	National Health Mission
NSSO	National Sample Survey Organization
NHP	National Health Policy
NMR	Neonatal Mortality Rate
NRCs	Nutrition Rehabilitation Centres
NRHM	National Rural Health Mission
NRHM	National Urban Health Mission
OOPE	Out of Pocket Expenditure
PHC	Primary Health Centre
PNC	Postnatal Care
PNMR	Perinatal mortality Rate
SBR	Still Birth Rate
SDG	Sustainable Development Goals
SNCUs	Sick New-born Care Units
SRS	Sample Registration System
RBSK	<i>Rashtriya Bal Swasthya Karyakram</i>
RHS	Rural Health Statistics
RKSK	<i>Rashtriya Kishore Swasthya Karyakram</i>
RMNCH+A	Reproductive Maternal New-born Child and Adolescent Health
TFR	Total Fertility Rate
U5MR	Under Five Mortality Rate
UNICEF	United Nations International Children's Emergency Fund
VHND	Village Health Nutrition Day
VHSNCs	Village Health, Sanitation and Nutrition Committee

WHO World Health Organization
WIFS Weekly Iron Folic Supplementation

INTRODUCTION

The National Rural Health Mission (NRHM) was launched in 2005 by the Government of India throughout the country, with a special focus on 18 states, to improve the accessibility, affordability and availability of health care especially to those residing in the rural areas, poor and women. The specific goals were reducing Maternal Mortality Ratio (MMR) to 100 per 1,00,000 births, Infant Mortality Rate (IMR) to 30 per 1000 births, and Total Fertility Rate (TFR) to 2.1 within seven years of its implementation i.e., by the year 2012, which were later extended to be achieved by the year 2020 under National Health Mission. NRHM goals also included prevention and reduction of anaemia in women aged 15-49; reducing mortality from communicable/non-communicable diseases, emerging diseases, injuries; reducing household out-of-pocket expenditure; reducing incidence and mortality from TB by half; reducing prevalence of Leprosy to below 1 per 10,000 population and incidence to zero in all districts; annual malaria incidence to be less than 1/1000 population; less than 1% microfilaria prevalence in all districts and Kala-azar elimination by 2015, less than 1 case per 10,000 in all endemic blocks. Qualitative goals were having decentralized, community owned, inter-sectoral health delivery systems which could address issues of water, sanitation, education, nutrition, social and gender equality. In 2013, the government of India launched the National Health Mission (NHM) which subsumed the NRHM and additionally launched the National Urban Health Mission (NUHM). The mission committed to raise the government spending to health from 0.9% to 2-3% of GDP. The mission was extended in 2018 to continue until 2020.

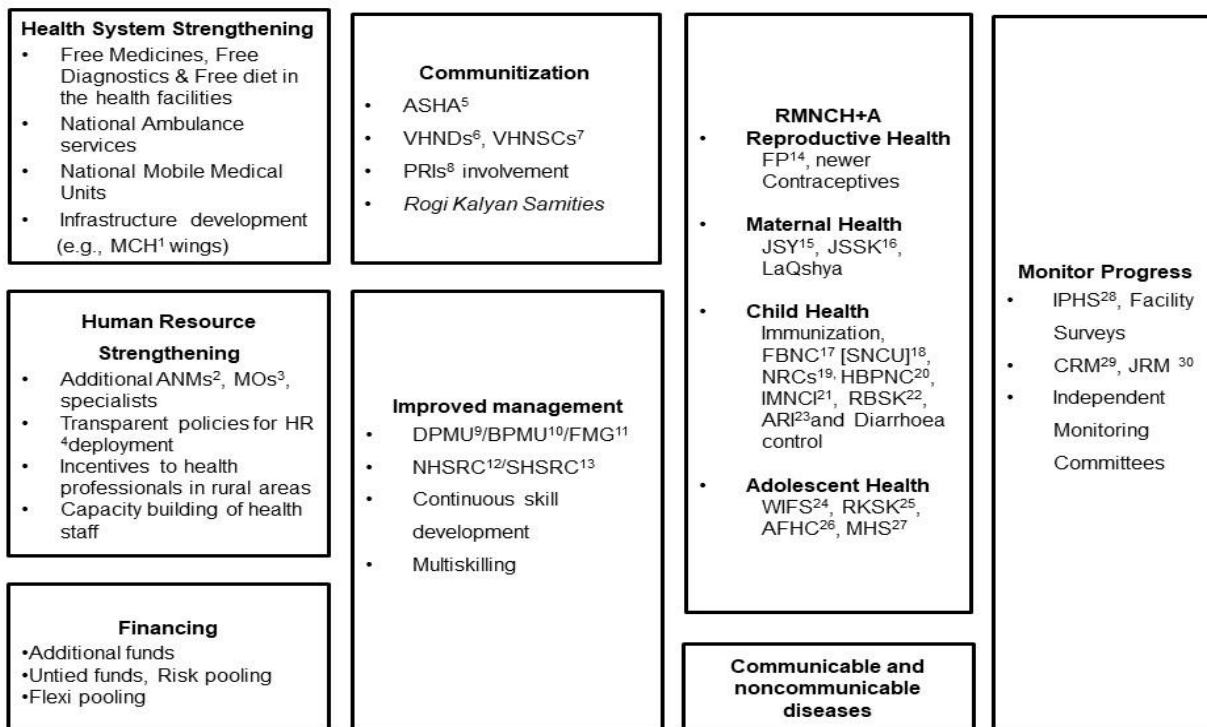
In 2017, the government has also brought out the National Health Policy (NHP), which aimed at attainment of the highest possible level of health and well-being for all, at all ages, through a preventive and promotive health care orientation in all developmental policies and universal access to good quality health care services without anyone having to face financial hardship as a consequence [1]. The sustainable development goals were also launched to replace the millennium development goals at the global level during 2015 [2]. The targets of NRHM, NHP and Sustainable Development Goals (SDGs) are listed below in the table 1 [2-4]. It was envisaged that NHM strategies will help in reaching SDGs at the national level.

Table 1. Targets of National Rural Health Mission (NRHM), National Health Policy (NHP) and Sustainable Development Goals (SDGs).

	NRHM 2012	NHP targets	SDG 2030
Maternal Mortality Ratio /lakh live births	100	100 by 2020	<70
Neonatal Mortality rate /1000 live births	-	16 by 2025	<12
Infant Mortality Rate /1000 live births	30	28 by 2019	< 20
Under 5 Mortality Rate /1000 live births	-	23 by 2025	<25
Total Fertility Rate	2.1	2 by 2025	-

The major NHM strategies to achieve the goals were health system strengthening by providing free medicines and diagnostics, infrastructure development, national ambulance services, national mobile services; human resource strengthening by providing additional Auxiliary Nurse Midwives (ANMs), Medical Officers (MOs) etc.; flexible financing; communitization including provision of Accredited Social Health Activists (ASHAs) in each village; improved management; implementing programs like reproductive maternal neonatal childhood and adolescent health, communicable and non-communicable diseases; and monitoring the progress. The main strategies and interventions of NHM and time of launch are summarized in Figure 1 and 2.

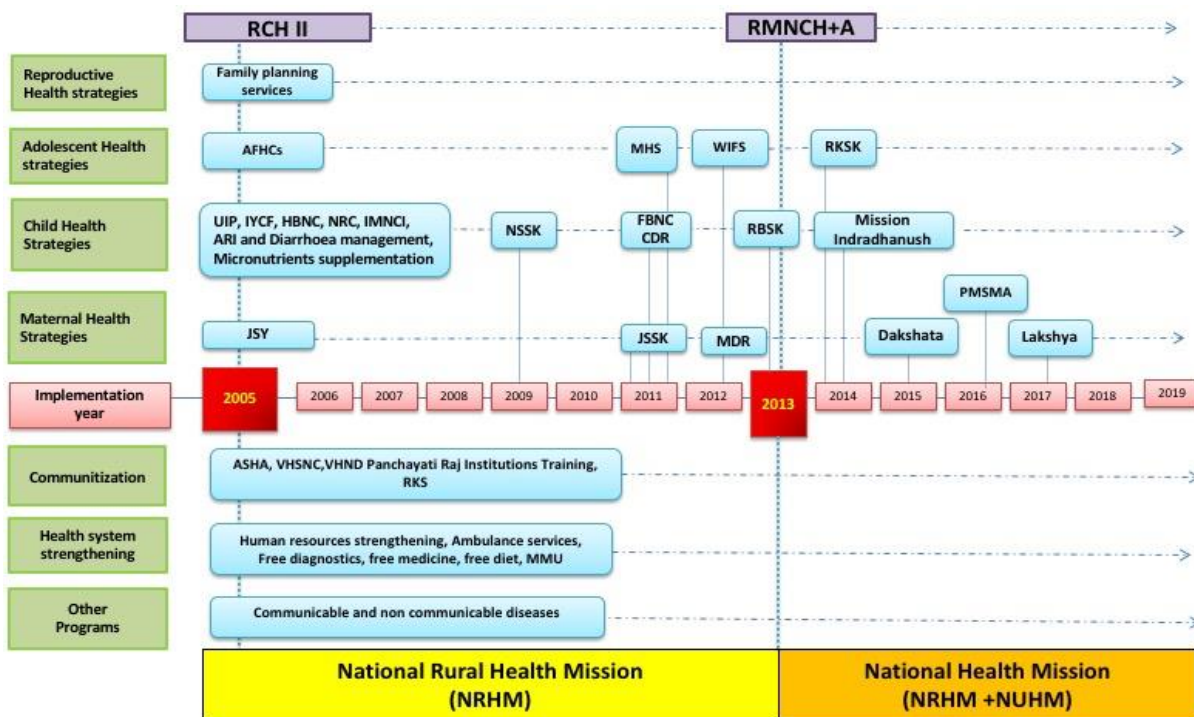
Figure 1: Main strategies of National Health Mission



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¹ Maternal and Child Health; ² Auxiliary Nurse Midwives; ³ Medical Officers; ⁴ Human Resource; ⁵ Accredited Social Health Activist; ⁶ Village Health Nutrition Day; ⁷ Village Health Sanitation and Nutrition Committee; ⁸ Panchayat Raj Institutions; ⁹ District level Project Management Unit; ¹⁰ Block level Project Management Unit; ¹¹ Financial Management Group; ¹² National Health System Resource Centre; ¹³ State Health System Resource Centre; ¹⁴ Family Planning; ¹⁵ Janani Suraksha Yojana; ¹⁶ Janani Shishu Suraksha Karyakram; ¹⁷ Facility Based New-born Care; ¹⁸ Sick Newborn Care Unit; ¹⁹ Nutrition Rehabilitation Centre; ²⁰ Home based Post-natal Care; ²¹ Integrated Management of Neonatal and Childhood Illness; ²² Rashtriya Bal Swasthya Karyakram; ²³ Acute Respiratory Infection; ²⁴ Weekly Iron Folic Acid Supplementation; ²⁵ Rashtriya Kishore Swasthya Karyakram; ²⁶ Adolescent Friendly Health Clinics; ²⁷ Menstrual Hygiene Scheme; ²⁸ Indian Public Health Standard; ²⁹ Common Review Mission; ³⁰ Joint Review Mission.

Figure 2. Timeline of major strategies implemented under National Health Mission from 2005 to 2019.



As NHM has completed about 15 years (2005-2020) there is a need to review the impact of NHM on health measures so that learnings from NHM can be utilized to further improve the outcomes for achieving Universal Health Coverage (UHC) by 2030. Most of the earlier studies have evaluated the effectiveness of NRHM strategies in improving the maternal and child health (MCH) outcomes, and most of these studies were state specific. A planning commission of India evaluated the implementation of NRHM conducted in seven states in 2011, and observed some improvements in the availability and utilization of maternal and child health services in rural areas. However, this evaluation lacked the comparison of the situation before the implementation of the NRHM [4]. A qualitative study by Gupta *et al* (2017) in Haryana highlighted that there was increase in the demand and utilization of MCH services after the implementation of NRHM strategies especially recruitment of accredited social health activists at the village level in the state of Haryana [5]. Carvalho *et al* (2014) and Randive *et al* (2013) reported positive impact of *Janani Suraksha Yojana* (JSY) on child immunization and institutional delivery rate,

respectively [6, 7]. A study by Prinja *et al* (2014) showed that the ambulance services led to increase in institutional delivery rate [8]. Study by Gupta *et al* (2017) reported increase in utilization of allocated NRHM funds for MCH strategies which correlated with improvement in health indicators. However, implementation of NRHM was found to be partial [5]. Review of existing literature indicated that many studies have been done on assessing the impact of NHM on health, but most of these studies had focused on some of its components, therefore, a comprehensive evaluation was required.

This assessment was done as part of a larger study, which was proposed by NITI Ayog, to carry out impact of NHM components in improving the health outcomes, in quantifiable terms so that lessons can be learnt on what has worked and what has not worked with a specific focus on financing, human resources and governance, and study the success of the NHM in achieving its said objectives while focusing on areas of improvements and actionable recommendations in context to the framework of **Ayushman Bharat** and India's commitment for **SDG Goals, UHC** and **Health Equity**. There were three components of the larger study including:

1. Impact of NHM on health outcomes
2. Impact of NHM on Health care spending and finances.
3. Impact of NHM on Health systems, Governance and HRH

We have focused on the first component and assessed the impact of NHM on health outcomes by synthesizing the existing evidence and performing secondary data analysis using national level data sources such as National Sample Survey Organization (NSSO), National Family Health Survey (NFHS), Sample Registration System (SRS), and Rural Health Statistics (RHS).

OBJECTIVES

1. To synthesize the evidence on impact of National Health Mission on health outcomes by conducting the systematic review.
2. To evaluate the impact of National Health Mission on health care utilization, health outcomes and health care inequalities by secondary data analysis.

METHODS

Evaluation Framework

We have considered the logic model i.e., Input-process-output-outcome-impact model for evaluation [9]. Inputs include the various NHM strategies (e.g., number of ASHAs recruited), the processes include the implementation of strategies/activities (e.g., number of ASHA's trained in providing reproductive and child health care), outputs include the activities done/completed (e.g., number of pregnant women contacted by ASHA's in the village and counselled for institutional deliveries), outcomes include the coverages (e.g., institutional delivery rate) and impact includes the effect on the mortality rates (e.g., reduction in maternal mortality ratio). The underlying principle of the logic model evaluation framework is that unless the inputs and processes are in place you might not achieve outputs, and unless you achieve the particular outputs you might not achieve outcomes and the resultant impact of the program.

Objective wise methodology is described below

Methodology of Objective 1

To synthesize the evidence on impact of National Health Mission on health outcomes by conducting the systematic review.

Study design

We did systematic review to synthesize the evidence on impact of National Health Mission's strategies on health outcomes, as per Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines. The PRISMA checklist is presented in Annexure 1 and protocol of the systematic review as per the outcome variables is presented in Annexure 2.

Eligibility Criteria of studies

Publication period considered

Studies published between the years 2005 and 2019 were searched.

Geographical area

All states and union territories of India.

Participants

Pregnant women, antenatal women, postpartum women, neonates, infants, children up-to the age group of 5 years , women in reproductive age group (15-49 years), eligible couples, adolescents, ASHA workers, ANMs.

Interventions

NHM strategies considered for review included:

- Health System Strengthening: Availability of free Medicines, free Diagnostics and free diet in the health facilities, National Ambulance services, National Mobile Medical Units (NMMUs), Infrastructure development
- Human Resource Strengthening: Availability of Medical Officers (MOs), specialists, Auxiliary Nurse Midwives (ANMs).
- Communitization: Accredited Social Health Activist (ASHA), Village Health Nutrition Day (VHNDs), Village Health, Sanitation and Nutrition Committee (VHNSCs).
- Reproductive health strategies: Family planning services, newer contraceptives.
- Maternal health strategies: *Janani Suraksha Yojana* (JSY), *Janani Shishu Suraksha Karyakram* (JSSK).
- Neonatal Health strategies: Facility Based Newborn Care (FBNC).
- Child health strategies: Immunization, Nutritional Rehabilitation Centres (NRCs), Home Based Post Neonatal Care (HBPNC), Integrated Management of Neonatal and Childhood Illness (IMNCI), *Rashtriya Bal Swasthya Karyakram* (RBSK), Acute Respiratory Infection (ARI) and Diarrhoea control.

- Adolescent health strategies: Weekly Iron Folic Supplementation (WIFS), *Rashtriya Kishor Swasthya Karyakram* (RKSK), Adolescent Friendly Health Clinics (AFHC), Menstrual Hygiene Scheme (MHS)

NHM strategies NOT considered for review were:

Strategies like Communicable and Non communicable disease and monitoring progress (IPHS, CRM, and JRM) have not been considered in this review.

Other interventions considered for review were:

- Road connectivity
- Mobile connectivity
- Water supply
- Sanitation

Comparisons

As applicable depending upon the study design.

Outcome

The outcome variables were:

Maternal Mortality Ratio (MMR)

Institutional delivery rate

Perinatal Mortality Rate (PNMR)

Neonatal Mortality Rate (NMR)

Infant Mortality Rate (IMR)

Under 5 Mortality Rate (U5MR)

Total fertility rate (TFR)

Contraceptive Prevalence Rate (CPR)

Full immunization coverage

Decrease in nutrition among children

Increase in Vitamin A supplementation

Early detection and treatment of childhood illnesses

Proportion of adolescents utilizing Adolescent Reproductive and Sexual Health (ARSH) services

Proportion of girls aware of menstrual hygiene and using sanitary napkins

Geographical, socioeconomic maternal health inequalities

Geographical, socioeconomic and gender child health inequalities

Study design

Studies with any study design such as randomized control trials, cluster randomized control trials, quasi experimental, before-after studies, cohort, case control, cross sectional and qualitative studies were included.

Information Sources

Studies were searched systematically using databases like PubMed, EMBASE, Google and Google Scholar, and databases of agencies like Ministry of Health and Family Welfare (MoHFW), National Health Systems Resource Centre (NHSRC), United Nations International Children's Emergency Fund (UNICEF), World Health Organization (WHO). Unpublished studies or grey literature, non-human studies, studies with a focus on other countries, published in language other than English or as abstract only were excluded in this review.

Search

Medical Subject Headings (MeSH) words in relevance to each strategy and outcomes were prepared for searching potential studies. (Annexure 3). The search strategy was prepared by two researchers independently. The cross references given in the selected articles were also searched to identify more relevant articles. Further, hand-searching of the contents of reputed public health journals and conference proceedings was conducted.

Study Selection

A two-stage screening process was followed based on pre-defined and explicit inclusion and exclusion criteria:

1. First stage: Articles were included based on the title and abstract
2. Second stage: Selected Articles were further screened and included based on the full-text

Criteria for assessing the quality of the studies

The quality of eligible studies was assessed based on three criteria:

1. Indexing of journal in PubMed or Scopus.
2. Studies having sufficient sample size.
3. Confounding variables controlled in the analysis.

The studies were graded on the basis of above criteria as explained below:

Table 2. Grading of studies based upon quality.

Quality	Description
(+++) Very Good	Studies fulfilling all the three criteria.
(++) Good	Studies fulfilling any two criteria.

(+) Adequate	Studies fulfilling any one criteria
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Data collection process





The data was extracted from the selected studies by two independent reviewers using standard data extraction forms. The discrepancy between the two researchers was resolved by involving the third reviewer.

Data analysis and synthesis of results

The statistical analysis approach developed by Cochrane collaborations was applied to synthesize data [10]. The possibility of conducting a meta-analysis was kept open depending upon the availability of studies with similar intervention and outcome and study design. The pooling of results was undertaken after considering clinical and methodological heterogeneity using statistical software Review Manager version 5.1 (RevMan) or STATA for meta-analysis.

Logic model was used to synthesize the evidence from good quality studies and the pathways for the impact of the NHM strategies on health care utilization, health inequalities and maternal and child mortality were identified. As per this framework, NRHM's interventions are the inputs leading to the outputs, outputs in turn leads to outcomes and outcomes lead to impact of the program. The outputs are relatively immediate effects that are expected to happen due to inputs and processes such as improvement in availability of MCH facilities. The outcomes represent the objective of interventions such as increase in utilization of MCH facilities and impact refers to the health indicators such as reduction in mortality indicators. In the framework the arrows have been used for showing the relation between input, output, outcome and impact. The thickness of the arrows indicates the strength of evidence (determined by the quality criteria of the studies) of that intervention on the outputs as shown in Figure 3 below.

Figure 3. Relation between thickness of arrow and strength of evidence.

Arrow thickness	Strength of evidence
	Very strong
	Strong
	Intermediate
	Weak

Methodology of Objective 2

To evaluate the impact of National Health Mission on health care utilization, health outcomes and health care inequalities by secondary data analysis.

For objective 2, we did secondary data analysis and used logic model evaluation framework for measuring the impact of NHM on health outcomes. The input, process, output, outcome and impact indicators were obtained from available national level data sources (rural health statistics, national family health surveys, national sample survey organization, sample registration system, census, national health accounts etc.). These indicators were compared from the status before the year 2005 (pre NHM period), and after the year 2015 (post NHM period). For the analysis, if the recent data was available after the year 2015, it was accordingly used (like National Health Accounts).

Data sources

Indicators related to financing such as public health expenditure and out of pocket health expenditure as percentage of the total health expenditure, and per capita public health expenditure were computed using National Health Accounts (NHA) data [11]. The primary data on public and private sector utilization and associated out-of-pocket expenditure on hospitalization and deliveries were obtained from National Sample Survey Organization (NSSO), 60th (2004), 71st (2014) and 75th (2018) round data [12, 13]. NSSO conducts recall based household surveys on various topics including health, consumer expenditure and employment.

The set of information on health system strengthening and human resources was obtained from Rural Health Statistics (RHS) reports, year 2005 to 2018 [14, 15], ASHA updates, year 2010 to 2019 [16] and Registers of Professional Councils [14, 15].

The status of National Health Mission's outcome indicators (also known as dependent variables) and predictor variables were obtained from the nationally representative demographic survey, National Family Health Survey (NFHS), round 3 (2005-06) [17] and National Family Health Survey, round 4 (2015-16) [18]. Data was collected from:

- ✚ 109,041 households and 124,385 women, interviewed in NFHS round 3 [17]

- ✚ 628,892 households and 689,246 women, interviewed in NFHS round 4 [18]

Information on neonatal mortality rate was obtained from NFHS. Data on infant mortality rate was obtained from NFHS and Sample Registration System (SRS) [17-19]. Latest Child Mortality Estimates were used for child health indicators as obtained from SRS or Unicef's mortality estimates. Data on maternal mortality ratio was obtained from SRS year 1990 to 2016 [19].

The information on socio-demographic variables, road density, telephone density and health worker density were collected from NFHS [17, 18], Ministry of Road transport & Highway [20, 21], Department of Telecommunications [22], Rural Health Statistics, Registers of Professional Councils [14, 15] and ASHA updates [16], respectively.

Input/process indicators

Financing indicators

Total health expenditure: Total health expenditure constitutes current and capital expenditures incurred by Government and Private Sources including external funds.

Out of pocket expenditure (OOPE): Out-of-Pocket Expenditures on Healthcare (OOPE) are payments made by an individual at the point of receiving healthcare goods and services.

Catastrophic health expenditure for hospitalization: Catastrophic health expenditure for hospitalization (or delivery) is defined as the health expenditure of a household due to hospitalization (or delivery) being above 25% of the usual household consumption expenditure over last one year from the date of survey.

Health System strengthening and Human Resource indicators

Hospital beds: Number of government hospital beds per 1000 population.

Auxiliary Nurse Midwife (ANMs): Number of ANMs per 10,000 population in rural areas.

Accredited Social Health Activist (ASHA): Number of ASHAs per 10,000 population.

Doctors: Number of doctors (Allopathic doctors, AYUSH doctors, dental surgeons) per 10,000 population in primary health centres (PHCs) and community health centres (CHCs).

Nurses: Number of nurses per 10,000 population in PHCs and CHCs.

Health Output/Outcome indicators

Maternal Health Indicators

First Trimester Registration: First antenatal care visit during first three months of pregnancy.

Three ANC Check-ups: Women getting at least 3 Antenatal care check-ups during pregnancy.

Adequate ANC: The antenatal care was termed adequate if any four of these seven criteria were met.

1. Weighed during Pregnancy
2. Blood pressure taken during pregnancy
3. Told about complications during pregnancy
4. Told about place to go in case of complications
5. Urine sample taken during pregnancy
6. 100 IFA tablets given during pregnancy
7. Blood sample taken during pregnancy

Two Doses of Tetanus Toxoid Injection: Two doses of tetanus toxoid injection one month apart before delivery if the woman has not previously been vaccinated. One dose of tetanus toxoid injection if the woman had two doses of tetanus toxoid injection in the previous pregnancy within 3 years of the current pregnancy.

100 Iron Folic Acid Tablets: Received 100 iron folic acid tablets during the pregnancy for the most recent live birth.

Anaemia during Pregnancy: Woman with haemoglobin of less than 11mg/dl was considered to be anaemic.

Institutional Delivery: Delivery in public, private, NGO / Trust hospital or health facility.

Postnatal Check-up: The woman who received a postnatal check-up.

Child Health Indicators

Breast feeding within an hour: Provision of mother's breast milk to infants within one hour of birth is referred to as "early initiation of breastfeeding"

Exclusive Breastfeeding: Infant received only breast milk for first six months of life. This was estimated for infants who were in the age group of 6-12 months.

Fully Immunized Children: To be called fully immunized, a child aged 12-23 months must have received one dose of BCG vaccine, which protects against tuberculosis, three doses of DPT vaccine, which protects against diphtheria, pertussis (whooping cough), and tetanus toxoid injection, three doses of polio vaccine and one dose of measles vaccine. Children aged 12-23 months who received specific vaccines (BCG, DPT1, DPT3, Measles and vitamin A1) at any time before the survey, ascertained by either vaccination card or mother's report.

Acute Respiratory Infection Incidence: Children under five years of age with symptoms of short, rapid breathing which is chest-related and/or difficult breathing which is chest-related in the 2 weeks preceding the survey.

Diarrhoea Incidence: Children under five years of age with diarrhoea at any time in the 2 weeks preceding the survey.

Diarrhoea Treatment or Advice: Children under five years of age with diarrhoea at any time in the 2 weeks preceding the survey, for whom advice or treatment was sought.

Number of days after Treatment for Diarrhoea was sought: Days after which advice or treatment for diarrhoea was sought for children under five years of age.

Reproductive Health Indicators

Family Size: Total number of children alive at the time of the survey who were given birth by women.

Contraception Rate: The currently married women aged 15-49 years who currently use any method of contraception (female sterilization, male sterilization, condom, intra uterine devices and contraceptive pills).

Impact Indicators

Infant Mortality Rate (IMR): Number of deaths per 1000 live births of children at ages 0 to 11 months for three years preceding the survey.

Neonate Mortality Rate (NMR): Number of deaths per 1000 live births of children at age 0 to 1 month for three years preceding the survey.

Maternal Mortality Ratio (MMR): Number of maternal deaths per lakh live births.

Covariates

Socio-Demographic variable: The socio demographic variables are given below:

Type of House: Houses were categorized into three groups: kuccha house, pukka house and kuccha pukka house. If wall, roof and floor of house were pukka then house was considered as pukka, kuccha pukka if any of two (wall, roof and floor) are pukka and if any of two (wall, roof and floor) are kuccha, house is defined as kuccha.

Cooking Fuel: Cooking fuel used by respondents has been categorized into three categories: LPG/electricity, kerosene and biomass.

Availability of Toilet (Sanitation): Toilet facility used by household is classified into two categories: No toilet facility and availability of toilet facility.

Source of Drinking Water: Improved sources of drinking water include piped water, public taps, standpipes, tube wells, boreholes, protected dug wells and springs, rainwater, and community reverse osmosis (RO) plants.

Religion: Religion has been categorized into four groups: Hindu, Muslim, Christian and others (Sikh, Jain, Buddhist, Jewish, Parish etc.)

Caste: Caste of respondent has been categorized into four groups: scheduled caste (SC), scheduled tribe (ST), other backward class (OBC) and others (general).

Maternal Age: Current maternal age is classified in 5-year groups: (15-19), (20-24), (25-29), (30-34), (35-39), (40-44) and (45-49) years.

Maternal Education: This is a standardized variable providing level of education in the categories: no education, primary, secondary and higher.

Wealth Index: The wealth index is a composite measure of a household's cumulative living standard. The wealth index is calculated using data on a household's ownership of selected assets, such as televisions and bicycles; materials used for housing construction; and types of water access and sanitation facilities. It is categorized into five groups: poorest, poorer, middle, richer and richest.

Place of Residence: Whether the respondent is a usual resident of urban or rural area.

Road Density: It is kilometres of roads for 1, 00,000 population in the particular state. It excludes roads constructed under Jawahar Rozgar Yojana (JRY) and Pradhan Mantri Gram Sadak Yojana (PMGSY).

Telephone Density: It is number of telephone connections for every hundred individuals living within the particular state.

Health Worker Density: Health worker density is defined as number of doctors, dental surgeons, AYUSH practitioners, ANMs, GNMs, LHVs, pharmacist who are registered in India and health worker (male), health assistant and ASHAs, working in government sector; per 10,000 population in the particular state.

States: The focus of this study is on less developed **Empowered Action Group (EAG)** states of India, namely, Rajasthan, Bihar, Uttar Pradesh, Madhya Pradesh, Odisha, Chhattisgarh, Uttaranchal and Jharkhand; and Non-Empowered Action Group (Non-EAG) states.

Data Analysis

The data was analyzed using Microsoft Excel (MS-Excel), Statistical Package for Social Sciences (SPSS), version 22, R software, version 3.5.2, Review Manager, version 5.1 (RevMan), Software for Statistics and Data (STATA), version 13.

The NSSO 60th round (2004) data on expenditure was inflated year wise up to 2014 using annual Consumer Price Index from the year 2004-05 to 2014-15. The formula used for this is given below:

*Inflated Expenditure = (((((((((((Total*1.042) *1.058) *1.063) *1.083) *1.108) *1.119) *1.088) *1.093) *1.109) *1.063) *1.058).*

The NSSO 60th round (2004), 71st round (2014) and 75th round (2018) data on expenditure was adjusted for five confounders including religion, caste, household sanitation, and household drinking water source and wealth status of the household. The data was subjected to cleaning and consistency check before analysis.

By using RHS 2005 to 2019 data, number of patient beds per 1000 population in pre NHM and post NHM period were compared. Number of ANMs (per 10,000 population), number of doctors in PHCs and CHCs (per 10,000 population) and number of ASHA workers were estimated. Health worker's density (per 10,000 population) was also included in the analysis.

Data files of NFHS round 3 and NFHS round 4 were screened to select the common outcome variables related to maternal, child (under-five) and reproductive health. The selected variables from both the data files were merged, recoded and computed to develop indicators which can be compared between pre NHM and post NHM period. Logistic regression was done to find out the change in the dependent variables including maternal, child and reproductive health indicators. Poisson regression was used for family size, negative binomial regression was done for IMR, NMR and number of days after treatment was sought for diarrhoea. The socio demographic variables, telephone density, road density and health worker density were adjusted to see the impact of NHM. For IMR and NMR analysis, telephone density and health worker density were not included due to ill fit in the model. The analysis was done at all India level to study the impact of NHM on IMR and NMR. The objective of NHM was also to reduce health inequalities across states and various groups, hence the data was also analysed across following domains:

1. EAG states versus Non-EAG states
2. Rural area versus Urban area
3. Caste
4. Wealth Index

The impact of NFHS 4 was compared with NFHS 3 for various indicators after controlling effect of social demographic variables, road, telephone and health facilities.

Control for Confounding variables

For adjusting the confounding variables, regression methods were used. The primary exposure variable/ independent variable was pre and post NHM period. The dependent variables that were studied as per the indicator group, confounders that were adjusted and the regression method that was used, are presented in the table 3 below.

Table 3. The variables selected for regression analysis.

Independent Variable	Indicator Group	Dependent Variables	Regression	Covariates
Pre NHM and Post NHM	Maternal Health	<ul style="list-style-type: none"> • First trimester Registration • Three ANC Check-up • Adequate ANC care • Anaemia During Pregnancy • 100 Iron folic acid • Small size of child • Breastfeeding within one hour • Institutional Delivery • 2 Tetanus Toxoid Injection • Exclusively Breastfeeding • Postnatal Check-up 	Logistic	<ul style="list-style-type: none"> • Age • Education • Place of Residence • Religion • Caste • Type of House • Sanitation • Safe Water Supply • Cooking fuel • Wealth Index • Road Density • Telephone density • Health Worker density
	Family Planning	<ul style="list-style-type: none"> • Female Sterilization • Male sterilization • Condom • Intra Uterine devices • Contraceptive Pills • Contraception rate 		
		<ul style="list-style-type: none"> • Family Size 	Poisson	
	Child Health	<ul style="list-style-type: none"> • Acute Respiratory Infection • Diarrhoea • Diarrhoea Treatment or Advice 	Logistic	
		<ul style="list-style-type: none"> • Number of days after which treatment was sought for diarrhoea 	Negative Binomial	

		<ul style="list-style-type: none"> • BCG • DPT1 • DPT3 • Measles • Vitamin A1 • Fully Immunized 	Logistic	<ul style="list-style-type: none"> • Age • Education • Place of Residence • Religion • Caste • Type of House • Sanitation • Safe Water Supply • Cooking fuel • Wealth Index • Road Density • Telephone density • Health Worker density • Institutional Delivery
		<ul style="list-style-type: none"> • Infant Mortality rate • Neonate Mortality Rate 	Negative Binomial	<ul style="list-style-type: none"> • Age • Education • Place of Residence • Religion • Caste • Type of House • Sanitation • Safe Water Supply • Cooking fuel • Wealth Index • Road Density

An interrupted time series (ITS) was also done using SRS data to evaluate the impact of the NHM implementation on mortality. The NHM was implemented in the entire country in order to improve the coverage of various health indicators. In such a scenario, the possibility of conducting a randomized control trial which is being considered as gold standard for evaluating the impact of an intervention was ruled out due to the absence of control group. This difficulty was dealt by utilizing the technique of interrupted time series (ITS). This procedure helps to compute the change in the slopes of IMR before and after the introduction of NHM with a two-step segmented time series regression analysis. The year wise data obtained on IMR from SRS was divided into two parts, namely pre intervention data and post intervention data. As the advent of NHM was considered to be the year 2005, hence this was treated as the cut-off point. However, choosing 2005 as the cut-off point is quite early to measure the impact of NHM implementation especially on mortality indicators, as initial few years might be utilized to develop programme strategies and to make it functional. Therefore, we have used year 2009 as the cut-off point especially for measuring the impact on IMR. In order to evaluate the impact and comparing the time

trends before and after intervention, we have utilized the method of ITS along with auto regressive integrated moving average (ARIMA) model. This methodology of segmented time-series regression analysis works in two steps. Firstly, the time series modelling adjusts for components like non-stationarity, seasonality (depending upon the data) and auto-correlation. Secondly, the multiple linear regression helps to calculate the estimates for change in level and trend separately, considering the adjusted time series as an outcome variable in the regression equation [23]. A change in level is defined as the difference between the observed level at the first intervention time point and that predicted by the pre-intervention time trend, and a change in trend is defined as the difference between post- and pre-intervention slopes. Finally, a positive (negative) change in level and slope indicates an increase (reduction) in outcome variable. As stated earlier, the outcome variables in our analysis was IMR. The following equation summarizes this multiple linear regression approach:

$$Y = \alpha + \beta_1 t + \beta_2 \text{Phase} + \beta_3 \text{Interaction} \quad (1)$$

As a part of this analysis, the adjusted time series of outcome variable is included in the first variable 'Y'. The time variable 't' includes the time points of observations. The phase variable is coded as 0 and 1 for pre and post-intervention period respectively. Finally, the fourth variable 'Interaction' takes zero value up to year 2005, beyond which it takes up the same value as that of variable 't'. Now, the coefficient β_1 of time 't' yields the slope of the regression line pre-intervention, β_2 represents the change in intercept and coefficient β_3 of 'interaction' gives the change in slope from pre- to post-intervention.

It is important to note that in order to evaluate the impact of the intervention using ITS method, the sufficient number of observations before and after the intervention was available only in case of IMR at the national and state level [23]. In fact, the MMR reported in the various surveys provide the data in a span of three years which resulted in the insufficient observations for utilizing the technique of ITS. Although, the U5MR is not reported at the intervals of three years but the data on this indicator was available 2008 onwards constituting only 9 observations to the present date. Apart from this, this was not available before the inception of intervention rendering this to be inappropriate for the comparison purpose. Hence, the impact of the NHM is evaluated only considering the IMR at national and state level. These estimates of pre slope, post slope and change at the juncture for all the states are computed

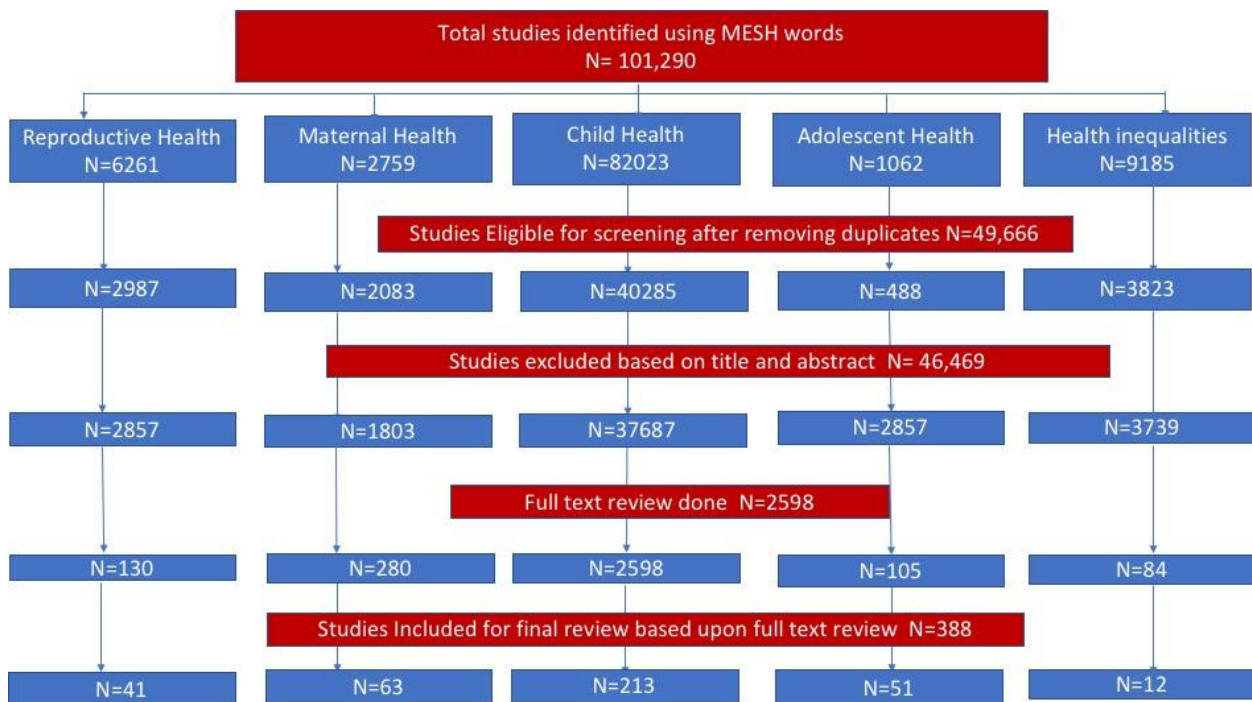
by applying ARIMA (1, 0, 0) while adjusting for trend, auto correlation imbibed in the data before evaluating the estimate of change using a regression model mentioned in equation 1.

RESULTS

FINDINGS OF SYSTEMATIC REVIEW

Total 101,290 studies were identified that had reported the effect of NHM/NRHM on maternal (n=2759), child (n=82023), adolescent (n=1062), reproductive (n=6261) health, and health inequalities (n=9185) through systematic review as per the search strategy, as shown in Table 3. After removal of duplicates, there were total 49,666 studies (2083 on maternal health, 40285 on child health, 2987 on reproductive health, 488 on adolescent health and 3823 on health inequalities) that were eligible for screening. Out of these, total 46,469 studies (1803 studies on maternal health, 37687 studies on child health, 2857 studies on reproductive health , 383 studies on adolescent health and 3739 studies on health inequalities) were excluded based on title and abstract. The abstracts of remaining studies that had reported the NHM/NRHM effect on maternal health (n= 280), child health (2598), reproductive health (n=130), adolescent health (n=105) and health inequalities (n=84) were preliminarily selected for full text review as per the inclusion criteria. On the basis of review of full length studies, total 2809 studies were excluded as per the exclusion criteria (217 studies on maternal, 2385 on child, 81 studies on reproductive, 54 on adolescent health and 72 on health inequalities). Therefore total 388 studies were included in the final analysis as shown in figure 4. The results of all these studies have been explained in annexure 5.

Figure 4. Flow chart showing the studies reviewed under systematic review and per PRISMA guidelines.



As shown in above figure, out of total 388 studies; 63 studies focused on impact of NHM on maternal health, 213 studies on child health, 51 studies on adolescent health, 41 studies on reproductive health and 12 studies on health inequalities. The characteristics of these studies have been explained in annexure 5.

The result of the systematic review is presented for the studies published during the period from 2005-13 (during NRHM implementation), and 2013-2019 (corresponding to NHM implementation).

Findings of studies reviewed for maternal health outcomes

Of the 65 studies identified for maternal health, 46 (25 pooled) were on institutional delivery and 19 on maternal mortality ratio.

Institutional delivery

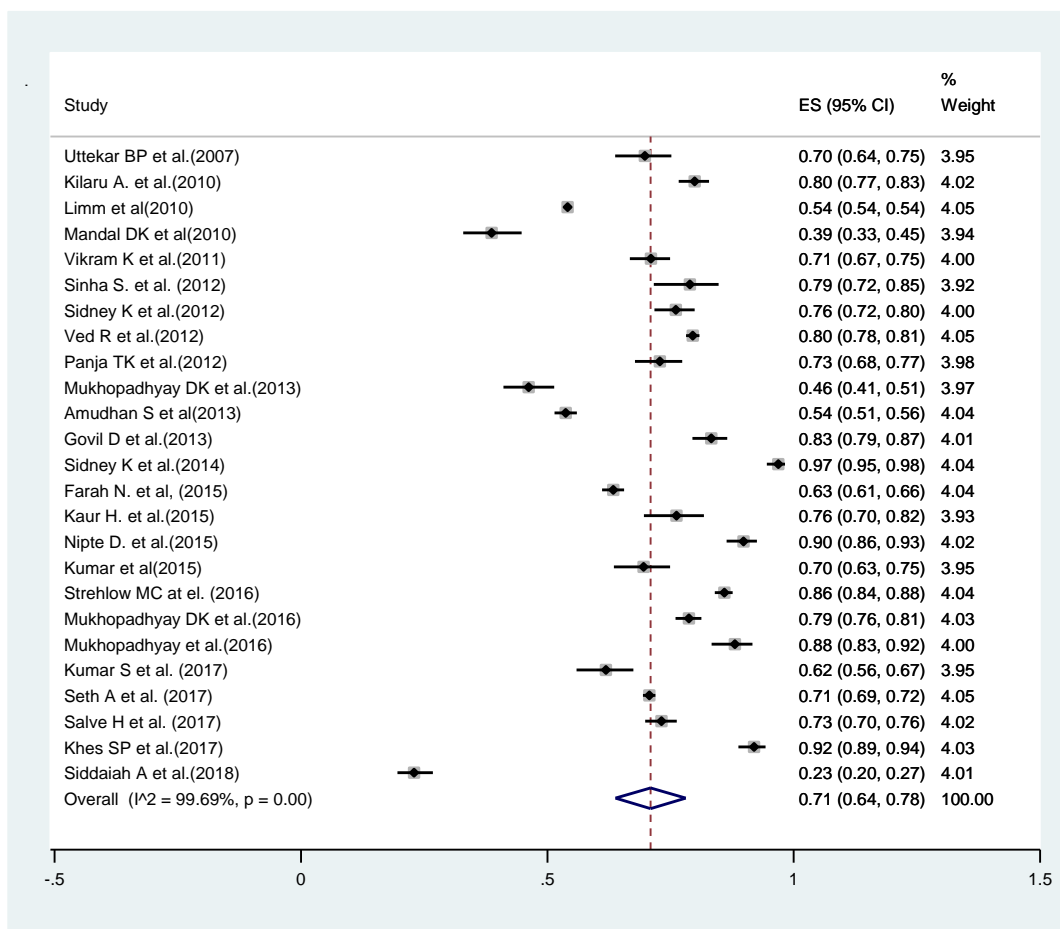
The description of the studies which were pooled and not pooled are given in Annexures 5.1.2 and 5.1.2.3 respectively. There were 25 studies [24-48] which were pooled and 21 studies which were not pooled [7, 44, 49-67].

Systematic review of studies on maternal health published before the year 2013, found that institutional deliveries increased after introduction of **Janani Suraksha Yojana (JSY)** as cash incentives under JSY had positive association with institutional deliveries [7, 26, 31-34, 54]. But not all beneficiaries of JSY had opted for institutional deliveries [31, 32, 34]. Also, cash incentives were not provided to all beneficiaries. Coverage of JSY was also reported to be low during the early implementation period [32]. The reason for this had been cited as low awareness among beneficiaries, not having the required documents to prove the eligibility or administrative weakness in early stage of implementation [32]. It is also reported that JSY scheme had increased the number of institutional deliveries without making effort to promote quality antenatal care (ANC) and early detection and treatment of complications [53]. Studies published after 2013, have shown that JSY was effective in increasing the institutional delivery rate [47, 48, 68].

Significant increase in institutional deliveries was also observed after the introduction of **free referral transport [8]**. In the EAG states as a whole, there was an increase of 13%- 40% points in the uptake of institutional delivery in during NHM period [64]. **ASHA** had played significant role in increasing institutional deliveries by behaviour change and communication. There were 3 studies on ASHAs which showed that ASHAs have also played a major role in improving maternal health by enhancing the knowledge of pregnant women/mothers [45, 69, 70]. Positive relationship was found between visit of ASHA and utilization of maternal health services [65].

The pooled institutional delivery rate from 25 studies [24-48] with number of pregnant women ranging from 147 to 182869 was found to be 71.2% from the year 2007-2018 after meta-analysis done in this study. (Figure 5). Of these 25 studies, 16 were on JSY, 3 on ASHA, 2 on birth preparedness and complication readiness and 2 on referral transport, 1 on *Janani Sishu Suraksha Karyakaram* and 1 on antenatal care.

Figure 5. Forest plot of studies on institutional deliveries.



Heterogeneity= 99.69% (very high because of sample size variability)

Maternal Mortality Ratio

Systematic review of 19 studies [57, 58, 61, 71-86] on maternal health found that during NHM period there has been decline in MMR. The detailed description has been given in annexure 5.1.1. The decline in MMR was observed in 16/19 studies. Results from 16 studies found that range of MMR reduction varied from 7% to 71.1% during NHM period after implementation of strategies like JSY, referral transport, institutional deliveries. On the contrary, increase in maternal deaths reported in the tertiary care hospitals due to increase in the load of institutional delivery in three studies, indicating poor quality of intranatal services [84-86].

Findings of studies reviewed for child health outcomes

It is reported that NHM has been successful in reducing neonatal, infant mortality, under five mortality and perinatal mortality rate over a period of time, through implementation of the schemes like Home based Post Neonatal Care (HBPNC), Facility Based Newborn Care (FBNC), Sick Newborn Care Units (SNCUs), Integrated Management of Neonatal And Childhood Illness (IMNCI), Essential Newborn Care (ENC) training, JSY, ASHA.

Neonatal Mortality Rate

Three studies reported impact of NRHM/NHM on neonatal mortality [57, 87, 88] (Annexure 5.2.2). Eight studies were focused upon specific strategies of NHM and neonatal mortality rate as an outcome [89-96] (Annexure 5.2.3). Six studies were having essential newborn care practices as an intervention [70, 97-101] (Annexure 5.2.4). Four studies were based upon FBNC [102-105] (Annexure 5.2.5). IMNCI was an intervention in eight studies [94, 106-112] (Annexure 5.2.6 and 5.2.11). Secondary data was analysed in 5 studies [113-117] and ten studies were found with HBPNC by ASHAs as an intervention [69, 118-126] (Annexure 5.2.7). In a recent study by Bora et al (2018), it is reported that for reaching sustainable development goal 3 target for 2030 for the NMR and the U5MR, the estimated NMR for India for the period 2015-16 is about 2.4 times higher, while the estimated U5MR is about double [117]. They have done the district wise analysis and observed that only 9% districts have already reached the NMR SDG targets (12/1000 live births), while 1/3 (177) will not be able to achieve this target. Majority of the high districts are located in EAG states, but a few also fall in rich and advance states.

Six studies were found reporting early neonatal mortality as an outcome (annexure 5.1.1) [57, 87, 90, 127-130]. The studies published before 2013 period reported that average annual rate reduction (AARR) in early neonatal mortality rate (ENMR) was found to be more (4.3) in post NRHM than pre NRHM period (-3.8). Average annual rate reduction (AARR) in early neonatal mortality rate (ENMR) in three epochs (pre-NRHM 2002-05, early post NRHM 2006-09, and later post NRHM 2010-13) was -3.8, 2.5 and 4.3 [57]. Decline in ENMR for rural areas was 6 points (19%) from 2005 to 2013, and in urban areas it was 5 points (31%). Post 2013 period, ENMR declined from 28 to 22, indicating a point decline of 6 and

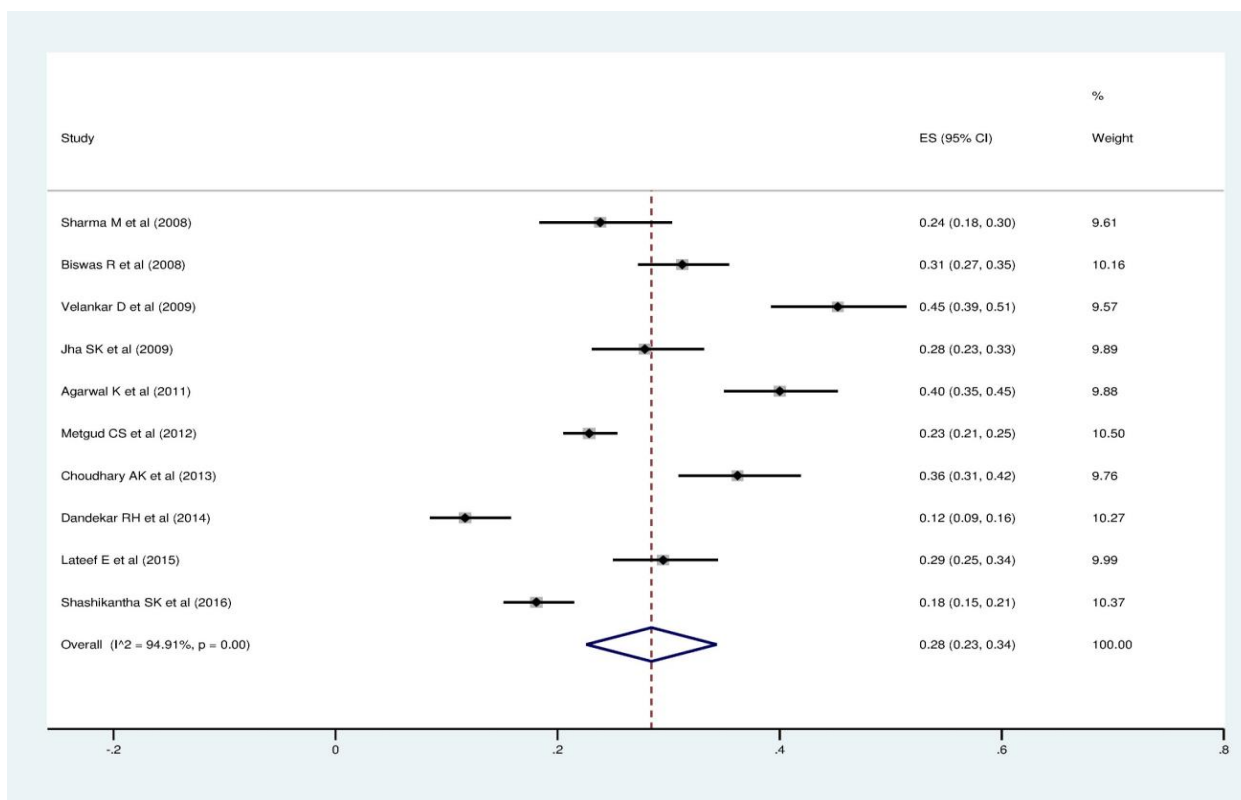
percentage decline of 21%. The maximum point decline was seen in Orissa (13 points) and minimum in Himachal Pradesh and Jharkhand (2 and 0 point each) [131]. The NMR declined from 37 to 28 indicating a point decline of 9 and percentage decline of 24% [57, 88, 95, 131]. The maximum point decline was seen in Orissa and Chhattisgarh (16 and 14 points, respectively) and minimum in Jharkhand (2 point). The maximum percentage decline is seen in Punjab (47%) and minimum in Jharkhand (7%). National NMR had declined from 37 (2005) to 31(2011) to 28(2013) per 1000 live births. NMR has declined in almost all the states [131].

NMR was lower in those who received a visit by community health worker on day one by than in those who received no visit [106, 108]. Neonatal mortality was significantly lower when the child's village was closer to the district hospital [106]. Neonatal tetanus mortality rate fell from 1.6 per 1000 live births in 2000 to less than 0.1 per 1000 live births in 2015 [132]. Average annual decline in mortality rates from 2000 to 2015 was 3.3% for neonates. **ASHA** had played a significant role in improving the neonatal health through home based preventive and curative neonatal care, prioritizing and addressing neonatal and maternal problems, and community mobilization efforts to increase the utilization of neonatal health care services [95, 106, 108, 118]. There was reduction in neonatal mortality through participatory meetings of ASHA with women's groups as NMR was 30 per 1000 live-births in the intervention group and 44 per 1000 live-births in the control group [95]. Home visits by community health workers were associated with a reduced risk of mortality during the neonatal period. HBPNC by ASHA was found to be an effective strategy as due to this 74% mothers started breastfeeding within the first hour, 87% fed colostrum, and 58% mothers exclusively breastfed their newborn. Significant increase in trend of unsafe newborn care practices (bathing baby before 48 hours, unclean cord) with regards to early bathing and cord care with fewer visits by ASHA was found. Regarding **Facility based new born care (FBNC)**, it was found that there has been improvement in newborn care and survival rate (74.4%- 85%) due to provision of manpower & equipment's in SNCU during NHM implementation period. Only 22.8% of the newborn care corners (NBCCs) were found to be fully functional, majority (68.4%) were partially functional, and 9% were non-functional [102]. As per evidence form Jabalpur, MP, NMR was reduced by 12% after provision of SNCU. Estimated neonatal deaths averted were 111(7%) out of 1590

admissions compared to 200(19.1%) out of 1048 admissions in previous year (p value <0.001). Improved survival and reduced morbidity after establishment SNCUs was reported [96]. Referral out (5%-1.7%), death rate (11.6%-9.6%), LAMA (9%-3.7%) rates were decreased after SNCU was functional [92, 96, 102-105]. Also it was found in one study that all the health personnel were not fully trained in **Navjat Shishu Suraksha Karyakram (NSSK)** [105]. **Regarding Essential New Born Care (ENBC)** it was found that in the year 2011, none of the CHCs have fully equipped facility based newborn care services (including newborn corner and newborn care stabilization unit [97], but studies published after 2013 period showed that, safe childbirth checklist (SCC) were used in 86% of the observed deliveries in intervention facilities in a study conducted in Rajasthan [70]. 65% newborns were breastfed within an hour after birth and 5.9% were prelacteal fed [100]. Trained *anganwadi* workers had enhanced the knowledge of childhood illness and their management as compared to IMNCI untrained counterparts [108]. However, implementation of IMNCI had no effect on inequities in neonatal mortality [94].

The metanalysis, done as part of this study, of the pooled studies published between 2008 to 2016 found the prevalence of low birth babies (10 studies pooled) to be 28%, and exclusive breast feeding (26 studies pooled) to be 47%, indicating that prevalence of low birth weight babies did not reduce and exclusive breast feeding did not improve much after implementation of the neonatal health strategies [133-142]. (Annexure 5.2.8).

Figure 6: Meta analysis of studies with outcome as prevalence of low birth weight babies



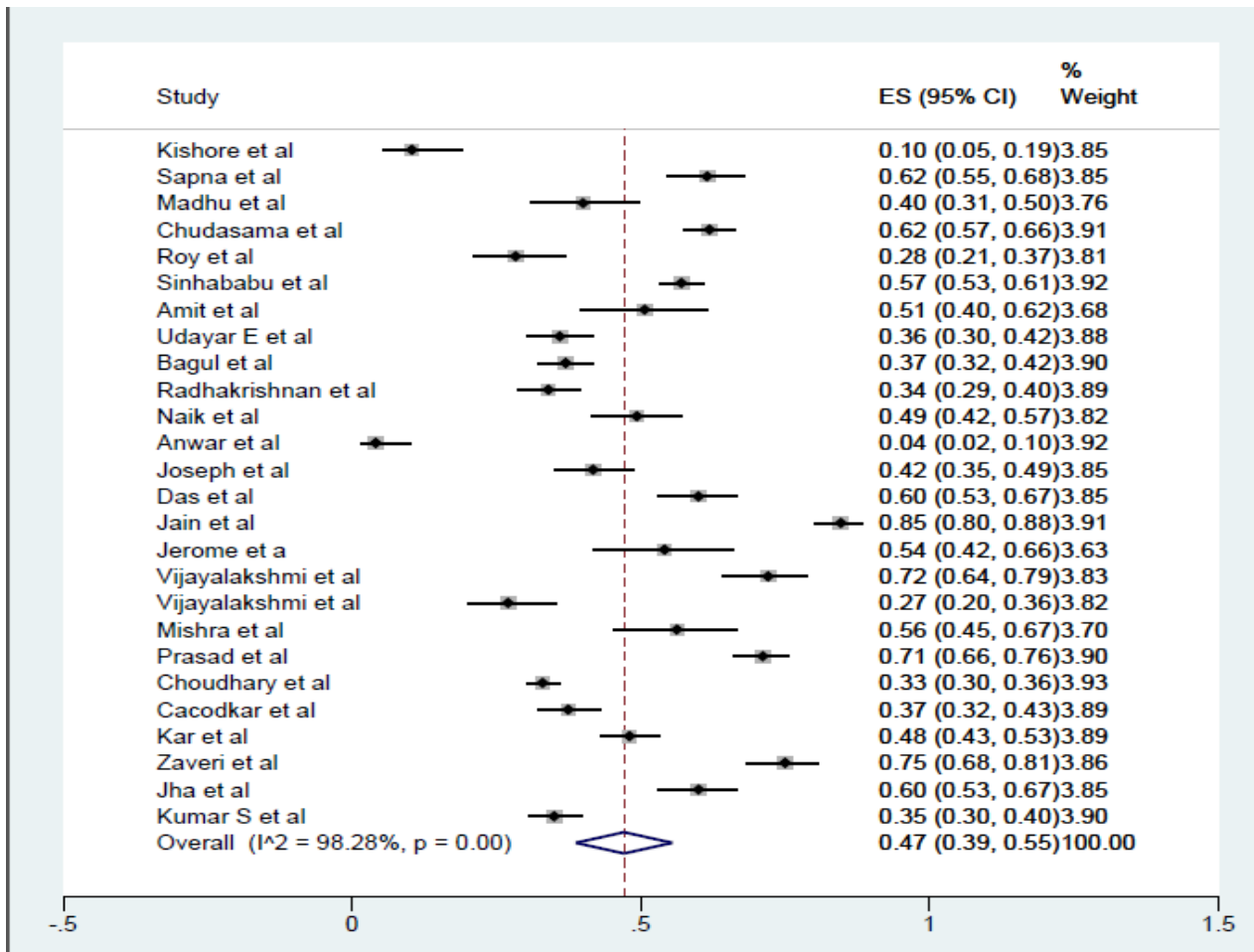
Infant Mortality Rate

There were sixteen studies which reported IMR as an outcome [143-158] (Annexure 5.2.9). As per Khurmi et al study (2015), annual rate of reduction of IMR was nearly 2 percent in 2000-05 and its previous years, but after implementation NRHM it has been accelerated to 4 percent in 2005-10 and nearly 6 percent in 2011 [143-147]. IMR declined from 58 to 40 (for India indicating a point decline of 18 and a percentage decline of 31%. The maximum point decline was seen in Orissa (24 points) and minimum in Mizoram (increased by 15 points) [131]. The maximum percentage decline was seen in Tamil Nadu (43%) and minimum in Mizoram (increased by 75%).

Study published before the year 2013 showed that, 48.6% ASHAs were unaware of preventive actions to be taken for Vitamin A and 20% of the ASHAs did not feel the need for referral for a child with diarrhoea who is unable to drink or breast feed. Also ASHA-investigator agreement on the need to assess infants was found to be intermediate. ASHAs had played a major role for improving knowledge of mothers

regarding infant care and creating awareness about exclusive breast feeding [69, 119-122]. There has been improvement in rate of exclusive breastfeeding as the pooled prevalence of exclusive breast feeding was found to be 47% from the year 2008-18.

Figure 7: Meta analysis of studies with outcome as Exclusive breast feeding



There were 26 studies which reported exclusive breastfeeding as an outcome [98, 159-181] (Annexure 5.2.13). Post 2013 publication period, it was found that average score of the ASHAs in child health care was 87%, around 81% of children in immunization were motivated by ASHAs and 80.93% knew about exclusive breast feeding correctly. Also 5.41% of the ASHA had poor, 83.78% had average and 10.81% had good level of knowledge score regarding HBPNC respectively [125]. It was also found that, all of

the ASHA's helped in immunization and 24.65% gave advice to mothers about breast feeding [126]. So overall, it was observed that that during the early implementation of the ASHA's scheme, her knowledge related to vitamin A supplementation, early diagnosis and prompt referral of children suffering with diarrhea/pneumonia was poor, and gradually with further trainings her knowledge and skills were improved especially related to immunization but it needs to be further improved for home based post natal care and exclusive breast feeding.

Role of IMNCI

Fourteen studies were found focused upon Integrated Management of Neonatal and Childhood Illness (IMNCI) [70, 89, 94, 97, 101, 106-110, 112, 117, 155, 182]. The existing evidence indicated that IMNCI implementation could reduce the infant mortality rate in an experimental setting (adjusted hazard ratio of IMR 0.85, 95% confidence interval 0.77 to 0.94, were significantly lower in the intervention clusters of IMNCI than in control clusters) as per Bhandari et al study (2012) [94]; and improved the skills of the health care workers in implementation settings as per Thummakomma et al (2016) and Chishty et al study (2016) [106, 111]. Sensitivity of IMNCI criterion in correctly identifying sick infants of age 0-2 months was 90.02%, specificity was 63.10%, positive predictive value being 92.44% and negative predictive value is 55.79% as per Thummakomma et al (2016) study [106].

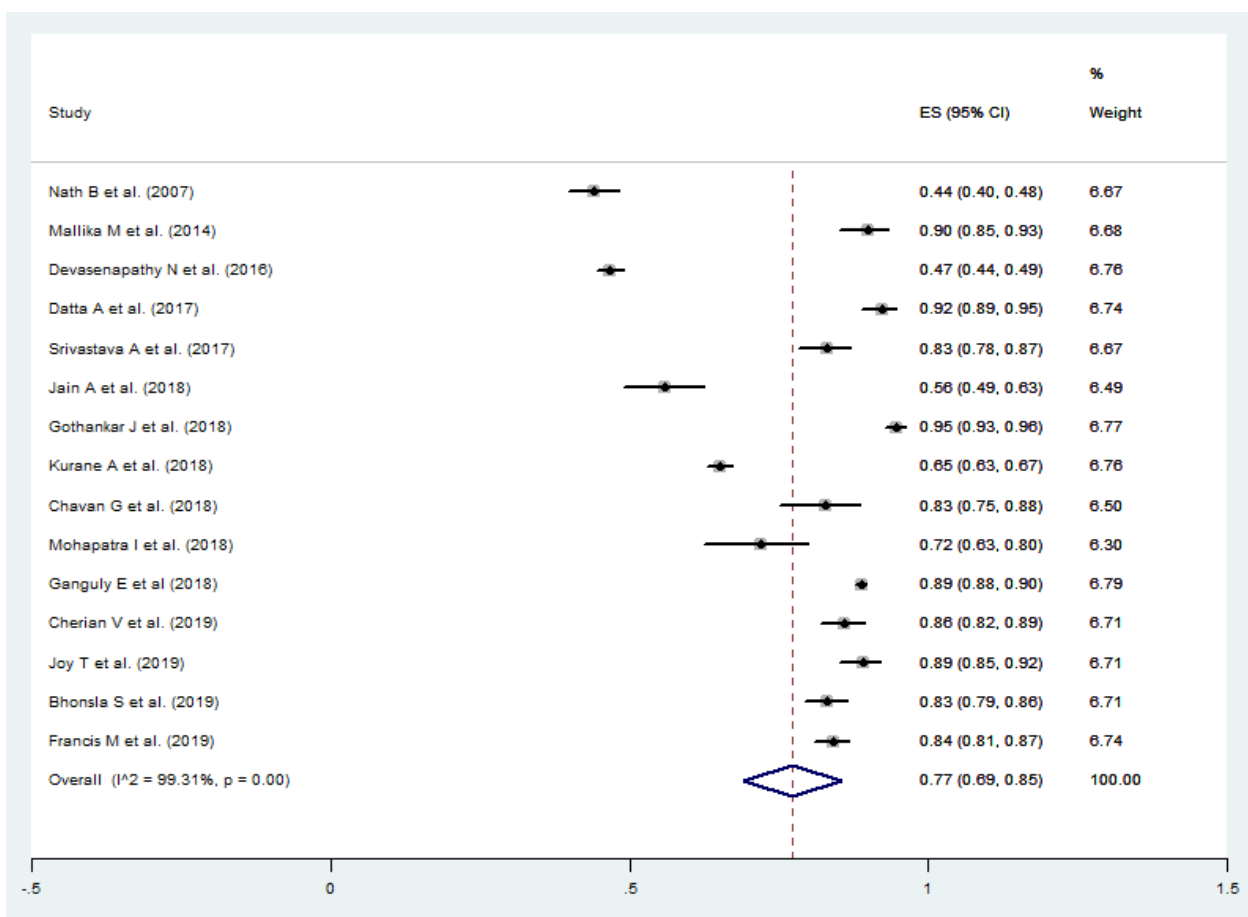
Under 5 Mortality Rate

Nine studies reported under 5 mortality rate [115, 158, 180, 183-188] (Annexures 5.2.15). NHM's child health strategies like NRCs, immunization, management of ARI and diarrhoea has played a significant role in reducing Under Five Mortality Rate (U5MR). U5MR fell at a mean rate of 3.7% per year between 2001-2012, from 96/1000 live births to 57.3/1000 live births. The number of districts with >80 deaths/1000 live births also reduced from 384 to 80 districts in the same period [115]. Average annual decline in U5MR from 2000-15 was 5.4%, annual decline from 2000-05 was 4.5%, and annual decline from 2005-15 was 5.9%. Decline in mortality rate from pneumonia was found to be 63%, decline in

diarrhea rate was 66% and decline in measles mortality rate was 3.3 to 0.3/1000 live births [132]. Proportion of Under 5 Mortality in Vitamin A supplemented children vs. non supplemented was 8.4% vs.11.4% [186].

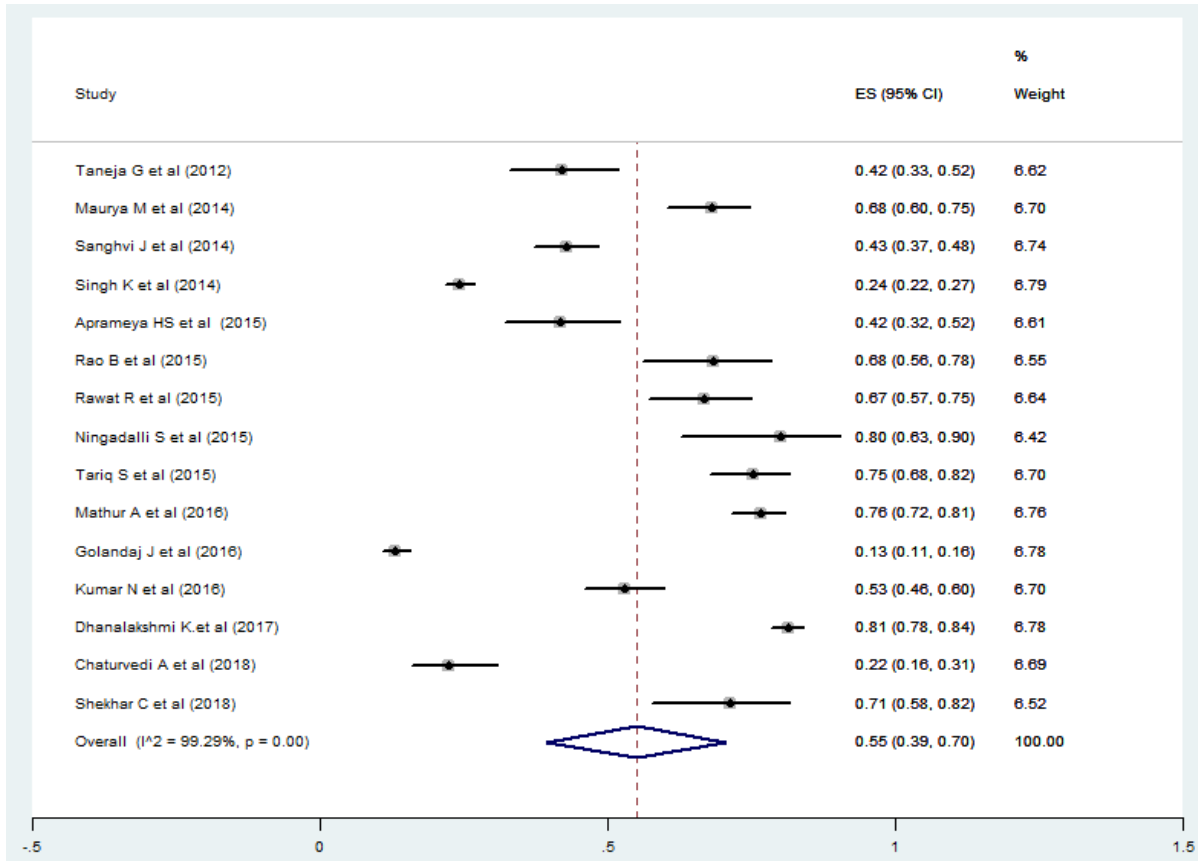
Studies on immunization coverage (annexure 5.2.15) found that strategies under NRHM such as Mission Indradhanush, financial assistance from JSY had played a significant role in improving vaccination coverage [6, 63, 188-207]. Meta analysis of 16 studies found the pooled immunization coverage among children to be 77% from the year 20014-19 (Figure 8). The improved vaccination coverage was also found to be associated with decrease in ARI and diarrhea in children as the incidence was less in immunized children than non-immunized children [189, 192-195].

Figure 8: Meta analysis of studies on full immunization coverage



Studies on National Rehabilitation Centers (NRCs) showed that NRCs were good initiative under NHM as percentage of pooled recovered children under NRCs was 77% as per metaanalysis of the studies from the year 2012-18 (Figure 9) [208-222].

Figure 9: Meta analysis of studies with outcome as recovered children under NRC



Studies published after the year 2013 showed that , only 25% of the children in India received vitamin A supplementation (VAS), rural children (72%) and children of educated mothers were more likely to receive vitamin A supplementation than others (urban- 28.2%). There was an Increase in the mean full VAS coverage in seven states from 44.7% to 67.3%. Also there was 40.3% annual decrease in the number of poor children who did not receive two VAS doses [186, 223-225] (Annexure 5.2.16).

Other child health strategies like rashtriya bal swasthaya karyakaram (RBSK) has also played an important role in screening, early diagnosis and management of severe illnesses like heart disease, birth

defects [226, 227]. However, its impact on reduction on under 5 child mortality is not documented in the existing literature.

Perinatal mortality

Fourteen studies reported perinatal mortality rate as an outcome [26, 52, 127, 228-238]. The studies have been described in annexure 5.2.1. Singh S et al (2017), has reported that in rural areas of India, hospital deliveries have increased during 2005–2013 from 24.4% to 69.7% and PNMR has declined from 40 to 28 per 1000 births. At the national level, in the rural areas, relative increase in hospital deliveries was 185.7% and relative decline in PNMR was 30% and it was significantly correlated. At the state level, there was significant correlation between the rise in hospital delivery rate and decline in PNMR (r 0.4, p 0.04) [52]. There is further evidence that have shown that increase in institutional delivery rate had reduced the perinatal mortality rate [declined from 41.3 to 34.6 ($p=0.008$) deaths per 1,000 births in Belgaum and from 47.4 to 40.8 ($p=0.09$) in Nagpur) and still births (declined from 22.5 to 16.3 per 1,000 births in Belgaum and from 29.3 to 21.1 in Nagpur (both $p=0.002$)] in southern and central India, respectively [239]. Earlier it was reported that implementation of JSY had impact on reducing perinatal mortality due to increase in institutional deliveries, antenatal check-up, and referral of the women. The studies published before 2013 showed that, JSY payment was associated with a reduction of 3-7 perinatal deaths per 1000 pregnancies due to increase in institutional deliveries, antenatal check-up, and referral of the women [26]. There is also evidence that essential newborn care trainings for those involved in conducting deliveries (medical officers, nurses, ANMs, informal birth attendants) had reduced the perinatal mortality rate from 52 per 1000 to 36 per 1000, and hence considered effective in reducing the PMR [231].

Still birth rate

There was a total of 25 studies which reported still birth rate as an outcome [68, 90, 127, 128, 182, 228-230, 233, 234, 237, 240-250]. The studies have been described in annexure 5.2.1. The studies that used the data between 2005-13 showed that the range of Still Birth Rate (SBR) was between 33.7 to 47 per

1000 births. [228, 229, 237, 238, 240, 244]. Essential Newborn care training was found to be associated with reduction in SBR from 23 to 15.9 per 1000 live births [228].

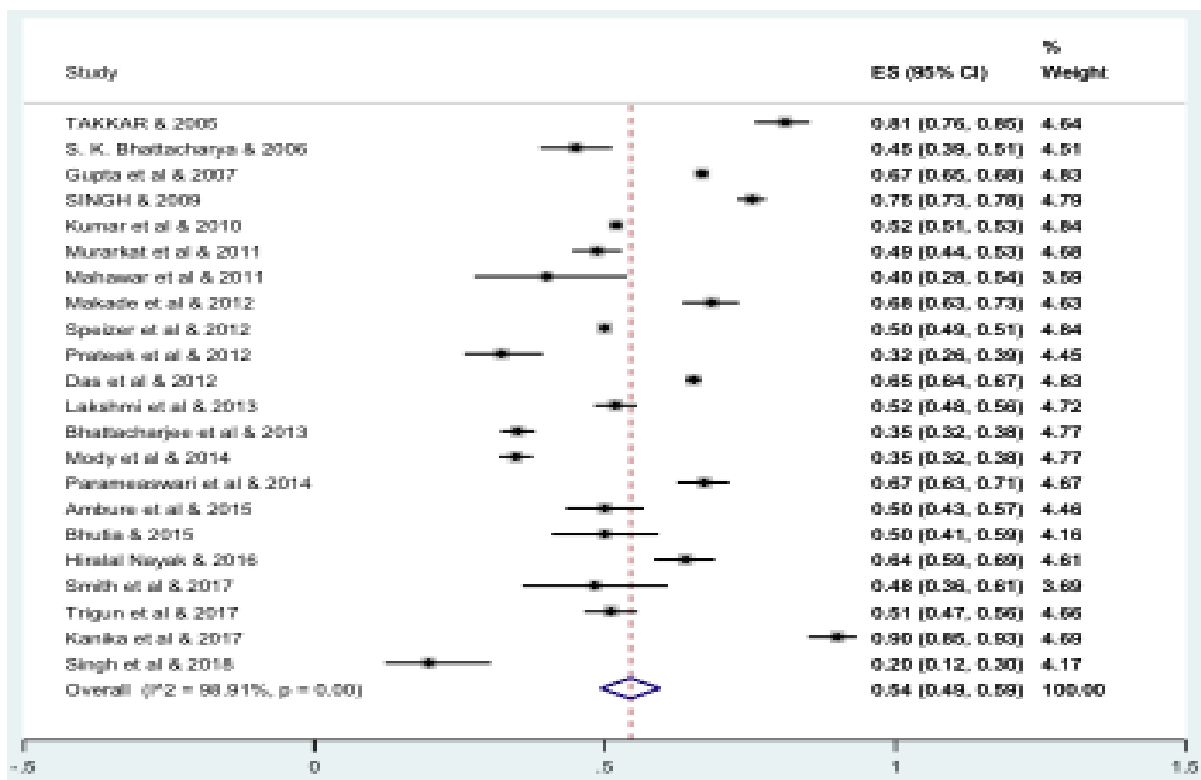
Evidence from the studies published after 2013 showed that, the range of SBR was between 15.4 to 26.5 per 1000 births [246, 247, 249]. Annual decline rate of SBR was found to be 4.5% (from 31.3 to 23.8 per thousand live births) from the year 2010 to 2016 in one of the study [247]. State specific results are on still births especially from Bihar are obtained from Dandona et al study, (2017, 2019) [131, 249]. Incidence of stillbirths was 21.2 per 1,000 births in Bihar state in the year 2014-15 and it declined to 15.4 per 1000 births in 2016, higher proportion of births was stillborn among those women for whom the delivery was deferred. [249]. It was also found that in rural communities of India, there was a significant reduction in SBR from 23 to 15.7 per 1000 births and the rate of stillbirths by delivery attendant decreased significantly for nurses/midwives but not for physicians [250].

Findings of studies reviewed for reproductive health outcomes

Studies published after the year 2013 found that TFR has been declined after the implementation of NRHM due to increase in the contraceptive prevalence rate (CPR), and increase in literacy rates [251-258] (Annexure 5.3.1). This is close to the target of achieving at least 60% CPR to attain the goal of total fertility rate of 2. The prevalence of contraceptive usage was found to be less among tribal population [259]. The knowledge about contraception was found to be high among males and females, but acceptance was poor among males. The tracking of eligible couples and motivating them for using contraception for spacing as well as delay in first pregnancy was an effective strategy implemented by ASHA. ASHAs performance was increased upto 1.13 times for eligible couples and 1.14 times for couples having two or less children after introduction of an incentive. From April 1, 2013, a new scheme was introduced in “ASHA INCENTIVE SCHEME” for promoting family planning—permanent sterilization. It is an incentive of Rs. 1,000 given to an ASHA who motivates and promotes couples having two or less than two children to undergo permanent sterilization [260]. Incentive based performance showed a significant impact on motivation of eligible couples for using contraceptive methods by ASHAs. It was

also found that the engagement of male counterparts have improved the performance of ASHA program (statistically non-significant) which unveils the complementarity of male and female CHWs in increased demand for MNCH services [122, 260-262]. ASHA's capacity was found to be low in motivating family planning cases for restricting high fertility in rural areas (30.49%). Meta-analysis of 22 studies [236, 259, 263-281] found the pooled CPR to be 54% from the year 2007-17 (Figure 10). (Annexure 5.3.2)

Figure 10: Meta-Analysis of studies on CPR



Result of studies reviewed for adolescent health outcomes

There has also been improvement in adolescent health indicators due to NRHM strategies such as Weekly Iron and Folic Acid Supplementation (WIFS), Adolescent Reproductive and Sexual Health (ARSH) and Menstrual Hygiene Scheme (MHS). WIFS program is a good initiative and compliance was also found to be satisfactory [282-290] Annexures 5.4.1 - 5.4.3). Studies published before the year 2013 showed significant decline in anemia due to WIFS revealing that IFA daily is an effective strategy of reducing the anemia in adolescents [92, 287]. Studies published after 2013 showed less knowledge

about anemia among adolescent girls [291]. It was also found that reduction of anemia was more among adolescent boys as compared to adolescent girls. The compliance to the WIFS program was 85.8% [292]. Pooled prevalence of anemia among adolescents was found to be 43% from the year 2008-17 (Figure 11). Also meta-analysis of 4 RCTs found 2% pooled reduction in anemia from the year 2009-16 (Figure 12).

Figure 11: Meta-analysis of 5 cross sectional studies on WIFS

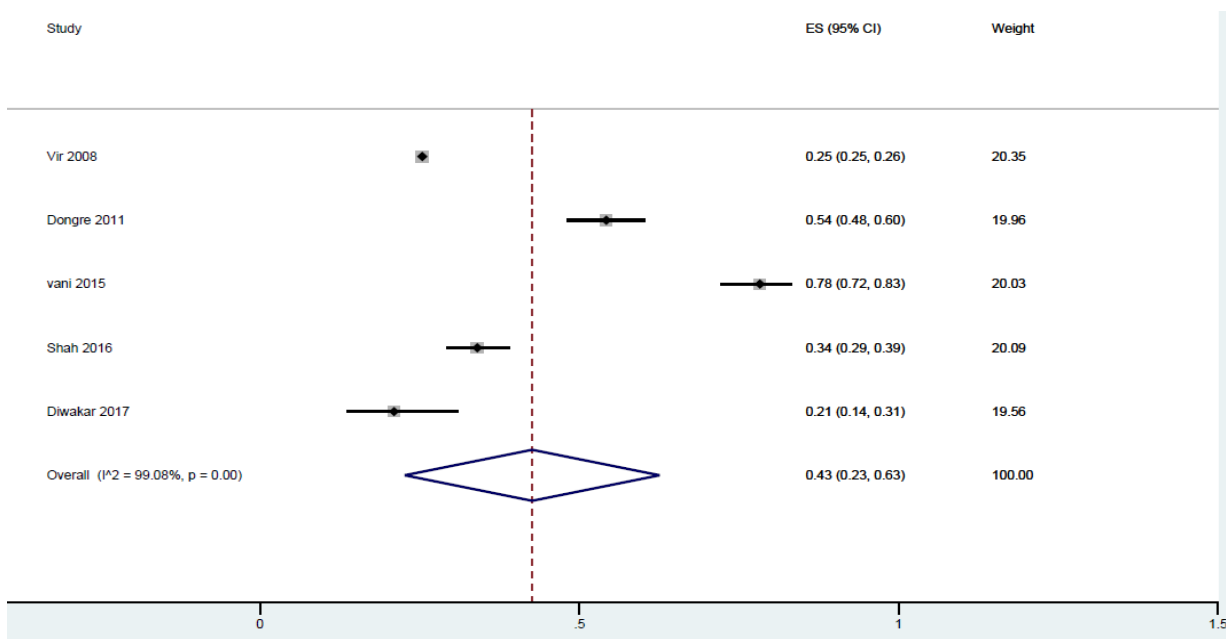
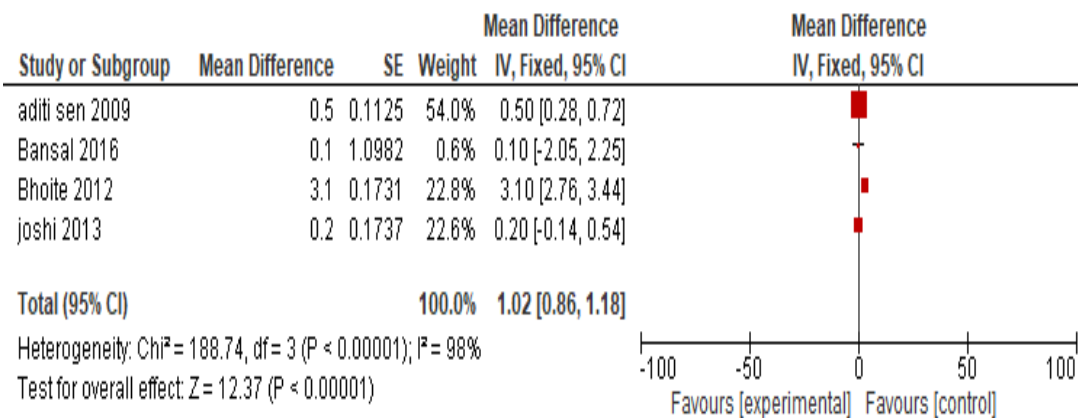
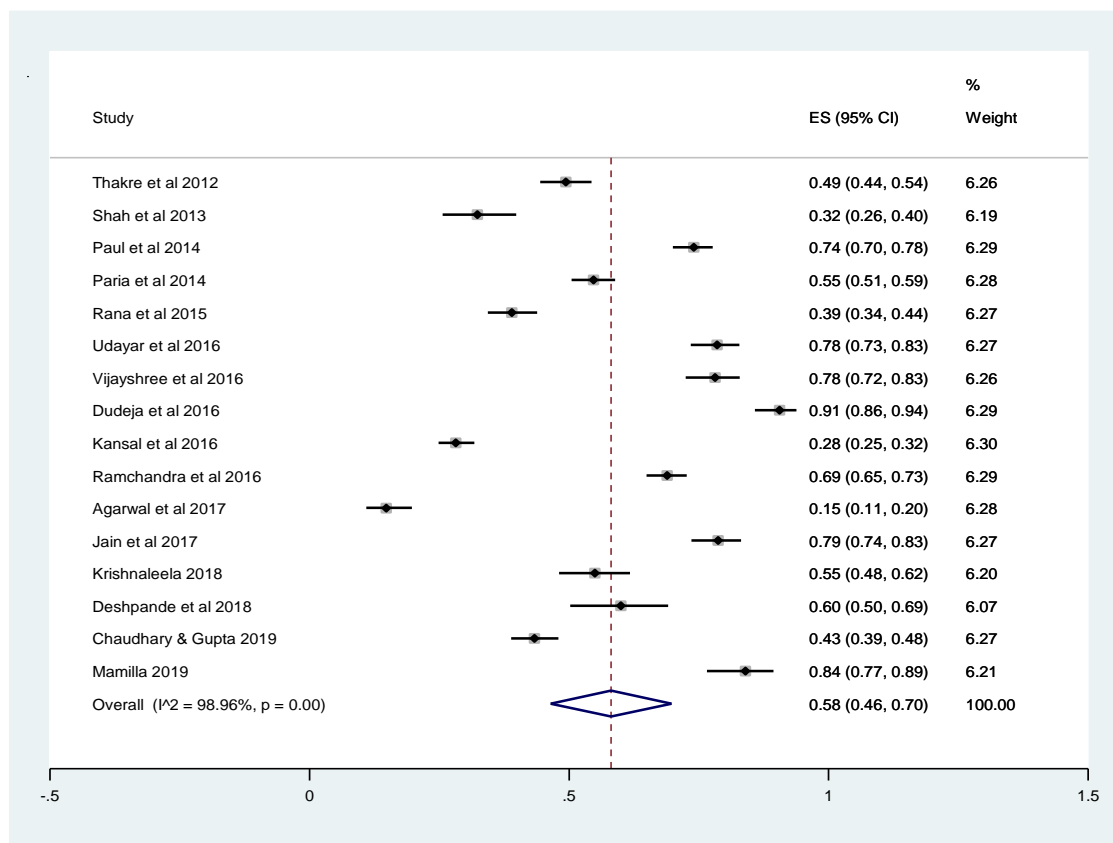


Figure 12: Meta analysis of 4 RCTs on WIFS



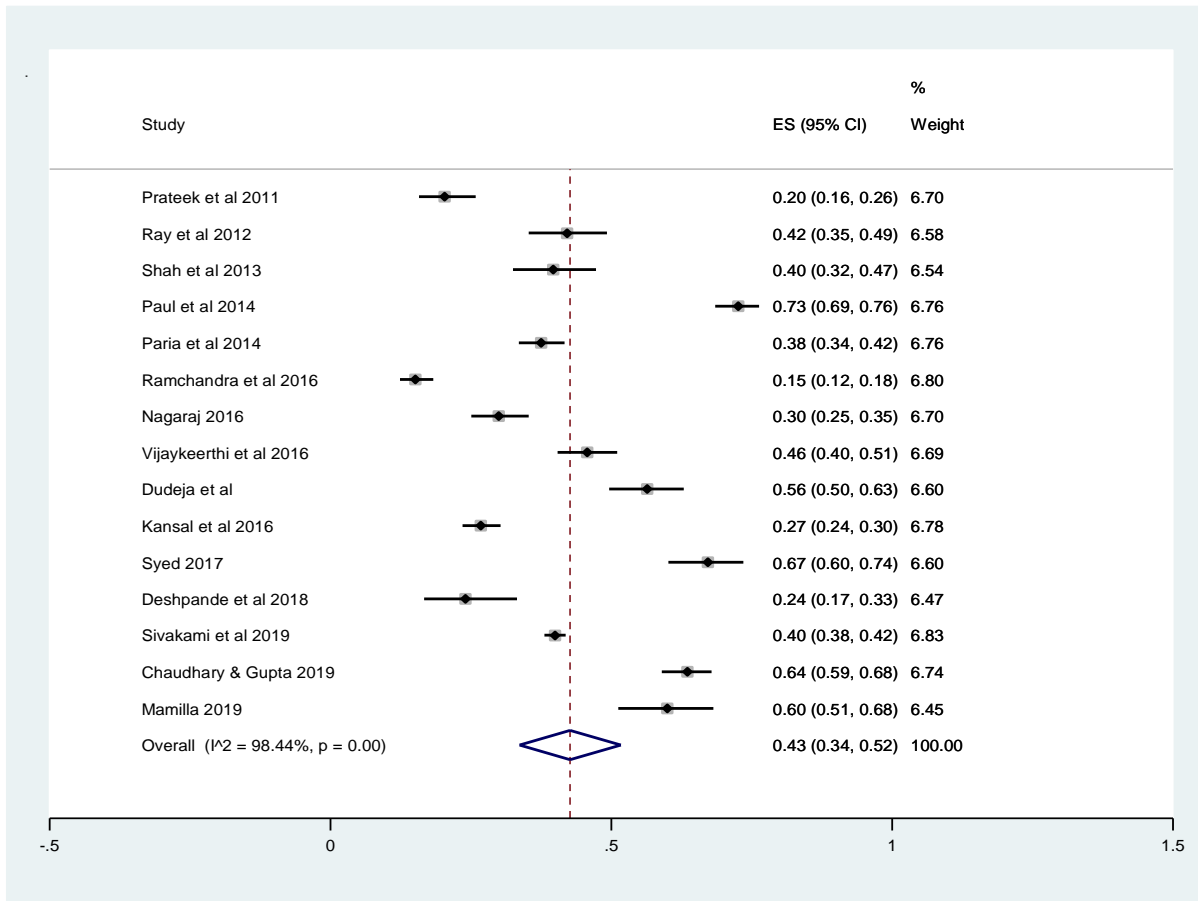
Studies published before 2013 had shown poor knowledge about menstruation. It was also found that the usage of sanitary pads was more in urban as compared to rural areas. However studies published after 2013 found that in post NRHM period usages of sanitary napkins had been increased. And the pooled prevalence of usage of sanitary napkins was found to be 58% from the year 2012-19, after meta-analysis (Figure 13) [178, 293-308]. Also the girls were less aware of government providing sanitary napkins on subsidized rates [72, 298, 309-311].

Figure 13: Meta-analysis of studies on usage of sanitary napkins



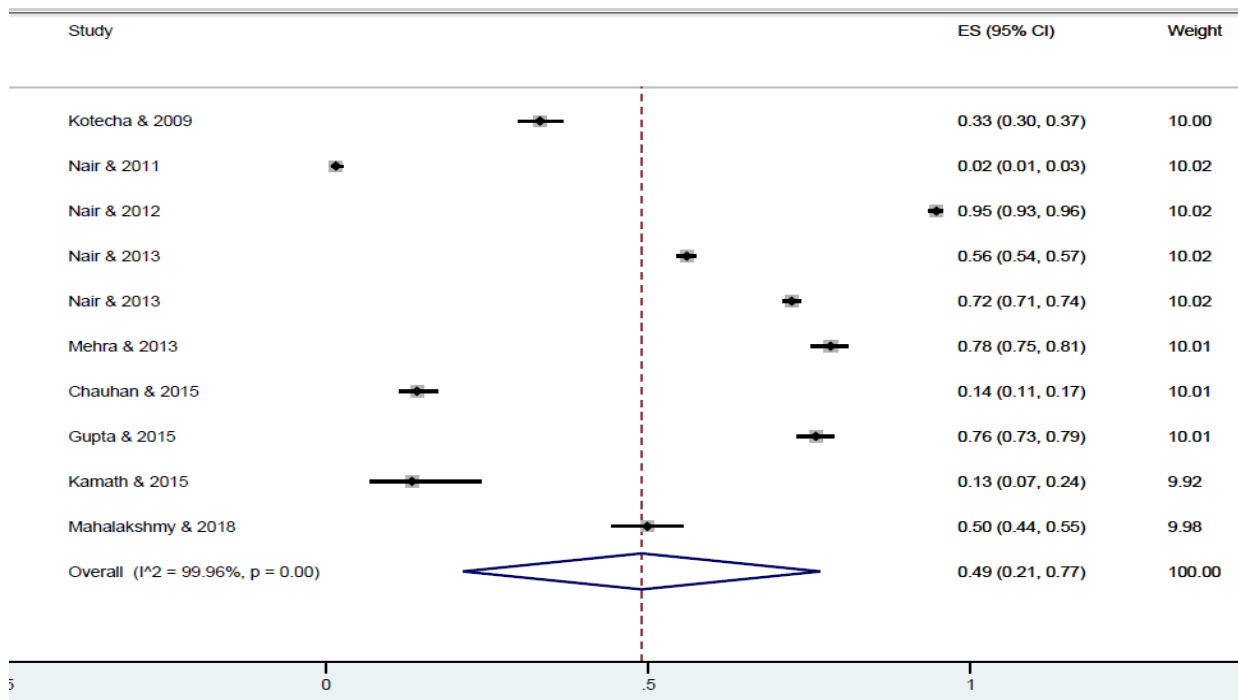
NRHM has also raised the awareness about menstrual hygiene among adolescents. However, the knowledge about menarche was more among urban girls as compared to the girls living in a slum. Meta analysis of 15 studies found the pooled awareness of menstrual hygiene to be 43 % from the year 2011-19 (Figure 14).

Figure 14: Meta analysis of 15 studies on awareness of menstrual hygiene



ARSH program was found to be a good initiative under NHM and the pooled awareness of Adolescent Friendly Health Clinics (AFHCs) was found to be 49% from the year 2009-18, after doing meta-analysis of 10 studies (Figure 15) [312-319] (Annexure 5.4.4).

Figure 15: Meta-analysis of 10 cross sectional studies on ARSH



Result of studies reviewed for health inequalities

Studies published after the year 2013 period showed that, the inequalities related to institutional delivery among rich and poor declined at steeper rate in post NRHM time period due to JSY and free ambulance services [5, 45, 61, 64, 73, 80, 320-330] (Annexure 5.5). Secondary data analysis of the DLHS data (round 1, 2, 3 and 4) by Vellakkal S et al (2017), have shown that socioeconomic inequalities for institutional deliveries and ANC's have been reduced in the EAG and NE states. In the EAG states as a whole, the uptake of ANC for the lowest, middle and highest wealth tertiles decreased by 5.3% ($\beta=-0.053$; $P<0.001$), 8.0% ($\beta=-0.080$; $P <0.001$) and 15.1% ($\beta=-0.151$; $P<0.001$), respectively. In the NE states, there was no significant effects for the uptake of ANC for the lowest and middle wealth tertiles, but negative effects for the highest wealth tertiles ($\beta=-0.131$; $P <0.001$). However, in the late post- NRHM period 2011–12, there was considerable improvement in the uptake of ANC, particularly for the lowest socioeconomic tertiles. Effects were stronger for institutional delivery than antenatal care [64].

ASHA had played a role in increasing the utilization of MCH services among poor women [45]. Utilization of MCH services such as ANC among Scheduled Caste (SC), Scheduled Tribe (ST) women was less in comparison to Muslims women. Contraception rate was still low among ST and Muslims [328]. Women belonging to SC/ST and Other Backward Class (OBC) were less likely, as compared to General Caste women, to participate in at least 4 ANC visits [45]. Positive relationship between visits by a community health worker and likelihood of utilizing critical maternal health services was seen. However, significant social inequalities still exist in association of community health worker visits [45].

As per Gupta et al study (2016) in Haryana, the geographical and socioeconomic differences between urban and rural areas, and between rich and poor were significantly ($p < 0.05$) reduced for pregnant women who had an institutional delivery. (geographical difference declining from 22% to 7.6%; socioeconomic from 48.2% to 13%), post-natal care within 2 weeks of delivery (2.8% to 1.5%; 30.3% to 7%); and for children with full vaccination (10% to 3.5%, 48.3% to 14%) and who received oral rehydration solution (ORS) for diarrhea (11% to -2.2%; 41% to 5%). Inequalities between male and female children were significantly ($p < 0.05$) reversed for full immunization (5.7% to -0.6%) and BCG immunization (1.9 to -0.9 points), and a significant ($p < 0.05$) decrease was observed for oral polio vaccine (4.0% to 0%) and measles vaccine (4.2% to 0.1%) [61].

In a qualitative study by Gupta et al, (2017), it was reported than an improvement in overall health infrastructure through an increased availability of accredited social health activists, free ambulance services, and free treatment facilities in rural areas was observed, which had increased the demand and utilization of MCH services, especially for those related to institutional delivery, even by the poor families. Service providers felt that acute shortage of human resources was a major health system level barrier.

Overall program managers, service providers and community representatives believed that NHM had a role in improving MCH outcomes and in

reduction of geographical and socioeconomic inequalities, through improvement in accessibility,

availability and affordability of the MCH services in the rural areas and for the poor. Any reduction in gender-based inequalities, however, was linked to the adoption of small family sizes and an increase in educational levels [5].

Result of studies reviewed for other interventions like road and mobile connectivity

There were total 1, 07,823 studies that had reported the effect of interventions other than NRHM such as road connectivity, mobile connectivity, water supply and sanitation on MCH outcomes. After removal of duplicates, there were total 42,982 studies that were eligible for screening. Out of these, 223 studies were selected after excluding the studies based on title and on abstract and 198 studies were excluded based on exclusion criteria. Therefore, total 25 studies were included in the final analysis. Out of these 25 studies, only 18 studies were identified as good quality studies [261, 300, 331-352] (annexures 5.6.1 – 5.6.2).

Systematic review on variables other than NHM such as road connectivity, mobile connectivity, water supply and sanitation found that mobile connectivity in form of health messages or as a tool to talk with higher health officers had increased the knowledge and awareness related to maternal and child health among people and front line health workers, which led to increase in early initiation of breastfeeding and ANC utilization [333, 335, 339]. There was increase in health reporting services. It was also found that women offered positive feedback regarding the voice messages as they described them as informative, entertaining, and a service that they would recommend to friends. Surface road connectivity was also found to be having positive impact on utilization of ANC and PNC services. Due to decrease in distance, there had been increase in the chances of institutional deliveries as well as increase in immunization among children and pregnant mothers. *Pradhan Mantri Gram Sadak Yojna* had also increased the connectivity of villages with health facilities. This had also improved the chances of availability of health care worker and ambulance services at village level [353]. Total sanitation program and NRHM in

coordination with other departments had increased the safe water supply which had reduced the water borne illness and enteric infections [347, 348].

Pathways leading to reduction in Maternal and child mortality

Pathways leading to reduction in Maternal and child mortality

We have also tried to reason out how the NHM schemes might have led to the reduction in MCH mortality and improved the MCH outcomes using good quality studies identified in the final step of the systematic review. So, based upon the duplication, inclusion, exclusion and quality criteria a total 92 studies i.e. on maternal health (n=18), child health (n=49), adolescent health (n=7), reproductive health (n=10), health inequalities (n=7) were identified to construct pathways to understand the impact of NHM on health outcomes as per logic model. (Table 4).

Table 4. Number of studies reviewed and included for construction of pathways leading to MCH outcomes.

Strategies	Studies Reviewed	Studies Included	Quality Studies
Maternal health	2759	63 Institutional delivery=44 MMR ¹ =19	18 Institutional delivery=14 MMR=4
Child health	82023 NMR ² = 19536 IMR ³ = 19,350 U5MR ⁴ =14,569 PNMR ⁵ = 28,568	213 NMR = 40 IMR=66 U5MR= 66 PNMR=41	49 NMR= 13 IMR= 15 U5MR=16 PNMR= 5
Adolescent health	1062	51 WIFS ⁶ =12 ARSH ⁷ =14 MHS ⁸ =25	7 ARSH=3 WIFS=2 MHS= 2
Reproductive health	6261	49 CPR ⁹ =27 TFR ¹⁰ =9 Utilization rate/barriers=13	10 CPR=10 TFR=0
Health inequalities	9185	12	8
Total	101290	388	92

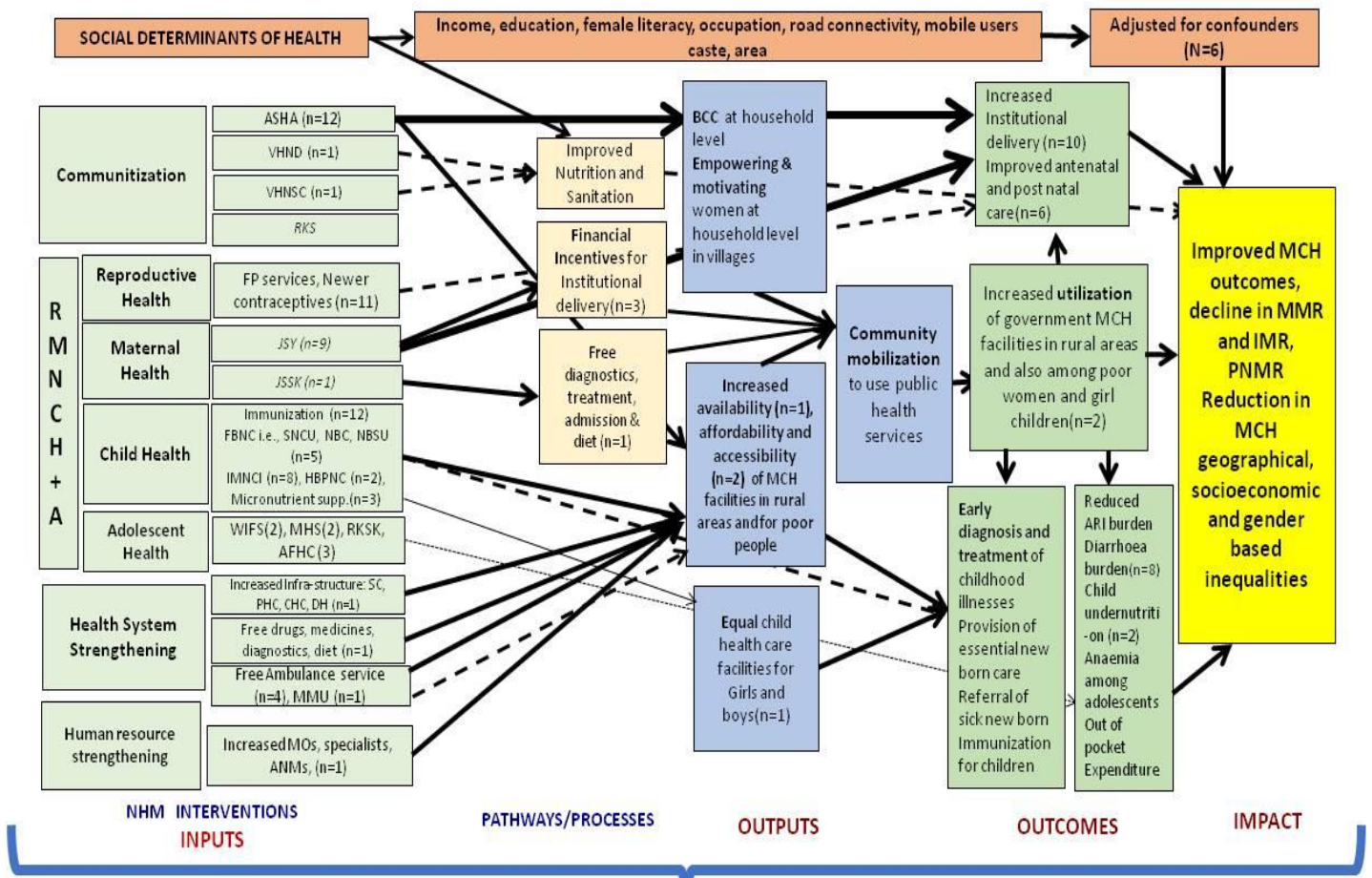
¹ Maternal Mortality Ratio; ² Neonatal Mortality Rate; ³ Infant Mortality Rate; ⁴ Under 5 Mortality Rate; ⁵ Perinatal Mortality Rate; ⁶ Weekly Iron Folic Acid Supplementation; ⁷ Adolescent Reproductive Sexual Health; ⁸ Menstrual Hygiene Scheme; ⁹ Contraceptive Prevalence Rate; ¹⁰ Total Fertility Rate

Pathways to understand the impact of NHM on health outcomes as per logic model is shown in Figure 16. The inputs (n=89) which included NHM strategies like communitization, RMNCHA+, health system strengthening, human resources strengthening and social determinants of the health such as income, education, female literacy, occupation, road connectivity, mobile users, caste and area. Processes (n=4) include the implementation of these activities like number of ASHA's trained in providing reproductive and child health care, provision of incentives for institutional delivery and free treatment, outputs (n=4) include the activities done/completed like number of pregnant women contacted by ASHA's in the village and counselled for institutional deliveries, increase in availability, affordability and accessibility of MCH facilities in rural areas, outcomes include the coverages such as increase in institutional delivery rate, increase in utilization of MCH facilities in rural areas and impact (n=80) includes the effect on the mortality rates like reduction in maternal mortality rate, infant mortality rate, in MCH geographical, socioeconomic and gender based inequalities.

The evidence for accredited health activists is denoted by thick arrow, which shows that ASHA had played a significant role in improving MCH outcomes by behaviour change and communication [69]. Both ASHA [5, 45, 63, 65, 69, 95, 354, 355] and maternal health intervention such as JSY [7, 26, 30-34, 54, 73, 74, 127] were (denoted by thick arrow) were found to be very effective in increasing the institutional delivery rate among pregnant women as compared to village health nutrition day (denoted as dotted arrow) [80]. Due to behaviour change communication and motivation, the pregnant women were empowered with adequate knowledge regarding the health sector plans of NRHM (free ambulance services, free hospital deliveries, free treatment, and financial incentives for hospital deliveries) which enabled them to take decisions regarding institutional delivery [5]. As a result, the community was mobilized to use the MCH facilities in rural areas [5]. These factors, along with other NRHM interventions *Janani Shishu Suraksha Karyakram* (JSSK) [80], child health interventions such as facility based newborn care (FBNC) [70, 89, 97, 101, 182], Integrated Management of Neonatal and Childhood Illness (IMNCI) [70, 89, 94, 97, 101, 106-110, 112, 117, 155, 182] home based postnatal care [90, 99,

119, 122, 125, 126], immunization coverage [190, 191, 194, 198, 201, 204, 205, 356], the availability of health facilities and doctors in rural areas and the free ambulance service [36, 41, 55], free medicines further improved the accessibility and affordability of MCH services and benefitted poor pregnant women and children whereas mobile medical units (MMUs) were perceived to be less effective in improving the accessibility of health services in rural areas as denoted by dotted arrow [80]. There is weak evidence for reproductive health strategies such as family planning in improving maternal health outcomes (denoted by dotted arrow) [259, 260, 265, 266, 273, 277, 357-360]. The diagram also shows that the increase in institutional delivery rate was mainly due to ASHA and JSY (denoted by thick arrow). Also due to community mobilization (denoted by thick arrow) there was increase in utilization of MCH facilities in rural areas which led to improvement in antenatal and postnatal care [45]. The increased utilization of MCH facilities and other factors like increase in accessibility of MCH facilities in rural areas [5], led to improvement in child health indicators such as early diagnosis and treatment of children, reduction in ARI, diarrhoea burden [61, 204] and malnutrition [221, 222] whereas there is weak evidence for other child health interventions such as RBSK [226, 227] and RKSK in provision of early diagnosis as well as treatment of childhood illnesses. There is weak evidence for adolescent health interventions like WIFS (denoted by dotted arrow) in reduction of anaemia among adolescents [282, 298, 311, 361-364]. Though NRHM interventions had improved the utilization of MCH services, there is weak evidence for provision of equal child health care facilities for girls and boys (denoted by dotted arrow) [5]. All these inputs and outputs had implications on improving MCH outcomes, on declining mortality rates and on bridging the socioeconomic, geographical and gender based MCH inequalities [5, 61, 63, 64, 73, 80, 321, 327, 361].

Figure 16. Impact of NHM Strategies: Evidence from Literature.



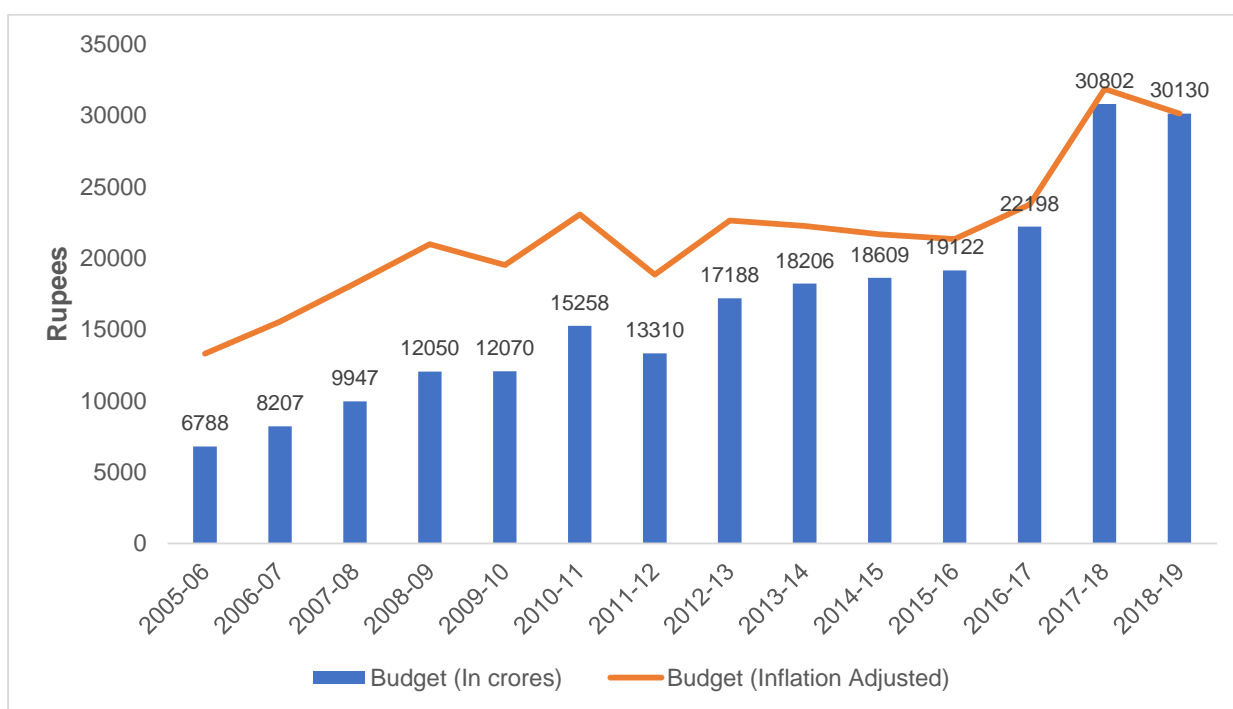
FINDINGS FROM SECONDARY DATA ANALYSIS

INPUT/PROCESS INDICATORS

Allocation of funds for NHM

The fund allocated to NRHM in the year 2005-06 was Rs 6788 crore and it increased to Rs 30,130 crore in the year 2018-19 under NHM. (Figure 17). The allocated fund had increased every year, however, allocation of fund had been declined by 0.7% (17,310 crore to 17,188 crore) in the financial year 2011-12 to 2012-13 and by 2% (30,802 crore to 30,130 crore) in the year 2017-18 to 2018-19 [88, 365]. The trend of inflation adjusted budget have shown that budget allocation increased from 2005-06 to 2008-09, and declined in the year 2009-10 and 2011-12. After that there was an increased allocation up to the year 2017-18, which later declined in the year 2018-19.

Figure 17. Allocation of funds under NHM.

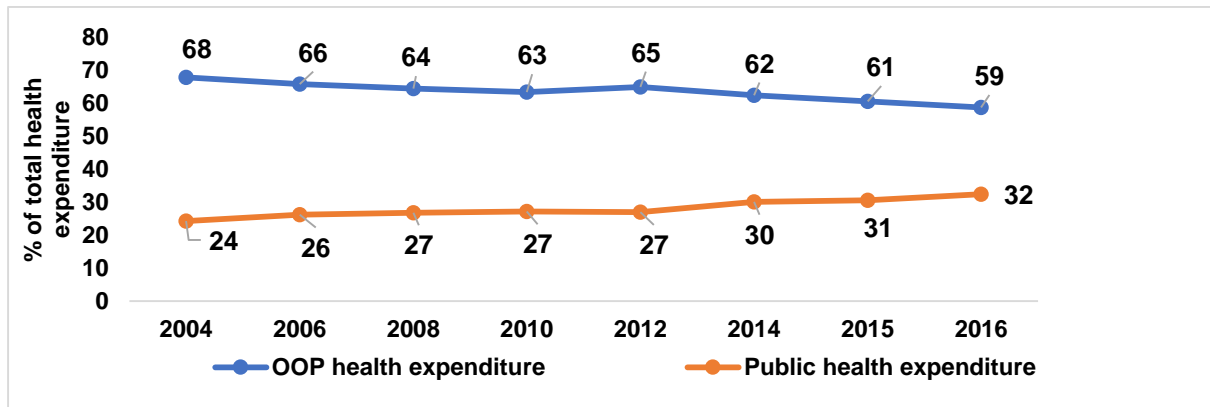


Data source: India Expenditure Budget, Volume 2, Ministry of Health and Family Welfare; Union Budget, Government of India.

Public and out of pocket health Expenditure and Per Capita Public Health Spending

Out of the total health expenditure, the percentage of the public health expenditure had increased from 24% to 32% from the year 2004 to 2016. In the same period, the percentage of out of pocket health expenditure had declined from 68% to 59%. (Figure 18).

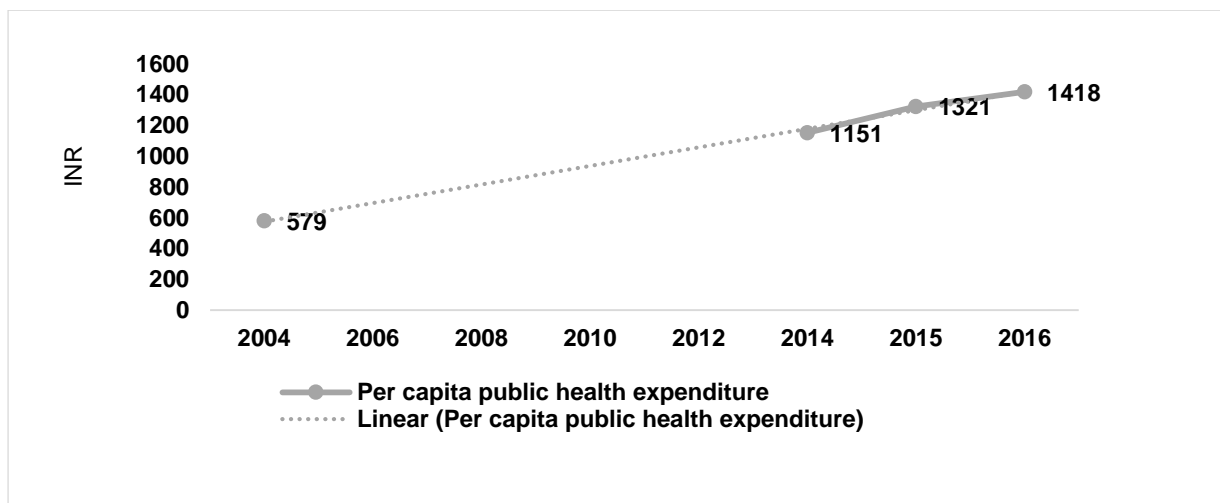
Figure 18. Out of pocket health expenditure and public health expenditure.



Data source: National Health Account year 2004 to 2016.

The per capita public health expenditure had increased from Rs 579 in 2004 to Rs 1418 in 2016. (Figure 19).

Figure 19. Per capita public health expenditure.

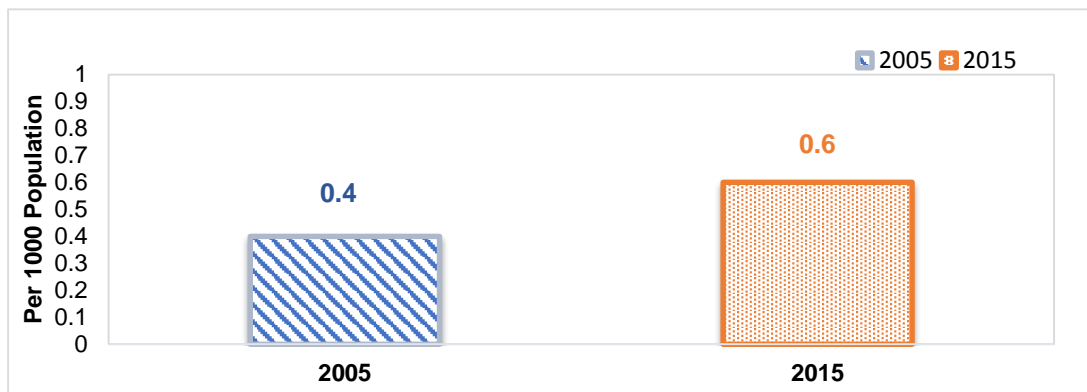


Data source: National Health Account year 2004 to 2016; Indian National Rupee; per capita public health expenditure in different years inflated to 2016 value.

Health system strengthening and human resources

Number of government hospital beds per 1000 population in rural and urban areas (including CHCs) in India increased from 0.4 in 2005 to 0.6 in 2015. (Figure 20).

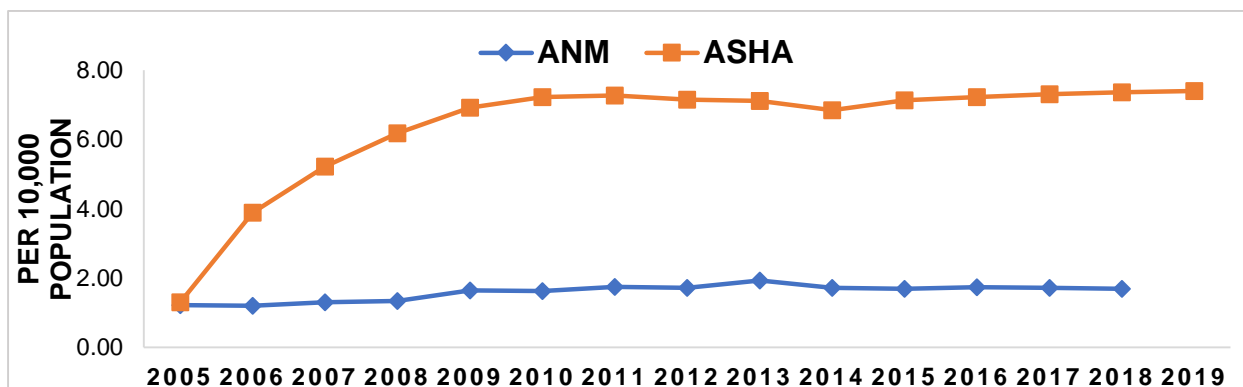
Figure 20. Number of Patient Beds/1000 population.



Data source: Rural Health Statistics year 2005-2015.

Number of ASHA workers per 10,000 population increased from 1.31 in 2005 to 7.40 in 2019. The number of ANMs per 10,000 population increased from 1.22 in 2005 to 1.69 in 2018. (Figure 21).

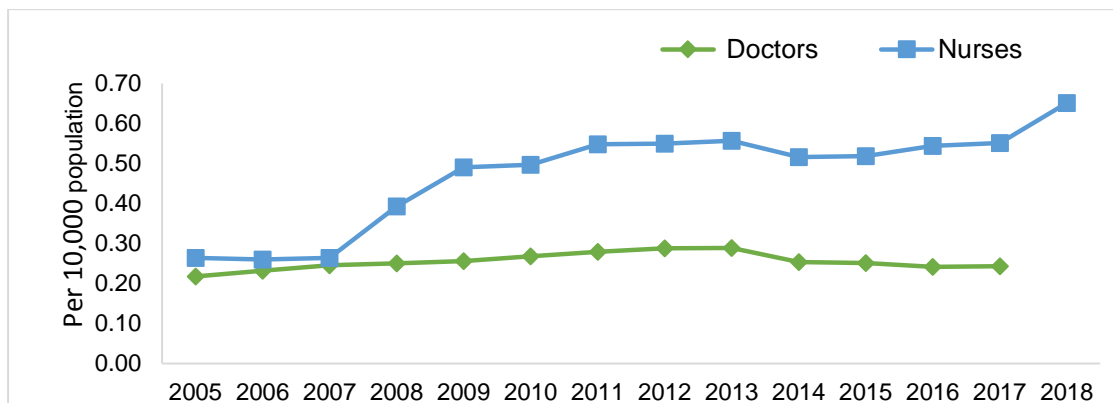
Figure 21. Trend showing number of ANMs and ASHAs per 10,000 population (2005-19).



Data source: ANMs data obtained from Rural Health Statistics year 2005-2018; ASHAs data obtained from ASHA updates 2005-2019.

The number of nursing staff increased from 0.26 in 2005 to 0.65 in 2018, in PHCs and CHCs per 10,000 population. Number of doctors in PHCs and CHCs per 10,000 population also increased from 0.22 in 2005 to 0.24 in 2017. (Figure 22).

Figure 22. Trend showing doctors and nursing staff per 10,000 population in PHCs and CHCs (2005-2018).



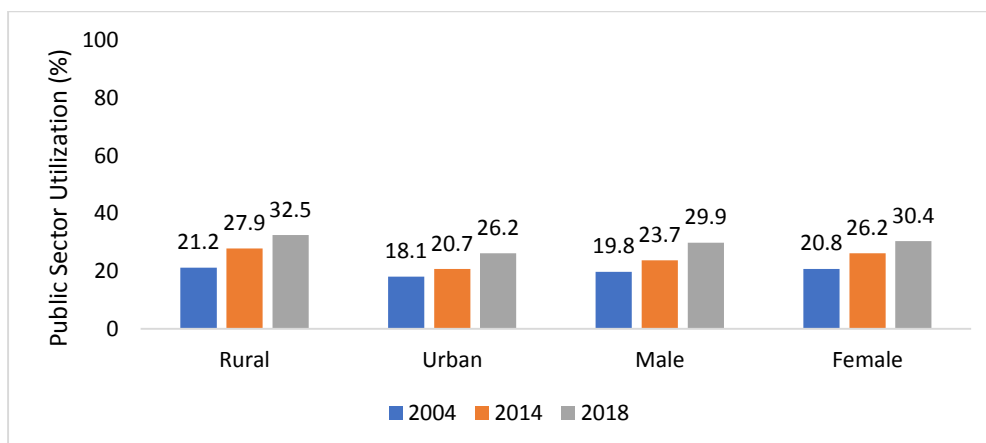
Data source: Rural Health Statistics year 2005 to 2018.

HEALTH OUTPUT/OUTCOME INDICATORS

Utilization of public sector for outpatient care

The utilization of public sector facilities for outpatient care services was higher in rural areas than urban areas, with an increase in utilization in both rural and urban settings over the years. The rate of increase, between years 2004 and 2014, was higher in rural areas (6.7%) in comparison to the urban areas (2.6%). However, between 2014 and 2018, the rate of change in urban areas (5.7%) surpassed the increase in rural areas (4.4%). This increase in public sector utilization was observed equally among both males (10.1%) and females (9.6%), but in the initial years, the increase was higher among females (6%) as compared to males (4%). (Figure 23).

Figure 23. Utilization of public sector for outpatient care.

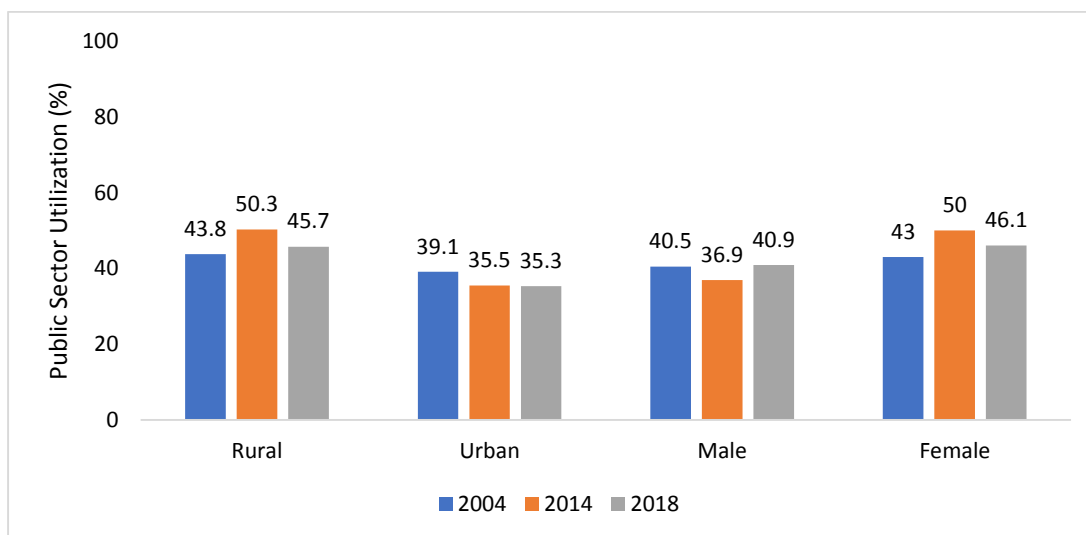


Data source: NSSO round 60th (2004), round 71th (2014), round 75th (2018)

Utilization of public sector for hospitalization

A higher utilization rate of public sector facilities for hospitalization was observed in rural areas in 2014 as compared to 2004 (increase of 7%), while the same declined by 3.5% in urban areas during this period. Between 2014 and 2018 however, whereas these utilization rates declined in rural areas by around 5%, the rates in urban areas remained almost the same. Overall, utilization of public sector was always higher in rural areas as compared to urban settings. A similar pattern was observed in the rates of utilization among females and males. While the rates of utilization among females declined by 4% in the later years, following an initial surge of 7% between 2004 and 2014, utilization by males declined by almost 4% between 2004 and 2014, followed by an increase of the same amount between 2014 and 2018. (Figure 24).

Figure 24. Utilization of public sector for hospitalization.

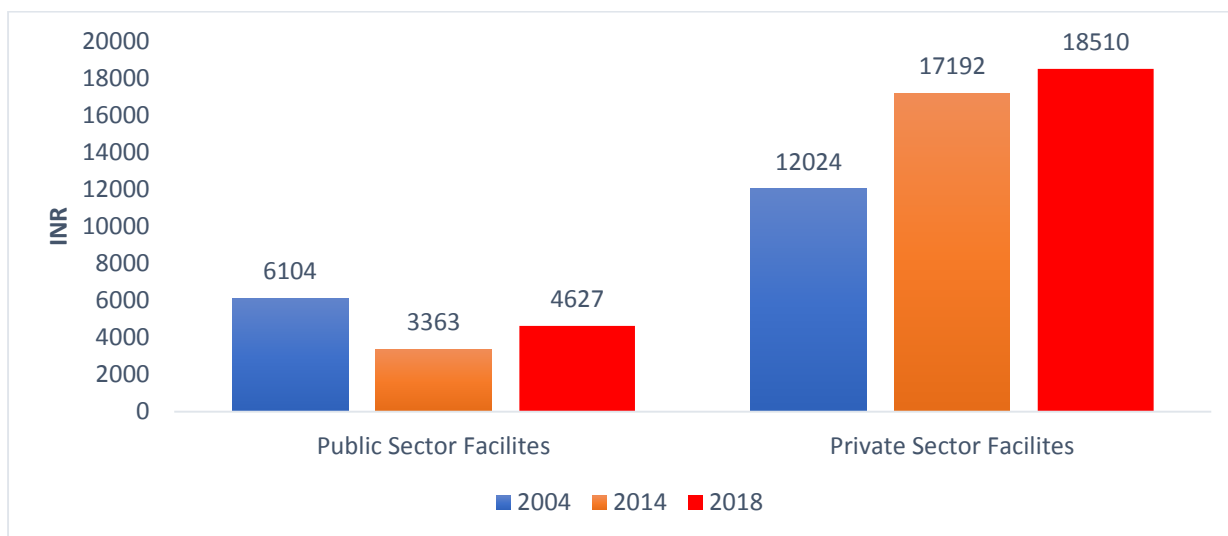


Data source: NSSO round 60th (2004), round 71th (2014), round 75th (2018)

Out-of-pocket expenditure for under-five child hospitalization

It was found that while the expenses at public health sector facilities for under five child hospitalization were lowered by Rs. 2741 in 2014 when compared to 2004, these increased by Rs. 1264 between 2014 and 2018. Expenses at private health facilities increased by around Rs. 5000 between 2004 to 2014 but only by Rs. 1500, between 2014 and 2018. (Figure 25).

Figure 25. Out-of-pocket expenditure for under-five child hospitalization.

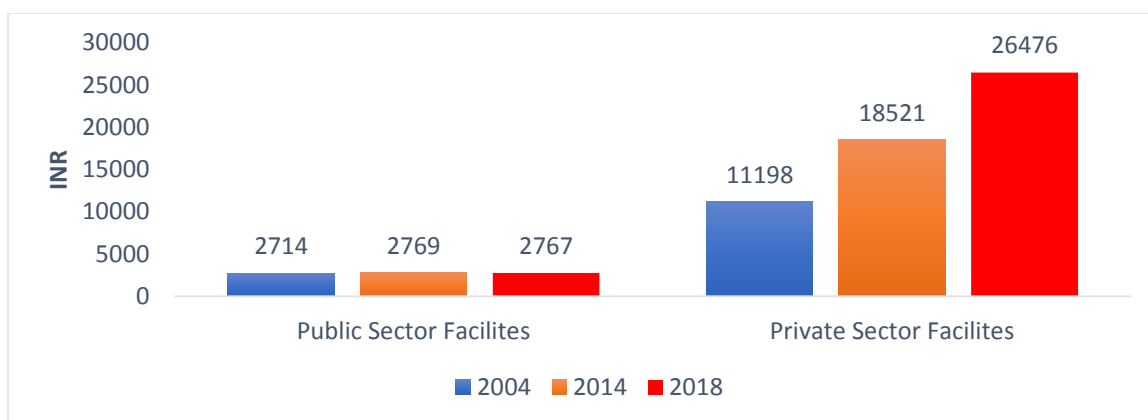


Data source: NSSO data round 60th (2004, round 71th (2014), round 75th (2018); 2004 and 2014 data values Inflated for 2018 using annual Consumer Price Index from year 2004-05 to 2017-18, 2018 values adjusted for confounders: Religion, Social class, HH sanitation, HH drinking water source, Wealth status of household; Indian National Rupee.

Out-of-pocket expenditure on institutional deliveries

The mean expenditure on institutional deliveries at public sector facilities increased marginally (by Rs. 55) in 2004-2014 period, expenses at private health facilities increased by around Rs 7000 in this period. No increase in mean expenditure on deliveries in 2014-18 period was observed at public sector facilities, however deliveries in private sector facilities had to spend an additional Rs. 8000 on an average.. (Figure 26).

Figure 26. Out-of-pocket expenditure on institutional deliveries.

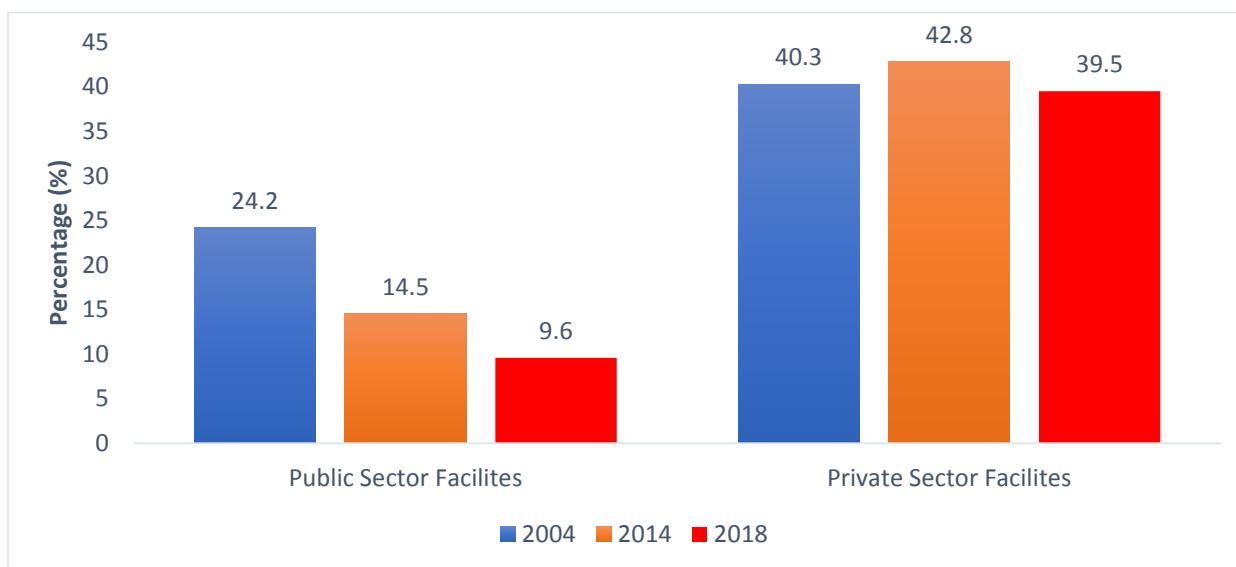


Data source: NSSO data round 60th (2004, round 71th (2014), round 75th (2018); 2004 and 2014 data values Inflated for 2018 using annual Consumer Price Index from year 2004-05 to 2017-18, 2018 values adjusted for confounders: Religion, Social class, HH sanitation, HH drinking water source, Wealth status of household; Indian National Rupee.

Catastrophic health expenditure on under-five child hospitalization

Catastrophic health expenditure due to hospitalizations at public health facilities reduced from 24.2% in 2004 to 14.5% in 2014, and further to 9.6% in 2018, whereas it stayed almost the same (around 40%) between 2004-2018 at private health facilities (Figure 27).

Figure 27. Catastrophic health expenditure on under-five child hospitalization.

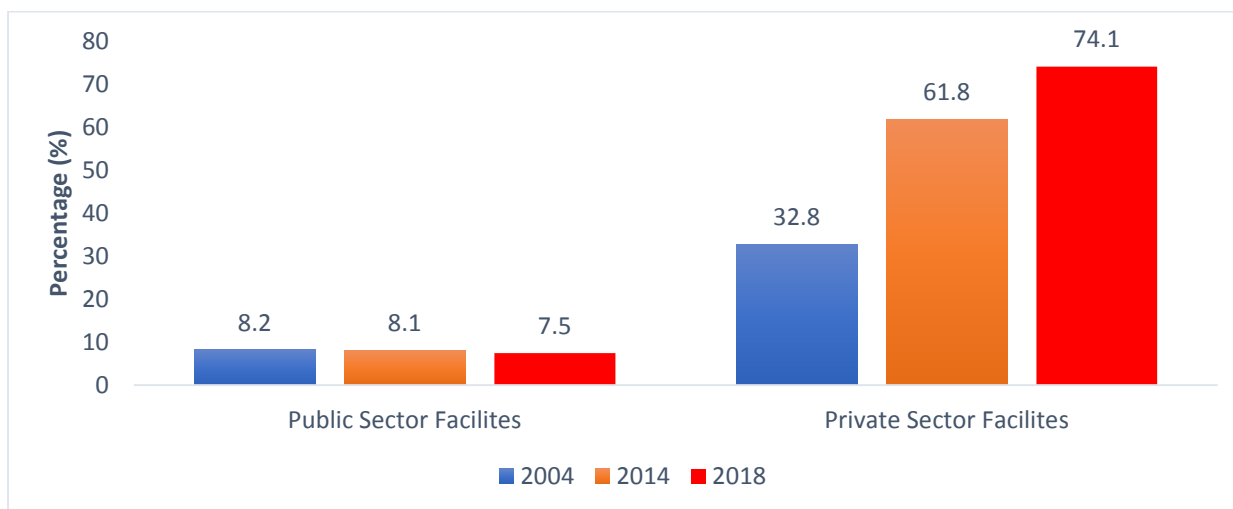


Data source: NSSO data round 60th (2004, round 71th (2014), round 75th (2018); 2004 and 2014 data values Inflated for 2018 using annual Consumer Price Index from year 2004-05 to 2017-18, 2018 values adjusted for confounders: Religion, Social class, HH sanitation, HH drinking water source, Wealth status of household; catastrophic health expenditure is > 25% of the total household consumption expenditure.

Catastrophic health expenditure on institutional deliveries

The public sector has also successfully managed the financial risk to households due to catastrophic health expenditure on delivery between 2004-18, which increased substantially from 32% to 74% at private sector facilities in the same period (Figure 28).

Figure 28. Catastrophic health expenditure on institutional deliveries.

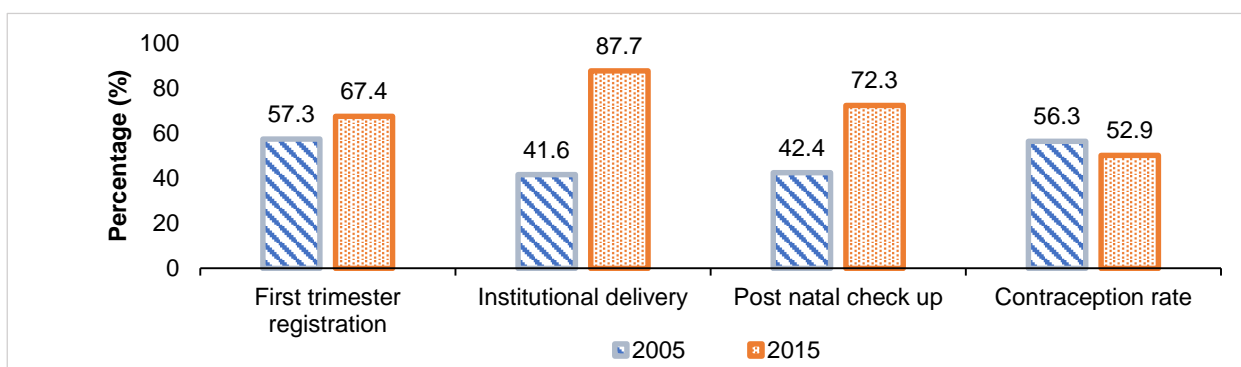


Data source: NSSO data round 60th (2004, round 71th (2014), round 75th (2018); 2004 and 2014 data values inflated for 2018 using annual Consumer Price Index from year 2004-05 to 2017-18, 2018 values adjusted for confounders: Religion, Social class, HH sanitation, HH drinking water source, Wealth status of household; catastrophic health expenditure is > 25% of the total household consumption expenditure.

Maternal Health Indicators

There was significant increase in the proportion of first trimester registration from 57.3% to 67.4%, in institutional delivery rate from 41.6% to 87.7% and proportion of women who received post-natal check-up from 42.4% to 72.3% from the year, 2005 to 2015. However, there was decline in contraception rate (from 56.3% to 52.9%) in the same period. (Figure 29).

Figure 29. Health indicators for women aged 15-49 years who had a live birth in the five years preceding the survey.



Data source: NFHS data round 3 and 4; adjusted percentage of NFHS 4 for place of residence, maternal age, education, religion, caste, wealth index, type of housing, availability of toilet, safe water supply, cooking fuel, health worker density, road density, telephone-density.

The odds of getting registered in first trimester of pregnancy was two times higher in post NHM period as compared to pre NHM period after adjusting for the effect of confounders. Similarly, the odds of having institutional delivery and postnatal check-ups was 11.5 and 3.5 times higher in post NHM period as compared to pre NHM period, respectively. However, the odds of contraception rate was lower in post NHM period as compared to pre NHM period after adjusting for the effect of confounders. (Table 5).

Table 5. Health indicators for women aged 15-49 years who had a live birth in the five years preceding the survey.

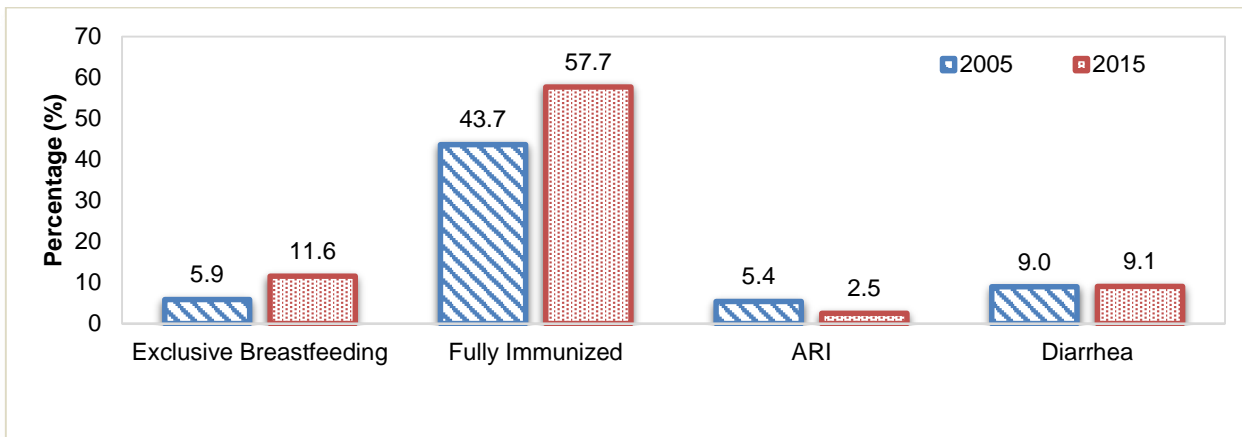
Health Indicators	Adjusted Odds Ratio	95% Confidence Interval	p-value
First trimester Registration	2.0	(1.896,2.082)	<0.01*
Institutional Delivery	11.5	(10.855,12.142)	<0.01*
Postnatal Check-ups	3.5	(3.377, 3.688)	<0.01*
Contraception Rate	0.9	(0.851, 0.895)	<0.01*

*Data source: NFHS data round 3 and 4; *significant; adjusted for place of residence, maternal age, education, religion, caste, wealth index, type of housing, availability of toilet, safe water supply, cooking fuel, health worker density, road density, telephone-density.*

Child Health Indicators

The adjusted proportions of children exclusive breastfed and fully immunized in post-NHM period increased as compared to pre-NHM period and adjusted proportions of children suffering from acute respiratory infection decreased in post NHM period. However, the proportion of children suffering from diarrhoea remained same before and after NHM period. (Figure 30).

Figure 30. Percentage of children for various child health indicators in 2005 and 2015.



Data source: NFHS data round 3 and 4; adjusted percentage of NFHS4 for institutional delivery, place of residence, maternal age, education, religion, caste, wealth index, type of housing, availability of toilet, safe water supply, cooking fuel, health worker density, road density, telephone- density.

The odds of exclusive breastfeeding was 2 times in post NHM period as compared to pre NHM period, after adjusting for confounders. Likewise, the odds of being fully immunized was 1.8 times higher in post NHM period as compared to pre NHM period. (Table 6).

Table 6. Child health indicators of children under 5 years of age in 2005 and 2015.

Child Health	Adjusted Odds Ratio	95% Confidence Interval	p-value
Exclusive Breastfeeding	2.1	(1.756, 2.509)	<0.01*
Fully Immunized	1.8	(1.618, 1.910)	<0.01*
Acute Respiratory Infection (ARI)	0.5	(0.417, 0.491)	<0.01*
Diarrhoea	1.0	(0.961, 1.068)	0.633

Data source: NFHS data round 3 and 4; *significant; adjusted for institutional delivery, place of residence, maternal age, education, religion, caste, wealth index, type of housing, availability of toilet, safe water supply, cooking fuel, health worker density, road density, telephone- density.

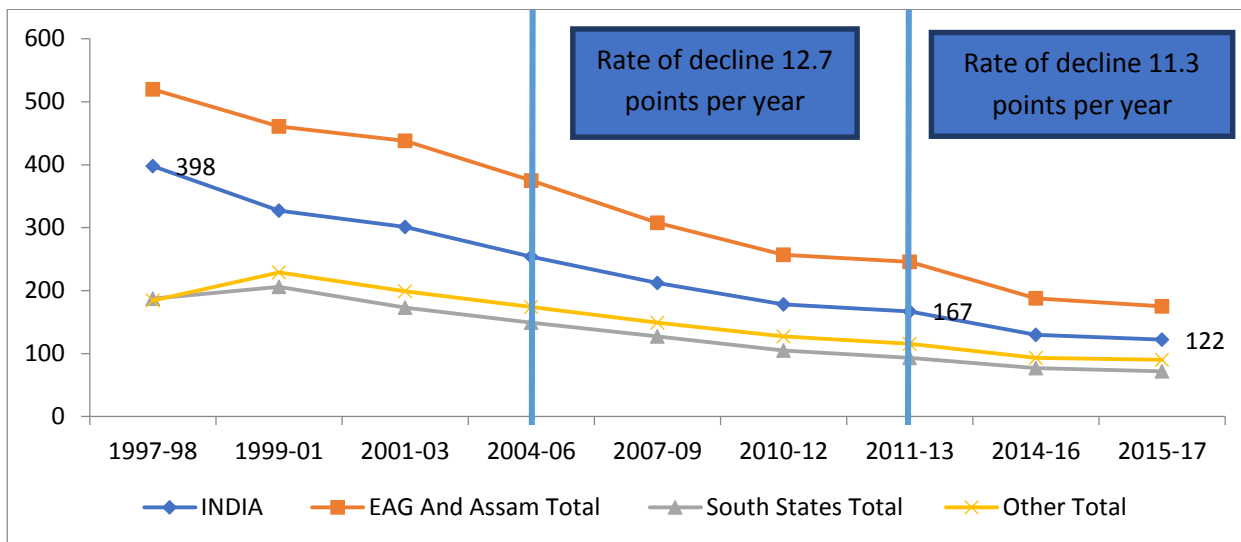
IMPACT INDICATORS

Maternal Mortality Ratio

The national MMR declined from 254 in the year 2004-06, to 167 in the year 2011-13, to 122 in the year 2015-17. Empowered Action Group (EAG) states and Assam also witnessed a decline from 246 to 175 in the same time period. It was also declined for South states total and other states total from 93 to 72 and 115 to 90 respectively. (Figure 31). Maternal mortality ratio declined by 52% from 2004-06 to 2015-

17, with 34.3% decline till 2011-13 and 26.9% decline during 2011-13 to 2015-17. Rate of decline per year was 12.7 points during 2004-06 to 2011-13 and 11.3 points post 2011-13.

Figure 31. Trend of Maternal Mortality Ratio 1997-2017.



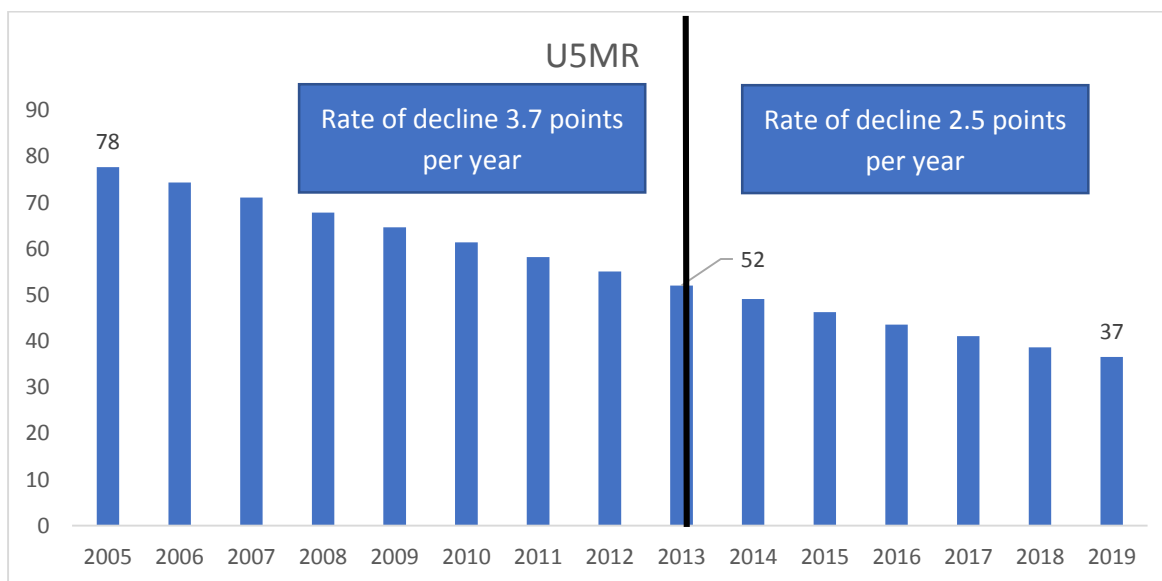
Source: SRS data

Child Health Outcomes

Under five mortality rate

Under five mortality rate declined from 78 to 37 per thousand live births from 2005 to 2019 (Unicef's child mortality estimates). [Figure 32]. Overall there is 52.6% reduction in U5MR from 2005 to 2019, with 33.3% during NRHM period (2005-12) and 28.8% during NHM period (2013-2019). Rate of decline per year was 3.7 points before and 2.5 points after the year 2013.

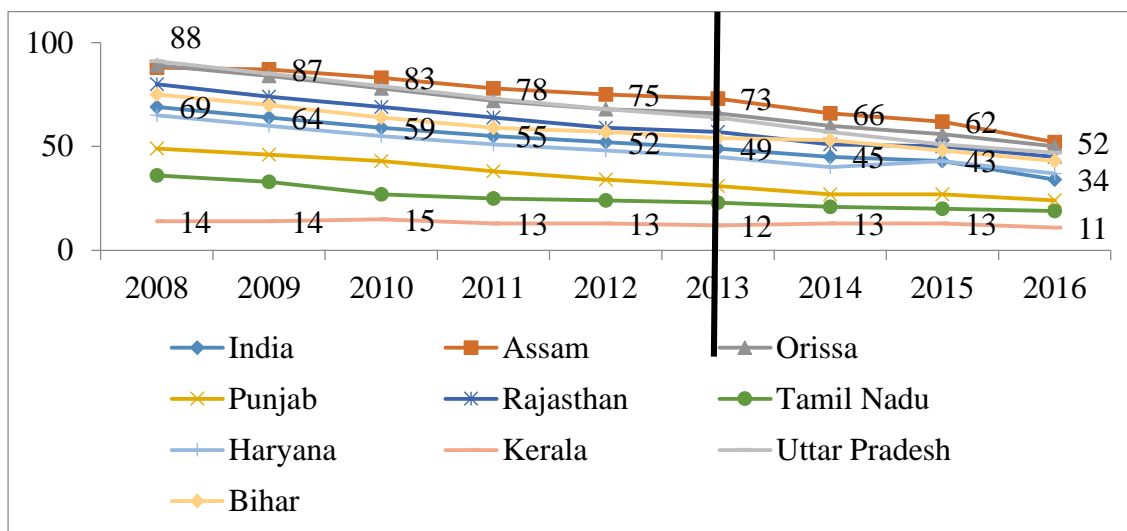
Figure 32. Trend of under five mortality rate in India, from 2005 to 2019.



Source: Unicef's Child Mortality estimates; SRS data

Among the states, maximum reduction was seen in Assam, where U5MR had declined from 88 to 75 per thousand live births by 2012 to 52 per 1000 live births by 2016, as per SRS data. Rate of decline per year increased from 2.6 points during 2008-12 to 5.25 points after the year 2013 in Assam. Minimum reduction was seen in the state of Kerala which varied from 14 to 11 in the same time period, as it already had very low U5MR. States where rate of decline increased per year after the year 2013 were Gujarat (2.4 to 3 points), HP (1.4 to 3.5 points), Jammu and Kashmir (2.4 to 3.5), Jharkhand (3.0 to 3.75) and West Bengal (0.8 to 2 points). In Orissa, pace of decline was also high at 4.0 points per year, which remained the same after the year 2013. Similarly, in Madhya Pradesh pace of decline remained the same (3.8 to 3.5 points). States where the pace of decline of U5MR reduced after the year 2013, included Punjab, Rajasthan, Tamil Nadu, Haryana, Bihar, Andhra Pradesh, Chattisgarh, Karnataka. (Figure 33).

Figure 33. Trend of under five mortality rate in Indian states, from 2008 to 2016.

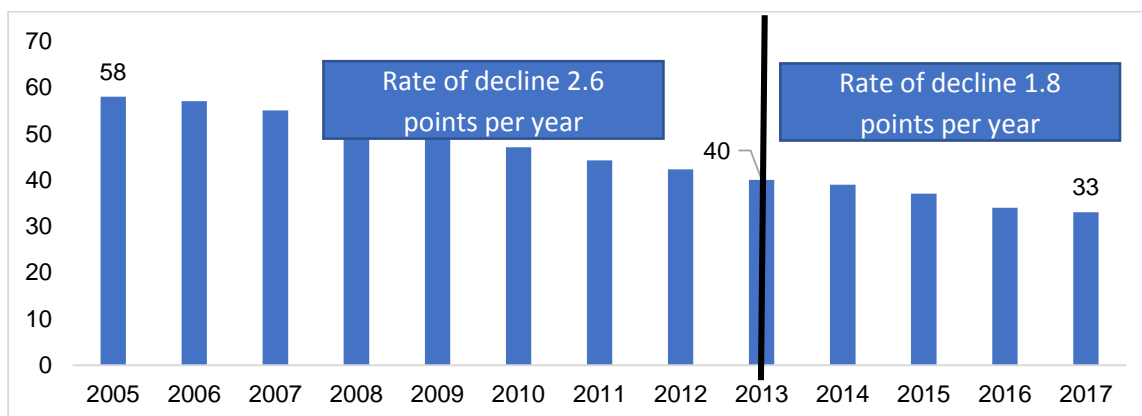


Source: SRS data

Infant Mortality rate

The infant mortality rate had declined from 58 per 1000 live births to 40 per thousand live births during 2005-13 (NRHM period) and to 33 per 1000 live births during 2013-17 (NHM period). [Figure 34].

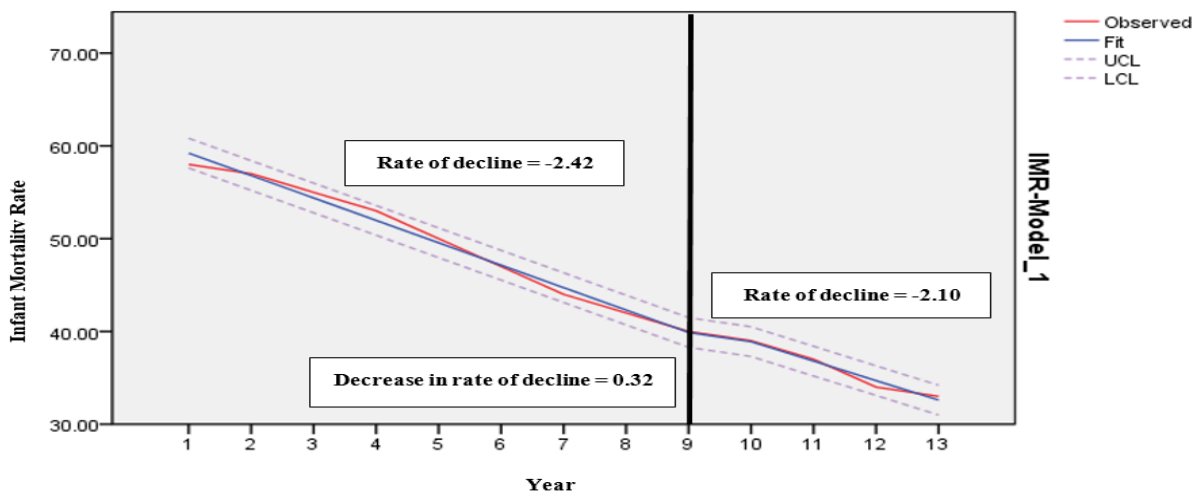
Figure 34. Trend of infant mortality rate in India, from 2005 to 2017.



Source: SRS data

The interrupted time series analysis from the Sample Registration System (SRS) data had shown that the rate of decline in IMR was 2.42 infant deaths per 1000 live births per annum before 2013 and it accelerated to 2.10 infant deaths per 1000 live births per annum after the year 2013-17. (Figure 35).

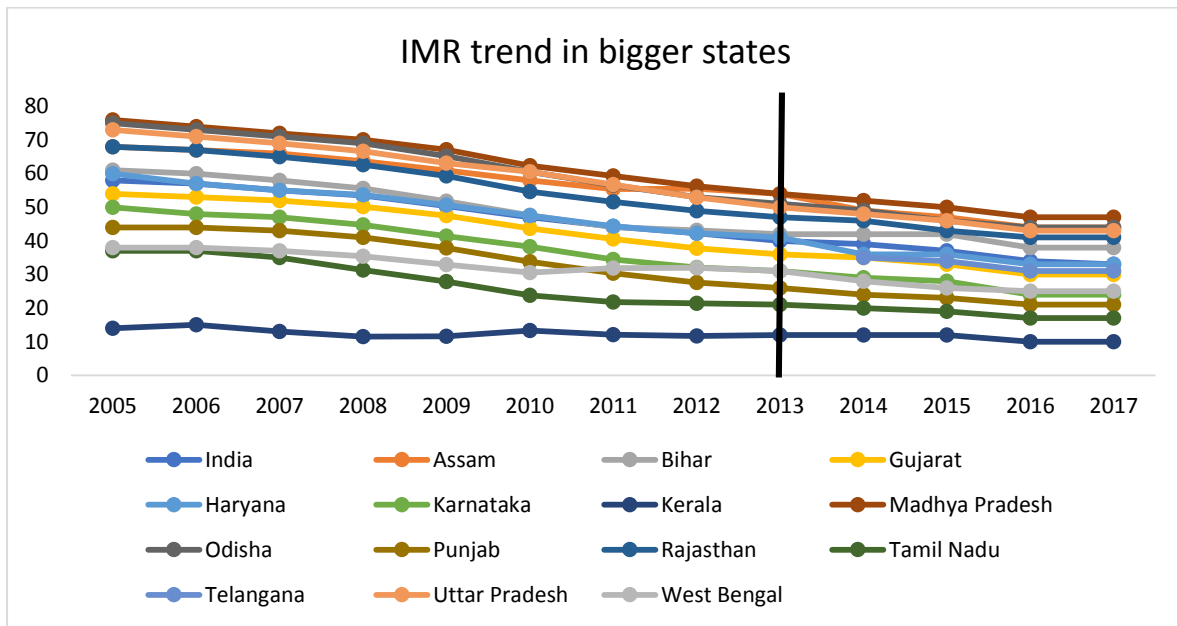
Figure 35. Trend of infant mortality rate as per interrupted time series analysis in India, from 2005 to 2017.



Data source: Sample Registration System; Interrupted Time series analysis; Year 1: 2005, Year 9: 2013, Year 13: 2017

The rate of decline for IMR was found to be sharper in post intervention period almost in every state except a few, as per SRS data. Among the set of bigger states, the maximum reduction was seen in the state of Orissa, where IMR had reduced from 51 to 41 infant deaths per 1000 live births from the year 2013-17. The minimum reduction was demonstrated by the state of Kerala which varied from 12 to 10 in the same time period. The trends of IMR for the set of smaller states/ UTs of the country had bit different picture from the bigger and country level estimates. From the year 2013 to 2017, Arunachal Pradesh and Manipur had witnessed an increase in IMR from 32 to 36 and from 10 to 11 per 1000 live births, respectively. Among Union Territories (UTs), Andaman & Nikobar and Puducherry had shown maximum decline in IMR from 24 to 16 and 17 to 10 respectively in the same time period. (Figure 36 and 37).

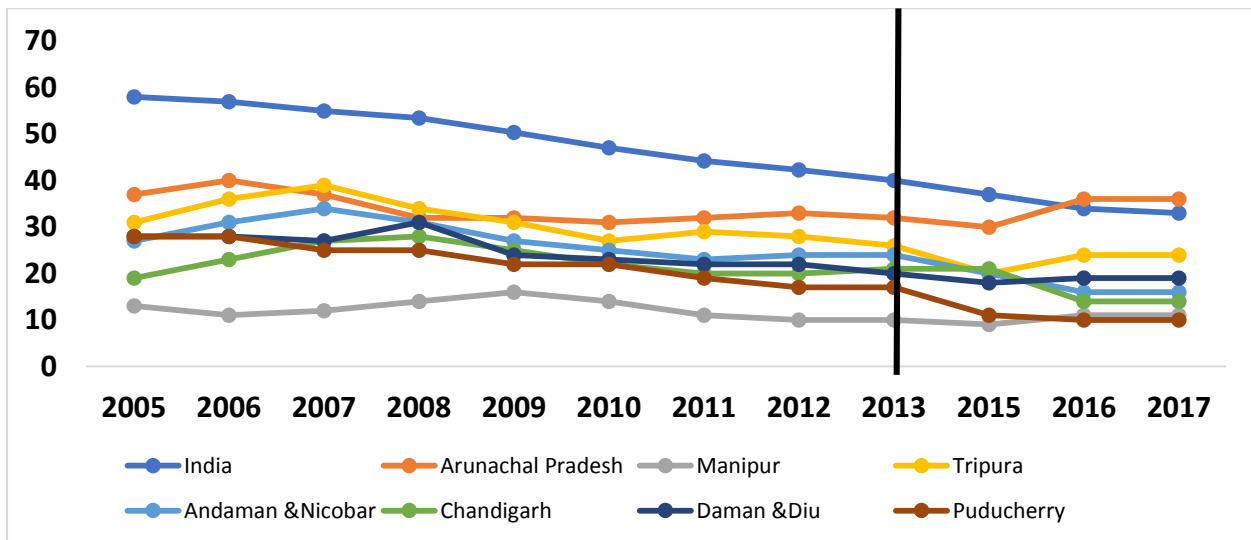
Figure 36. Trend of infant mortality rate in bigger states in India, from 2005 to 2017.



Source: SRS

data

Figure 37. Trend of infant mortality rate in smaller states in India, from 2005 to 2017.

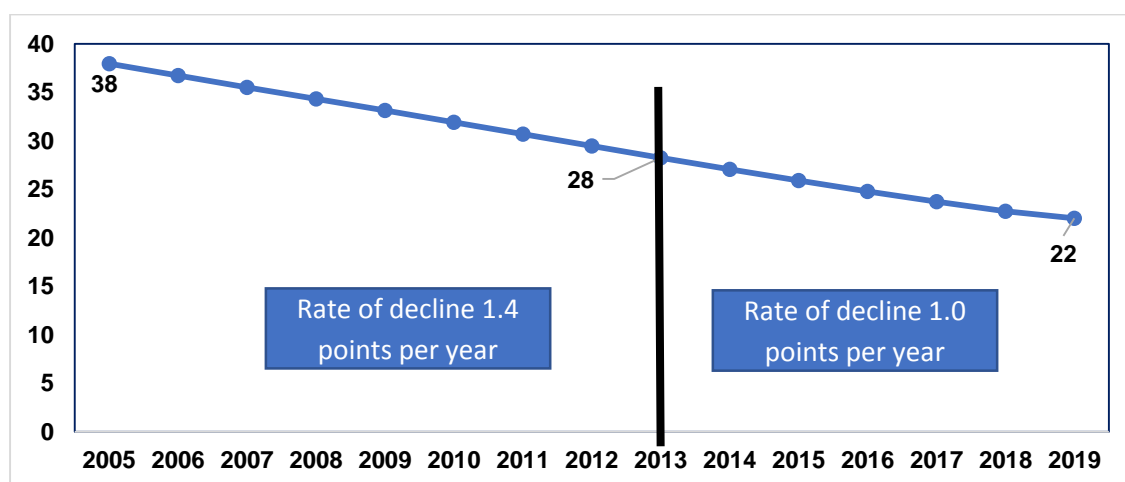


Source: SRS data

Neonatal Mortality

Overall the neonatal mortality reduced from 38 per thousand live births to 22 per thousand live births, with a percentage decline of 42.1% from 2005 to 2019, as per Unicef's Child mortality estimates. The rate of decline per year was 1.4 points from 2005 to 2013 and 1.0 from 2013 to 2019. (Figure 38).

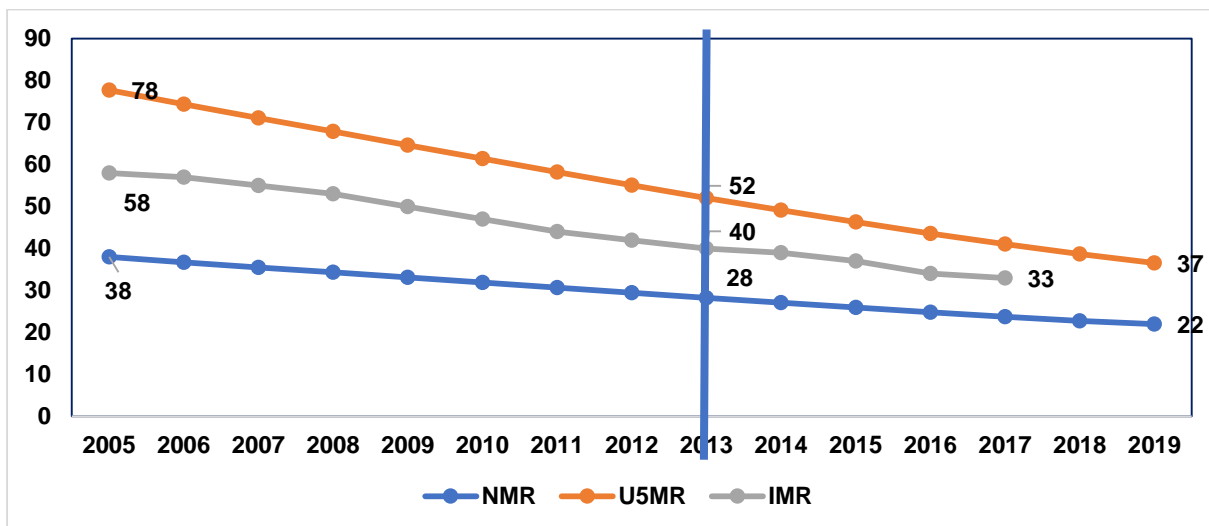
Figure 38. Trend of neonatal mortality rate in India, from 2005 to 2019.



Source: Unicef's Child Mortality estimates; SRS data

While the under-five mortality rate reduced from 78 to 37 (52.6% decline), infant mortality rate from 58 to 33 (43.1% decline), neonatal mortality rate reduced from 38 to 22 per thousand live births (42.1% decline). The percentage decline was 26.3%, 31% and 33.3% during NHM period (2005-13), and 21.4%, 17.5% and 28.8% during NHM period for under-five mortality rate, infant mortality rate and neonatal mortality rate, respectively.

Figure 39. Trend of neonatal mortality, infant mortality and under five mortality in India, from 2007 to 2019.

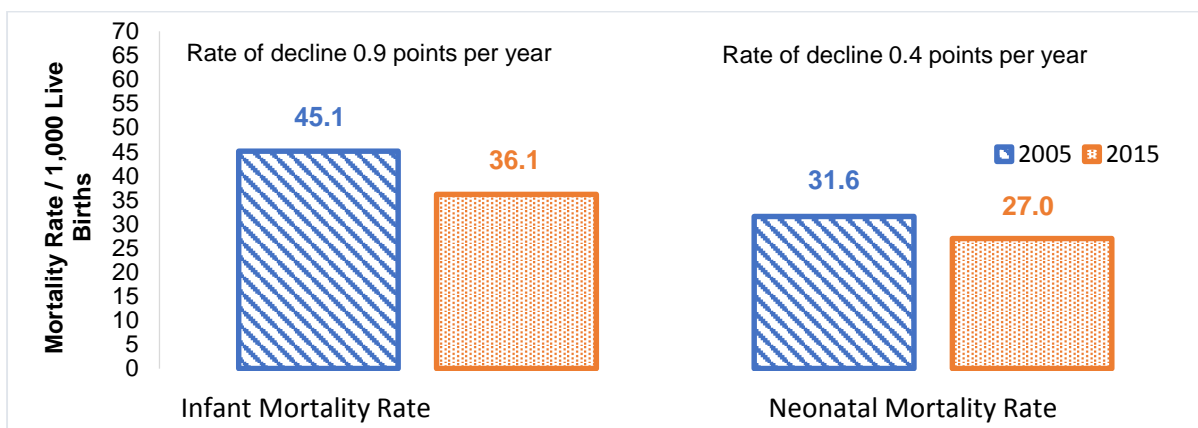


Source:

Unicef's Child Mortality estimates, SRS data

The analysis of NFHS 3 and NFHS 4 data showed that the infant mortality rate and neonatal mortality rate had reduced significantly in post NHM period as compared to pre NHM period. Rate of decline was 0.9 points per year for IMR and it was 0.4 points per year for NMR. (Figure 40).

Figure 40. Infant Mortality Rate and Neonatal Mortality Rate per 1,000 live births in 2005 and 2015.



Data source: NFHS data round 3 and 4; adjusted rate of NFHS4 for maternal age, education, religion, caste, wealth index, type of housing, availability of toilet, place of residence, safe water supply, cooking fuel, road density.

The adjusted infant mortality rate as well as neonatal mortality rate in post-NHM period had been reduced as compared to pre-NHM period. The risk of infant death was significantly lower in post NHM period as compared to pre NHM period (RR=0.8). [p<0.01]. Similarly, the risk of neonate death was

significantly lower in post NHM period as compared to pre NHM period after adjusting for confounders (RR=0.9). (Table 7).

Table 7. Infant mortality rate and Neonate mortality rate (per 1000 live births) of children born in the three years preceding the survey.

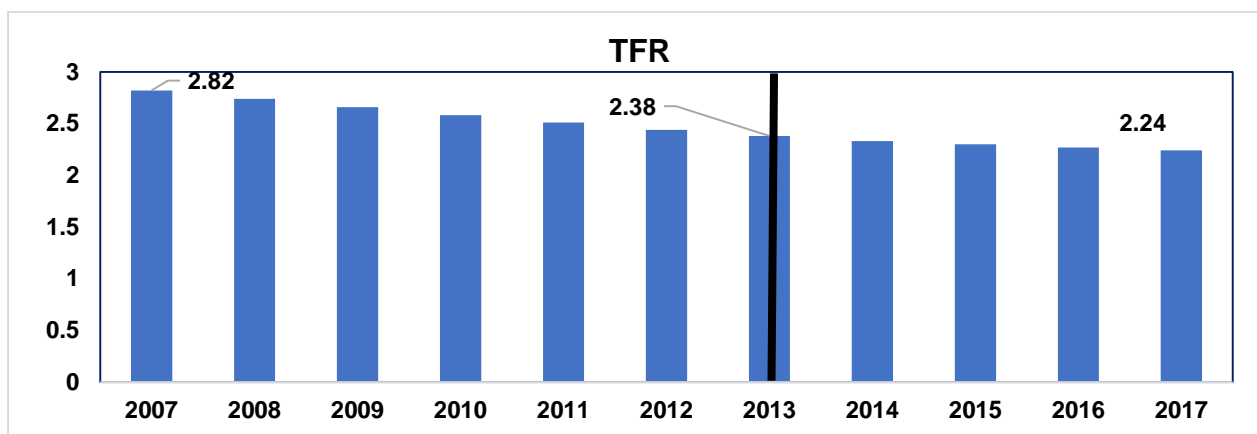
	Adjusted Risk Ratio	95% Confidence Interval	p-value
Infant Mortality Rate	0.8	(0.749,0.857)	<0.01*
Neonate Mortality Rate	0.9	(0.789, 0.925)	<0.01*

Data source: NFHS data round 3 and 4; *significant; adjusted for maternal age, education, religion, caste, wealth index, type of housing, availability of toilet, place of residence, safe water supply, cooking fuel, road density.

Total Fertility Rate

Total fertility rate has declined from 2.82 to 2.24 from 2007 to 2017. The percentage decline was 20.6% in this period, with 15.6% decline till 2013 and 5.9% decline after 2013. (Figure 41).

Figure 41. Trend of Total Fertility Rate in India, from 2007 to 2017.



Source: SRS data

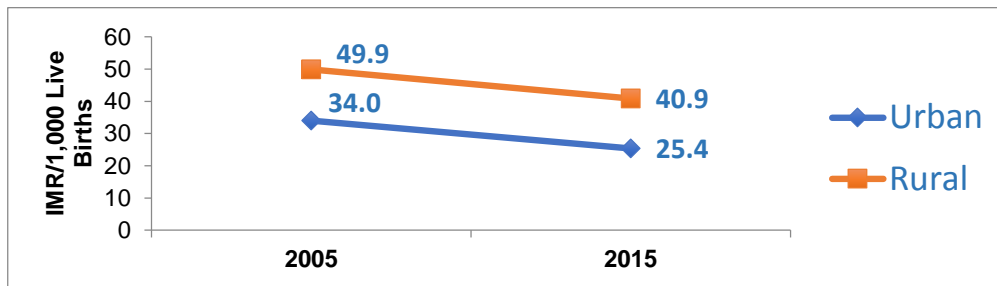
Impact of NHM on health inequalities

Geographical inequalities in IMR

IMR declined in both urban and rural areas from 2005 to 2015. The extent of decline was slightly higher in rural (9.0 points) as compared to urban areas (8.6 points). The inequalities in IMR in the urban and rural

areas declined from 15.9 points in 2005 to 15.5 points in 2015 after adjustment for confounders. (Figure 42).

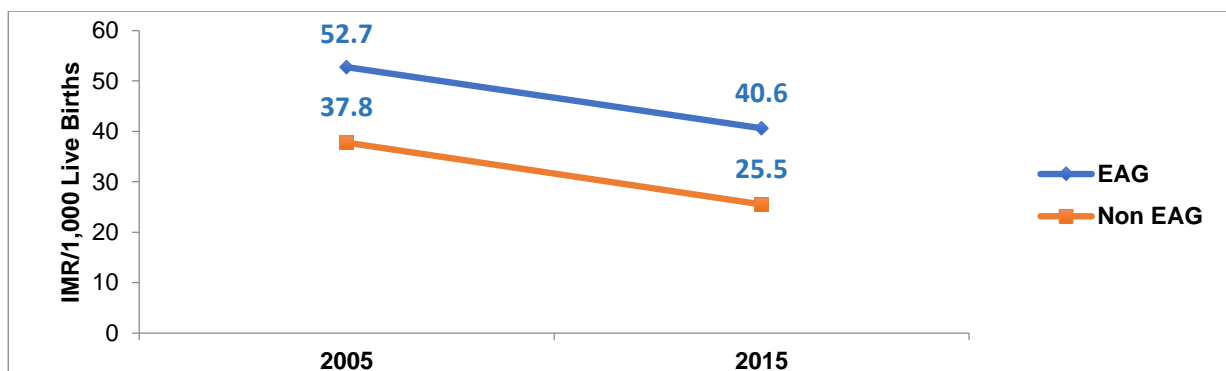
Figure 42. Comparison of infant mortality rate among urban and rural areas in 2005 and 2015.



Data source: NFHS data round 3 and 4; adjusted rate of NFHS 4 for maternal age, education, religion, caste, wealth Index, type of housing, availability of toilet, safe water supply, cooking fuel, road density.

The extent of decline in IMR was almost similar in EAG (12.1 points) and non EAG states (12.3 points) from 2005 to 2015. Inequalities in IMR between EAG and Non-EAG states increased from 14.9 points in 2005 to 15.1 points in 2015 after adjustment for confounders. (Figure 43).

Figure 43. Comparison of infant mortality rate among EAG and Non-EAG states in 2005 and 2015.



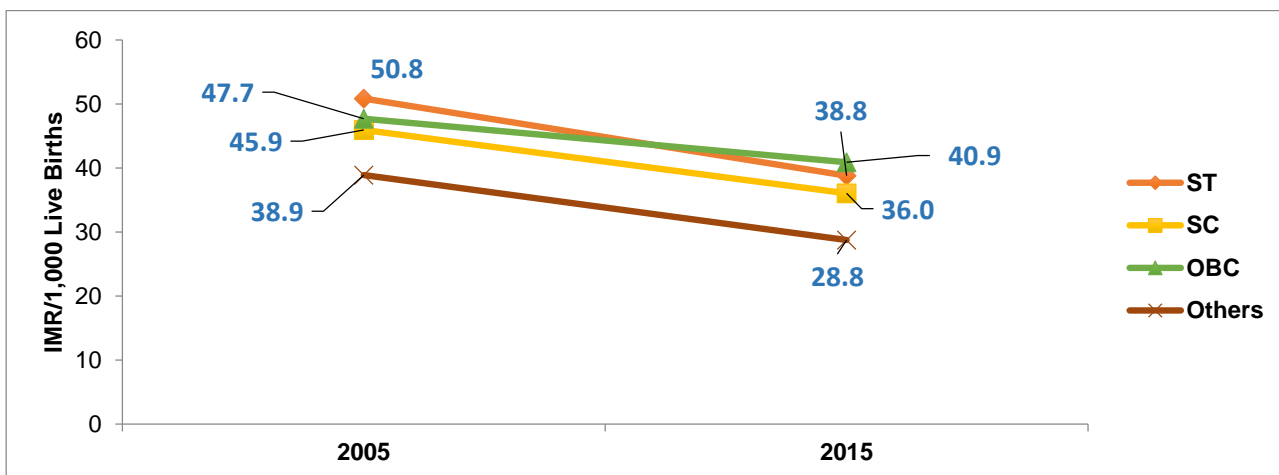
Data source: NFHS data round 3 and 4; adjusted rate of NFHS4 for maternal age, education, religion, caste, wealth index, type of housing, availability of toilet, place of residence, safe water supply, cooking fuel, road density.

Socioeconomic inequalities in IMR

Caste wise inequalities

The Infant mortality rate reduced in all the castes, reduction being the higher among scheduled tribes (ST) by 12 points from 2005 to 2015. Caste wise inequalities in IMR between schedule caste (SC) and general category reduced from 11.9 points in 2005 to 10.0 points in 2015. (Figure 44).

Figure 44. Caste wise health inequalities for infant mortality rate in 2005 and 2015.

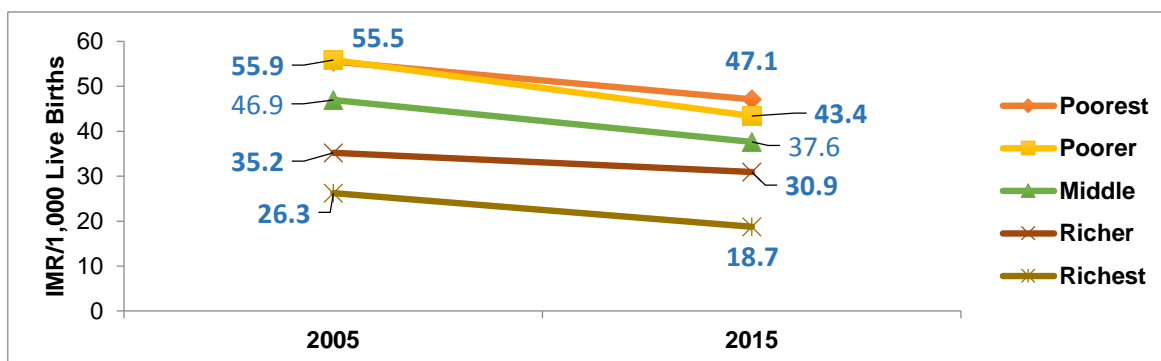


Data source: NFHS data round 3 and 4; adjusted rate of NFHS4 for maternal age, education, religion, wealth index, type of housing, availability of toilet, place of residence, safe water supply, cooking fuel, road density.

Income wise inequalities

Infant mortality rate reduced in all the quintile groups, reduction being the highest in the poorer quintile (12.5 points) and the least in richer quintile (4.3 points) from 2005 to 2015. The inequality in IMR between the poorest and richest quintile group reduced from 29.3 points to 28.4 points from 2005 to 2015. (Figure 45).

Figure 45. Wealth wise health inequalities for infant mortality rate in 2005 and 2015.



Source: NFHS data round 3 and 4; adjusted rate of NFHS4 for maternal age, education, religion, caste, type of housing, availability of toilet, place of residence, safe water supply, cooking fuel, road density.

The infant mortality rate had reduced significantly in post NHM as compared to pre NHM period. The adjusted risk was significantly less for urban area as well as for rural area in post NHM as compared to pre NHM period. ($p < 0.01$). Likewise, the adjusted risk was less for EAG states as well as for Non-EAG states in post NHM period as compared to pre NHM period. ($p < 0.01$). [Table 8].

Table 8. Health Inequalities of infant mortality rate (per 1000 live births) for children born in the three years preceding the survey.

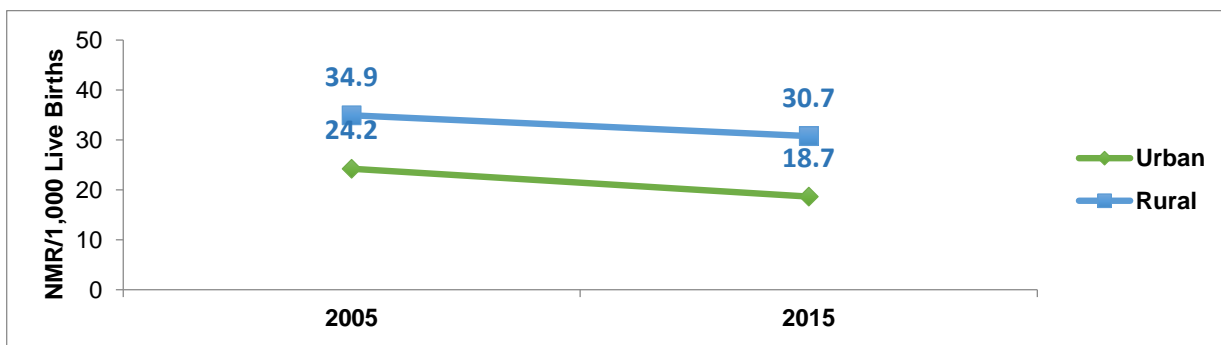
Infant Mortality Rate		Adjusted Risk Ratio	95% Confidence Interval	p-value
Place of Residence	Urban	0.8	(0.640, 0.867)	<0.01*
	Rural	0.8	(0.761, 0.883)	<0.01*
States	EAG States	0.8	(0.710, 0.837)	<0.01*
	Non-EAG States	0.7	(0.600, 0.759)	<0.01*
Caste	Schedule Caste	0.8	(0.683, 0.901)	<0.01*
	Schedule Tribe	0.8	(0.624, 0.933)	<0.01*
	Other Backward Class	0.9	(0.775, 0.949)	<0.01*
	Others	0.8	(0.639, 0.855)	<0.01*
Wealth Index	Poorest	0.9	(0.757, 0.953)	<0.01*
	Poorer	0.8	(0.680, 0.888)	<0.01*
	Middle	0.8	(0.686, 0.937)	<0.01*
	Richer	0.9	(0.726, 1.060)	0.176
	Richest	0.7	(0.512, 0.889)	<0.01*

*Significant; Source: NFHS data round 3 and 4; adjusted for maternal age, education, religion, type of housing, availability of toilet, safe water supply, cooking fuel, road density.

Geographical inequalities in NMR

NMR declined in both urban and rural areas from 2005 to 2015. The extent of decline in NMR was higher in urban (5.5 points) as compared to rural areas (4.2 points) from 2005 to 2015. The inequalities in NMR in the urban and rural areas increased from 10.7 points in 2005 to 12 points in 2015 after adjustment for confounders. (Figure 46).

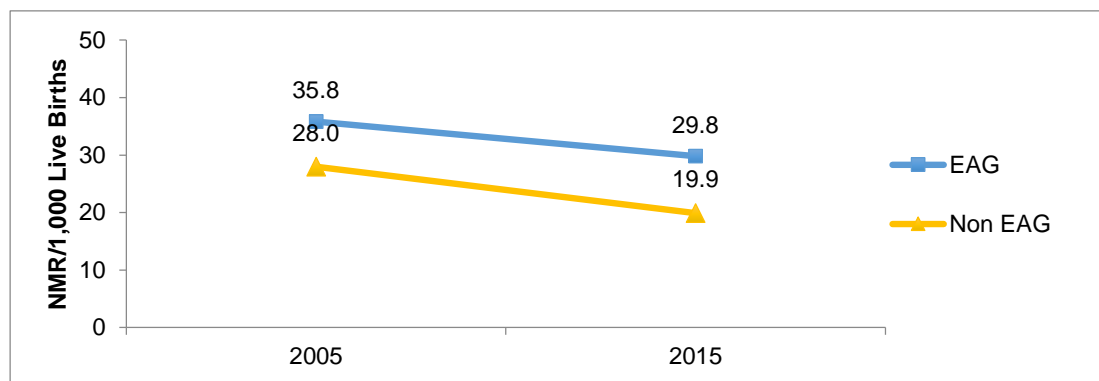
Figure 46. Comparison of neonate mortality rate among urban and rural areas in 2005 and 2015.



Source: NFHS data round 3 and 4; adjusted rate of NFHS4 for maternal age, education, religion, caste, wealth index, type of housing, availability of toilet, safe water supply, cooking fuel, road density.

Neonatal mortality rate reduced with higher reduction in Non-EAG states (8.1 points) as compared to EAG states (6.0 points) from 2005 to 2015. Inequalities in NMR between EAG and Non-EAG states increased from 7.8 points in 2005 to 9.9 points in 2015 after adjustment for confounders. (Figure 47).

Figure 47. Comparison of neonatal mortality rate among EAG and Non-EAG states in 2005 and 2015.



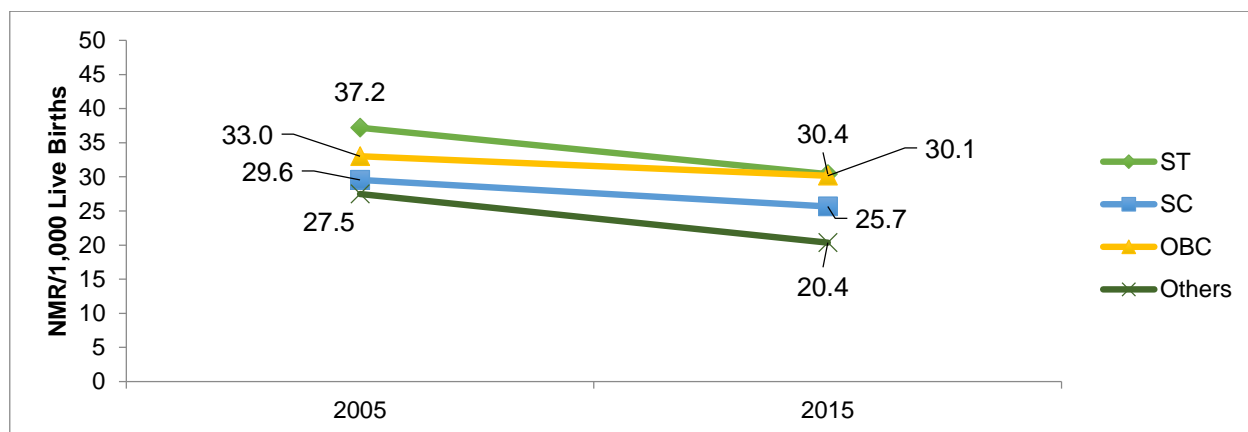
Source: NFHS data round 3 and 4; adjusted rate of NFHS4 for maternal age, education, religion, caste, wealth index, type of housing, availability of toilet, place of residence, safe water supply, cooking fuel, road density.

Socioeconomic inequalities in IMR

Caste wise inequalities

NMR reduced in all the castes, reduction being the least in other backward caste (OBC) (2.9 points) and the highest in other caste (7.1 points) category, from 2005 to 2015. (Figure 30). Caste wise inequalities in NMR between schedule tribe (ST) and general category remained almost same in 2005 (9.7 points) and 2015 (10 points). (Figure 48).

Figure 48. Caste wise health inequalities for neonate mortality rate in 2005 and 2015.

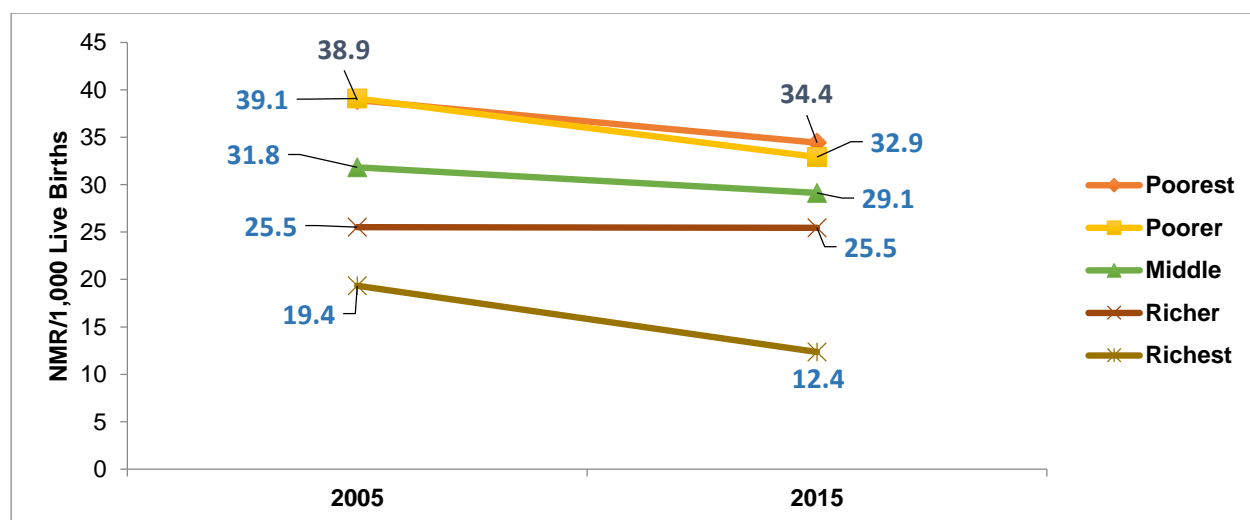


Source: NFHS data round 3 and 4; adjusted rate of NFHS4. for maternal age, education, religion, wealth index, type of housing, availability of toilet, place of residence, safe water supply, cooking fuel, road density.

Income wise inequalities in NMR

NMR reduced in all the quintile groups, reduction being poorest quintile was 4.5 points and poorer quintile was 6.2 points from 2005 to 2015. However, the inequality in NMR between the poorest and richest quintile group increased from 19.5 points to 22 points from 2005 to 2015. (Figure 49).

Figure 49. Wealth wise health inequalities for neonate mortality rate in 2005 and 2015.



Source: NFHS data round 3 and 4; adjusted rate of NFHS4 for maternal age, education, religion, caste, type of housing, availability of toilet, place of residence, safe water supply, cooking fuel, road density.

Neonatal mortality rate reduced significantly in post NHM period as compared to pre NHM period. The risk was significantly less for urban area (RR=0.7) as well as for rural area (RR=0.9) in post NHM as compared to pre NHM period. ($p < 0.01$). Similarly, the risk was significantly less for EAG states (RR=0.8) as well as for Non-EAG states (RR=0.7) in post NHM period as compared to pre NHM period. (Table 9).

Table 9. Health inequalities for neonate mortality rate (per 1000 live births) for children born in three years preceding the survey.

Neonate Mortality Rate		Adjusted Risk Ratio	95% Confidence Interval	p-value
Place of Residence	Urban	0.7	(0.645, 0.922)	<0.01*
	Rural	0.9	(0.806, 0.962)	<0.01*
States	EAG States	0.8	(0.754, 0.918)	<0.01*
	Non-EAG States	0.7	(0.620, 0.817)	<0.01*
Caste	Schedule Caste	0.9	(0.737, 1.023)	0.092
	Schedule Tribe	0.8	(0.635, 1.053)	0.119
	Other Backward Class	0.9	(0.809, 1.029)	0.134
	Others	0.7	(0.626, 0.877)	<0.01*
Wealth Index	Poorest	0.9	(0.772, 1.014)	0.080
	Poorer	0.8	(0.717, 0.989)	0.036*
	Middle	0.9	(0.760, 1.102)	0.349
	Richer	1.0	(0.798, 1.247)	0.982
	Richest	0.7	(0.498, 0.819)	<0.01*

*Significant; Source: NFHS data round 3 and 4; adjusted for maternal age, education, religion, type of housing, availability of toilet, safe water supply, cooking fuel, road density.

DISCUSSION

The results of this study have shown that there has been increase in utilization of public health services and reduction in OOPE and for MCH services post NRHM implementation period. There is improvement in availability and accessibility of health facilities after NRHM implementation. The human resources as well as infrastructure has also been strengthened in post NRHM period. MCH coverage indicators have shown improvement and overall mortality statistics (MMR and IMR) has registered a significant decline after NRHM implementation.

In this study, we have used logic model evaluation framework to evaluate the impact of National Health Mission on health care utilization, health care inequalities and health outcomes by conducting a systematic review and secondary data analysis. The logic model is helpful in showing the interrelationship among different components such as between program input and activities and desired outcomes. It also helps in understanding the complex mechanisms of whole interventions that how they work. The simplicity of logic model is one of its strength as well as weakness. However due to its simplicity it may also omits the details for clarity of the representation [366].

Earlier studies have used the logical model evaluation framework for assessing the effectiveness of interventions and showed the interrelationship among different components [61, 80, 367, 368]. By applying this approach to explain the results of this study, it was found that there has been considerable increase in inputs and processes that provides the link in improving the output in terms of improved MCH coverage indicators and ultimately outcomes and impact in terms of reduction in MCH inequalities and mortality. There is no 'control' population for establishing the cause and effect relationship, therefore the assessment of effect of interventions by measuring the inputs, processes, outputs, outcomes, and impact over a longer time horizon is considered as a best available option [61].

The results of present study shows that out of the total health expenditure, the percentage of the public health expenditure had increased from 24% to 32% from the year 2004 to 2016. In the same period, the percentage of out of pocket health expenditure had declined from 63% to 59%. Also the per capita public health expenditure had increased from Rs 579 in 2004 to Rs 1418 in 2016. Our results also revealed

that expenses at public sector facilities were lower in 2014 when compared to 2004 and the mean expenditure on deliveries at public sector facilities increased marginally (by Rs. 129) in 2004-2014 period, whereas the expenses at private health facilities increased by around Rs 7000 in this period. The catastrophic health expenditure due to deliveries at private health facilities, increased significantly in this period. Also the catastrophic health expenditure due to hospitalization and institutional deliveries for the household presented a marginal decline from 2004 to 2014. These findings are indicative of the success of NRHM's policies and programs in reducing out of pocket expenditures for institutional delivery in public sector facilities. Increased public health spending in the post-NRHM period and introduction of strategies such as the JSY and JSSK has contributed positively toward reducing out of pocket expenditures [6, 57, 102, 369].

The results of present study also shows that there is improvement in availability and accessibility and of health facilities after NRHM implementation. The human resources as well as health infrastructure has also been strengthened in post NRHM period. Our results from logistic regression analysis found that in post NRHM period there has been increase in number of ANMs, medical officers as well as increase in number of beds in rural and urban areas hospitals. The evidence which was synthesized from previous literature also validated these findings and concluded that post NRHM period there has been strengthening of health system due to improvement in health facilities, availability of ASHA, ANMs, Nurses and MOs, availability of free medicines and diet and free ambulance services [5]. Based on the achievements of NHM since 2005, it has been a guiding framework for strengthening the Indian health system [57]. The output indicators like first trimester registration, institutional delivery and post-natal check-up also increased significantly post NRHM period. The evidence showed that the NRHM interventions such as cash incentives for hospital deliveries (*Janani Suraksha Yojna*) [7, 26, 30-34, 54, 73, 74, 127], free diagnostics, treatment and diet (*Janani Shishu Suraksha Karyakram*) [80], and appointment of Accredited Social Health Activists (ASHAs) [5, 45, 63, 65, 69, 95, 354, 355] led to improvement in antenatal care, institutional delivery rate and postnatal care. We also found that various child health indicators like exclusive breastfeeding and full immunization coverage improved significantly in post NRHM period whereas acute respiratory infections reduced significantly to 2.5% from 2005 to

2015. The child health strategies of NHM/NRHM like IMNCI, immunization, micronutrient supplementation along with early diagnosis and treatment by RBSK improved the affordability, accessibility of health services which improved the child health indicators [70, 89, 94, 97, 101, 106-110, 112, 117, 155, 182, 190, 191, 194, 198, 201, 204, 205, 226, 227, 356].

Regarding the impact indicators, it was found that neonatal and infant mortality rate reduced significantly in post NHM as compared to pre NHM period. Both NMR and IMR reduced significantly from 31.6 to 27 neonatal deaths per 1000 live births and 45.1 to 36.1 infant deaths per 1000 live births from 2005 to 2015, respectively. The results from interrupted time series also found that NHM had contributed to reduce the infant mortality rate at the national level. The IMR reduced at the rate of 2.2% per year in comparison to the 1.6 % on yearly basis in pre NRHM period. The various maternal and child health interventions by NHM had succeeded well in declining maternal as well as child mortality rate. Manifestations of impact of NHM can be observed in declining trends of infant, child and maternal mortality indicators [4, 26, 34, 57].

Additionally, the logic regression analysis also looked at the health inequalities and found that in the post NRHM period there has been reduction socioeconomic and geographic inequalities for IMR. The infant mortality rate reduced with similar rate of reduction in urban and rural areas, among various caste categories, the wealth quintiles, and EAG and non-EAG states. Neonatal mortality rate reduced with highest rate of reduction in non-EAG states as compared to EAG states. However, the inequalities in NMR did not reduce across socioeconomic and geographic gradients post NHM period. It was also evident from the literature that some of the indicators are even better in rural areas as compared to urban area like receiving ORS for diarrhoea, and immunization among female children during the NRHM time period [80]. Inequalities related to institutional delivery among rich and poor also declined at steeper rate in post NRHM time period [64]. MCH inequalities reduced due to more awareness regarding MCH services by ASHA, free ambulances and diet during hospital stay [5].

We also found from the evidence that interventions other than NRHM such as road connectivity, mobile connectivity and water sanitation had positive impact on health care utilization and has increased the

chances of full vaccination, maternal health services utilization. However, the secondary data used for analysis in this study was adjusted for confounders like place of residence, maternal age, education, religion, caste, wealth index, type of housing, availability of toilet, safe water supply, cooking fuel, health worker density, road density, and telephone-density. Therefore it is unlikely that other interventions like road connectivity, mobile connectivity, water sanitation and health were much effective in improving MCH outcomes.

Strength and limitations of the study

The strength of this study is its integrated approach and holistic review of NRHM interventions related to maternal and child health. To the best of our knowledge, this was the first kind of study to evaluate the impact of NHM on health care utilization, inequalities and outcomes all together by using a logic model evaluation framework at national level. We did the holistic review of impact of NRHM interventions on health outcomes as well as the impact of interventions other than NRHM such as impact of road connectivity, mobile connectivity, water supply and sanitation on MCH outcomes at national level. Also our study has given due consideration to both pre and post intervention duration to have precise comparisons. The estimates of slope for pre, post and change at the juncture are robust and precise in comparison to the simple percentage decline over the years. The findings from the current study can be generalized, as we did the analysis for assessing the impact of NRHM on health outcomes post NRHM period at national level.

Our study has few limitations. Meta-analysis was not possible for each intervention due to heterogeneity of studies, hence formal narrative synthesis was done. For trend analysis, the appropriate number of data points remains the issue to limit the present analysis with respect to IMR only. In the absence of suitable control, we could not use the randomized control trials design which are considered to be the gold standards for the evaluation of intervention based studies. Also the inter-state comparison was not done due to variation in socio demographic and developmental characteristics of a particular state. The magnitude of the slope is valid only with respect to the previous period of the same state.

Public Health implications of the study

The results of this study have important public health implications as it was found that the public health system can improve access, affordability, and effectiveness of health care delivery especially among rural population, poor, women and children. The results of this study have shown that due to NRHM schemes there has been significant improvement in MCH outcomes, therefore these schemes should be further continued with special focus on poor women and children of rural areas. The schemes aiming at improving child health such as RBSK and on adolescent health such as WIFS, MHS needs to be strengthened. However, the investments in NRHM had been far below the requirements i.e. 1.2% of GDP for investing in health where goal was to increase it up to 2-3%. The further investments are likely to strengthen HR, institutions and supplies leading to universal health coverage for treatment, prevention and promotion and to attain NHP goals by 2025. However achievement of universal health coverage requires the more rigorous planning, stringent enforcement of laws, consistent monitoring, optimum health service delivery and innovative technologies. Hence, it can be stated that NRHM has played a role through influencing health system in terms of improving MCH outcomes and reducing the MCH inequalities. Therefore it is recommended that NHM should be continued with doubling of resources.

CONCLUSIONS

Evidence from the systematic review

- Among maternal health care strategies, JSY strategy had a strong evidence in providing financial incentives and promoting institutional delivery and reducing perinatal mortality. JSSK had a role in providing free diagnostics there by increasing the affordability. However, because of increase in the number of institutional deliveries the mortality in the institutes reported to have increase in the tertiary care hospitals indicating poor quality of intranatal and newborn care services.
- Among the communitization component of NHM, ASHA scheme had a strong evidence of reducing maternal mortality and perinatal mortality, through the pathway of contacting the pregnant women at the household level in the villages, behavior change communication, empowering and mobilizing them to the health facilities mainly for

institutional deliveries. VHND and VHNSC had weak evidence in bringing these health outcomes.

- Among child health strategies, FBNC, HBPNC, IMNCI and immunization had a strong evidence in increasing the availability, affordability and accessibility of child health services especially for the rural and poor community. RBSK and micronutrient supplements had a weak evidence in improving the child health outcomes
- Adolescent health strategies including WIFS, MHS, RKSK, AFHS had weak evidence in improving the reproductive, maternal and child health outcomes.
- Strategies under health system strengthening including increased infrastructure, free drugs and medicines, free referral services, increased human resources (MOs, specialists, ANMs) had a strong evidence in improving the availability affordability and accessibility of MCH services, leading to community mobilization to use public facilities leading to increase in the utilization of MCH services leading to early diagnosis and treatment of child hood illnesses, improved antenatal and postnatal care leading ultimately to improved MCH outcomes.
- Evidence for use mobile medical units was weak in improving the MCH outcomes.

Evidence from secondary data analysis

- Maternal mortality ratio (MMR) declined by 52%, from 257 per lakh live births in 2004-06 to 122 per lakh live births, in 2015-17. Nearly, 34.3% decline in MMR occurred during NRHM period (2004-06 to 2011-13) and 26.9% decline during NHM period (2011-13 to 2015-17). Rate of decline per year was 12.7 points during 2004-06 to 2011-13, and it was 11.3 points post 2011-13.
- Under five mortality rate (U5MR) declined from 78 to 37 per thousand live births from 2005 to 2019, as per Unicef's child mortality estimates. Overall, there is 52.6% reduction in U5MR from 2005 to 2019, with 33.3% during NRHM period (2005-12) and 28.8%

during NHM period (2013-2019). Rate of decline per year was 3.7 points before and 2.5 points after the year 2013.

- Rate of decline in U5MR per year increased from 2.6 points during 2008-12 to 5.25 points after the year 2013, in Assam. Minimum reduction was seen in the state of Kerala which varied from 14 to 11 in the same time period, as it already had very low U5MR. States where rate of decline increased per year after the year 2013 were Gujarat (2.4 to 3 points), HP (1.4 to 3.5 points), Jammu and Kashmir (2.4 to 3.5), Jharkhand (3.0 to 3.75) and West Bengal (0.8 to 2 points).
- The infant mortality rate (IMR) had declined from 58 per 1000 live births to 40 per thousand live births during 2005-13 (NRHM period) and to 33 per 1000 live births during 2013-17 (NHM period). The interrupted time series analysis have shown that the rate of decline in IMR was 2.42 infant deaths per 1000 live births per annum before 2013, and it accelerated to 2.10 infant deaths per 1000 live births per annum after the year 2013-17. There was lot of interstate variability in IMR.
- Overall the neonatal mortality reduced from 38 per thousand live births to 22 per thousand live births, with a percentage decline of 42.1% from 2005 to 2019, as per Unicef's Child mortality estimates. The rate of decline per year was 1.4 points from 2005 to 2013 and 1.0 from 2013 to 2019.
- Overall, the rate of decline per year for NMR was slower than the rate of decline in IMR and U5MR.
- The percentage decline was less for NMR (42.1%) as compared with IMR (43.1%) and U5MR (52.6%), from 2005-19. However, the percentage decline for NMR (21.4%) was higher as compared with IMR (17.5%) during NHM period (2013-17). This could be attributed to better implementation of facility based new born care including sick new born care units as evidenced from systematic review.

- Total fertility rate has declined from 2.82 to 2.24 from 2007 to 2017. The percentage decline was 20.6% in this period, with 15.6% decline till 2013 and 5.9% decline after 2013.
- NHM has led to the improvement in the MCH outcomes. Also post NRHM period there has been increase in the human resources and infrastructure and due to increase in affordability, accessibility there is better access of MCH services.
- There has been reduction in out of pocket expenditure (OOPE) for MCH and MCH indicators have shown improvement which has led to reduction in IMR, NMR and MMR. However, human resources and infrastructure are still half of the requirement. Also MCH practices and utilization of services are still not optimum. Despite reduction in expenditure, OOPE is still high.
- Though the mortality indicators for maternal and child health have been declined, the IMR, NMR and MMR is still high. The NHM has worked in both supply and demand side components of public health system. Despite, the evidences on improved status of public health system and decline in the targeted health indicators, the goal of equitable, affordable and quality health care is still not fully achieved.

RECOMMENDATIONS

Maternal Health strategies

It is recommended to strengthen the implementation of successful schemes like ASHA, *Janani Suraksha Yojana*, *Janani Shishu Suraksha Karyakram*, which have shown to be associated with improvement in maternal health indicators. More focus should be given for JSY implementation as there was high variability in implementation of JSY from state to state. Also there was low coverage of JSY due to the inadequate funds for JSY and delayed payments which should be taken into consideration. Increase in the hospital based maternal mortality indicated poor quality of intranatal maternal care services. Hence, there is need to focus on providing quality maternal health care services especially during intranatal period. Laqshay strategy might have led to improvement in the intranatal health care practices, which need to be evaluated in the near future.

Child health strategies

All facility based newborn care centers including NBCC, NBSU and SNCU should be strengthened, and monitored by experts regularly to check the equipment status and ensure that health personnel are following standard guidelines. Training regarding NSSK should be provided to all the health personnel involved in newborn care. Health care personnel in the delivery points should be sensitized or reoriented time to time regarding various knowledge and skill for newborn care. It was found that there is an increased risk of stillbirths in deferred and referred deliveries in addition to demographic and clinical risk factors for ante-partum and intrapartum stillbirths which highlight the aspects of health care that need attention in addition to improving skills of health providers to reduce stillbirths. In case of referrals, partnership with private sector for improved quality of care in referrals should be encouraged. It is also recommended to further strengthen the implementation of immunization services, home based post-natal check-ups, integrated

management of childhood and neonatal illnesses, Nutritional Rehabilitation Centers, as these were evidenced to have strong association with improving the child health outcomes. Strategies like micronutrient supplementation, RBSK need to be further evaluated for their effectiveness in improving the child health outcomes.

Reproductive Health strategies

The reproductive health indicators had definitely improved after inception of ASHA worker in rural community. There is also an urgent need for such a change in urban area for proper coverage of urban population. There is a need to take corrective measure on tribal population as well as for EAG states as the prevalence of contraceptive usage was found to be less among tribal population.

Adolescent Health strategies

Adolescent health strategies after merging with school health program can have better performance so as to involve teachers, also to educate the children as well as adolescents and counsel them according to their needs. Training should be given to mothers as well as the teachers about menstrual hygiene as they are the primary source of information. ARSH strategy needs to be advertised more effectively specially the focus should be on RTI/STI and not only on HIV. NRHM has raised the awareness about menstrual hygiene among adolescents but there is less awareness of government scheme of distribution of sanitary napkins on subsidized rates. It can be advertised more effectively by strengthening the IEC activities such as regular awareness campaigns, community based awareness activities.

Communitization

Periodical refresher training and continuous capacity-building to improve knowledge and skills of ASHAs should be conducted for the ASHA workers. ANMs and ASHAs should also be employed to track the nutritional status of every child after their discharge from

the NRC and also for community based follow up and appropriate feedback to the mothers. Also training of community health workers to address potential biases in quality and quantity of their house visits based on socioeconomic, class and caste is recommended so that inequalities can be reduced. The incentives can be increased for ASHAs to mobilize the people of ST, SC and other minor communities. Microteaching using video recording is an effective technique for improving home-based postnatal care skills of the health care workers and a feasible option for supportive supervision. This supervisory tool has public health implications in terms of scaling it up in routine program settings to improve maternal and newborn survival. Greater coverage of ante-partum, intrapartum and early postnatal health interventions in combination with promotion of health care seeking behavior and links between communities and health facilities in areas with lesser use of health care services should be enhanced.

Health system strengthening

It is recommended to strengthen the implementation of successful schemes like free ambulance service, free medicine and diagnostic facilities, increased human resource especially doctors and nurses as these have been evidenced to be associated with improvement in maternal and child health outcomes. The schemes like medical mobile units need to be reviewed again for their impact and utility, as these were found to be weakly associated with improvement in MCH indicators. Resources spent upon this strategy can be diverted to more effective strategies like free ambulance services. It is also recommended to increase percentage of state budget on health to 8%, increase the per capita public health expenditure in health from INR 1418 to INR 3000, increase the number of beds in government hospitals & CHCs from 0.6 to at least 1 per 1000 population, increase the number of doctors, nurses and ANMs per 10,000 population in

government health facilities as per IPHS, and to establish one Arogya Kendra per 1000 population with one full time Health Promoter/Community Health Worker.

ANNEXURES

ANNEXURE 1. PRISMA CHECKLIST.

Section/topic	#	Checklist item	Page No.
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	N/A
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	N/A
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	7
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	8
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	annexure 2
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	9-12
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	12-13
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	13 and annexure 3
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	13

Section/topic	#	Checklist item	Page No.
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	14
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	11-12
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	N/A
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	N/A
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	14 and Annexure 4
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	N/A
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	N/A
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	13
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	27-28 and annexure 4
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	N/A
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	Annexure 4 and 5
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	Annexure 4 (N/A)

Section/topic	#	Checklist item	Page No.
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	N/A
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression -see Item 16).	N/A
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	53-58
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	56-57
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	58
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	N/A

ANNEXURE 2. PROTOCOLS FOR SYSTEMATIC REVIEW

The review protocols were registered with an open-access electronic database-PROSPERO (International prospective register of systematic reviews). The protocol details are given below:

2.1. Impact of National Health Mission on Maternal Mortality Ratio of India: A systematic review

Review Question

Do National Health Mission strategies had any impact on maternal mortality ratio of India?

Searches

Studies published between the years 2005 and 2018 will be identified using the PubMed, EMBASE databases and Google Scholar. MeSH terms will be used to search the references and the reference lists of all identified articles on interventions will be checked to identify relevant studies.

Types of studies to be included

Both quantitative and qualitative studies focusing upon impact of National Health Mission strategies on maternal mortality ratio will be included for review. In addition grey literature will be hand searched and evidence including reports from government and non-governmental agencies and reports from international agencies will also be included.

Condition or domain being used

This systematic review focuses on impact of National Health Mission strategies on maternal mortality ratio.

Participants/population

Pregnant/antenatal, postpartum women.

Intervention(s), Exposure(s)

The exposure refers to any strategy of National Health Mission (NHM) India focussing on maternal mortality ratio (MMR) of India. The main aim of NHM interventions such as Accredited Social Health Activist (ASHA), Janani Suraksha Yojana (JSY), Janani Shishu Suraksha Karyakaram (JSSK), referral transport is to promote institutional deliveries for reducing maternal mortality ratio. These might be in the form of counselling, advertising, communitization, incentive or any other method of promoting

institutional deliveries such as collaborating with nongovernmental organizations, private sectors and public sector undertakings through public private partnerships or reaching out to rural and poor and other marginalized populations.

Comparator(s)/control

Not applicable

Primary outcome(s)

The primary outcome for this review is: Decrease in maternal mortality ratio.

Secondary outcome(s)

The secondary outcome for this review is: Increase in rate of institutional deliveries.

Data extraction

After identifying eligible studies, data will be extracted using a structured form by two reviewers using PRISMA guidelines. The form will contain:

1. Source: Citation and other contact details.
2. Eligibility: Including the reasons for inclusion.
3. Methods: Including the study design, study duration, sequence generation, allocation concealment, and blinding.
4. Participants: Number and socio-demographics.
5. Interventions: Total groups or arms, and intervention details.
6. Outcomes: Outcomes measurement, outcomes definition, scales used if any (with time points of collection).
7. Results: Number of participants allocated in each group, sample size, missing data, summary data, effect size estimates, and subgroup analysis (if applicable).
8. Other: Sources of funding.
9. Key conclusions.
10. Limitations.
11. Comments by the review authors.
12. Implications/Recommendations.

Two reviewers will extract the data independently and discuss with the other reviewers in case of any disagreement. Reviewers will enter relevant information into Review Manager 5.1 or STATA for meta-analysis using a structured data extraction form.

Risk of bias (quality) assessment

For this review, quality assessment would be conducted primarily for included studies focussing primarily on maternal mortality ratio. However, systematic data extraction would be conducted for all relevant sources.

Strategy for data synthesis

Aggregate data will be used to synthesize results depending on the quality of the mined data. A formal narrative synthesis will be done showing impact of each strategy of NHM on maternal mortality ratio. Meta-analysis will be conducted depending on availability of eligible studies. Minimum 5 studies will be pooled and the results will be interpreted by using summary measures like risk ratio (in case of RCTs) or percentages (in case of cross-sectional studies). The research findings will be aggregated to examine the effectiveness of the interventions in focus under National Health Mission. The different interventions will be pooled separately and the results will be described for each intervention. The results of those studies which primarily focused upon maternal mortality ratio without referring to any particular intervention will not be pooled for meta-analysis and will be narrated in the results. Finally, recommendations will be made according to results obtained after extracting the results from each eligible study. Subgroup analysis will be conducted as per the nature of the data obtained.

Subject index terms

National Rural Health Mission, National Urban Health Mission, National Health Mission, Maternal Mortality Ratio, Institutional Deliveries, Institutional Delivery Rate.

2.2. Impact of National Health Mission on Perinatal mortality rate of India: A Systematic Review

Registration ID: CRD42020147992

Review Question

In India, what is the impact of National Health Mission strategies on perinatal mortality rate?

Searches

Studies published between the years 2005 and 2018 will be identified using the PubMed, EMBASE. Relevant articles and reports will be searched in Google and Google Scholar. Appropriate search strategy would be used for conducting search in databases. In addition, the reference lists of all identified articles on interventions will be checked to identify relevant studies.

Types of studies to be included

Both quantitative and qualitative studies focusing upon impact of National Health Mission strategies on perinatal mortality rate will be included for review. In addition grey literature will be hand searched and evidence including reports from government and non-governmental agencies and reports from international agencies will also be included.

Condition or domain being used

This systematic review focuses on impact of National Health Mission strategies on perinatal mortality rate in India.

Participants

Neonates, antenatal/pregnant women, post-natal women.

Intervention(s), Exposure(s)

The exposure refers to any strategy focusing on improving perinatal health under the various strategies implemented under National Health Mission, India. These interventions might be in the form of counselling, advertising or any other method of improving neonatal health (such as collaborating with nongovernmental organizations, private sectors and public sector undertakings) through public private partnerships or reaching out to rural and poor and other marginalized populations.

Comparator(s)/control

Not applicable

Primary outcome(s)

The primary outcome for this review is: Perinatal mortality rate

Secondary outcome(s)

The secondary outcomes include: Stillbirth rate, Early Neonatal mortality rate.

Data extraction

After identifying eligible studies, data will be extracted using a structured form by two reviewers using PRISMA guidelines. The form will contain:

1. Source: Citation and other contact details.
2. Eligibility: Including the reasons for inclusion.
3. Methods: Including the study design, study duration, sequence generation, allocation concealment, and blinding.
4. Participants: Number and socio-demographics.
5. Interventions: Total groups or arms, and intervention details.
6. Outcomes: Outcomes measurement, outcomes definition, scales used if any (with time points of collection).
7. Results: Number of participants allocated in each group, sample size, missing data, summary data, effect size estimates, and subgroup analysis (if applicable).
8. Other: Sources of funding.
9. Key conclusions.
10. Limitations.
11. Comments by the review authors.
12. Implications/Recommendations.

The two reviewers will extract the data independently and discuss with the third reviewer in case of any disagreement. Reviewers will enter relevant information into Review Manager 5.1 or STATA for meta-analysis using a structured data extraction form.

Risk of bias (quality) assessment

For this review, quality assessment would be conducted primarily for included studies focusing primarily on perinatal mortality in India. However, systematic data extraction would be conducted for all relevant sources.

Strategy for data synthesis

Aggregate data will be used to synthesize results depending on the quality of the mined data. A formal narrative synthesis will be done showing the impact of each strategy of NHM on perinatal mortality rate. The meta-analysis will be conducted depending on the availability of eligible studies. Minimum 5 studies will be pooled and the results will be interpreted by using summary measures like risk ratio (in the case of RCTs) or percentages (in the case of cross-sectional studies) depending upon the study findings. The research findings will be aggregated to examine the effectiveness of the interventions in focus under the National Health Mission. The different interventions will be pooled separately and the results will be described for each intervention. The results of those studies which primarily focused upon neonatal mortality rate without referring to any particular intervention will not be pooled for meta-analysis and will be narrated in the results. Finally, recommendations will be made according to results obtained after extracting the results from each eligible study. Subgroup analysis will be conducted as per the nature of the data obtained.

Subject index terms

National Rural Health Mission, National Urban Health Mission, National Health Mission strategies, perinatal mortality rate.

2.3. Impact of National Health Mission on neonatal mortality rate of India: A Systematic Review

Review Question

In India, what is the impact of newborn health strategies under National Health Mission on neonatal mortality rate?

Searches

Studies published between the years 2005 and 2018 will be identified using the PubMed, EMBASE. Relevant articles and reports will be searched in Google and Google Scholar. Appropriate search strategy would be used for conducting search in databases. In addition, the reference lists of all identified articles on interventions will be checked to identify relevant studies.

Types of studies to be included

Both quantitative and qualitative studies focusing upon impact of National Health Mission strategies on neonatal mortality rate will be included for review. In addition grey literature will be hand searched and evidence including reports from government and non-governmental agencies and reports from international agencies will also be included.

Condition or domain being used

This systematic review focuses on impact of National Health Mission strategies on neonatal mortality in India.

Participants

Neonates, antenatal/pregnant women, post-natal women.

Intervention(s), Exposure(s)

Aggregate data will be used to synthesize results depending on the quality of the mined data. A formal narrative synthesis will be done showing the impact of each strategy of NHM on neonatal mortality rate. The meta-analysis will be conducted depending on the availability of eligible studies. Minimum 5 studies will be pooled and the results will be interpreted by using summary measures like risk ratio (in the case

of RCTs) or percentages (in the case of cross-sectional studies) depending upon the study findings. The research findings will be aggregated to examine the effectiveness of the interventions in focus under the National Health Mission. The different interventions will be pooled separately and the results will be described for each intervention. The results of those studies which primarily focussed upon neonatal mortality rate without referring to any particular intervention will not be pooled for meta-analysis and will be narrated in the results. Finally, recommendations will be made according to results obtained after extracting the results from each eligible study. Subgroup analysis will be conducted as per the nature of the data obtained.

Comparator(s)/control

Not applicable

Primary outcome(s)

The primary outcome for this review is: Neonatal mortality rate

Secondary outcome(s)

The secondary outcomes include:

- Breast feeding practices
- Newborn care practices
- Prevalence of LBW

Data extraction

After identifying eligible studies, data will be extracted using a structured form by two reviewers using PRISMA guidelines. The form will contain:

1. Source: Citation and other contact details.
2. Eligibility: Including the reasons for inclusion
3. Methods: Including the study design, study duration, sequence generation, allocation concealment, and blinding
4. Participants: Number and socio-demographics
5. Interventions: Total groups or arms, and intervention details

6. Outcomes: Outcomes measurement, outcomes definition, scales used if any (with time points of collection)
7. Results: Number of participants allocated in each group, sample size, missing data, summary data, effect size estimates, and subgroup analysis (if applicable)
8. Other: Sources of funding
9. Key conclusions
10. Limitations
11. Comments by the review authors
12. Implications/Recommendations

The two reviewers will extract the data independently and discuss with the third reviewer in case of any disagreement. Reviewers will enter relevant information into Review Manager 5.1 or STATA for meta-analysis using a structured data extraction form.

Risk of bias (quality) assessment

For this review, quality assessment would be conducted primarily for included studies focusing primarily on neonatal mortality in India. However, systematic data extraction would be conducted for all relevant sources.

Strategy for data synthesis

Aggregate data will be used to synthesize results depending on the quality of the mined data. A formal narrative synthesis will be done showing the impact of each strategy of NHM on neonatal mortality rate. The meta-analysis will be conducted depending on the availability of eligible studies. Minimum 5 studies will be pooled and the results will be interpreted by using summary measures like risk ratio (in the case of RCTs) or percentages (in the case of cross-sectional studies) depending upon the study findings. The research findings will be aggregated to examine the effectiveness of the interventions in focus under the National Health Mission. The different interventions will be pooled separately and the results will be described for each intervention. The results of those studies which primarily focussed upon neonatal mortality rate without referring to any particular intervention will not be pooled for meta-analysis and will be narrated in the results. Finally, recommendations will be made according to results obtained after

extracting the results from each eligible study. Subgroup analysis will be conducted as per the nature of the data obtained.

Subject index terms

National Rural Health Mission, National Urban Health Mission, National Health Mission, Child health strategies, Neonatal mortality rate.

2.4. Impact of National Health Mission on infant mortality rate of India: A Systematic Review

Review Question

In India, what is the impact of child health strategies under National Health Mission on infant mortality rate?

Searches

Studies published between the years 2005 and 2018 will be identified using the PubMed, EMBASE. Relevant articles and reports will be searched in Google and Google Scholar. Appropriate search strategy would be used for conducting search in databases. In addition, the reference lists of all identified articles on interventions will be checked to identify relevant studies.

Types of studies to be included

Both quantitative and qualitative studies focusing upon impact of National Health Mission strategies on infant mortality rate will be included for review. In addition grey literature will be hand searched and evidence including reports from government and non-governmental agencies and reports from international agencies will also be included.

Condition or domain being used

This systematic review focuses on impact of National Health Mission strategies on infant mortality in India.

Participants

Women in reproductive age group (15-49 years)/eligible couples, Newborns, Infants, ASHA workers, ANMs, Anganwadi workers, Service providers.

Intervention(s), Exposure(s)

The exposure refers to any strategy focusing on improving infant health under the Child Health Programme implemented under National Health Mission, India. These interventions might be in the form of counselling, advertising or any other method of improving infant health (such as collaborating with nongovernmental organizations, private sectors and public sector undertakings) through public private partnerships or reaching out to rural and poor and other marginalized populations.

Comparator(s)/control

Not applicable

Primary outcome(s)

The primary outcome for this review is: Infant mortality rate

Secondary outcome(s)

The secondary outcomes include:

- Prevalence of exclusive breast feeding
- Increased knowledge of ASHAs in HBPNC
- Increase in immunization coverage

Data extraction

After identifying eligible studies, data will be extracted using a structured form by two reviewers using PRISMA guidelines. The form will contain:

1. Source: Citation and other contact details.
2. Eligibility: Including the reasons for inclusion
3. Methods: Including the study design, study duration, sequence generation, allocation concealment, and blinding
4. Participants: Number and socio-demographics
5. Interventions: Total groups or arms, and intervention details

6. Outcomes: Outcomes measurement, outcomes definition, scales used if any (with time points of collection)
7. Results: Number of participants allocated in each group, sample size, missing data, summary data, effect size estimates, and subgroup analysis (if applicable)
8. Other: Sources of funding
9. Key conclusions
10. Limitations
11. Comments by the review authors
12. Implications/Recommendations

The two reviewers will extract the data independently and discuss with the third reviewer in case of any disagreement. Reviewers will enter relevant information into Review Manager 5.1 or STATA for meta-analysis using a structured data extraction form.

Risk of bias (quality) assessment

For this review, quality assessment would be conducted primarily for included studies focusing primarily on infant mortality in India. However, systematic data extraction would be conducted for all relevant sources.

Strategy for data synthesis

Aggregate data will be used to synthesize results depending on the quality of the mined data. A formal narrative synthesis will be done showing the impact of each strategy of NHM on infant mortality rate. The meta-analysis will be conducted depending on the availability of eligible studies. Minimum 5 studies will be pooled and the results will be interpreted by using summary measures like risk ratio (in the case of RCTs) or percentages (in the case of cross-sectional studies) depending upon the study findings. The research findings will be aggregated to examine the effectiveness of the interventions in focus under the National Health Mission. The different interventions will be pooled separately and the results will be described for each intervention. The results of those studies which primarily focused upon neonatal mortality rate without referring to any particular intervention will not be pooled for meta-analysis and will be narrated in the results. Finally, recommendations will be made according to results obtained after

extracting the results from each eligible study. Subgroup analysis will be conducted as per the nature of the data obtained.

Subject index terms

National Rural Health Mission, National Urban Health Mission, National Health Mission, Child health strategies, Infant mortality rate.

2.5 Impact of National Health Mission on under 5 child mortality rate of India: A Systematic Review

Review Question

In India, what is the impact of child health strategies under National Health Mission on under 5 child mortality rate?

Searches

Studies published between the years 2005 and 2018 will be identified using the PubMed, EMBASE. Relevant articles and reports will be searched in Google and Google Scholar. Appropriate search strategy would be used for conducting search in databases. In addition, the reference lists of all identified articles on interventions will be checked to identify relevant studies.

Types of studies to be included

Both quantitative and qualitative studies focusing upon impact of National Health Mission strategies on mortality rate in children under 5 years will be included for review. In addition grey literature will be hand searched and evidence including reports from government and non-governmental agencies and reports from international agencies will also be included.

Condition or domain being used

This systematic review focuses on impact of National Health Mission strategies on child mortality in India.

Participants

Children up-to the age group of 5 years.

Intervention(s), Exposure(s)

The exposure refers to any strategy focusing on improving child health under the Child Health Programme implemented under National Health Mission, India. These interventions might be in the form of counselling, advertising or any other method of improving child health (such as collaborating with nongovernmental organizations, private sectors and public sector undertakings) through public private partnerships or reaching out to rural and poor and other marginalized populations.

Comparator(s)/control

Not applicable

Primary outcome(s)

The primary outcome for this review is:

Under 5 child mortality rate

Secondary outcome(s)

The secondary outcomes include:

- Increase in immunization coverage
- Decrease in malnutrition
- Increase in Vitamin A supplementation
- Incidence of pneumonia and diarrhoea
- Early detection and treatment of diseases

Data extraction

After identifying eligible studies, data will be extracted using a structured form by two reviewers using PRISMA guidelines. The form will contain:

1. Source: Citation and other contact details.
2. Eligibility: Including the reasons for inclusion
3. Methods: Including the study design, study duration, sequence generation, allocation concealment, and blinding
4. Participants: Number and socio-demographics
5. Interventions: Total groups or arms, and intervention details
6. Outcomes: Outcomes measurement, outcomes definition, scales used if any (with time points of collection)

7. Results: Number of participants allocated in each group, sample size, missing data, summary data, effect size estimates, and subgroup analysis (if applicable)

8. Other: Sources of funding

9. Key conclusions

10. Limitations

11. Comments by the review authors

12. Implications/Recommendations

The two reviewers will extract the data independently and discuss with the third reviewer in case of any disagreement. Reviewers will enter relevant information into Review Manager 5.1 or STATA for meta-analysis using a structured data extraction form.

Risk of bias (quality) assessment

For this review, quality assessment would be conducted primarily for included studies focusing primarily on child mortality in India. However, systematic data extraction would be conducted for all relevant sources.

Strategy for data synthesis

Aggregate data will be used to synthesize results depending on the quality of the mined data. A formal narrative synthesis will be done showing the impact of each strategy of NHM on under five mortality rate. The meta-analysis will be conducted depending on the availability of eligible studies. Minimum 5 studies will be pooled and the results will be interpreted by using summary measures like risk ratio (in the case of RCTs) or percentages (in the case of cross-sectional studies) depending upon the study findings. The research findings will be aggregated to examine the effectiveness of the interventions in focus under the National Health Mission. The different interventions will be pooled separately and the results will be described for each intervention. The results of those studies which primarily focused upon neonatal mortality rate without referring to any particular intervention will not be pooled for meta-analysis and will be narrated in the results. Finally, recommendations will be made according to results obtained after extracting the results from each eligible study. Subgroup analysis will be conducted as per the nature of the data obtained.

Subject index terms

National Rural Health Mission, National Urban Health Mission, National Health Mission, Child health strategies, U 5 child mortality rate.

2.6. Impact of National Health Mission on total fertility rate of India: A systematic review

Review Question

In India,

1. Do the family planning program under National Health Mission had any impact on total fertility rate?
2. Do the family planning program under National Health Mission had any impact on contraceptive prevalence rate?

Searches

Studies published between the years 2005 and 2018 will be identified using the PubMed, EMBASE and CINAHL. The reference lists of all identified articles on interventions will be checked to identify relevant studies. In addition, citations tracking of prominent researchers working in the field of family planning will be conducted to identify relevant articles. Further, hand-searching of the contents of reputed obstetric/public health journals and conference proceedings will also be conducted. Relevant articles and reports will be searched in Google, Google Scholar, and in databases of agencies such as UNICEF and WHO.

Types of studies to be included

Both quantitative and qualitative studies focussing upon impact of NHM strategies on family planning or contraceptive usage will be included for review. In addition grey literature will be hand searched and evidence including reports from government and non-governmental agencies and reports from international agencies will also be included.

Condition or domain being used

This systematic review focuses on family planning and contraceptive prevalence in India.

Participants

Women in reproductive age group (15-49 years)/ eligible couples.

Intervention(s), Exposure(s)

The exposure refers to any strategy focusing on birth control under the reproductive health program implemented by the Ministry of Health and Family Welfare, India. These interventions might be in the form of counselling, advertising, communitization or any other method of promoting family planning methods (such as collaborating with nongovernmental organizations, private sectors and public sector undertakings through public private partnerships or reaching out to rural and poor and other marginalized populations.

Comparator(s)/control

Not applicable

Primary outcome(s)

The primary outcomes for this review are:

- Total fertility rate
- Contraceptive prevalence rate

Secondary outcome(s)

The secondary outcomes include:

- Total unmet need
- Gaps in strategies for family planning under National Health Mission.

Data extraction

After identifying eligible studies, data will be extracted using a structured form by two reviewers using PRISMA guidelines. The form will contain:

1. Source: Citation and other contact details.
2. Eligibility: Including the reasons for inclusion
3. Methods: Including the study design, study duration, sequence generation, allocation concealment, and blinding
4. Participants: Number and socio-demographics
5. Interventions: Total groups or arms, and intervention details

6. Outcomes: Outcomes measurement, outcomes definition, scales used if any (with time points of collection)
7. Results: Number of participants allocated in each group, sample size, missing data, summary data, effect size estimates, and subgroup analysis (if applicable)
8. Other: Sources of funding
9. Key conclusions
10. Limitations
11. Comments by the review authors
12. Implications/Recommendations

The two reviewers will extract the data independently and discuss with the third reviewer in case of any disagreement. Reviewers will enter relevant information into Review Manager 5.1 or STATA for meta-analysis using a structured data extraction form.

Risk of bias (quality) assessment

For this review, quality assessment would be conducted primarily for included studies focusing primarily on total fertility rate in India. However, systematic data extraction would be conducted for all relevant sources. For this review, quality assessment would be conducted primarily on total fertility rate and contraceptive prevalence rate in India. However, systematic data extraction would be conducted for all relevant sources. The Cochrane risk of bias tool will be used to assess the internal validity. The quality assessment will be done by two reviewers and any disagreement between reviewers judgement will be resolved by the third reviewer. Depending upon the study design the risk of bias will be assessed. In randomized control trials the clarity in description of randomization, allocation concealment and blinding will be assessed. The study will be assessed critically on the basis of methodology followed in the study. The studies will be segregated in terms of low, moderate and high risk of bias. The studies with minimal risk of bias will be pooled for meta-analysis.

Strategy for data synthesis

Aggregate data will be used to synthesize results depending on the quality of the mined data. A formal narrative synthesis will be done showing the impact of each strategy of NHM on total fertility rate. The meta-analysis will be conducted depending on the availability of eligible studies. Minimum 5 studies will be pooled and the results will be interpreted by using summary measures like risk ratio (in the case of

RCTs) or percentages (in the case of cross-sectional studies) depending upon the study findings. The research findings will be aggregated to examine the effectiveness of the interventions in focus under the National Health Mission. The different interventions will be pooled separately and the results will be described for each intervention. The results of those studies which primarily focused upon neonatal mortality rate without referring to any particular intervention will not be pooled for meta-analysis and will be narrated in the results. Finally, recommendations will be made according to results obtained after extracting the results from each eligible study. Subgroup analysis will be conducted as per the nature of the data obtained.

Analysis of subgroups or subsets

We will conduct appropriate analysis as per the nature of data. Differences in subgroups (e.g. urban and rural settings, education status) on outcomes such as contraceptive prevalence rate will be summarized by relevant measures (e.g., rate ratios).

Subject index terms

National Rural Health Mission, National Urban Health Mission, National Health Mission, Total Fertility Rate, Family Planning, Contraceptive Prevalence Rate.

2.7 Level of awareness and utilization of Adolescent Reproductive and Sexual Health Services clinics in India: A systematic review

Review Question

In India,

- 1) What is the level of awareness and utilization of adolescent reproductive and sexual health service clinics in India?

Searches

Studies published between the years 2005 and 2018 will be identified using the PubMed, EMBASE. The reference lists of all identified articles on interventions will be checked to identify relevant studies. In addition, citations tracking of prominent researchers working in the field of adolescent health will be conducted to identify relevant articles. Further, hand-searching of the contents of reputed public health journals and conference proceedings will also be conducted. Relevant articles and reports will be searched in Google, Google Scholar, and in databases of agencies such as WHO.

Types of studies to be included

Both quantitative and qualitative studies focusing upon awareness of adolescent reproductive and sexual health service (ARSH) clinics implemented as a strategy under national health mission (NHM) for providing information regarding sex, stages of development, RTI/STI or menstrual hygiene to the adolescent age group will be included for review. In addition, grey literature will be hand searched and evidence including reports from government and non-governmental agencies and reports from international agencies will also be included.

Condition or domain being used

This systematic review focuses on level of awareness and utilization of adolescent reproductive and sexual health service clinics in India.

Intervention(s), Exposure(s)

The exposure refers to the awareness and utilization of ARSH services under NHM implemented by the Ministry of Health and Family Welfare, India by adolescents for any purpose related to their health. The purpose may be for procuring sanitary napkins or asking for any guidance from counsellors.

Comparator(s)/control

In case a randomized control study or a quasi-experimental study has been conducted the controls will include those adolescents which will not be given the above stated intervention.

Primary outcome(s)

The primary outcomes for this review are:

- Awareness and utilization of adolescent reproductive and sexual health service clinics

Secondary outcome(s)

Nil

Data extraction

After identifying eligible studies, data will be extracted using a structured form by two reviewers using PRISMA/STROBE guidelines. The form will contain:

1. Source: Citation and other contact details.
2. Eligibility: Including the reasons for inclusion
3. Methods: Including the study design, study duration, sequence generation, allocation concealment, and blinding (if applicable)
4. Participants: Number and socio-demographics
5. Interventions: Total groups or arms, and intervention details
6. Outcomes: Outcomes measurement, outcomes definition, scales used if any (with time points of collection)
7. Results: Number of participants allocated in each group, sample size, missing data, summary data, effect size estimates, and subgroup analysis (if applicable)
8. Other: Sources of funding
9. Key conclusions
10. Limitations

11. Comments by the review authors

12. Implications/Recommendations

The two reviewers will extract the data independently and discuss with the third reviewer in case of any disagreement. Reviewers will enter relevant information into Review Manager 5.1 or STATA for meta-analysis using a structured data extraction form.

Risk of bias (quality) assessment

For this review, quality assessment would be conducted primarily for included studies focusing primarily on awareness of ARSH clinics among adolescents in India. However, systematic data extraction would be conducted for all relevant sources. The Cochrane risk of bias tool will be used to assess the internal validity. The quality assessment will be done by two reviewers and any disagreement between reviewers judgement will be resolved by the third reviewer. Depending upon the study design the risk of bias will be assessed. In randomized control trials the clarity in description of randomization, allocation concealment and blinding will be assessed. The study will be assessed critically on the basis of methodology followed in the study. The studies will be segregated in terms of low, moderate and high risk of bias. The studies with minimal risk of bias will be pooled for meta-analysis.

Strategy for data synthesis

Aggregate data will be used to synthesize results depending on the quality of the mined data. A formal narrative synthesis will be done showing the impact of ARSH clinics on awareness and utilization by adolescents in India. A meta-analysis will be conducted depending on the availability of eligible studies. Minimum 5 studies will be pooled and the results will be interpreted by using summary measures like risk ratio (in the case of RCTs) or percentages (in the case of cross-sectional studies). The research findings will be aggregated to examine the effectiveness of the interventions in focus under the National Health Mission. The results of those studies which primarily focused upon the ARSH strategy will be pooled for meta-analysis. Finally, recommendations will be made according to results obtained after extracting the results from each eligible study. Subgroup analysis will be conducted as per the nature of the data obtained.

Analysis of subgroups or subsets

We will conduct appropriate analysis as per the nature of data. Differences in subgroups (e.g. Urban and rural settings, education status) on outcomes such as utilization of ARSH clinics will be summarized by relevant measures (e.g. proportions).

Subject index terms

National Rural Health Mission, National Urban Health Mission, National Health Mission, adolescent reproductive and sexual health (ARSH), Adolescent health, Anaemia

2.8 Level of awareness and utilization of Menstrual Hygiene Scheme in India: A systematic review

Registration ID: CRD42020148116

Review Question

In India,

- 1) What is the level of awareness regarding menstrual hygiene among adolescents in India?
- 2) What is the utilization rate of sanitary napkins among adolescents in India?

Searches

Studies published between the years 2005 and 2018 will be identified using the PubMed, EMBASE. The reference lists of all identified articles on interventions will be checked to identify relevant studies. In addition, citations tracking of prominent researchers working in the field of adolescent health will be conducted to identify relevant articles. Further, hand-searching of the contents of reputed public health journals and conference proceedings will also be conducted. Relevant articles and reports will be searched in Google, Google Scholar, and in databases of agencies such as WHO.

Types of studies to be included

Both quantitative and qualitative studies focusing upon awareness of menstrual hygiene or utilization rate of sanitary napkins among adolescent age group published after the launch of national rural health mission (NRHM) will be included for review. In addition, grey literature will be hand searched and evidence including reports from government and non-governmental agencies and reports from international agencies like UNICEF will also be included.

Condition or domain being used

This systematic review focuses on level of awareness regarding menstrual hygiene and utilization rate of sanitary napkins among adolescents in India.

Intervention(s), Exposure(s)

The exposure refers to the awareness generation regarding menstrual hygiene that may be through information education and communication by organizing camps in schools or in residential areas. In

case of cross-sectional studies assessment of the knowledge and awareness about menstrual hygiene program being implemented under NHM by the Ministry of Health and Family Welfare, India will be done. Apart from this the usage of sanitary napkins will be assessed as these are provided at subsidized rates under menstrual hygiene scheme.

Comparator(s)/control

In case a randomized control study or a quasi-experimental study has been conducted the controls will include those adolescents which will not be given the above stated intervention.

Primary outcome(s)

The primary outcomes for this review are:

- Awareness about menstrual hygiene
- Utilization rate of sanitary napkins among adolescents

Secondary outcome(s)

Nil

Data extraction

After identifying eligible studies, data will be extracted using a structured form by two reviewers using PRISMA/STROBE guidelines. The form will contain:

1. Source: Citation and other contact details.
2. Eligibility: Including the reasons for inclusion
3. Methods: Including the study design, study duration, sequence generation, allocation concealment, and blinding (if applicable)
4. Participants: Number and socio-demographics
5. Interventions: Total groups or arms, and intervention details
6. Outcomes: Outcomes measurement, outcomes definition, scales used if any (with time points of collection)

7. Results: Number of participants allocated in each group, sample size, missing data, summary data, effect size estimates, and subgroup analysis (if applicable)

8. Other: Sources of funding

9. Key conclusions

10. Limitations

11. Comments by the review authors

12. Implication recommendations

The two reviewers will extract the data independently and discuss with the third reviewer in case of any disagreement. Reviewers will enter relevant information into Review Manager 5.1 or STATA for meta-analysis using a structured data extraction form.

Risk of bias (quality) assessment

For this review, quality assessment would be conducted primarily for included studies focusing primarily on awareness generation regarding menstrual hygiene or utilization of sanitary napkins among adolescents in India. However, systematic data extraction would be conducted for all relevant sources.

Strategy for data synthesis

Aggregate data will be used to synthesize results depending on the quality of the mined data.

Analysis of subgroups or subsets

We will conduct appropriate analysis as per the nature of data. Differences in subgroups (e.g., urban and rural settings, education status) on outcomes such as utilization of sanitary napkins will be summarized by relevant measures (e.g. proportions).

Subject index terms

National Rural Health Mission, National Urban Health Mission, National Health Mission, Menstrual Hygiene, Menstrual Hygiene Scheme, Adolescent health.

2.9 Impact of weekly iron and folic acid supplementation on prevalence of anaemia among adolescents in India: A systematic review

Review Question

In India,

- 1) Does the Weekly Iron and Folic acid supplementation program under National Health Mission had any impact on reducing anaemia in adolescents?

Searches

Studies published between the years 2005 and 2018 will be identified using the PubMed, EMBASE. The reference lists of all identified articles on interventions will be checked to identify relevant studies. In addition, citations tracking of prominent researchers working in the field of adolescent health will be conducted to identify relevant articles. Further, hand-searching of the contents of reputed public health journals and conference proceedings will also be conducted. Relevant articles and reports will be searched in Google, Google Scholar, and in databases of agencies such as UNICEF and WHO.

Types of studies to be included

Both quantitative and qualitative studies focusing upon impact of weekly supplementation of iron and folic acid (WIFS) program implemented as a strategy under national health mission (NHM) on prevalence of anemia among adolescents in India will be included for review. In addition, grey literature will be hand searched and evidence including reports from government and non-governmental agencies and reports from international agencies will also be included.

Condition or domain being used

This systematic review focuses on prevalence of anaemia among adolescents after the launch of WIFS program in India.

Intervention(s), Exposure(s)

The exposure refers to the intake of iron and folic acid supplementation in any dose under the WIFS program under NHM implemented by the Ministry of Health and Family Welfare, India. These interventions might be in the form of tablets or syrups provided to the adolescents by public sector undertakings or nongovernmental organizations, private sectors or through public private partnerships.

Comparator(s)/control

In case a randomized control study or a quasi-experimental study has been conducted the controls will include those adolescents which will not be given the above stated intervention.

Primary outcome(s)

The primary outcome for this review is:

- Prevalence of anaemia

Secondary outcome(s)

The secondary outcomes include:

- Improvement in body mass index

Data extraction

After identifying eligible studies, data will be extracted using a structured form by two reviewers using PRISMA/STROBE guidelines. The form will contain:

1. Source: Citation and other contact details.
2. Eligibility: Including the reasons for inclusion
3. Methods: Including the study design, study duration, sequence generation, allocation concealment, and blinding (if applicable)
4. Participants: Number and socio-demographics
5. Interventions: Total groups or arms, and intervention details
6. Outcomes: Outcomes measurement, outcomes definition, scales used if any (with time points of collection)
7. Results: Number of participants allocated in each group, sample size, missing data, summary data, effect size estimates, and subgroup analysis (if applicable)
8. Other: Sources of funding
9. Key conclusions

10. Limitations

11. Comments by the review authors

12. Implications/Recommendations

The two reviewers will extract the data independently and discuss with the third reviewer in case of any disagreement. Reviewers will enter relevant information into Review Manager 5.1 or STATA for meta-analysis using a structured data extraction form.

Risk of bias (quality) assessment

For this review, quality assessment would be conducted primarily for included studies focusing primarily on prevalence of anaemia among adolescents after the implementation of WIFS program in India. However, systematic data extraction would be conducted for all relevant sources.

Strategy for data synthesis

Aggregate data will be used to synthesize results depending on the quality of the mined data.

The research findings will be aggregated to examine the effectiveness of the interventions in focus under WIFS program.

Analysis of subgroups or subsets

We will conduct appropriate analysis as per the nature of data. Differences in subgroups (e.g., urban and rural settings, education status) on outcomes such as prevalence of anaemia will be summarized by relevant measures (e.g., rate ratios, mean difference).

Subject index terms

National Rural Health Mission, National Urban Health Mission, National Health Mission, Weekly Iron and Folic Acid Supplementation (WIFS), Adolescent health, Anaemia.

2.10. Impact of Road Connectivity, Mobile Connectivity and Others Variables on Health Outcomes in India: A Systematic Review

Review Question

In India,

1) Do Road Connectivity, Mobile Connectivity and other variables such as water supply, sanitation and nutrition, had any impact on health outcomes?

Methods

Searches

Studies published between the years 2005 and 2018 will be identified using the PubMed, EMBASE databases and Google Scholar. MeSH terms will be used to search the references and the reference lists of all identified articles on interventions will be checked to identify relevant studies.

Types of studies to be included

Both quantitative and qualitative studies focusing upon impact of variables such as road connectivity and mobile connectivity on health outcomes will be included for review. In addition grey literature will be hand searched and evidence including reports from government and non-governmental agencies and reports from international agencies will also be included.

Condition or domain being used

This systematic review focuses on impact of variables such as road connectivity and mobile connectivity on health outcomes.

Participants/population

Pregnant/antenatal, postpartum females, health workers, children, adolescents.

Intervention(s), Exposure(s)

The exposure refers to any variables focusing on health outcomes. These variables might be any social or infrastructural, impacting health outcomes.

Comparator(s)/control

Not applicable

Primary outcome(s)

The primary outcome for this review is: Impact on health outcomes.

Data extraction

After identifying eligible studies, data will be extracted using a structured form by two reviewers using PRISMA guidelines. The form will contain:

1. Source: Citation and other contact details.
2. Eligibility: Including the reasons for inclusion
3. Methods: Including the study design, study duration, sequence generation, allocation concealment, and blinding
4. Participants: Number and socio-demographics
5. Interventions: Total groups or arms, and intervention details
6. Outcomes: Outcomes measurement, outcomes definition, scales used if any (with time points of collection)
7. Results: Number of participants allocated in each group, sample size, missing data, summary data, effect size estimates, and subgroup analysis (if applicable)
8. Other: Sources of funding
9. Key conclusions
10. Limitations
11. Comments by the review authors
12. Implications/Recommendations

Two reviewer will extract the data independently and discuss with the other reviewers in case of any disagreement. Reviewers will enter relevant information into Review Manager 5.1 or STATA for meta-analysis using a structured data extraction form.

Risk of bias (quality) assessment

For this review, quality assessment would be conducted primarily for included studies focussing on impact of road and mobile connectivity on health outcomes. However, systematic data extraction would be conducted for all relevant sources.

Strategy for data synthesis

Aggregate data will be used to synthesize results depending on the quality of the mined data
The research findings will be aggregated to examine the effectiveness of the road and mobile connectivity and other variables in focus of health outcomes.

Subject index terms

Road connectivity, mobile connectivity, water supply, nutrition, health outcomes.

2.11. Impact of National Health Mission on maternal and child health inequalities in India: A Systematic Review

Review Question

What is the impact of National Health Mission on maternal and child health inequalities in India?

Methods

Searches

Studies published between the years 2005 and 2018 will be identified using the PubMed, EMBASE databases and Google Scholar. MeSH terms will be used to search the references and the reference lists of all identified articles on interventions will be checked to identify relevant studies.

Types of studies to be included

Both quantitative and qualitative studies focusing upon impact of National Health Mission strategies on health inequalities (maternal and child health) will be included for review. In addition grey literature will be hand searched and evidence including reports from government and non-governmental agencies and reports from international agencies will also be included.

Condition or domain being used

This systematic review focuses on impact of National Health Mission on maternal and child health inequalities.

Participants/population

Mothers, pregnant females, postpartum females, children

Intervention(s), Exposure(s)

The exposure refers to any strategy of National Health Mission India focusing on maternal and child health inequalities. These interventions might be in the form of counselling, advertising, communitization, incentive or any other method of promoting maternal and child health such as collaborating with nongovernmental organizations, private sectors and public sector undertakings

through public private partnerships or reaching out to rural and poor and other marginalised population.

Comparator(s)/control

Not applicable

Primary outcome(s)

Impact on maternal and child health inequalities after launch of National Health Mission in India.

Data extraction

After identifying eligible studies, data will be extracted using a structured form by two reviewers using PRISMA guidelines. The form will contain:

1. Source: Citation and other contact details.
2. Eligibility: Including the reasons for inclusion
3. Methods: Including the study design, study duration, sequence generation, allocation concealment, and blinding
4. Participants: Number and socio-demographics
5. Interventions: Total groups or arms, and intervention details
6. Outcomes: Outcomes measurement, outcomes definition, scales used if any (with time points of collection)
7. Results: Number of participants allocated in each group, sample size, missing data, summary data, effect size estimates, and subgroup analysis (if applicable)
8. Other: Sources of funding
9. Key conclusions
10. Limitations
11. Comments by the review authors
12. Implications/Recommendations

Two reviewer will extract the data independently and discuss with the other reviewers in case of any disagreement. Reviewers will enter relevant information into Review Manager 5.1 or STATA for meta-analysis using a structured data extraction form.

Risk of bias (quality) assessment

For this review, quality assessment would be conducted primarily for included studies focusing primarily on maternal and child health inequalities. However, systematic data extraction would be conducted for all relevant sources.

Strategy for data synthesis

Aggregate data will be used to synthesize results depending on the quality of the mined data. The research findings will be aggregated to examine the effectiveness of the interventions in focus under National Health Mission.

Subject index terms

Health inequalities, maternal health inequalities, child health inequalities, National Rural Health Mission, National Urban Health Mission, National Health Mission, Janani Suraksha Yojana, Accredited Social Health Activist, Janani Shishu Surakhsha Karyakram, referral transport.

ANNEXURE 3. MeSH STRATEGY.

Maternal Health	
Keywords	MeSH
Maternal mortality ratio AND India	((("maternal mortality"[MeSH Terms] OR ("maternal"[All Fields] AND "mortality"[All Fields]) OR "maternal mortality"[All Fields]) AND ("Ratio (Oxf)"[Journal] OR "ratio"[All Fields])) AND ("india"[MeSH Terms] OR "india"[All Fields]) AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT]))
"National Health Mission" impact on "Maternal mortality ratio" AND "India"	"National Health Mission"[All Fields] AND ("Impact (Am Coll Physicians)"[Journal] OR "impact"[All Fields]) AND "Maternal mortality ratio"[All Fields] AND "India"[All Fields] AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])
Birth preparedness and complication readiness AND maternal mortality ratio AND India	((("parturition"[MeSH Terms] OR "parturition"[All Fields] OR "birth"[All Fields]) AND preparedness[All Fields] AND complication[All Fields] AND readiness[All Fields]) AND ((("maternal mortality"[MeSH Terms] OR ("maternal"[All Fields] AND "mortality"[All Fields]) OR "maternal mortality"[All Fields]) AND ("Ratio (Oxf)"[Journal] OR "ratio"[All Fields])) AND ("india"[MeSH Terms] OR "india"[All Fields]) AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT]))
Janani Suraksha Yojana	"Janani Suraksha Yojana"[All Fields] AND "India"[All Fields]
Janani Shishu Suraksha Karyakram	"Janani Shishu Suraksha Karyakram"[All Fields] AND "India"[All Fields]
Antenatal care OR Postnatal care OR Intranatal care AND	("prenatal care"[MeSH Terms] OR ("prenatal"[All Fields] AND "care"[All Fields]) OR "prenatal care"[All Fields] OR ("antenatal"[All Fields] AND "care"[All Fields]) OR "antenatal care"[All Fields]) OR ("postnatal care"[MeSH Terms] OR ("postnatal"[All Fields] AND "care"[All Fields]) OR "postnatal care"[All Fields])

<p>Maternal mortality ratio AND India</p>	<p>OR (Intranatal[All Fields] AND care[All Fields]) AND (("maternal mortality"[MeSH Terms] OR ("maternal"[All Fields] AND "mortality"[All Fields]) OR "maternal mortality"[All Fields]) AND ("Ratio (Oxf)"[Journal] OR "ratio"[All Fields])) AND ("india"[MeSH Terms] OR "india"[All Fields]) AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])</p>
<p>"free ambulance" AND "maternal mortality ratio" AND "India"</p>	<p>"free ambulance"[All Fields] AND "maternal mortality ratio"[All Fields] AND "India"[All Fields] AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])</p>
<p>(ASHA role) AND Maternal mortality</p>	<p>((("ASHA"[Journal] OR "ASHA Suppl"[Journal] OR "asha"[All Fields]) AND ("role"[MeSH Terms] OR "role"[All Fields])) AND ("maternal mortality"[MeSH Terms] OR ("maternal"[All Fields] AND "mortality"[All Fields]) OR "maternal mortality"[All Fields]) AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])</p>
<p>((ASHA worker) AND Maternal health) AND India</p>	<p>((("ASHA"[Journal] OR "ASHA Suppl"[Journal] OR "asha"[All Fields]) AND ("occupational groups"[MeSH Terms] OR ("occupational"[All Fields] AND "groups"[All Fields]) OR "occupational groups"[All Fields] OR "worker"[All Fields])) AND ("maternal health"[MeSH Terms] OR ("maternal"[All Fields] AND "health"[All Fields]) OR "maternal health"[All Fields])) AND ("india"[MeSH Terms] OR "india"[All Fields]) AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])</p>
<p>((ASHA) AND maternal mortality ratio) AND India</p>	<p>((("ASHA"[Journal] OR "ASHA Suppl"[Journal] OR "asha"[All Fields]) AND ("maternal mortality"[MeSH Terms] OR ("maternal"[All Fields] AND "mortality"[All Fields]) OR "maternal mortality"[All Fields]) AND ("Ratio (Oxf)"[Journal] OR "ratio"[All Fields])) AND ("india"[MeSH Terms] OR "india"[All Fields]) AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])</p>
<p>referral transport AND maternal mortality AND India</p>	<p>((("referral and consultation"[MeSH Terms] OR ("referral"[All Fields] AND "consultation"[All Fields]) OR "referral and consultation"[All Fields] OR "referral"[All Fields]) AND ("biological transport"[MeSH Terms] OR ("biological"[All Fields] AND "transport"[All Fields]) OR "biological transport"[All Fields] OR "transport"[All Fields])) AND ("maternal mortality"[MeSH Terms] OR ("maternal"[All Fields] AND "mortality"[All Fields]) OR "maternal mortality"[All Fields]) AND ("india"[MeSH Terms] OR "india"[All Fields]) AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])</p>

	Fields)) AND ("india"[MeSH Terms OR "india"[All Fields]) AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])
"Prahdhan Mantri Matritva Vandana Yojana" AND "maternal mortality ratio" AND "India"	(mantri[All Fields] AND matritva[All Fields] AND vandana[All Fields] AND ("Yojana"[Journal] OR "yojana"[All Fields])) AND "maternal mortality ratio"[All Fields] AND "India"[All Fields] AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])
"Prahdhan Mantri Surakshit Matritva Abhyan" AND "maternal mortality ratio" AND "India"	(Mantri[All Fields] AND Surakshit[All Fields] AND Matritva[All Fields] AND Abhyan[All Fields]) AND "maternal mortality ratio"[All Fields] AND "India"[All Fields] AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])
"Prahdhan Mantri Matritva Sahyog Yojna" AND "maternal mortality ratio" AND "India"	(Mantri[All Fields] AND Matritva[All Fields] AND Sahyog[All Fields] AND Yojna[All Fields]) AND "maternal mortality ratio"[All Fields] AND "India"[All Fields] AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])

NEWBORN AND CHILD HEALTH

Neonatal Mortality rate (NMR)	"Infant mortality"[MeSH Terms] OR ("infant"[All Fields] AND "mortality"[All Fields]) OR "infant mortality"[All Fields] OR ("neonatal"[All Fields] AND "mortality"[All Fields]) OR "neonatal mortality"[All Fields]
Facility based newborn care (FBNC)	Facility[All Fields] AND based[All Fields] AND ("infant, newborn"[MeSH Terms] OR ("infant"[All Fields] AND "newborn"[All Fields]) OR "newborn infant"[All Fields] OR "newborn"[All Fields]) AND care[All Fields]
Essential newborn care	Essential[All Fields] AND ("infant, newborn"[MeSH Terms] OR ("infant"[All Fields] AND "newborn"[All Fields]) OR "newborn infant"[All Fields] OR "newborn"[All Fields]) AND care[All Fields]
Special New Born Care Units (SNCUs)	Special[All Fields] AND ("infant, newborn"[MeSH Terms] OR ("infant"[All Fields] AND "newborn"[All Fields]) OR "newborn infant"[All Fields] OR "newborn"[All Fields]) AND care[All Fields] AND unit[All Fields]
New Born Baby Corners (NBCCs)	New[All Fields] AND ("parturition"[MeSH Terms] OR "parturition"[All Fields] OR "born"[All Fields]) AND ("infant, newborn"[MeSH Terms] OR ("infant"[All Fields] AND "newborn"[All Fields]) OR "newborn infant"[All Fields] OR "baby"[All Fields] OR "infant"[MeSH Terms] OR "infant"[All Fields]) AND corners[All Fields] OR "NBCC"[All Fields]
Breast feeding practices	Breast feeding practices"[All Fields] AND "India"[MeSH Terms]
Navjat Shishu Shuraksha Karyakaram (NSSK)	Navjat[All Fields] AND shishu [All Fields] AND suraksha [All Fields] AND karyakram [All Fields] OR NSSK[All Fields]
Home based newborn care by ASHA (HBNC)	Home [All Fields] AND BASED[All Fields] AND ("infant, newborn"[MeSH Terms] OR ("infant"[All Fields] AND "newborn"[All Fields]) OR "newborn infant"[All Fields] OR "newborn"[All Fields]) AND CARE[All Fields] AND ("ASHA"[Journal] OR "ASHA Suppl"[Journal] OR "asha"[All Fields])

<p>Early initiation and exclusive breast feeding</p>	<p>Early[All Fields] AND initiation[All Fields] AND ("breast feeding"[MeSH Terms] OR ("breast"[All Fields] AND "feeding"[All Fields]) OR "breast feeding"[All Fields] OR ("exclusive"[All Fields] AND "breast"[All Fields] AND "feeding"[All Fields]) OR "exclusive breast feeding"[All Fields]</p>
<p>Tracking of low birth weight babies</p>	<p>Tracking[All Fields] AND ("infant, low birth weight"[MeSH Terms] OR ("infant"[All Fields] AND "low"[All Fields] AND "birth"[All Fields] AND "weight"[All Fields]) OR "low birth weight infant"[All Fields] OR ("low"[All Fields] AND "birth"[All Fields] AND "weight"[All Fields]) OR "low birth weight"[All Fields] AND ("infant"[MeSH Terms] OR "infant"[All Fields] OR "babies"[All Fields])</p>
<p>Mothers' Absolute Affection Programme (MAA)</p>	<p>Mothers'[All Fields] AND Absolute[All Fields] AND Affection[All Fields] AND Programme[All Fields]) AND ("india"[MeSH Terms] OR "india"[All Fields])</p>
<p>Infant and Young Child Feeding Practices AND India</p>	<p>Infant[Title] AND Young[Title] AND Child[Title] AND Feeding[Title] AND Practices[Title] AND india[Title]</p>
<p>Home based newborn care by ASHA AND India</p>	<p>(Home[All Fields] AND based[All Fields] AND ("infant, newborn"[MeSH Terms] OR ("infant"[All Fields] AND "newborn"[All Fields]) OR "newborn infant"[All Fields] OR "newborn"[All Fields]) AND care[All Fields] AND ("ASHA"[Journal] OR "ASHA Suppl"[Journal] OR "asha"[All Fields])) AND ("india"[MeSH Terms] OR "india"[All Fields])</p>
<p>Integrated management of neonatal and childhood illness AND Children AND India</p>	<p>(Integrated[All Fields] AND ("organization and administration"[MeSH Terms] OR ("organization"[All Fields] AND "administration"[All Fields]) OR "organization and administration"[All Fields] OR "management"[All Fields] OR "disease management"[MeSH Terms] OR ("disease"[All Fields] AND "management"[All Fields]) OR "disease management"[All Fields]) AND ("infant, newborn"[MeSH Terms] OR ("infant"[All Fields] AND "newborn"[All Fields]) OR "newborn infant"[All Fields] OR "neonatal"[All Fields]) AND ("Childhood"[Journal] OR "childhood"[All Fields]) AND illness[All Fields]) AND ("child"[MeSH Terms] OR "child"[All Fields] OR "children"[All Fields]) AND ("india"[MeSH Terms] OR "india"[All Fields]) AND (("2005/01/01"[PDAT] : "2018/12/31"[PDAT]) AND "humans"[MeSH Terms])</p>

<p>Management of Diarrheal diseases with ORS and zinc AND Infants AND India</p>	<p>((("organization and administration"[MeSH Terms] OR ("organization"[All Fields] AND "administration"[All Fields]) OR "organization and administration"[All Fields] OR "management"[All Fields] OR "disease management"[MeSH Terms] OR ("disease"[All Fields] AND "management"[All Fields]) OR "disease management"[All Fields]) AND Diarrheal[All Fields] AND ("disease"[MeSH Terms] OR "disease"[All Fields] OR "diseases"[All Fields]) AND ("ORALIT"[Supplementary Concept] OR "ORALIT"[All Fields] OR "ors"[All Fields]) AND ("zinc"[MeSH Terms] OR "zinc"[All Fields])) AND ("infant"[MeSH Terms] OR "infant"[All Fields] OR "infants"[All Fields]) AND ("india"[MeSH Terms] OR "india"[All Fields]))</p>
<p>Intensified Diarrhea Control Fortnight AND Infants AND India</p>	<p>(Intensified[All Fields] AND ("diarrhoea"[All Fields] OR "diarrhea"[MeSH Terms] OR "diarrhea"[All Fields]) AND ("prevention and control"[Subheading] OR ("prevention"[All Fields] AND "control"[All Fields]) OR "prevention and control"[All Fields] OR "control"[All Fields] OR "control groups"[MeSH Terms] OR ("control"[All Fields] AND "groups"[All Fields]) OR "control groups"[All Fields]) AND Fortnight[All Fields]) AND ("infant"[MeSH Terms] OR "infant"[All Fields] OR "infants"[All Fields]) AND ("india"[MeSH Terms] OR "india"[All Fields]) AND ("loattrfull text"[sb] AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT]) AND "humans"[MeSH Terms]))</p>

<p>Mothers' Absolute Affection Programme (MAA)</p>	<p>(Mothers'[All Fields] AND Absolute[All Fields] AND Affection[All Fields] AND Programme[All Fields]) AND MAA[All Fields] AND ("india"[MeSH Terms] OR "india"[All Fields])</p>
<p>Tracking of low birth weight babies AND India</p>	<p>(Tracking[All Fields] AND ("infant, low birth weight"[MeSH Terms] OR ("infant"[All Fields] AND "low"[All Fields] AND "birth"[All Fields] AND "weight"[All Fields]) OR "low birth weight infant"[All Fields] OR ("low"[All Fields] AND "birth"[All Fields] AND "weight"[All Fields]) OR "low birth weight"[All Fields]) AND ("infant"[MeSH Terms] OR "infant"[All Fields] OR "babies"[All Fields])) AND ("india"[MeSH Terms] OR "india"[All Fields])</p>

<p>Management of Acute Respiratory Infections AND Infants AND India</p>	<p>((("organization and administration"[MeSH Terms] OR ("organization"[All Fields] AND "administration"[All Fields]) OR "organization and administration"[All Fields] OR "management"[All Fields] OR "disease management"[MeSH Terms] OR ("disease"[All Fields] AND "management"[All Fields]) OR "disease management"[All Fields]) AND Acute[All Fields] AND ("respiratory tract infections"[MeSH Terms] OR ("respiratory"[All Fields] AND "tract"[All Fields] AND "infections"[All Fields]) OR "respiratory tract infections"[All Fields] OR ("respiratory"[All Fields] AND "infections"[All Fields]) OR "respiratory infections"[All Fields])) AND ("infant"[MeSH Terms] OR "infant"[All Fields] OR "infants"[All Fields]) AND ("india"[MeSH Terms] OR "india"[All Fields]))</p>
<p>Micronutrient supplementation (Vitamin A, Iron Folic Acid) AND Infants AND Mortality AND India</p>	<p>((("trace elements"[Pharmacological Action] OR "micronutrients"[Pharmacological Action] OR "trace elements"[MeSH Terms] OR ("trace"[All Fields] AND "elements"[All Fields]) OR "trace elements"[All Fields] OR "micronutrient"[All Fields] OR "micronutrients"[MeSH Terms] OR "micronutrients"[All Fields]) AND supplementation[All Fields]) AND (("vitamin a"[MeSH Terms] OR "vitamin a"[All Fields]) AND ("iron"[MeSH Terms] OR "iron"[All Fields]) AND ("folic acid"[MeSH Terms] OR ("folic"[All Fields] AND "acid"[All Fields]) OR "folic acid"[All Fields])) AND ("infant"[MeSH Terms] OR "infant"[All Fields] OR "infants"[All Fields]) AND ("mortality"[Subheading] OR "mortality"[All Fields] OR "mortality"[MeSH Terms]) AND ("india"[MeSH Terms] OR "india"[All Fields]) AND ("loattrfull text"[sb] AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT]) AND "humans"[MeSH Terms]))</p>
<p>Early initiation and exclusive breast feeding AND India</p>	<p>(early[All Fields] AND initiation[All Fields] AND ("breast feeding"[MeSH Terms] OR ("breast"[All Fields] AND "feeding"[All Fields]) OR "breast feeding"[All Fields] OR ("exclusive"[All Fields] AND "breast"[All Fields] AND "feeding"[All Fields]) OR "exclusive breast feeding"[All Fields])) AND ("india"[MeSH Terms] OR "india"[All Fields]))</p>

<p>Full immunization coverage AND Children AND India</p>	<p>(Full[All Fields] AND ("vaccination coverage"[MeSH Terms] OR ("vaccination"[All Fields] AND "coverage"[All Fields]) OR "vaccination coverage"[All Fields] OR ("immunization"[All Fields] AND "coverage"[All Fields]) OR "immunization coverage"[All Fields])) AND ("child"[MeSH Terms] OR "child"[All Fields] OR "children"[All Fields]) AND ("india"[MeSH Terms] OR "india"[All Fields]) AND ("loattrfull text"[sb] AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT]) AND "humans"[MeSH Terms]))</p>
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<p>Complementary feeding practices AND Infants AND India</p>	<p>((("infant nutritional physiological phenomena"[MeSH Terms] OR ("infant"[All Fields] AND "nutritional"[All Fields] AND "physiological"[All Fields] AND "phenomena"[All Fields]) OR "infant nutritional physiological phenomena"[All Fields] OR ("complementary"[All Fields] AND "feeding"[All Fields]) OR "complementary feeding"[All Fields]) AND practices[All Fields]) AND ("infant"[MeSH Terms] OR "infant"[All Fields] OR "infants"[All Fields]) AND ("india"[MeSH Terms] OR "india"[All Fields]) AND ("loattrfull text"[sb] AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])) AND "humans"[MeSH Terms])</p>
<p>Prevalence of diarrhea in Infants in India</p>	<p>((("epidemiology"[Subheading] OR "epidemiology"[All Fields] OR "prevalence"[All Fields] OR "prevalence"[MeSH Terms]) AND ("diarrhoea"[All Fields] OR "diarrhea"[MeSH Terms] OR "diarrhea"[All Fields]) AND ("infant"[MeSH Terms] OR "infant"[All Fields] OR "infants"[All Fields]) AND ("india"[MeSH Terms] OR "india"[All Fields])) AND ("loattrfull text"[sb] AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])) AND "humans"[MeSH Terms])</p>
<p>Management of pneumonia AND Infants AND India</p>	<p>((("organization and administration"[MeSH Terms] OR ("organization"[All Fields] AND "administration"[All Fields]) OR "organization and administration"[All Fields] OR "management"[All Fields] OR "disease management"[MeSH Terms] OR ("disease"[All Fields] AND "management"[All Fields]) OR "disease management"[All Fields]) AND ("pneumonia"[MeSH Terms] OR "pneumonia"[All Fields])) AND ("infant"[MeSH Terms] OR "infant"[All Fields] OR "infants"[All Fields]) AND ("india"[MeSH Terms] OR "india"[All Fields]) AND ("loattrfull text"[sb] AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])) AND "humans"[MeSH Terms])</p>
<p>Impact Indicator: Infant Mortality Rate in India</p>	<p>((("infant mortality"[MeSH Terms] OR ("infant"[All Fields] AND "mortality"[All Fields]) OR "infant mortality"[All Fields]) AND ("J Rehabil Assist Technol Eng"[Journal] OR "rate"[All Fields]) AND ("india"[MeSH Terms] OR "india"[All Fields])) AND ("loattrfull text"[sb] AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])) AND "humans"[MeSH Terms])</p>

<p>Perinatal mortality rate AND India</p>	<p>"perinatal mortality"[MeSH Terms] OR ("perinatal"[All Fields] AND "mortality"[All Fields]) OR "perinatal mortality"[All Fields] OR "perinatal death"[MeSH Terms] OR ("perinatal"[All Fields] AND "death"[All Fields]) OR "perinatal death"[All Fields] OR ("perinatal"[All Fields] AND "mortality"[All Fields])) AND ("india"[MeSH Terms] OR "india"[All Fields]) AND (("2005/01/01"[PDAT] : "2018/12/31"[PDAT]) AND "humans"[MeSH Terms])</p>
<p>Impact of Home based newborn care on perinatal mortality india</p>	<p>((("Impact (Am Coll Physicians)"[Journal] OR "impact"[All Fields]) AND home[All Fields] AND based[All Fields] AND ("infant, newborn"[MeSH Terms] OR ("infant"[All Fields] AND "newborn"[All Fields]) OR "newborn infant"[All Fields] OR "newborn"[All Fields]) AND care[All Fields] AND ("perinatal mortality"[MeSH Terms] OR ("perinatal"[All Fields] AND "mortality"[All Fields]) OR "perinatal mortality"[All Fields] OR "perinatal death"[MeSH Terms] OR ("perinatal"[All Fields] AND "death"[All Fields]) OR "perinatal death"[All Fields] OR ("perinatal"[All Fields] AND "mortality"[All Fields])) AND ("india"[MeSH Terms] OR "india"[All Fields])) AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])</p>
<p>Janani Suraksha Yojana AND Perinatal mortality AND India</p>	<p>(Janani[All Fields] AND Suraksha[All Fields] AND ("Yojana"[Journal] OR "yojana"[All Fields])) AND ("perinatal mortality"[MeSH Terms] OR ("perinatal"[All Fields] AND "mortality"[All Fields]) OR "perinatal mortality"[All Fields] OR "perinatal death"[MeSH Terms] OR ("perinatal"[All Fields] AND "death"[All Fields]) OR "perinatal death"[All Fields] OR ("perinatal"[All Fields] AND "mortality"[All Fields])) AND ("india"[MeSH Terms] OR "india"[All Fields]) AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])</p>
<p>Impact of "Janani Shishu Suraksha Karyakram" AND "Perinatal Mortality" AND India</p>	<p>("Impact (Am Coll Physicians)"[Journal] OR "impact"[All Fields]) AND "Janani Shishu Suraksha Karyakram"[All Fields] AND "Perinatal Mortality"[All Fields] AND ("india"[MeSH Terms] OR "india"[All Fields]) AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])</p>
<p>Impact of "Institutional Delieveries" AND</p>	<p>=("Impact (Am Coll Physicians)"[Journal] OR "impact"[All Fields]) AND Institutional[All Fields] AND "Perinatal Mortality"[All Fields] AND ("india"[MeSH Terms] OR "india"[All Fields]) AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])</p>

<p>"Perinatal Mortality" AND India</p>	
<p>Accredited Social Health Activist AND Perinatal Mortality AND India</p>	<p>(Accredited[All Fields] AND Social[All Fields] AND ("health"[MeSH Terms] OR "health"[All Fields]) AND Activist[All Fields]) AND ("perinatal mortality"[MeSH Terms] OR ("perinatal"[All Fields] AND "mortality"[All Fields]) OR "perinatal mortality"[All Fields] OR "perinatal death"[MeSH Terms] OR ("perinatal"[All Fields] AND "death"[All Fields]) OR "perinatal death"[All Fields] OR ("perinatal"[All Fields] AND "mortality"[All Fields])) AND ("india"[MeSH Terms] OR "india"[All Fields]) AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])</p>
<p>Impact of Navjat Shishu Suraksha Krayakram on Perinatal Mortality AND India</p>	<p>((("Impact (Am Coll Physicians)"[Journal] OR "impact"[All Fields]) AND Shishu[All Fields] AND Suraksha[All Fields] AND ("perinatal mortality"[MeSH Terms] OR ("perinatal"[All Fields] AND "mortality"[All Fields]) OR "perinatal mortality"[All Fields] OR "perinatal death"[MeSH Terms] OR ("perinatal"[All Fields] AND "death"[All Fields]) OR "perinatal death"[All Fields] OR ("perinatal"[All Fields] AND "mortality"[All Fields]))) AND ("india"[MeSH Terms] OR "india"[All Fields]) AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])</p>
<p>Facility based newborn care AND perinatal mortality AND India</p>	<p>(Facility[All Fields] AND based[All Fields] AND ("infant, newborn"[MeSH Terms] OR ("infant"[All Fields] AND "newborn"[All Fields]) OR "newborn infant"[All Fields] OR "newborn"[All Fields]) AND care[All Fields]) AND ("perinatal mortality"[MeSH Terms] OR ("perinatal"[All Fields] AND "mortality"[All Fields]) OR "perinatal mortality"[All Fields] OR "perinatal death"[MeSH Terms] OR ("perinatal"[All Fields] AND "death"[All Fields]) OR "perinatal death"[All Fields] OR ("perinatal"[All Fields] AND "mortality"[All Fields])) AND ("india"[MeSH Terms] OR "india"[All Fields]) AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])</p>
<p>Essential newborn care AND Perinatal</p>	<p>(Essential[All Fields] AND ("infant, newborn"[MeSH Terms] OR ("infant"[All Fields] AND "newborn"[All Fields]) OR "newborn infant"[All Fields] OR "newborn"[All Fields])</p>

<p>mortality rate AND India</p>	<p>AND care[All Fields]) AND (("perinatal mortality"[MeSH Terms] OR ("perinatal"[All Fields] AND "mortality"[All Fields]) OR "perinatal mortality"[All Fields] OR "perinatal death"[MeSH Terms] OR ("perinatal"[All Fields] AND "death"[All Fields]) OR "perinatal death"[All Fields] OR ("perinatal"[All Fields] AND "mortality"[All Fields])) AND ("J Rehabil Assist Technol Eng"[Journal] OR "rate"[All Fields])) AND ("india"[MeSH Terms] OR "india"[All Fields]) AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])</p>
<p>Traditional Birth attendants AND Perinatal mortality in India</p>	<p>("midwifery"[MeSH Terms] OR "midwifery"[All Fields] OR ("traditional"[All Fields] AND "birth"[All Fields] AND "attendants"[All Fields]) OR "traditional birth attendants"[All Fields]) AND (("perinatal mortality"[MeSH Terms] OR ("perinatal"[All Fields] AND "mortality"[All Fields]) OR "perinatal mortality"[All Fields] OR "perinatal death"[MeSH Terms] OR ("perinatal"[All Fields] AND "death"[All Fields]) OR "perinatal death"[All Fields] OR ("perinatal"[All Fields] AND "mortality"[All Fields])) AND ("india"[MeSH Terms] OR "india"[All Fields])) AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])</p>
<p>Special New Born Care Units (SNCUs) AND Perinatal mortality in India</p>	<p>(Special[All Fields] AND New[All Fields] AND ("parturition"[MeSH Terms] OR "parturition"[All Fields] OR "born"[All Fields]) AND Care[All Fields] AND Units[All Fields]) AND SNCUs[All Fields] AND (("perinatal mortality"[MeSH Terms] OR ("perinatal"[All Fields] AND "mortality"[All Fields]) OR "perinatal mortality"[All Fields] OR "perinatal death"[MeSH Terms] OR ("perinatal"[All Fields] AND "death"[All Fields]) OR "perinatal death"[All Fields] OR ("perinatal"[All Fields] AND "mortality"[All Fields])) AND ("india"[MeSH Terms] OR "india"[All Fields])) AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])</p>
<p>Birth preparedness and complication readiness AND perinatal mortality rate AND India</p>	<p>((("parturition"[MeSH Terms] OR "parturition"[All Fields] OR "birth"[All Fields]) AND preparedness[All Fields] AND complication[All Fields] AND readiness[All Fields]) AND (("perinatal mortality"[MeSH Terms] OR ("perinatal"[All Fields] AND "mortality"[All Fields]) OR "perinatal mortality"[All Fields] OR "perinatal death"[MeSH Terms] OR ("perinatal"[All Fields] AND "death"[All Fields]) OR "perinatal death"[All Fields] OR ("perinatal"[All Fields] AND "mortality"[All Fields])) AND ("J Rehabil Assist Technol</p>

	Eng[Journal] OR "rate"[All Fields])) AND ("india"[MeSH Terms] OR "india"[All Fields]) AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])
Antenatal care OR Postnatal care OR Intranatal care AND perinatal mortality AND India	("prenatal care"[MeSH Terms] OR ("prenatal"[All Fields] AND "care"[All Fields]) OR "prenatal care"[All Fields] OR ("antenatal"[All Fields] AND "care"[All Fields]) OR "antenatal care"[All Fields]) OR ("postnatal care"[MeSH Terms] OR ("postnatal"[All Fields] AND "care"[All Fields]) OR "postnatal care"[All Fields]) OR (Intranatal[All Fields] AND care[All Fields]) AND ("perinatal mortality"[MeSH Terms] OR ("perinatal"[All Fields] AND "mortality"[All Fields]) OR "perinatal mortality"[All Fields] OR "perinatal death"[MeSH Terms] OR ("perinatal"[All Fields] AND "death"[All Fields]) OR "perinatal death"[All Fields] OR ("perinatal"[All Fields] AND "mortality"[All Fields])) AND ("india"[MeSH Terms] OR "india"[All Fields]) AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])
Still birth rate AND India	((("stillbirth"[MeSH Terms] OR "stillbirth"[All Fields] OR ("still"[All Fields] AND "birth"[All Fields]) OR "still birth"[All Fields]) AND ("J Rehabil Assist Technol Eng"[Journal] OR "rate"[All Fields])) AND ("india"[MeSH Terms] OR "india"[All Fields]) AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])
Impact of Jannani Suraksha Yojana(JSY) on still birth rate AND India	((("Impact (Am Coll Physicians)"[Journal] OR "impact"[All Fields]) AND Suraksha[All Fields] AND ("Yojana"[Journal] OR "yojana"[All Fields])) AND JSY[All Fields] AND ((("stillbirth"[MeSH Terms] OR "stillbirth"[All Fields] OR ("still"[All Fields] AND "birth"[All Fields]) OR "still birth"[All Fields]) AND ("J Rehabil Assist Technol Eng"[Journal] OR "rate"[All Fields])) AND ("india"[MeSH Terms] OR "india"[All Fields]) AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])
Impact of Jannani Shishu Suraksha Karyakram(JSSK) on still birth rate AND India	Impact of Jannani Shishu Suraksha Karyakram(JSSK) on still birth rate ((("Impact (Am Coll Physicians)"[Journal] OR "impact"[All Fields]) AND Shishu[All Fields] AND Suraksha[All Fields] AND Karyakram[All Fields]) AND JSSK[All Fields] AND ((("stillbirth"[MeSH Terms] OR "stillbirth"[All Fields] OR ("still"[All Fields] AND "birth"[All Fields]) OR "still birth"[All Fields]) AND ("J Rehabil Assist Technol Eng"[Journal] OR "rate"[All Fields])) AND ("india"[MeSH Terms] OR "india"[All Fields]) AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])

<p>Antenatal care OR Intranatal care AND still birth rate AND India</p>	<p>("prenatal care"[MeSH Terms] OR ("prenatal"[All Fields] AND "care"[All Fields]) OR "prenatal care"[All Fields] OR ("antenatal"[All Fields] AND "care"[All Fields]) OR "antenatal care"[All Fields]) OR (Intranatal[All Fields] AND care[All Fields]) AND (("stillbirth"[MeSH Terms] OR "stillbirth"[All Fields] OR ("still"[All Fields] AND "birth"[All Fields]) OR "still birth"[All Fields]) AND ("J Rehabil Assist Technol Eng"[Journal] OR "rate"[All Fields])) AND ("india"[MeSH Terms] OR "india"[All Fields]) AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])</p>
<p>Care during labour and child birth AND still birth rate AND India</p>	<p>(Care[All Fields] AND ("labour"[All Fields] OR "work"[MeSH Terms] OR "work"[All Fields] OR "labor"[All Fields] OR "labor, obstetric"[MeSH Terms] OR ("labor"[All Fields] AND "obstetric"[All Fields]) OR "obstetric labor"[All Fields]) AND ("child"[MeSH Terms] OR "child"[All Fields]) AND ("parturition"[MeSH Terms] OR "parturition"[All Fields] OR "birth"[All Fields])) AND (("stillbirth"[MeSH Terms] OR "stillbirth"[All Fields] OR ("still"[All Fields] AND "birth"[All Fields]) OR "still birth"[All Fields]) AND ("J Rehabil Assist Technol Eng"[Journal] OR "rate"[All Fields])) AND ("india"[MeSH Terms] OR "india"[All Fields]) AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])</p>
<p>India Newborn Action Plan (INAP) and still birth rate</p>	<p>((("india"[MeSH Terms] OR "india"[All Fields]) AND ("infant, newborn"[MeSH Terms] OR ("infant"[All Fields] AND "newborn"[All Fields]) OR "newborn infant"[All Fields] OR "newborn"[All Fields]) AND "action"[All Fields] AND Plan[All Fields]) AND ("isonitrosoacetophenone"[Supplementary Concept] OR "isonitrosoacetophenone"[All Fields] OR "inap"[All Fields]) AND (("stillbirth"[MeSH Terms] OR "stillbirth"[All Fields] OR ("still"[All Fields] AND "birth"[All Fields]) OR "still birth"[All Fields]) AND "rate"[All Fields])</p>
<p>Accredited Social Health Activist(ASHA) role AND still birth rate AND India</p>	<p>(Accredited[All Fields] AND Social[All Fields] AND ("health"[MeSH Terms] OR "health"[All Fields])) AND ("ASHA"[Journal] OR "ASHA Suppl"[Journal] OR "asha"[All Fields]) AND ("role"[MeSH Terms] OR "role"[All Fields]) AND (("stillbirth"[MeSH Terms] OR "stillbirth"[All Fields] OR ("still"[All Fields] AND "birth"[All Fields]) OR "still birth"[All Fields]) AND ("J Rehabil Assist Technol Eng"[Journal] OR "rate"[All Fields])) AND</p>

	("india"[MeSH Terms] OR "india"[All Fields]) AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])
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Management of Diarrheal diseases with ORS and zinc AND Children AND india	((("organization and administration"[MeSH Terms] OR ("organization"[All Fields] AND "administration"[All Fields]) OR "organization and administration"[All Fields] OR "management"[All Fields] OR "disease management"[MeSH Terms] OR ("disease"[All Fields] AND "management"[All Fields]) OR "disease management"[All Fields]) AND Diarrheal[All Fields] AND ("disease"[MeSH Terms] OR "disease"[All Fields] OR "diseases"[All Fields]) AND ("ORALIT"[Supplementary Concept] OR "ORALIT"[All Fields] OR "ors"[All Fields]) AND ("zinc"[MeSH Terms] OR "zinc"[All Fields])) AND ("child"[MeSH Terms] OR "child"[All Fields] OR "children"[All Fields]) AND ("india"[MeSH Terms] OR "india"[All Fields]) AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])
Management of Acute Respiratory Infections AND Children AND India	((("organization and administration"[MeSH Terms] OR ("organization"[All Fields] AND "administration"[All Fields]) OR "organization and administration"[All Fields] OR "management"[All Fields] OR "disease management"[MeSH Terms] OR ("disease"[All Fields] AND "management"[All Fields]) OR "disease management"[All Fields]) AND Acute[All Fields] AND ("respiratory tract infections"[MeSH Terms] OR ("respiratory"[All Fields] AND "tract"[All Fields] AND "infections"[All Fields]) OR "respiratory tract infections"[All Fields] OR ("respiratory"[All Fields] AND "infections"[All Fields]) OR "respiratory infections"[All Fields])) AND (("child"[MeSH Terms] OR "child"[All Fields] OR "children"[All Fields]) AND under[All Fields] AND 5[All Fields] AND years[All Fields]) AND ("india"[MeSH Terms] OR "india"[All Fields]) AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])
Intensified Diarrhea Control Fortnight AND Children AND India	(Intensified[All Fields] AND ("diarrhoea"[All Fields] OR "diarrhea"[MeSH Terms] OR "diarrhea"[All Fields]) AND ("prevention and control"[Subheading] OR ("prevention"[All Fields] AND "control"[All Fields]) OR "prevention and control"[All Fields] OR "control"[All Fields] OR "control groups"[MeSH Terms] OR ("control"[All Fields] AND "groups"[All Fields]) OR "control groups"[All Fields]) AND Fortnight[All Fields]) AND (("child"[MeSH

	Terms] OR "child"[All Fields] OR "children"[All Fields]) AND under[All Fields] AND 5[All Fields] AND years[All Fields]) AND ("india"[MeSH Terms] OR "india"[All Fields]) AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])
Integrated management of neonatal and childhood illness AND Children AND India	(Integrated[All Fields] AND ("organization and administration"[MeSH Terms] OR ("organization"[All Fields] AND "administration"[All Fields]) OR "organization and administration"[All Fields] OR "management"[All Fields] OR "disease management"[MeSH Terms] OR ("disease"[All Fields] AND "management"[All Fields]) OR "disease management"[All Fields]) AND ("infant, newborn"[MeSH Terms] OR ("infant"[All Fields] AND "newborn"[All Fields]) OR "newborn infant"[All Fields] OR "neonatal"[All Fields]) AND ("Childhood"[Journal] OR "childhood"[All Fields]) AND illness[All Fields]) AND ("child"[MeSH Terms] OR "child"[All Fields] OR "children"[All Fields]) AND ("india"[MeSH Terms] OR "india"[All Fields]) AND (("2005/01/01"[PDAT] : "2018/12/31"[PDAT]) AND "humans"[MeSH Terms])
Micronutrient supplementation (Vitamin A, Iron Folic Acid) AND Children AND Mortality AND India	((("trace elements"[Pharmacological Action] OR "micronutrients"[Pharmacological Action] OR "trace elements"[MeSH Terms] OR ("trace"[All Fields] AND "elements"[All Fields]) OR "trace elements"[All Fields] OR "micronutrient"[All Fields] OR "micronutrients"[MeSH Terms] OR "micronutrients"[All Fields]) AND supplementation[All Fields]) AND ("vitamin a"[MeSH Terms] OR "vitamin a"[All Fields]) OR ("folic acid"[MeSH Terms] OR ("folic"[All Fields] AND "acid"[All Fields]) OR "folic acid"[All Fields]) AND ("child mortality"[MeSH Terms] OR ("child"[All Fields] AND "mortality"[All Fields]) OR "child mortality"[All Fields]) OR ("children"[All Fields] AND "mortality"[All Fields]) OR "children mortality"[All Fields]) AND ("india"[MeSH Terms] OR "india"[All Fields]) AND ("loattrfull text"[sb] AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT]) AND "humans"[MeSH Terms])
Supplementation with micronutrients in children AND Children AND India	supplementation[All Fields] AND ("micronutrients"[Pharmacological Action] OR "micronutrients"[MeSH Terms] OR "micronutrients"[All Fields]) AND ("child"[MeSH Terms] OR "child"[All Fields] OR "children"[All Fields])) AND ("child"[MeSH Terms] OR "child"[All Fields] OR "children"[All Fields]) AND ("india"[MeSH Terms] OR "india"[All Fields]) AND ("loattrfull text"[sb] AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT]) AND "humans"[MeSH Terms])

Universal immunization AND Children AND India	((Universal[All Fields] AND ("immunisation"[All Fields] OR "vaccination"[MeSH Terms] OR "vaccination"[All Fields] OR "immunization"[All Fields] OR "immunization"[MeSH Terms])) AND ("child"[MeSH Terms] OR "child"[All Fields] OR "children"[All Fields])) AND ("india"[MeSH Terms] OR "india"[All Fields]) AND ("loattrfull text"[sb] AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT]) AND "humans"[MeSH Terms])
Full immunization coverage AND Children AND India	(Full[All Fields] AND ("vaccination coverage"[MeSH Terms] OR ("vaccination"[All Fields] AND "coverage"[All Fields]) OR "vaccination coverage"[All Fields] OR ("immunization"[All Fields] AND "coverage"[All Fields]) OR "immunization coverage"[All Fields])) AND ("child"[MeSH Terms] OR "child"[All Fields] OR "children"[All Fields]) AND ("india"[MeSH Terms] OR "india"[All Fields]) AND ("loattrfull text"[sb] AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT]) AND "humans"[MeSH Terms])

Child screening and early intervention services AND Children AND India	("child"[MeSH Terms] OR "child"[All Fields]) AND ("diagnosis"[Subheading] OR "diagnosis"[All Fields] OR "screening"[All Fields] OR "mass screening"[MeSH Terms] OR ("mass"[All Fields] AND "screening"[All Fields]) OR "mass screening"[All Fields] OR "screening"[All Fields] OR "early detection of cancer"[MeSH Terms] OR ("early"[All Fields] AND "detection"[All Fields] AND "cancer"[All Fields]) OR "early detection of cancer"[All Fields]) AND ("early intervention (education)"[MeSH Terms] OR ("early"[All Fields] AND "intervention"[All Fields] AND "(education)"[All Fields]) OR "early intervention (education)"[All Fields] OR ("early"[All Fields] AND "intervention"[All Fields]) OR "early intervention"[All Fields]) AND services[All Fields]) AND ("child"[MeSH Terms] OR "child"[All Fields] OR "children"[All Fields]) AND ("india"[MeSH Terms] OR "india"[All Fields]) AND ("loattrfull text"[sb] AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT]) AND "humans"[MeSH Terms])
Birth defects in children under 5 years AND NRHM AND India	(("abnormalities"[Subheading] OR "abnormalities"[All Fields] OR ("birth"[All Fields] AND "defects"[All Fields]) OR "birth defects"[All Fields] OR "congenital abnormalities"[MeSH Terms] OR ("congenital"[All Fields] AND "abnormalities"[All Fields]) OR "congenital abnormalities"[All Fields] OR ("birth"[All Fields] AND "defects"[All Fields])) AND ("child"[MeSH Terms] OR "child"[All Fields] OR "children"[All Fields]) AND under[All Fields] AND 5[All Fields] AND years[All Fields]) AND ("india"[MeSH Terms] OR "india"[All Fields])

IFA Supplementation AND Children AND India	(("iron"[MeSH Terms] OR "iron"[All Fields]) AND ("folic acid"[MeSH Terms] OR ("folic"[All Fields] AND "acid"[All Fields]) OR "folic acid"[All Fields]) AND supplementation[All Fields] AND IFA[All Fields] AND Supplementation[All Fields]) AND ("child"[MeSH Terms] OR "child"[All Fields] OR "children"[All Fields]) AND ("india"[MeSH Terms] OR "india"[All Fields]) AND ("loattrfull text"[sb] AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT]) AND "humans"[MeSH Terms])
Rashtriya bal Swasthya karyakram	(Rashtriya[All Fields] AND bal[All Fields] AND swasthya[All Fields] AND karyakram[All Fields]) AND ("child"[MeSH Terms] OR "child"[All Fields] OR "children"[All Fields]) AND ("india"[MeSH Terms] OR "india"[All Fields]) AND ("loattrfull text"[sb] AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT]) AND "humans"[MeSH Terms])
National deworming day AND Children AND India	(("federal government"[MeSH Terms] OR ("federal"[All Fields] AND "government"[All Fields]) OR "federal government"[All Fields] OR "national"[All Fields]) AND deworming[All Fields] AND day[All Fields]) AND ("child"[MeSH Terms] OR "child"[All Fields] OR "children"[All Fields]) AND ("india"[MeSH Terms] OR "india"[All Fields]) AND ("loattrfull text"[sb] AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT]) AND "humans"[MeSH Terms])
Complementary feeding practices AND Children AND India	(("infant nutritional physiological phenomena"[MeSH Terms] OR ("infant"[All Fields] AND "nutritional"[All Fields] AND "physiological"[All Fields] AND "phenomena"[All Fields]) OR "infant nutritional physiological phenomena"[All Fields] OR ("complementary"[All Fields] AND "feeding"[All Fields]) OR "complementary feeding"[All Fields]) AND practices[All Fields]) AND ("child"[MeSH Terms] OR "child"[All Fields] OR "children"[All Fields]) AND ("india"[MeSH Terms] OR "india"[All Fields]) AND ("loattrfull text"[sb] AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT]) AND "humans"[MeSH Terms])
	Fields]) AND ("loattrfull text"[sb] AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT]) AND "humans"[MeSH Terms])
Deficiencies in Children under 5 years AND India	(Deficiencies[All Fields] AND ("child"[MeSH Terms] OR "child"[All Fields] OR "children"[All Fields]) AND under[All Fields] AND 5[All Fields] AND years[All Fields]) AND ("india"[MeSH Terms] OR "india"[All Fields]) AND ("loattrfull text"[sb] AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT]) AND "humans"[MeSH Terms])

Disease management in children in NRHM AND India	(("therapy"[Subheading] OR "therapy"[All Fields] OR ("disease"[All Fields] AND "management"[All Fields]) OR "disease management"[All Fields] OR "disease management"[MeSH Terms] OR ("disease"[All Fields] AND "management"[All Fields])) AND ("child"[MeSH Terms] OR "child"[All Fields] OR "children"[All Fields]) AND NRHM[All Fields]) AND ("india"[MeSH Terms] OR "india"[All Fields]) AND ("loattrfull text"[sb] AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT]) AND "humans"[MeSH Terms])
Nutritional rehabilitation centres AND Children AND India	(Nutritional[All Fields] AND ("rehabilitation"[Subheading] OR "rehabilitation"[All Fields] OR "rehabilitation"[MeSH Terms]) AND centres[All Fields]) AND ("child"[MeSH Terms] OR "child"[All Fields] OR "children"[All Fields]) AND ("india"[MeSH Terms] OR "india"[All Fields]) AND ("loattrfull text"[sb] AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT]) AND "humans"[MeSH Terms])
Disease management in children in NRHM AND India	(("therapy"[Subheading] OR "therapy"[All Fields] OR ("disease"[All Fields] AND "management"[All Fields]) OR "disease management"[All Fields] OR "disease management"[MeSH Terms] OR ("disease"[All Fields] AND "management"[All Fields])) AND ("child"[MeSH Terms] OR "child"[All Fields] OR "children"[All Fields]) AND NRHM[All Fields]) AND ("india"[MeSH Terms] OR "india"[All Fields]) AND ("loattrfull text"[sb] AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT]) AND "humans"[MeSH Terms])
Prevalence of diarrhea in under 5 children in India	(("epidemiology"[Subheading] OR "epidemiology"[All Fields] OR "prevalence"[All Fields] OR "prevalence"[MeSH Terms]) AND ("diarrhoea"[All Fields] OR "diarrhea"[MeSH Terms] OR "diarrhea"[All Fields]) AND under[All Fields] AND 5[All Fields] AND ("child"[MeSH Terms] OR "child"[All Fields] OR "children"[All Fields]) AND ("india"[MeSH Terms] OR "india"[All Fields])) AND ("2005/01/01"[PDAT] : "2013/12/31"[PDAT])
Impact Indicator: Under 5 Mortality Rate in India	(Under[All Fields] AND 5[All Fields] AND ("mortality"[MeSH Terms] OR "mortality"[All Fields] OR ("mortality"[All Fields] AND "rate"[All Fields]) OR "mortality rate"[All Fields]) AND ("india"[MeSH Terms] OR "india"[All Fields])) AND ("loattrfull text"[sb] AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT]) AND "humans"[MeSH Terms])

REPRODUCTIVE HEALTH	
National Health Mission	"National Health Mission" OR "NHM" [MeSH words] OR "National" [All Fields] AND "Health" [All Fields] AND "Mission" [All Fields]
National Rural Health Mission	"National Rural Health Mission" OR "NRHM" [MeSH words] OR "National" [All Fields] AND "Rural" [All fields] AND "Health" [All Fields] AND "Mission" [All Fields] "National Rural Health Mission" OR "NRHM" [MeSH words] OR "National" [All Fields] AND "Rural" [All fields] AND "Health" [All Fields] AND "Mission" [All Fields]
National Urban Health Mission	"National Urban Health Mission" OR "NRHM" [MeSH words] OR "National" [All Fields] AND "Urban" [All fields] AND "Health" [All Fields] AND "Mission" [All Fields]
Reproductive Health Program	"Reproductive Health Program" [MeSH words] OR "Reproductive" [All Fields] AND "Health" [All Fields] AND "Program" [All Fields] AND "Evaluation" [All Fields]
Family Planning	"Family planning" [MeSH words] OR "Family" [All Fields] AND "Planning" [All Fields] OR "Birth Control" OR "Birth" [All Fields] AND "control" [All Fields]
Contraceptive Prevalence Rate	"Contraceptive Prevalence Rate" [MeSH words] OR "Contraceptive" [All Fields] AND "Prevalence" [All Fields] AND "Rate" [All Fields]
Total Unmet need	"Total Unmet Need" [MeSH words] OR "Total" [All Fields] AND "Unmet" [All Fields] AND "Need" [All Fields]
Total Fertility Rate	"Total Fertility Rate" [MeSH words] OR "Total" [All Fields] AND "Fertility" [All Fields] AND "Rate" [All Fields]
Rashtriya Kishor Swasthya Karyakram	"Rashtriya Kishor Swasthya Karyakram" [MeSH words] OR "Rashtriya" [All Fields] AND "Kishor" [All Fields] AND "Swasthya" [All Fields] AND "Karyakram" [All Fields]
Adolescent Friendly Health Clinics	"Adolescent Friendly Health Clinics" [MeSH words] OR "Adolescent" [All Fields] AND "Friendly" [All Fields] AND "Health" [All Fields] AND "Clinics" [All Fields]
Adolescent Reproductive and Sexual Health/ ARSH	"Adolescent Reproductive and Sexual Health" [MeSH words] OR "ARSH" [MeSH word] OR "Adolescent" [All Fields] AND "Reproductive" [All Fields] AND "Sexual" [All Fields] AND "Health" [All Fields]
Weekly Iron and Folic Acid Supplementation	"Weekly Iron and Folic Acid Supplementation" [MeSH words] OR "Weekly" [All Fields] AND "Iron" [All Fields] AND "Folic Acid" [All Fields] AND "Supplementation" [All Fields]
Menstrual Hygiene Scheme	"Menstrual hygiene scheme" [MeSH words] OR "Menstrual" [All Fields] AND "Hygiene" [All Fields] AND "Scheme" [All Fields]
Other variables	

Keywords	MeSH
"road connectivity" AND "maternal health" AND "India"	"road connectivity"[All Fields] AND "maternal health"[All Fields] AND "India"[All Fields] AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])
"road connectivity" AND "child health" AND "India"	"road connectivity"[All Fields] AND "child health"[All Fields] AND "India"[All Fields] AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])
"road connectivity" AND "adolescent health" AND "India"	"road connectivity"[All Fields] AND "adolescent health"[All Fields] AND "India"[All Fields] AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])
"road connectivity" AND "health outcomes" AND "India"	"road connectivity"[All Fields] AND "health outcomes"[All Fields] AND "India"[All Fields] AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])
"surfaced road" AND "health outcomes" AND "India"	(surfaced[All Fields] AND road[All Fields]) AND "health outcomes"[All Fields] AND "India"[All Fields] AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])
"rural road connectivity" AND "health " AND "India"	(rural[All Fields] AND road[All Fields] AND connectivity[All Fields]) AND "health "[All Fields] AND "India"[All Fields] AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])
"rural connectivity" AND "health outcomes" AND India	(rural[All Fields] AND connectivity[All Fields]) AND "health outcomes"[All Fields] AND ("india"[MeSH Terms] OR "india"[All Fields]) AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])
(mobile phone use) AND maternal health) AND India	("cell phone use"[MeSH Terms] OR ("cell"[All Fields] AND "phone"[All Fields]) OR "cell phone use"[All Fields] OR ("mobile"[All Fields] AND "phone"[All Fields]) OR "mobile phone use"[All Fields]) AND ("maternal health"[MeSH Terms] OR ("maternal"[All Fields] AND "health"[All Fields]) OR "maternal health"[All Fields])) AND ("india"[MeSH Terms] OR "india"[All Fields]) AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])
"mobile phone use" AND "maternal health" AND "India"	mobile[Title] AND phone[Title] AND maternal[Title] AND health[Title] AND India[Title]
mobile connectivity AND maternal health AND India	(mobile[All Fields] AND connectivity[All Fields]) AND ("maternal health"[MeSH Terms] OR ("maternal"[All Fields] AND "health"[All Fields]) OR "maternal health"[All Fields]) AND ("india"[MeSH Terms] OR "india"[All Fields]) AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])

"mobile connectivity" AND "maternal health" AND "India"	"mobile connectivity"[All Fields] AND "maternal health"[All Fields] AND "India"[All Fields] AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])
"mobile phone" AND "maternal health" AND "India"	"mobile phone"[All Fields] AND "maternal health"[All Fields] AND "India"[All Fields] AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])
"mobile connectivity" impact on "health outcomes" AND "India"	"mobile connectivity"[All Fields] AND ("Impact (Am Coll Physicians)"[Journal] OR "impact"[All Fields]) AND "health outcomes"[All Fields] AND "India"[All Fields] AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])
"mobile connectivity" impact on "maternal health" AND "India"	"mobile connectivity"[All Fields] AND ("Impact (Am Coll Physicians)"[Journal] OR "impact"[All Fields]) AND "maternal health"[All Fields] AND "India"[All Fields] AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])
"telecommunication connectivity" AND "maternal health" AND "India"	((("telecommunications"[MeSH Terms] OR "telecommunications"[All Fields] OR "telecommunication"[All Fields]) AND connectivity[All Fields]) AND "maternal health"[All Fields] AND "India"[All Fields] AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT]))
"AAROGYAM" AND "Maternal health" AND "India"	"AAROGYAM"[All Fields] AND "Maternal health"[All Fields] AND "India"[All Fields] AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT]))
"mother and child tracking system" AND "India"	"mother and child tracking system"[All Fields] AND "India"[All Fields] AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])
"information and communication technology" AND "maternal mortality ratio" AND "India"	"information and communication technology"[All Fields] AND "maternal mortality ratio"[All Fields] AND "India"[All Fields] AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])
"mobile connectivity" impact on "child health" AND "India"	"mobile connectivity"[All Fields] AND ("Impact (Am Coll Physicians)"[Journal] OR "impact"[All Fields]) AND "child health"[All Fields] AND "India"[All Fields] AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])
"mobile phone" AND "child health" AND "India"	"mobile connectivity"[All Fields] AND ("Impact (Am Coll Physicians)"[Journal] OR "impact"[All Fields]) AND "child health"[All Fields] AND "India"[All Fields] AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])

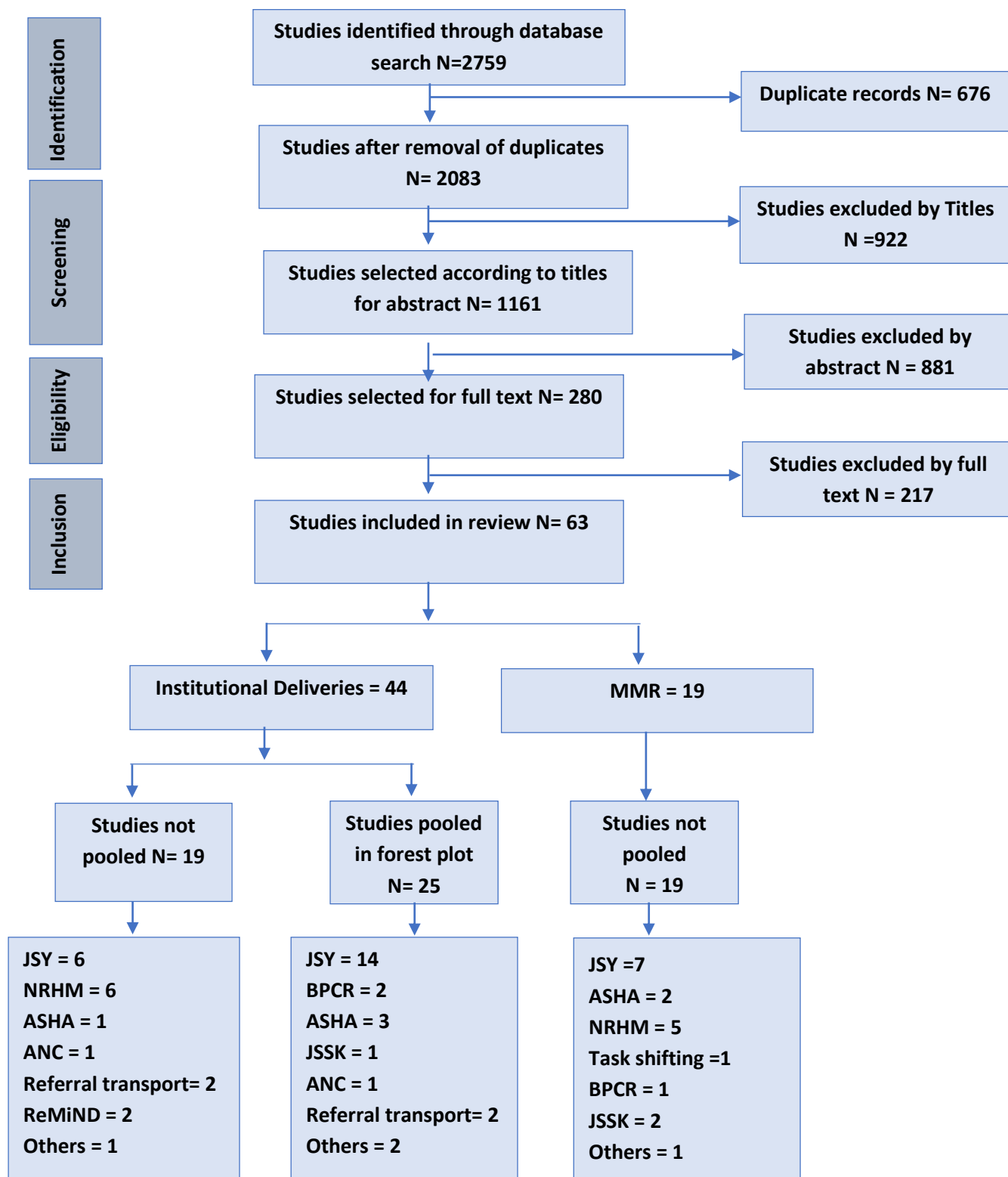
mobile connectivity AND child health AND India	(mobile[All Fields] AND connectivity[All Fields]) AND ("child health"[MeSH Terms] OR ("child"[All Fields] AND "health"[All Fields]) OR "child health"[All Fields]) AND ("india"[MeSH Terms] OR "india"[All Fields]) AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])
"mobile connectivity" AND "child health" AND "India"	"mobile connectivity"[All Fields] AND "child health"[All Fields] AND "India"[All Fields] AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])
((mobile phone use) AND child health) AND India	((("cell phone use"[MeSH Terms] OR ("cell"[All Fields] AND "phone"[All Fields]) OR "cell phone use"[All Fields] OR ("mobile"[All Fields] AND "phone"[All Fields]) OR "mobile phone use"[All Fields]) AND ("child health"[MeSH Terms] OR ("child"[All Fields] AND "health"[All Fields]) OR "child health"[All Fields])) AND ("india"[MeSH Terms] OR "india"[All Fields]) AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])
"mobile phone use" AND "child health" AND "India"	"mobile phone use"[All Fields] AND "child health"[All Fields] AND "India"[All Fields] AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])
"AAROGYAM" AND "child health" AND "India"	"AAROGYAM"[All Fields] AND "child health"[All Fields] AND "India"[All Fields] AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])
"AAROGYAM" AND "health outcomes" AND "India"	"AAROGYAM"[All Fields] AND "health outcomes"[All Fields] AND "India"[All Fields] AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])
"mobile connectivity" impact on "adolescent health" AND "India"	"mobile connectivity"[All Fields] AND ("Impact (Am Coll Physicians)"[Journal] OR "impact"[All Fields]) AND "adolescent health"[All Fields] AND "India"[All Fields] AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])
"mobile phone" AND "adolescent health" AND "India"	"mobile phone"[All Fields] AND "adolescent health"[All Fields] AND "India"[All Fields] AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])
mobile connectivity AND adolescent health AND India	(mobile[All Fields] AND connectivity[All Fields]) AND ("adolescent health"[MeSH Terms] OR ("adolescent"[All Fields] AND "health"[All Fields]) OR "adolescent health"[All Fields]) AND ("india"[MeSH Terms] OR "india"[All Fields]) AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])
mobile phone use AND adolescent health AND India	("cell phone use"[MeSH Terms] OR ("cell"[All Fields] AND "phone"[All Fields]) OR "cell phone use"[All Fields] OR ("mobile"[All Fields] AND "phone"[All Fields]) OR "mobile phone use"[All Fields]) AND ("adolescent health"[MeSH Terms] OR ("adolescent"[All Fields] AND "health"[All Fields]) OR "adolescent health"[All Fields]) AND ("india"[MeSH Terms] OR "india"[All Fields]) AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])

	Fields]) AND ("india"[MeSH Terms] OR "india"[All Fields]) AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])
"mobile phone use" AND "adolescent health" AND "India"	"mobile phone use"[All Fields] AND "adolescent health"[All Fields] AND "India"[All Fields] AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])
water supply AND health outcomes AND India	("water supply"[MeSH Terms] OR ("water"[All Fields] AND "supply"[All Fields]) OR "water supply"[All Fields]) AND (("health"[MeSH Terms] OR "health"[All Fields]) AND outcomes[All Fields]) AND ("india"[MeSH Terms] OR "india"[All Fields])
water supply impact on health outcomes AND India	((("water supply"[MeSH Terms] OR ("water"[All Fields] AND "supply"[All Fields]) OR "water supply"[All Fields]) AND ("Impact (Am Coll Physicians)"[Journal] OR "impact"[All Fields]) AND ("health"[MeSH Terms] OR "health"[All Fields]) AND outcomes[All Fields]) AND ("india"[MeSH Terms] OR "india"[All Fields]) AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])
sanitation impact on health outcomes in India	((("sanitation"[MeSH Terms] OR "sanitation"[All Fields]) AND ("Impact (Am Coll Physicians)"[Journal] OR "impact"[All Fields]) AND ("health"[MeSH Terms] OR "health"[All Fields]) AND outcomes[All Fields]) AND ("india"[MeSH Terms] OR "india"[All Fields])) AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])
sanitation AND health outcomes AND India	("sanitation"[MeSH Terms] OR "sanitation"[All Fields]) AND (("health"[MeSH Terms] OR "health"[All Fields]) AND outcomes[All Fields]) AND ("india"[MeSH Terms] OR "india"[All Fields]) AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])
Impact of toilets on health outcomes in India	((("Impact (Am Coll Physicians)"[Journal] OR "impact"[All Fields]) AND ("bathroom equipment"[MeSH Terms] OR ("bathroom"[All Fields] AND "equipment"[All Fields]) OR "bathroom equipment"[All Fields] OR "toilets"[All Fields]) AND ("health"[MeSH Terms] OR "health"[All Fields]) AND outcomes[All Fields]) AND ("india"[MeSH Terms] OR "india"[All Fields])) AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])
nutrition AND health outcomes AND India	("nutritional status"[MeSH Terms] OR ("nutritional"[All Fields] AND "status"[All Fields]) OR "nutritional status"[All Fields] OR "nutrition"[All Fields] OR "nutritional sciences"[MeSH Terms] OR ("nutritional"[All Fields] AND "sciences"[All Fields]) OR "nutritional sciences"[All Fields]) AND (("health"[MeSH Terms] OR "health"[All Fields]) AND outcomes[All Fields]) AND ("india"[MeSH Terms] OR "india"[All Fields]) AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])

<p>impact of nutrition on health outcomes AND India</p>	<p>((("Impact (Am Coll Physicians)"[Journal] OR "impact"[All Fields]) AND ("nutritional status"[MeSH Terms] OR ("nutritional"[All Fields] AND "status"[All Fields]) OR "nutritional status"[All Fields] OR "nutrition"[All Fields] OR "nutritional sciences"[MeSH Terms] OR ("nutritional"[All Fields] AND "sciences"[All Fields]) OR "nutritional sciences"[All Fields]) AND ("health"[MeSH Terms] OR "health"[All Fields]) AND outcomes[All Fields]) AND ("india"[MeSH Terms] OR "india"[All Fields]) AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT]))</p>
<p>"sanitation" impact on "health outcomes" in "India" NOT animals</p>	<p>"sanitation"[All Fields] AND impact[All Fields] AND "health outcomes"[All Fields] AND "India"[All Fields] NOT animals[All Fields] AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT])</p>
<p>ability to call ambulance AND impact on health outcomes AND India</p>	<p>((("aptitude"[MeSH Terms] OR "aptitude"[All Fields] OR "ability"[All Fields]) AND call[All Fields] AND ("ambulances"[MeSH Terms] OR "ambulances"[All Fields] OR "ambulance"[All Fields])) AND ((("Impact (Am Coll Physicians)"[Journal] OR "impact"[All Fields]) AND ("health"[MeSH Terms] OR "health"[All Fields]) AND outcomes[All Fields]) AND ("india"[MeSH Terms] OR "india"[All Fields]) AND ("2005/01/01"[PDAT] : "2018/12/31"[PDAT]))</p>

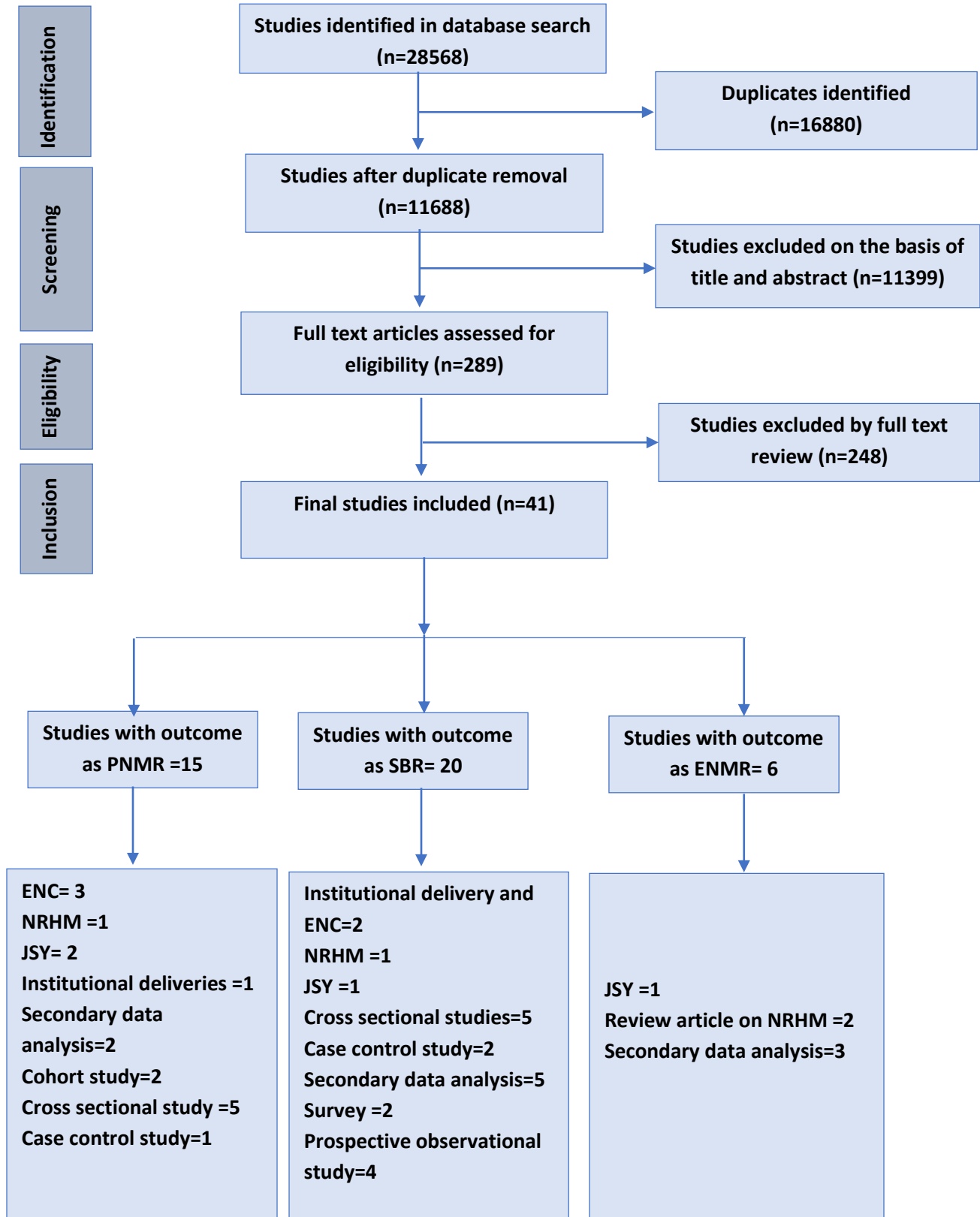
ANNEXURE 4. FLOW DIAGRAM OF STUDIES INCLUDED IN THE SYSTEMATIC REVIEW

4.1. MATERNAL MORTALITY RATIO

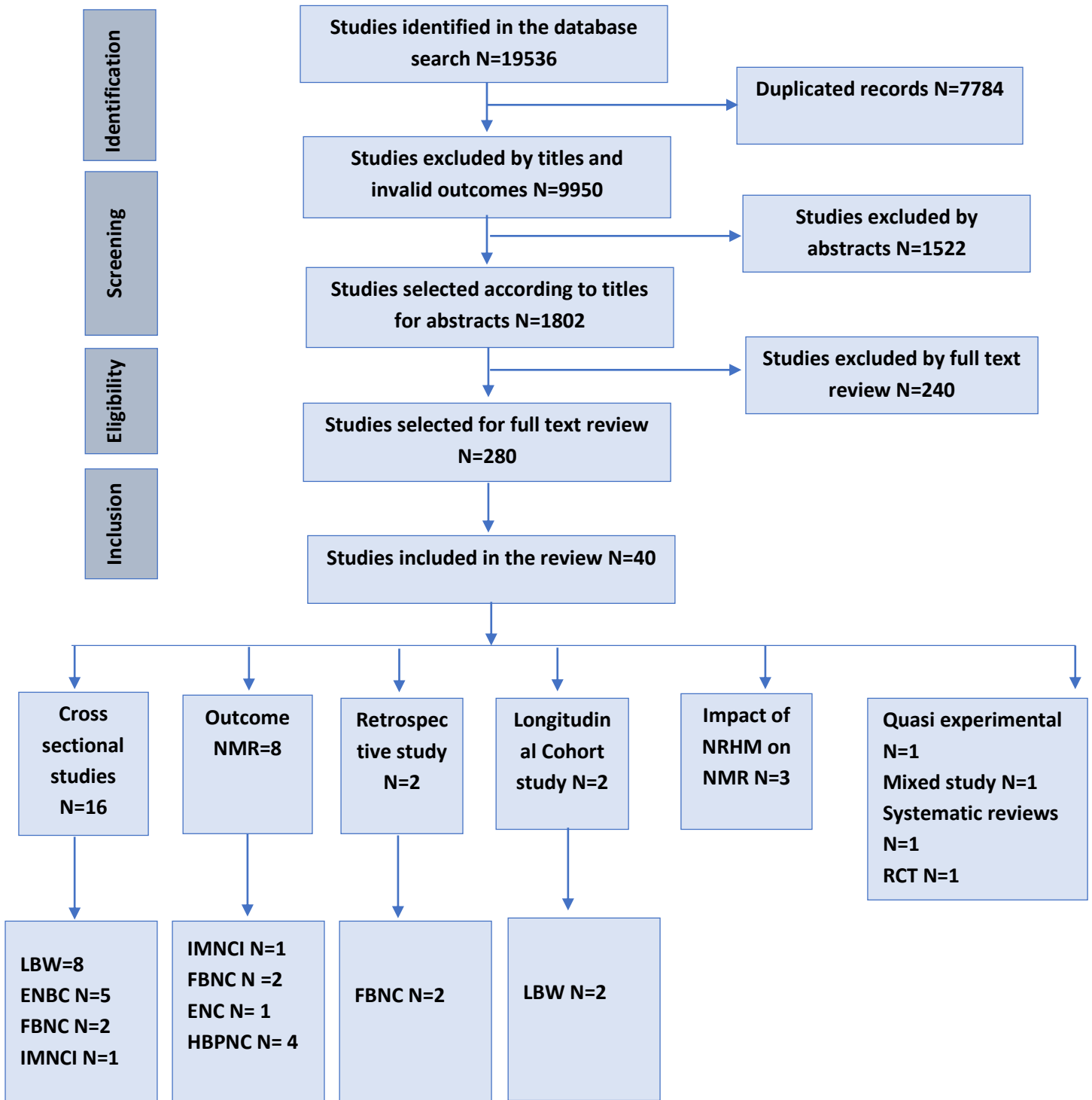


4.2 CHILD HEALTH

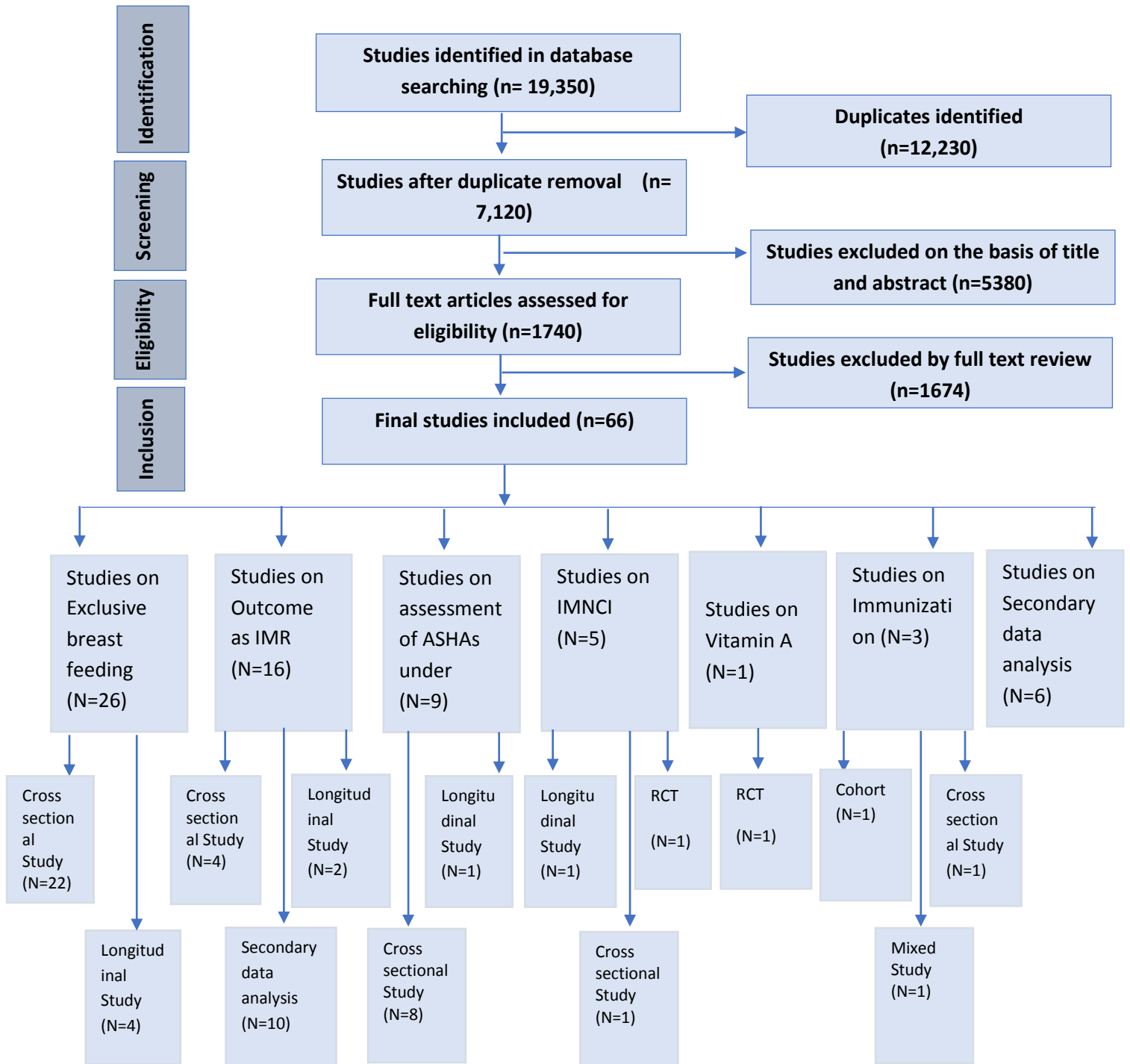
4.2.1 PERINATAL MORTALITY RATE



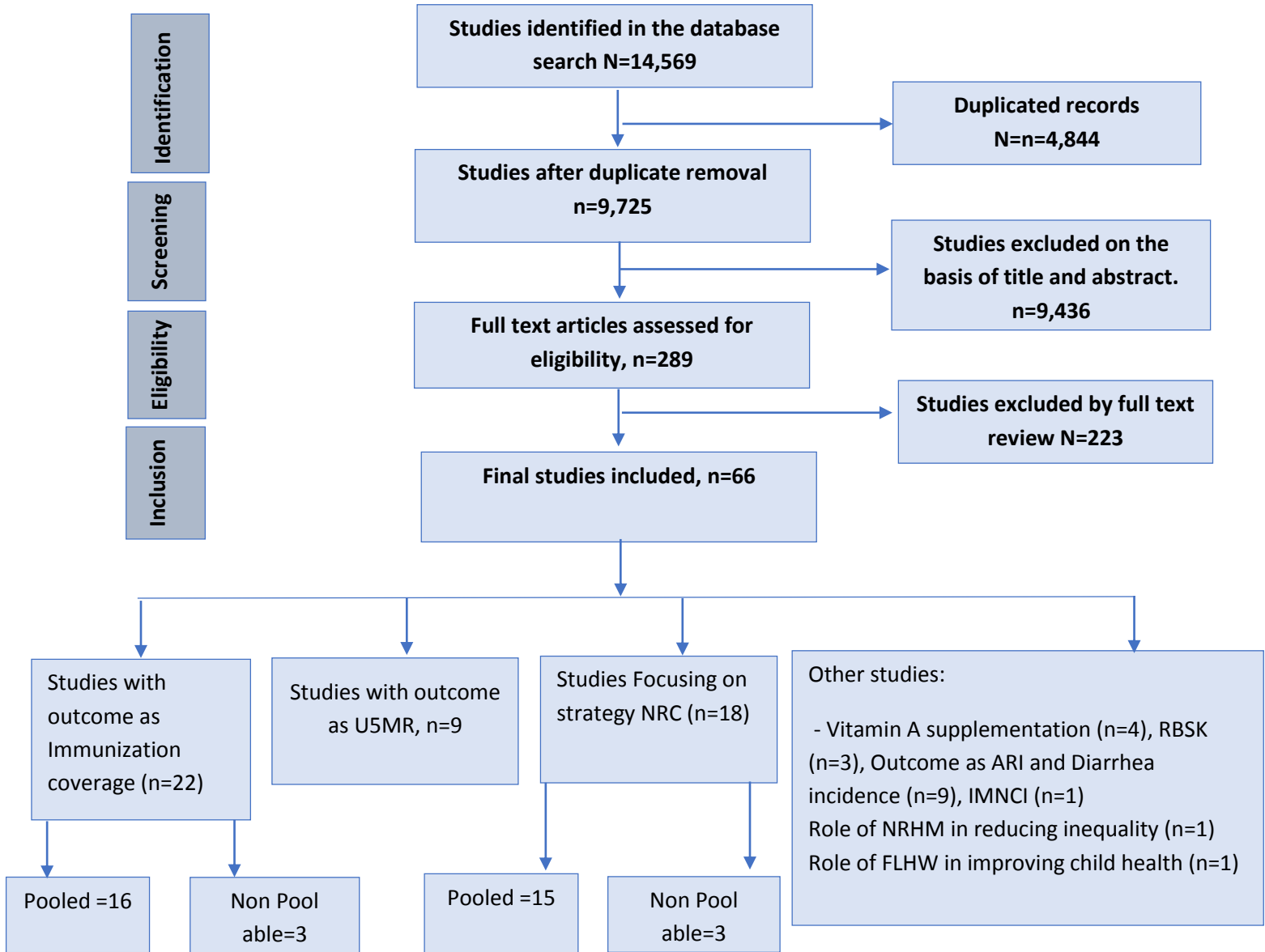
4.2.2 NEONATAL MORTALITY RATE



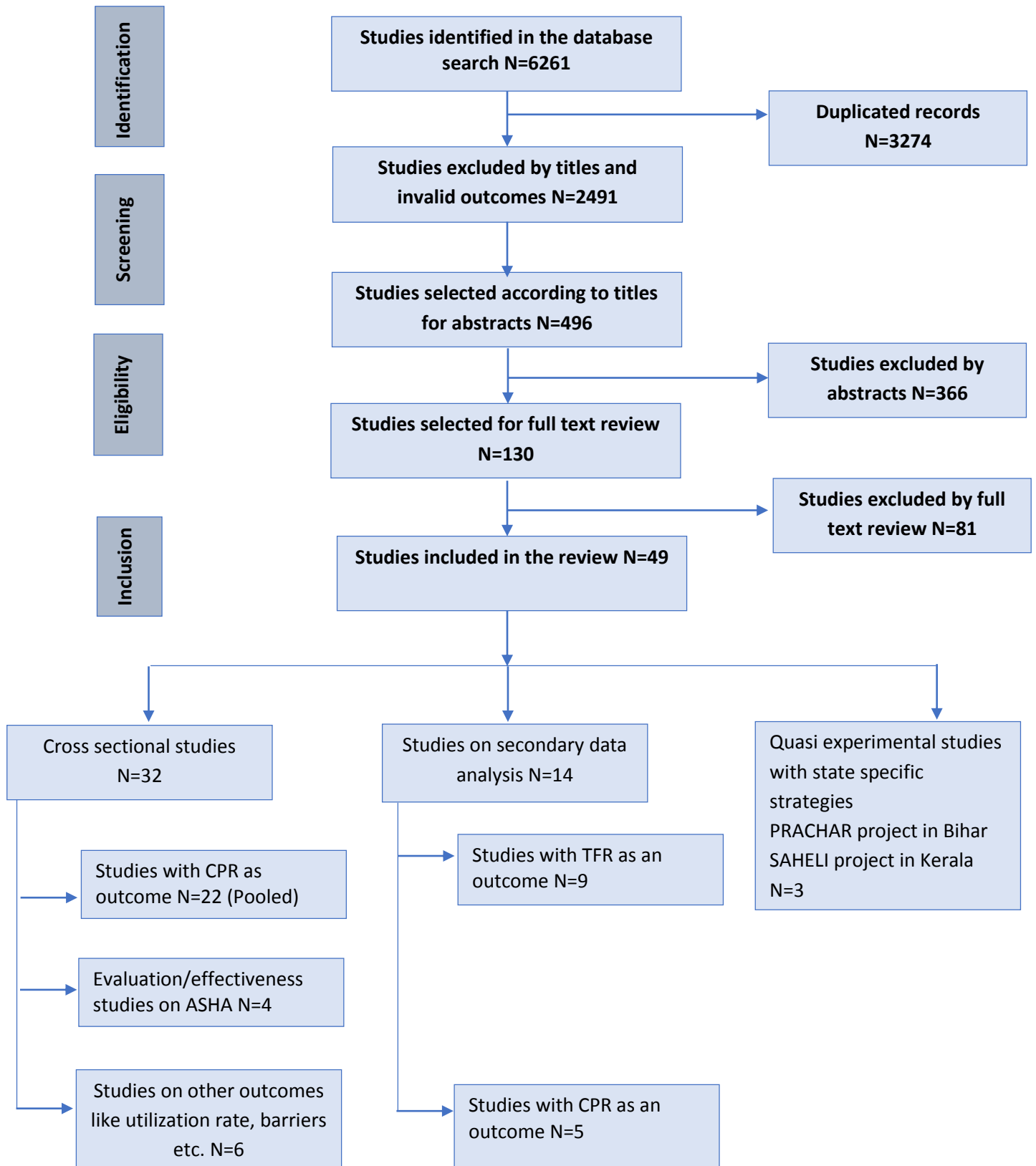
4.2.3. INFANT MORTALITY RATE



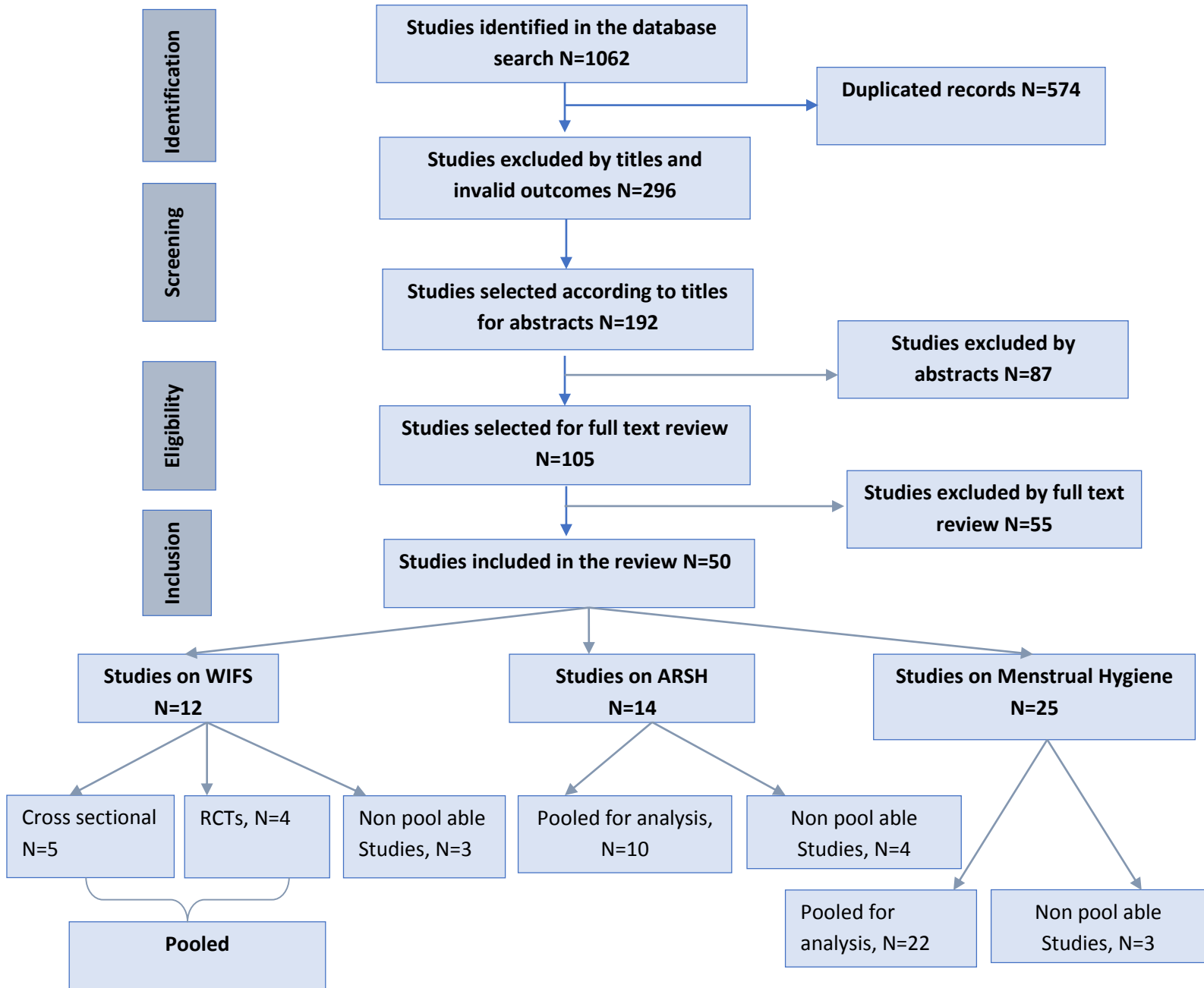
4.2.4 UNDER FIVE MORTALITY RATE



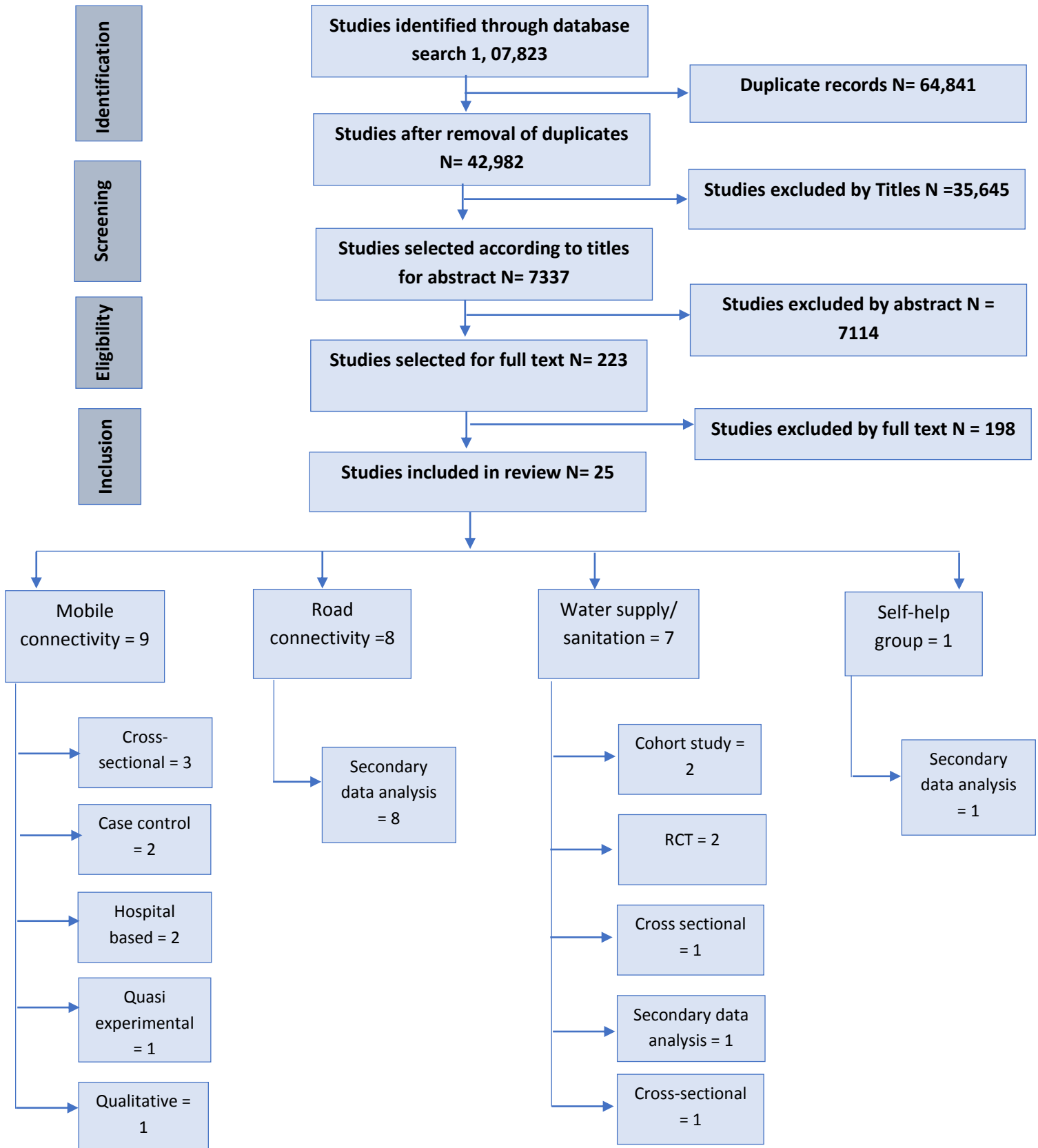
4.3 TOTAL FERTILITY RATE AND CONTRACEPTIVE PREVELANCE RATE



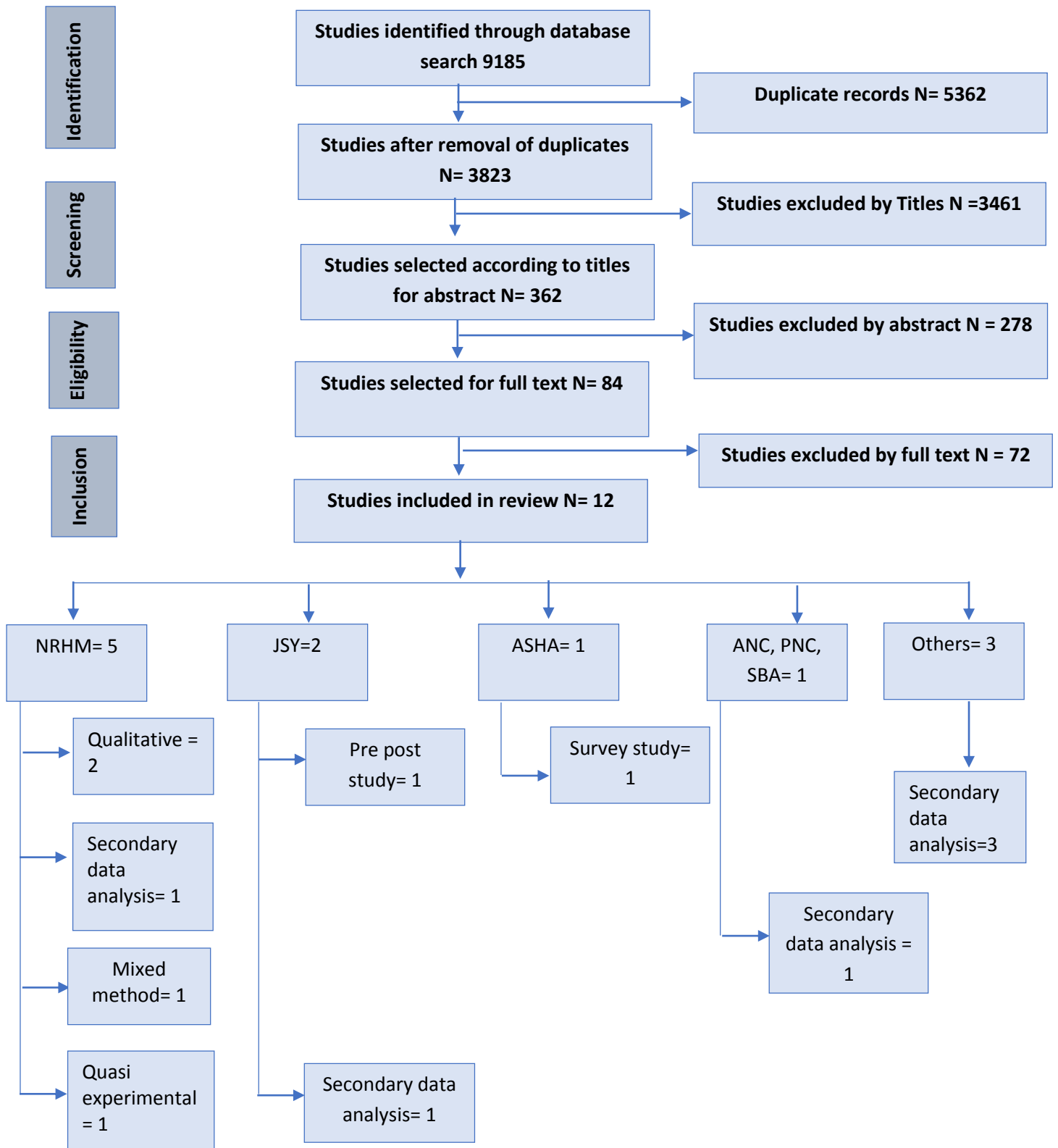
4.4 ADOLESCENT REPRODUCTIVE SEXUAL HEALTH CLINICS AND WEEKLY IRON FOLIC SUPPLEMENTATION



4.5 IMPACT OF OTHER VARIABLES ON MCH OUTCOMES



4.6 MCH INEQUALITIES



ANNEXURE 5. RESULTS OF STUDIES INCLUDED IN SYSTEMATIC REVIEW.

5.1 MATERNAL HEALTH

5.1.1 Results of studies with MMR as an outcome (N=19)

Author & year of publication	Study Period/ Location	Study Design	Objective/Intervention	Results
After 2013				
Begum R. et al. 2014[71]	2004-06 to 2012-13, Assam and India	Secondary data analysis (SRS data)	NHM, JSY, JSSK, MCTS, quality ante-natal care	<i>Assam</i> : MMR reduction =480 to 301 /lakh live births (LB) [37.3% decline], mainly due to increased institutional delivery due to JSY <i>India</i> : MMR=254 to 178 [30% decline]
Shah P. et al. 2014[72]	2002-03 to 2010-11, Jhagadia block (rural tribal area), Gujarat [SEWA].	Prospective study	JSY/Chiranjeevi Yojana/free referral transport services/Community based interventions	MMR reduction = 520 - 146 / lakh LB (71.1% decline)
Randive B. et al. 2014[73]	2007-2009, 9 low performing states of India [RJ,MP,CH,BH, JH,UP,UK,OR, AS]	Secondary data analysis (DLHS 3, AHS 1 and 2, Census 2011)	JSY	MMR reduction 4 times faster in richest areas compared to poorest, MMR=301-178/lakh LB [40% decline in 2003-2013 in India], Disadvantaged population needs to be targeted for cash incentives
Ng M. et al. 2014 [74]	2005-2010, Madhya Pradesh	Continuous time series for MMR(SRS report,	Impact of JSY on MMR	MMR reduction = 371 to 327/lakh LB (12% decline),JSY supported

		AHS, MP vital statistics, research studies from PubMed, google scholar)		institutional delivery: 14% to 80%.Not associated with decline on MMR due to inadequate quality of care
Mane A B et al. 2014 [75]	2001-2012, India	Review study	ASHA	MMR reduction = 301 to 100/ Lakh LB (66.6% decline),Due to promotion of institutional deliveries by ASHA
Bhushan H et al. 2015 [76]	2006-13, India	Secondary data analysis (Training records from 12 states)	Task shifting from specialist to non-specialist doctors	ANC coverage improved by 43%, 44%, 58% during first, second and third trimesters. 50% reduction in maternal deaths
Nagarajan S. et al. 2015 [57]	2001-05 (pre NRHM) to 2005-11 (post NRHM), India	Secondary data analysis (SRS data)	Impact of NRHM on Maternal mortality	MMR reduction = 301 to 178/ Lakh LB (40% decline) .0.2% increase in MMR reduction.MMR was already in declining phase prior to NRHM owing to increased economic growth/ roads/ transportation/ private sectors. NRHM did provide the further impetus to the decline by provision of ambulance services EMOC, JSY.
Doke PP et al. 2016 [77]	1997–2004 to 2005-12, (8 years before and 8 years after) India	Pre NRHM, post NRHM implementation study Secondary data analysis (SRS Data)	NRHM	MMR reduction= 398 to 167 /lakh LB Pre NRHM, MMR decline = 36.2% Post NRHM, MMR decline= 34.2%(MMR decline had already in

				pace even before NRHM. (RCH program in 1997)
Vohra K. et al, 2015[58]	1991-2009, India	Secondary data analysis (SRS, Census data, DLHS, NFHS)	NRHM	MMR reduction= 437 to 178 /lakh LB (59.3% decline) Reduction in birth and increased institutional deliveries could be the reason for decline in MMR. Slow reduction in MMR despite maternal healthcare utilization is inequalities related to literacy status, economic situation, geographic locations.E.g. ANC check up 1st trimester(38% Rural, 62% urban),Institutional deliveries (38% rural,71%Urban)
Ahmed SJ et al. 2016 [78]	1997-2013, Assam, India	Secondary data analysis (SRS Data)	-	Assam MMR reduction = 520-257/lakh LB (50.5% decline) India MMR reduction= 398-178/lakh LB (55.3% decline)
Gupta M. et al. 2016 [61]	2002-04 to 2012-13, Haryana	Secondary data analysis in Haryana(DLHS)	NRHM	MMR reduction =185 to 121 /lakh LB (34.6% decline).ANC check up difference in rural and urban = 8 % pre NRHM, 12.4% during NRHM, 6.8% post NRHM

Mahala U. et al. 2017 [79]	2008-11 to 2012-15, Jaipur	Retrospective hospital based descriptive study (data related to institutional deliveries from medical records of Medical college)	JSSY (JSSK)	MMR reduction= 267 to 248/lakh LB from pre to post JSSK period (7.1% decline) Because of JSSK (JSSY); Annual prenatal check-up = 55% increase, Annual institutional deliveries = 37.9% increase
Gupta M. et al. 2017 [80]	2013, Haryana	Mixed method study (Secondary data analysis Qualitative interviews/FGD/In-depth interviews in Ambala and Mewat)	ASHA, JSY, JSSK	MMR= 121/lakh live births MCH inequalities reduced due to more awareness regarding MCH services by ASHA, free ambulances, diet during hospital stay. ASHA scheme appreciated by all participants
Khanna D. et al. 2018 [81]	1 year, Lucknow, UP	Case control Cases = maternal deaths, Control = Geographic matched control and complication matched control	BPCR	50% reduction in risk of MMR when the place of delivery was suggested as Institution over the home delivery. When place of delivery decided as institution then risk of maternal deaths reduced by three fifth times.
Prinja S. et al. 2018[82]	2011-2020, Mooratganj Manjhanpur blocks of Kaushambi	Quasi-experimental design	ReMiND intervention through 259 ASHAs	Resulted in 0.2% reduction in maternal deaths.

Siddika B. et al. 2018 [83]	2004-06 to 2013, Assam, India	Descriptive study and secondary data analysis (Assam Human Development Reports)	JSY	Assam MMR reduction= 480 to 300/lakh LB (37.5% decline) India MMR reduction = 254 to 167/lakh LB (34.2% decline) - Poor living conditions, nutritional deficiencies, inadequate health care, lack of information.
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5.1.2. Forest Plot studies (Outcome = Institutional deliveries, n= 25)

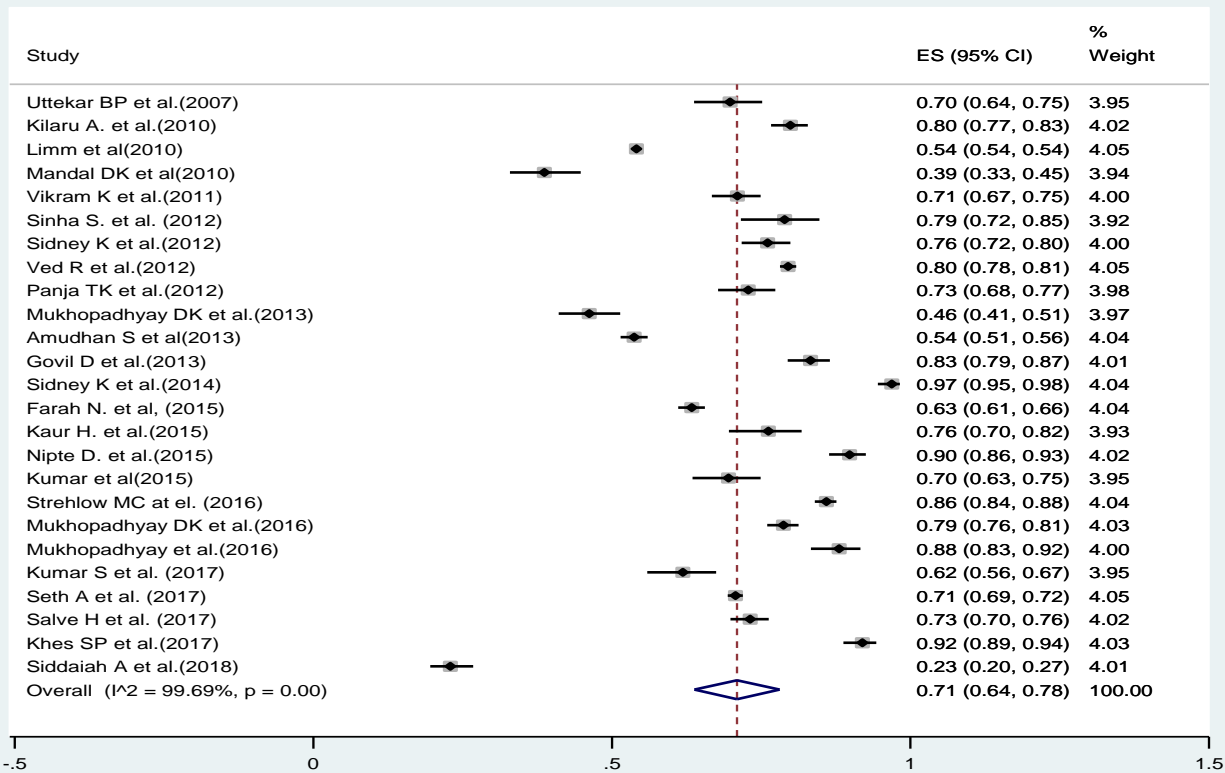
Author & year of publication	Study Period/Location	Study Type	Intervention	Results
Before 2013				
Uttekar B.P. et al. 2007[24]	2007, Jaisalmer, Bhilwara, Udaipur	Secondary data analysis(For JSY NFHS and RCH data)	JSY	173 deliveries out of total 248 beneficiaries.
Kilaru A. et al., 2010 [49]	2007-2009, Ramanagara Taluka, Karnataka	Prospective study	Institutional delivery	513 institutional deliveries out of 642
Lim et al, 2010 [26]	2004-04 to 2007-09, India	Secondary data analysis(DLHS)	JSY	98932 institutional deliveries out of 182869
Mandal D.K. et al, 2010 [27]	2007-09, West Bengal	Cross sectional	JSY	99 institutional deliveries out of 256 post-partum females

Vikram K et al. 2011 [28]	2009-10, Trans Yamuna area of Delhi	Cross sectional survey	JSY	333 institutional deliveries out of 469 mothers
Sinha S. et al. 2012 [29]	2010, Chandigarh	Retrospective	ANC	116 institutional deliveries out of 147 ANC mothers
Sidney K. et al. 2012 [30]	Jan-May 2011, Ujjain, MP	Cross sectional	JSY	318 institutional deliveries out of 418 pregnant women.
Ved R. et al. 2012 [31]	2008-09, Empowered Action Group States(BH, CH, OR, RJ, UK, UP, JH, MP,)	Mixed method	JSY	2759 institutional deliveries out of 3469 post-partum females.JSY has resulted in increase institutional deliveries. Reasons for home delivery = limited access to transport, poor quality of services, high cost in institution, cultural preferences
Panja TK et al. 2012 [32]	2008, Bankura District, West Bengal	Cross sectional	JSY	236 institutional deliveries out of 324 JSY beneficiaries. Cash incentive under JSY had positive association on institutional deliveries.
After 2013				
Mukopadhyay D.K. et al. 2013 [33]	Sep-Dec 2011, Uttar Dinajpur, West Bengal	Cross sectional mixed method	BPCR	164 institutional deliveries out of 355 women

Amudhan S. et al 2013 [34]	2006-2010, Ballabgarh (HR)	Quasi experimental	JSY	1012 institutional deliveries out of 1884 JSY mothers
Govil D et al. 2013 [35]	April 2010 - March 2011, Udaipur, Banaswara, , Sikar, Sawai Madhopur districts of Rajasthan	Cross-sectional	JSY	353 institutional deliveries out of 424 mothers. Out of these 62 % in public facilities and 21 % in private facilities. JSY has done phenomenal increase in institutional deliveries and decrease in out of pocket expenditure.
Sidney K. et al. 2014 [36]	2012-13, Madhya Pradesh	Cross-sectional	JEY(Janani Express Yojna) State Run Public Private Emergency Transportation Service	342 institutional deliveries out of 353 women who used JEY. JEY usage was greater among women from lower socioeconomic position
Fathima F.N. et al 2015 [69]	2012, Kolar, Chamrajanagar and Haveri districts of Karnataka	Cross-sectional	ASHA	1141 institutional deliveries out of 1800 mothers.
Kaur H. et al. 2015 [38]	Jan-June 2014, Amritsar, Punjab	Cross sectional	JSY	141 delivered at hospital out of 185 JSY beneficiaries. JSY was not rolled out strongly in the state.
Nipte D. et al. 2015 [39]	July –September 2013, Maharashtra	Cross sectional survey	JSY	336 institutional deliveries out of 374 mothers Only 50% of mothers have completed three ANC visits.
Kumar et al 2015 [40]	2010-11, Agra	Cross-sectional	JSY	171 institutional deliveries out of 246 beneficiaries. 55% increase in ANC registration after JSY implementation
Strehlow M.C. et al. 2016 [41]	Feb-April 2014, India— Andhra Pradesh, Assam, Gujarat, Karnataka and Meghalaya	Prospective observational study	free of charge ambulance transport	1212 institutional deliveries out of 1411 deliveries.

Mukhopadhyay DK et al. 2016 [43]	2012-2013, West Bengal	Cross-sectional	JSY	745 institutional deliveries out of 946 JSY mothers. Cash incentive most crucial step influencing institutional care.
Mukhopadhyay et al. 2016 [42]	2011, Bankura District, West Bengal	Cross sectional study	BPCR	207 institutional deliveries out of 235 women who have delivered recently
Kumar S. et al. 2017 [44]	2008-2009, Uttar Pradesh	Cross-sectional study	ASHA	167 institutional deliveries out of 270 women who have delivered in last 6 months. ASHA has helped the rural beneficiaries in getting continuous information about ANC.
Seth A. et al. 2017 [45]	2014, Varanasi, Uttar Pradesh	Mix method	ASHA	3472 institutional deliveries influenced by ASHA out of 4912 mothers. There is positive relationship between visit of ASHA and utilization of maternal health services.
Salve H. R. et al. 2017 [46]	August 2010 to March 2013, Ballabgarh, Haryana	Cross-sectional	JSSK	537 institutional deliveries out of 734 beneficiaries
Khes SP et al. 2017 [47]	June 2015-July 2016, Chhattisgarh	Cross-sectional	JSY	353 institutional deliveries out of 384 beneficiaries. Majority of participants were not aware about JSY services except monetary services.
Siddaiah A et al 2018 [48]	2015, Faridabad	Mixed method	JSY	119 institutional deliveries out of 518 mothers

Meta-analysis of studies with outcome as institutional deliveries.



Interpretation of forest plot

Year of publication = 2007 to 2018

Total studies pooled = 25

Sample size = 147 - 182869 mothers

Pooled prevalence of institutional deliveries = 71% (CI : 0.64 to 0.78)

Heterogeneity = 99.69% (very high because of sample size variability)

5.1.3 Results of studies with Institutional deliveries as an outcome, but not included in forest plot (n=21)

Author & year of publication	Study Period	Study Type	Intervention	Results
Before 2013				
Nandan D. et al. 2010 [370]	2010, Delhi	Descriptive study	MAMTA Scheme	84.3 % of beneficiaries under the scheme came to know about the scheme through ASHAs. Scheme has increased number of institutional deliveries among the target women in some localities, where it is functional. But 30% of the beneficiaries underwent delivery at home.
Kilaru A et al. 2010 [25]	1996-1998 to 2007-2009, Karnataka	Comparative study	NRHM (Institutional deliveries SBA home deliveries)	45% increase in institutional deliveries 17% decline in SBA home deliveries
Singh SK et al. 2011 [52]	2005-2008, India	Secondary data analysis (SRS data)	NRHM (SRS data)	57% relative increase in institutional deliveries.
Sandeep S. et al. 2012 [53]	2011, Haryana	Cross-sectional descriptive study	JSY	Out of 72 JSY mothers, 39 mothers had institutional deliveries. Out of 76 non-JSY mothers 55 had institutional deliveries.
Gupta SK et al. 2012 [51]	2003-2005 to 2005-2007, Jabalpur, MP	Observational study	JSY	42.6% increase in institutional deliveries.
Gopalan D et al. 2012 [54]	2005-09, Orissa	Mixed method design (HMIS data, FGDs of JSY	JSY	18.1% increase in institutional deliveries. Gain in institutional deliveries is greater than those of ANC, PNC indicating limited role of JSY in comprehensively

		beneficiaries and ASHA)		addressing maternal care needs.
After 2013				
Randive et al. 2013 [7]	2005-2010, India	Secondary data analysis (SRS data)	JSY	Increase in institutional births= 20% to 49%
Prinja S. et al. 2014 [55]	2011, Haryana, 3 districts= Ambala, Hisar, Narnaul	Secondary data analysis (Civil registration data on institutional deliveries)	National ambulance system utilization	Institutional deliveries in Haryana rose significantly after the introduction of NAS service Ambala (OR=137.4, CI=22.4-252.4) Hisar (OR=215, CI=88.5-341.3). No significant increase was observed in Narnaul (OR=4.5, CI= -137.4 to 146.4)
Mohanani M. et al. 2014 [56]	2010, Gujarat	Observational study	Chiranjeevi Yojana	10.7 % point increase in institutional deliveries.
Nagarajan S. et al. 2015 [57]	2001-05 to 2005-11, India	Secondary data analysis (DLHS)	NRHM	Increase in Institutional deliveries = 39% to 84%.
Vohra K. et al. 2015 [58]	1992-2009, India	Secondary data analysis (SRS, census data)	NRHM	73 % increase in institutional deliveries.
Prinja S. et al. 2015 [59]	2011–15, UP, district Kaushambi	RCT	ReMiND Project(MNCH services)	34% increase in coverage of institutional deliveries.
Saksena S. R. et al. 2015 [60]	2009-2010, Unnao district, Uttar Pradesh	Descriptive study	Referral transport	25% of the women were taken to one facility, 32% were taken to two facilities, and 25% taken to three facilities, while 19% were not taken to any facility before deaths.

Gupta M. et al. 2016 [61]	2002-04 to 2012-13, Haryana	Secondary data analysis (DLHS data)	NRHM	Institutional delivery rate has been narrowed down from 48.2% to 13%.
Singh U.B., 2016 [62]	2005-6 V/s 2010-11, Uttrakhand	Secondary data analysis (AHS, DLHS 3, NFHS 3)	NRHM	Increase in institutional deliveries 15.7%
Prinja P. et al. 2017 [63]	2015, UP	Pre- and post-quasi-experimental	ReMiND intervention	Increase in Institutional deliveries 30-40%.
Vellakkal S. et al. 2016 [64]	2007-08 to 2011-12	Secondary data analysis (DLHS, AHS)	NRHM	In the EAG states as a whole, there was an increase of 13% and 40% points in the uptake of institutional delivery in the early post-NRHM period 2007-08 (38.3%) and late post-NRHM period 2011-12 (65.5%)
Wagner AL. et al. 2017 [65]	2007-08 and 2012-13, India	Secondary data analysis (DLHS)	ASHA	Institutional delivery increased = 61.6% to 82.5%
Apum A. Et al. 2017 [66]	2014, Assam	Cross sectional	ANC services Institutional deliveries	Institutional delivery = 33.3% ANC visits (4 or more) = 50.3%
Singh SK et al. 2017 [44]	2005-13, India	Secondary data analysis (SRS data)	JSSK and JSY	Institutional deliveries increased = 24.4 to 69.7 %.
Agarwal R. et al. 2018 [67]	2014-2015, Haryana	Cluster randomised trial	Quality management activities	7345 deliveries = 5108 delivered in the PHCs 2237 were referred to higher centres before childbirth

ANNEXURE 5.2. CHILD HEALTH

5.2.1 Results of studies with outcome as Perinatal Mortality Rate (N=14).

Author Name, Year of publication	Journal Name	Study period, Place	Type of study/ Intervention	Results [n,(N)]
Singh S et al,2011 [52]	Indian Pediatrics	2005-2008, Indian states(Rural area)	Secondary data analysis (SRS)/ NRHM	Relative decline in PNMR was only 2.5% in the rural areas, relative increase in hospital deliveries:57%
Goudar S et al,2015 [229]	Reproductive health journal	Jan 2010-Dec 2013, Belgaun,Nagpur	Prospective population based surveillance	Increase in community PMR from 60.7 to 76.7 per 1000 births in Belgaum, from 114.1 to 400.0 deaths per 1000 births in Nagpur;
Vishwanah K et al,2015 [231]	The international electronic journal of Rural and Remote Health Research, education, practice and policy	Feb-July 2012, Jawadhi Hills Tamilnadu, under CMC Vellore	Case control study	Perinatal mortality rate: 149.3/1000 births)(40 perinatal deaths) ;preterm: 16,term: 24
Mony P et al,2015 [230]	BMJ Open	Nov 2012(30 days), 10 districts of the northern state of Rajasthan	Hospital based prospective cohort study	The estimated perinatal mortality rate was 35.8 (34 to 37) per 1000 births
Rani S et al,2012 [232]	Indian Pediatrics	May-Oct 2009, Labor room and postnatal wards of a teaching hospital in North India.	Prospective cohort study.	IPPM Rate: 80/1000 live births(8%) ,significant risk factors for IPPM: presence of obstructed labor , father engaged in unskilled labor and absence of urine examination during antenatal period .

Carlo W et al, 2018 <i>Multicounty study [228]</i>	New England Journal of Medicine	Mar 2005-Feb 2007, Indian(Rural communities)	Pre post study design/ Training of Birth Attendants on ENC	Perinatal mortality did not significantly decrease after ENBC.
Siddalingappa H et al, 2013 [233]	Journal of Clinical and Diagnostic Research	2011, Nanjangud taluk of Mysore district, India	Cross sectional community based study	PNMR: 28.93 per 1000 live births.
Asalkar MR et al, 2013 [234]	International Journal of Reproduction, Contraception, Obstetrics and Gynaecology	Jan 2008-December 2010	cross sectional study	PNMR: 86/1000,preterm PNMR: 426/1000,Term: 37/1000,Post Term: 68/1000.
Singh S et al, 2017 [371]	Indian Journal of Community Medicine	2005-2013 rural areas in each of the major states of India	Secondary data analysis (SRS)	Increase in hospital deliveries: 185.7%, relative decline in PNMR was 30%, most states had significant decline in PNMR; Assam, Haryana, and Karnataka have only a marginal decline, but Jharkhand has shown no decline in PNMR during the same period
Iyengar K et al,2012 [235]	J health popul nutr	April-December 2006,	Community based study	Compared to women with no anaemia, women with severe anaemia were 3.7 times more likely to have a perinatal death while compared to mild anaemia, they were 2.1times more likely to have perinatal death
Lim S et al,2010 [26]	Lancet	2010	Secondary data analysis from the nationwide district-level household surveys(2002-04,2007-09)	In matching analysis: JSY payment was associated with a reduction of 3.7 (95% CI 2.2–5.2) perinatal deaths per 1000 pregnancies, In the with-versus-without comparison, the reductions were 4.1 (2.5–5.7) perinatal deaths per 1000 pregnancies
Gaur A et al,2015 [127]	Journal of Evidence based Medicine and Healthcare	(2003–2004), 2006–2007,2010-2011, tertiary care hospital, associated with medical college in M.P.	retrospective hospital based, observational comparative study	Perinatal deaths have decreased from 64.86 in 2003-04 to 51.54 in 2006-07 (p<0.05) and 31.97 in 2010-2011.

Kulkarni R et al,2007 [237]	Indian Journal of Community Medicine	Rural and urban areas in six districts in Maharashtra	Verbal autopsy	Total number of perinatal deaths= 83 (31 stillbirths and 52 early neonatal deaths,
Devi P et al, 2015 [128]	Journal of Evolution of Medical and Dental Sciences	January 2014 to January 2015, Tertiary Care Hospital of Andhra Pradesh.	retrospective study	The PMR was 15.3 per thousand births(129)

Results of studies with outcome as Still birth Rate(n=25)

Author ,Publication year	Journal Name	Study period, Place	Type of study/Intervention	Results
Goudar S,2015 [229]	Reproductive health journal	Jan 2010-Dec 2013, Belgaun,Nagpur	Prospective population based surveillance	Decline in SBR from 22.5 to 16.3 per 1,000 births in Belgaum and from 29.3 to 21.1 in Nagpur
Carlo W et al,2018 [228]	New England Journal of Medicine	Mar 2005-Feb 2007, Indian(Rural communities)	Pre post study design/ Training of Birth Attendants on ENC	There was a significant reduction in SBR (RR 0.69,the rate of stillbirths by delivery attendant decreased significantly for nurses/midwives (RR 0.50 and TBA (RR 0.63; but not for physicians. The SBR among home deliveries decreased.
McClure E et al,2015[240]	Reproductive Health Journal	2010-13, Belgaun,Nagpur	Prospective observational	Nagpur: Reduction in SBR from 33 to 25,Belgaum: Reduction in SBR from 28.3 to 22.3
Newtonraj A et al,2017 [243]	BMC Pregnancy and Childbirth	July 2013-Aug 2014, Chandigarh	Case control study	SBR: 16/1000 births per year, Antepartum causes: 68% ,intrapartum causes: 32%.

Kumbhare S et al,2016 [242]	The Journal of Obstetrics and Gynecology of India	Sep 2012-Aug 2013, Department of Obstetrics and Gynecology,Medical College Baroda, Gujarat.	Prospective case control study	SBR: 87.83 per 1000 live births(506),fresh stillbirths: 88.5 %,macerated stillbirths: 11.5 %
Bhattacharyya R et al,2011 [241]	Journal of Obstetrics and Gynecology Research	Jan 1999-Dec 2008, Department of Obstetrics & Gynaecology, Burdwan Medical College, Burdwan(WB)	retrospective cross-sectional study	SBR: 33.67 per 1000 births,SBR decreased from 44.87 per 1000 total births in 1999–2003 to 24.15 per 1000 total births in 2004–2008
Altijani N et al,2018 [244]	BMJ Open	2010-2013, Nine states in India	Secondary analysis of cross-sectional data from the Indian Annual Health Survey	SBR: 10 per 1000 total Births.
Siddalingappa H et al,2013 [233]	Journal of Clinical and Diagnostic Research	2011, Nanjangud talluk of Mysore district, India	Cross sectional community based study	Still birth rate of 9.55 per 1000 total births.
Kulkarni N et al,2018 [237]	Journal of the Turkish-German Gynecological Association	January 2017 to December 2017, Tertiary care perinatal center, Christian Medical College Vellore	Retrospective data analysis	SBR:16.8 per 1000 births.
Kochar P et al,2014 [245]	BMC Pregnancy and Childbirth	2012, all districts of Bihar	baseline survey	SBR: 20 per 1,000 births.
McClure E et al, 2018 [246]	BJOG	2014-15, Belagavi,Nagpur	Prospective, observational study	SBR in Belgavi: 24.1,Nagpur: 20.9
Asalkar MR et al,2013 [234]	International Journal of Reproduction, Contraception, Obstetrics and Gynecology	2008-2010, Dept of Obs and Gynae,rural MIMER Medical College and Dr. Bhausahab Sardesai Talegaon rural Hospital, Talegaon Dabhade, Pune, Maharashtra.	cross sectional study	SBR: 47/1000,Preterm:74.3/1000 Term:28.81/1000,Post-term: 40.5/1000
Saleem S et al,2018 [247]	BMC Reproductive Health,	Jan 2010-Dec 2016, Belagavi and Nagpur	prospective, population-based observational study	cumulative SBR: 25.3/1000 births and decreased from 31.3/1000 births in 2010 to 23.8/1000 births in 2016 giving an annual decline rate of 4.5%
Satishchandra DM et al,2009 [248]	Indian Journal of Pediatrics	Mar 2006 to Feb 2007, Primary Health Centre	Community based study,	statistically significant (p<0.05) reduction in the

		(PHC) area of Vantamuri, District Belgaum, Karnataka		perinatal deaths (11 to 3) after the training.
Mukhopadhyay P et al,2010 [68]	J HEALTH POPUL NUTR	June 2006–May 2007, R.G. Kar Medical College and Hospital in Kolkata	cross-sectional, observational	5.1%(18) vs 0.9%(6)
Dandona R et al,2019 [250]	BMC Medicine	January to December 2016, 1657 clusters in Bihar state		15.4 per 1000 births , Antepartum and intrapartum SBR was 5.6 and 4.5 per 1000 births , higher proportion of births was stillborn (8.6%, $p < 0.001$) among women (175, 0.9%) for whom the delivery was deferred
Dandona R et al,2017 [249]	PLOS Medicine	2014 -2015. 38 districts of Bihar (772 rural and 245 urban clusters)	Survey	Incidence of stillbirths was 21.2 per 1,000 births in Bihar state
Gaur A et al,2015 [127]	Journal of Evidence based Medicine and Healthcare	(2003–2004),2006–2007, 2010-2011, tertiary care hospital, associated with medical college in M.P.	retrospective hospital based, observational comparative study	Stillbirths have decreased from 4.8% in 2003-04 of 3.0% in 2006-07 ($p < 0.210$) and 2.5% in 2010-2011.
Malhotra S et al, 2014 [182]	Journal of health population nutrition	Apr 2009-Mar 2010, Nagaur district in Rajasthan and Chhatarpur district in Madhya Pradesh	Record review	SBR of both the DHs was around 38/1,000 births.
Devi P et al, 2015 [128]	Journal of Evolution of Medical and Dental Sciences	2014-January 2015, Tertiary Care Hospital of Andhra Pradesh	retrospective study	still birth rate was 11.7 per thousand births.
Baqui AH et al, 2006 [90]	Bulletin of World Health Organization	, 17 rural sectors in 2 districts of Uttar Pradesh Barabanki , Unnao	Verbal autopsy	SBR was 31.8 deaths per 1000 births.

Mony P et al,2015 [230]	BMJ Open	Nov 2012(30 days), 21 public sector health facilities of 10 districts of the northern state of Rajasthan	Hospital based prospective cohort study	The stillbirth rate was 26.5 per 1000 births.
Malhotra S et al, 2014 [182]	Journal of health population nutrition	Apr 2009-Mar 2010, Nagaur district in Rajasthan and Chhatarpur district in Madhya Pradesh	Record review	SBR of both the DHs was around 38/1,000 births.
Devi P et al, 2015 [128]	Journal of Evolution of Medical and Dental Sciences	2014-January 2015, Tertiary Care Hospital of Andhra Pradesh	retrospective study	Still birth rate was 11.7 per thousand births.

Result of studies with ENMR as outcome (n=6).

Author ,Publication year	Journal Name	Study period, Place	Type of study	Results [n,(N)]
Nagarajan S et al, 2015 [57]	Elsevier		Review article	Average annual rate reduction (AARR) in early neonatal mortality rate (ENMR) in three epochs (pre-NRHM 2002-05, early post NRHM 2006-09, and later post NRHM 2010-13): -3.8,2.5 and 4.3
Khurmi M et al,2015 [131]	Indian Journal of Child Health		Review article	ENMR declined from 28 to 22 (SRS 2005, 2013) for India, indicating a point decline of 6 and percentage decline of 21%.The maximum point decline is seen in Orissa (13points) and minimum in Himachal Pradesh and Jharkhand (2 and 0 point each). Decline in ENMR rural from 2005 to 2013: 6 points (19%),urban ENMR: 5 points (31%)
Gaur A et al,2015 [127]	Journal of Evidence based Medicine and Healthcare	tertiary care hospital, associated with medical	Observational study	Reduction in early neonatal Deaths from 99 in 2003 to 54 in 2011.

		college in M.P.		
Devi P et al,2015 [238]	Journal of Evolution of Medical and Dental Sciences	January 2014 to January 2015, Tertiary Care Hospital of Andhra Pradesh.	retrospective study	Early neonatal death rate 3.56 per thousand births
Baqi AH et al,2006 [90]	Bulletin of World Health Organization	17 rural sectors in 2 districts of Uttar Pradesh Barabanki ,Unnao	Verbal autopsy	ENMR 35.1/1000 live births, LNMR 13.9 per 1000 live births.
Lahariya C et al, 2010 [129]	Indian J Pediatr	India	secondary data analysis from SRS ,NFHS	The mortality rates in early neonatal period declined by 21.6% between 1990 to 2007, rate of mortality decline is different for 2000–2003 compared to 2004–2007. rapid ARR in ENMR during 2000-03,increase in ENMR during 2004-07
Bapat U et al,2012 [130]	BMC Pregnancy and Childbirth	48 slum localities in six municipal wards of Mumbai	verbal autopsies	ENMR=7.6/1000 live births

5.2.2 Overall Impact of NRHM/NHM on NMR (n=3).

Author, Year of Publication, Area	Journal Name	Study Period	Results
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Kumutha;2014,Tamil Nadu [88]	Indian Journal of Paediatrics	2005-2012	In 2005, national NMR was 37/1,000 & Tamil Nadu was 26/1,000 live births. In 2011 national NMR dropped to 31/1,000 (only six points drop from 2005). But Tamil Nadu NMR dropped to 15/1,000 livebirths (drop of 11 points) & significant 42% reduction from 2005.
Nagarajan et al; 2015 [57]	Seminar in Fetal and Neonatal Medicine	2001-2013	NMR (per 1000 live births) declined from 37 in 2005 to 28 in 2013. NRHM has brought MDG 4 & 5 within India's grasp.
Khurmi et al;2015 [87]	Indian Journal of Child Health	2005-2013	NMR declined from 37 to 28 (SRS 2005,2013) indicating a point decline of 9 and percentage decline of 24%. The maximum point decline is seen in Orissa and Chhattisgarh (16 and 14 points, respectively) and minimum in Jharkhand (2 point). The maximum percentage decline is seen in Punjab (47%) and minimum in Jharkhand (7%).

5.2.3. Studies with specific strategies and NMR as an outcome (n=8)

Author ,Publication year, Area	Journal Name	Study period	Type of study	Intervention	Results
Agarwal et al; 2007, India [89]	Journal of Perinatology	January 2004 –August 2005	Before-and-after intervention trial	Essential new born care	30% decline in NMR during intervention period as compared to control period (20.3 versus 29.3 per 1000 live births; RR 0.69, 95% confidence interval (CI) 0.57 to 0.85).

Baquai et al; 2008, Uttar Pradesh [372]	Bulletin of the World Health Organization	2004-2005	Quasi experimental study	HBPNC	Neonates who received a postnatal home visit within 28 days of birth had 34% lower NMR (35.7 deaths per 1000 live births, 95% confidence interval, CI: 29.2–42.1) than those who received no postnatal visit (53.8 deaths per 1000 live births, 95% CI: 48.9–58.8),
Sen A et al; 2009, [92] Purulia, West Bengal	Journal of Perinatology	January 2003 to October 2005	Observational study	Facility based new born care	NMR reduced by 14% in 1st year and 21% in 2nd year after SNCU became functional. Estimated neonatal deaths averted were 329, which would reduce NMR of the district from 55 to 47 in 2 years.
Baqui et al; 2009, Sylhet district, [91] Bangladesh	BMJ	2004-2005	Observational Cohort study	HBPNC	NMR was 67% lower in those who received a visit on day one than in those who received no visit (adjusted hazard ratio 0.33, 95% confidence interval 0.23 to 0.46; P<0.001).
Darmstadt et al; 2010 [93] Mirzapur, Bangladesh	PLOS One	January 2004–December 2006	Cluster randomised controlled trial	HBPNC	NMR was 24.8 (95% CI: 20.7–29.4) and 27.9 (95% CI: 23.5–32.8) in the comparison arm at baseline and endline, respectively, and was 25.2 (95% CI: 21.0–30.1) and 24.0 (95% CI: 19.8–29.0) in the intervention arm at baseline and end line, respectively.

Bhandari et al;2012, [94]Faridabad, Haryana	BMJ	January 2008 and 31 March 2010	Cluster randomised trial.	IMNCI	NMR beyond first 24hours (adjusted hazard ratio 0.86, 0.79 to 0.95) were significantly lower in intervention than in control clusters. Adjusted hazard ratio for NMR was 0.91(0.80to 1.03) .
Tripathy et al; 2016, [95] Rural Jharkhand & Odisha	Lancet Global Health	September 2009– December 2012	Cluster randomised controlled trial	HBPNC	NMR was 30 per 1000 livebirths in the intervention group and 44 per 1000 livebirths in the control group. (odds ratio [OR] 0.69, 95% CI 0.53–0.89). 31% reduction in neonatal mortality rate during 2 years.
Gautam et al; 2016, [96] Jabalpur, Madhya Pradesh	International Journal of Healthcare and Biomedical Research	August 2011 to July 2012	Observational study	Facility based new born care	NMR was reduced by 12% . Estimated neonatal deaths averted were 111(7%) out of 1590 admissions compared to 200(19.1%) out of 1048 admissions in previous year (p value <0.001). Improved survival and reduced morbidity after establishment of SNCU .

5.2.4. Studies with essential newborn care practices as an intervention (n=6).

Author, Publication year , Area	Journal Name	Study period	Type of study	Intervention	Results
Sodani et al; 2011 [97] CHC, Bharatpur district, Rajasthan	Indian Journal of Public Health	September and October 2010	Cross sectional study	Essential new born care	None of the CHCs have fully equipped facility based newborn care services (including newborn corner and newborn care stabilization unit).

5.2.5 Studies with facility based newborn care as an intervention (n=4).

Vijayalakshmi et al; 2014, [173]	Journal of Neonatal Biology	1st April 2012 to 31st June 2012	Cross sectional	Essential new born care	65% newborns were breastfed within an hour after birth and 5.9% were pre lacteally fed. Mothers age at marriage and day of first bath to newborn's was significantly associated (p=0.02).
Sinha et al;2014, [99] Mewat, Haryana	Western Pacific Surveillance and Response Journal	January and March 2013	Cross sectional study	Essential new born care	60% of mothers adopted less than three safe practices (wrapping newborns, delayed bathing, cord care). 237 (74%) mothers started breastfeeding within the first hour, 279 (87%) fed colostrum, and 188 (58%) mothers exclusively breastfed their newborn.
Kumar et al; 2016 [70] Rajasthan, India	BMC Pregnancy and Childbirth	March 2013 to April 2014.	Quasi-experimental	Essential new born care	Safe childbirth checklist (SCC) was used in 86 % of the observed deliveries in intervention facilities. Client in intervention facility received 11.5 more SCC (95 % CI-8.5–14.6)) best practices than client in comparison sites (p<0.001).
Narasimha BC et al; 2016, [100]	International Journal of Community Medicine and Public Health	October 2013 to September 2014.	Cross-sectional	Essential new born care	62.5% of the mothers initiated breast feeding within 1 hour and colostrum was fed to 95.6% of babies. About 137 (85.6%) babies were immunized up to date. 12.5% (20) were low birth weight babies.
Gosain et al; 2017, [101]	Journal of Tropical Paediatrics	February-March 2014	Cross sectional study	Essential new born care	ENC services were largely in the public-sector domain (68.5% of births). SNC burden was largely borne by the private sector (66% of admissions). Only 53.9% of government facilities and 17.5% of private facilities had a fully equipped newborn care corner.

Author ,Publication year,Area	Journal Name	Study period	Type of study	Intervention	Results
Kumaravel et al;2015, [102] Dharmapuri district, Tamil Nadu	Journal of Evolution of Medicine and Dental sciences	Jan 2011 to Dec 2014.	Descriptive-retrospective study	Facility based new born care	Increase newborn care, survival rate (74.4%- 85%) due to NRHM provided manpower & equipments to improve SNCU. Admissions increased two folds in the past 4 years. Referral out(5%-1.7%), death rate(11.6%-9.6%), LAMA(9%-3.7%) rates were decreased.
Sachan et al;2015, Lucknow, Uttar Pradesh [103]	Journal of Neonatology	2013 to 2015	Retrospective analytical study	Facility based new born care	Score in FBNC training pre-test was 2.80 (± 0.31) which increased to 8.25 (± 0.49) in post test. The increase from pre-test to post test was 5.30 (± 0.33) ($p=0.0001$). FBNC training program by the GOI has improved the knowledge of the participants significantly which is expected to result in decline of NMR at faster pace.
Chauhan et al;2016,Bihar [104]	Indian Journal of Public Health	May to June 2015	Cross sectional study	Facility based new born care	Only 22.8% of the NBCCs were found to be fully functional, majority (68.4%) were partially functional, and 9% were nonfunctional. 1/3rd of the neonates delivered were kept in NBCCs

Oza JR et al;2017, Rajkot district,Gujarat [105]	International Journal of Community Medicine & Public Health	August 2013 to October, 2013	Cross sectional study	Facility based new born care	All 32 (100%) NBCC were found partially functional. Total 68 (67.3%) of 101 respondents were trained in NSSK. From total 68 trained health personnel, 12 (17.7%) got the score above the cut off for resuscitation skill.
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5.2.6 Studies with IMNCI as an intervention (n=3).

Author ,Publication year,Area	Journal Name	Study period	Type of study	Interventio n	Results
Mohan et al;2011, India [108]	Journal of Health, Population and Nutrition	2005-2009	Mixed methods study	IMNCI	65.5% newborns were visited by a trained worker within 24 hours, and 63.1% were visited three times within 10 days. Difference was significant only for care-seeking for ARI (net difference: 17.8%; 95% confidence interval 2.3-33.2, p<0.026).
Taneja et al;2015, Faridabad, Haryana [107]	Journal of Global Health	Jan 2008	Cluster– randomized controlled trial	IMNCI	Implementation of IMNCI had no effect on inequities in neonatal mortality but reduced inequities in post–neonatal mortality between wealth quintiles

5.2.7 Studies on secondary data analysis (n=5)

Som et al;2017, Odisha [106]	International Journal of Health Sciences & Research	Not mentioned	Cross sectional	IMNCI	Trained AWW have enhanced knowledge of childhood illness and their management as compared to IMNCI untrained counterparts 1.41(95% CI,1.07-1.73), P<0.0001
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Author, Year of Publication	Journal Name	Study Period	Results
Rammohan et al;2013 [113]	Plos One	2008-2010	80% of neonatal deaths occurred within the first week of birth. Neonatal mortality is significantly lower when the child's village is closer to the district hospital (DH), suggesting the critical importance of specialist hospital care in the prevention of newborn deaths.
Aguayo et al;2016[114]	BMJ Global Health	2006-2014	Rates of early initiation of breastfeeding increased from 24.5% in 2006to 44.6% in 2014 (i.e. a 1.8-fold increase).
Jha et al; 2017 [115]	Lancet	2000-2015	Neonatal tetanus mortality rate fell from 1.6 per 1000 livebirths in 2000 to less than 0.1 per 1000 livebirths in 2015 . Average annual decline in mortality rates from 2000 to 2015 was 3.3% for neonates
Phukan et al;2018 [116]	International Breastfeeding Journal	2011-2015	Less than 1/4 th (21%) of children were breastfed within 1 h of birth. Odds of neonatal deaths were increased (OR 2.93; 95% CI 1.89, 4.53) in comparison with neonates who have breastfed within 1 h of birth.
Bora et al;2018 [117]	Plos One	2015-2016	Estimated NMR is about 2.4 times greater than the targeted one (estimated 29.2 against targeted 12.0 deaths per 1000 live births in SDG3).
Review Study with HBPNC by ASHAs as an intervention (n=1)			

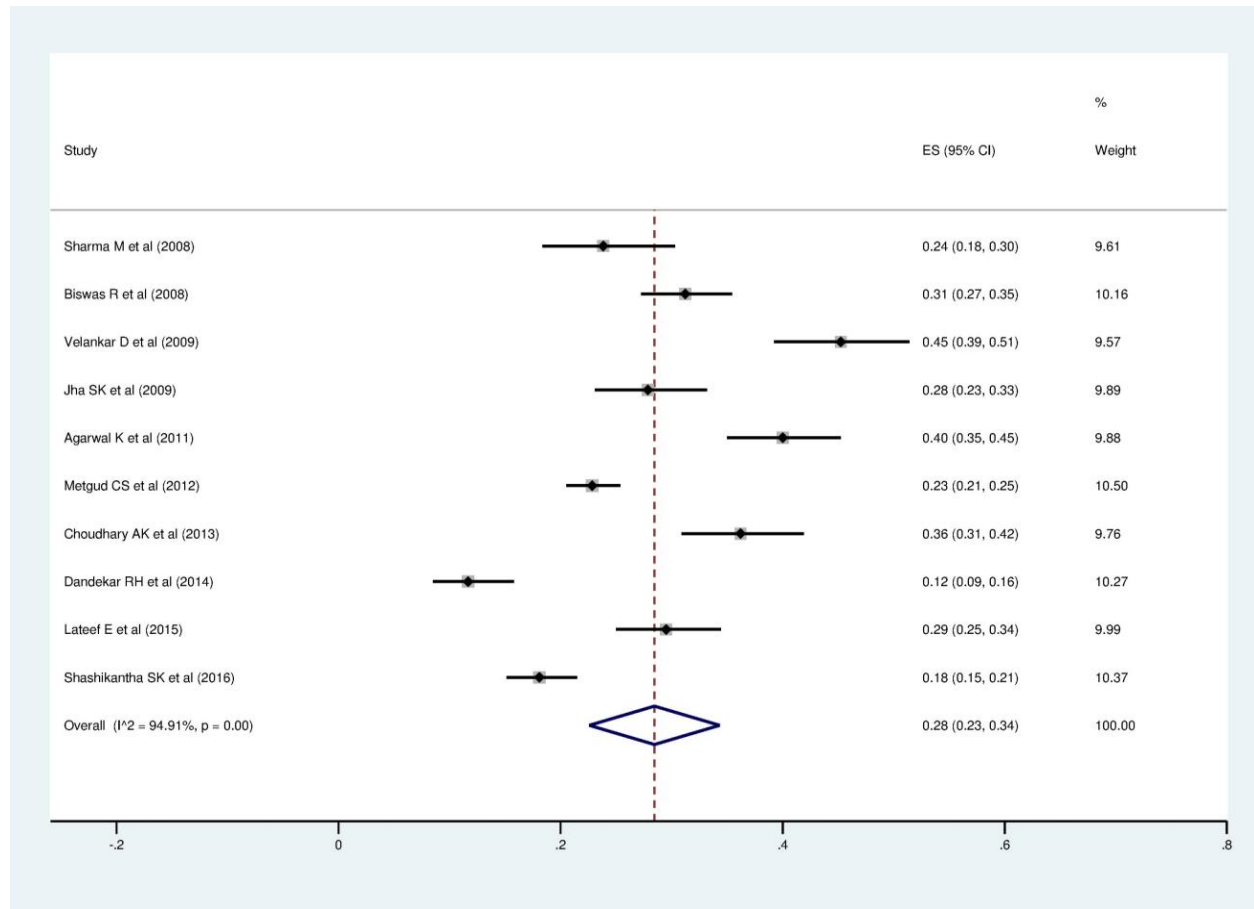
Gogia et al;2016 [118]	Journal of Perinatology	2012	Intervention was associated with a reduced risk of mortality during the neonatal period . RR = 0.75; 95% confidence intervals (CIs) 0.61 to 0.92, P = 0.005
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5.2.8 Studies included in forest plot with outcome as prevalence of low birth weight babies. (n=10).

Author ,Publication year,Area	Journal Name	Study period	Type of study	Intervention /Strategy	Results Number of low birth babies [n,(N)]
Sharma et al; 2008, Government Medical College, Chandigarh [373]	The Internet Journal of Health	April 2007 to March 2008	Cross sectional study	LBW	46(193)
Biswas et al;2008, District of Puruliya, West Bengal [134]	Rural Health Journal	2004-05	Cross sectional study	LBW	152(487)
Velankar et al;2009,Sahaji Nagar, Mumbai [135]	Bombay Hospital Journal	Ten months	Cross sectional study	LBW	114(252)
Jha et al;2009,Varanasi district, Uttar Pradesh [136]	Indian Journal of Community Health	June 2006-May 2007	Longitudinal Cohort study	LBW	83(298)
Agarwal et al;2011,Tertiary care hospital, Uttar Pradesh [137]	Annals of Nigerian Medicine	Not mentioned	Cross sectional study	LBW	140(350)
Metgud et al;2012, Kinaye (PHC) in rural Karnataka, [138]	Plos One	June 2008 to December 2009.	Cross sectional study	LBW	260(1138)
Choudhary et al;2013, Banganga, Bhopal [139]	Indian Journal of Public Health	Not mentioned	Longitudinal Cohort study	LBW	105(290)
Dandekar et al;2014, Perambalur,Tamil Nadu [140]	Global Journal of Medicine and Public Health	June – November 2013	Cross sectional study	LBW	35(300)
Lateef et al;2015, Era's Lucknow Medical College [141]	International Journal of Community Medicine and Public Health	July 2014 to December 2014	Cross sectional study	LBW	105(356)
Shashikantha et al;2016, Chiri,	International Journal of	February to April 2013	Cross sectional study	LBW	102(564)

PGIMS, [142]	Rohtak	Community Medicine and Public Health				
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Meta-analysis of studies with outcome as prevalence of low birth weight babies.



Interpretation of Forest Plot

Study design: Cross sectional, longitudinal cohort study,

Year of publication: 2008 to 2016,

Total studies pooled: 10

Sample size: 193 to 1138

Pooled LBW: 28% (CI: 0.23, 0.34)

Heterogeneity: 94.91% (very high because of sample size variability)

5.2.9 Result of studies with IMR as an outcome (n=16).

Author ,Publication year,Area	Journal Name	Study period	Type of study	Intervention/ Strategy	Results
Ramani et al ; 2010 [143]	VIKALPA	1990-2008	Secondary data analysis	NRHM	Average annual reduction of 1.9 % in IMR over the period 1990-2008. Aim for annual average rate of reduction of 6.74 per cent in IMR during the period 2009-2015 if MDG target of IMR at 28/1,000 live births by 2015 is to be achieved.
Shah et al ; 2011, Aligarh district, Uttar Pradesh [144]	Australasian Medical Journal	July 2005 to June 2006	Cross sectional study	Infants death in Medical College	Infant mortality rate was 83.0 per thousand live births . Main causes of death were diarrhoea, pneumonia and malnutrition in the post- neonatal period.
Prasad et al ; 2013 [145]	Global Health Action	April 2005 to March 2012	Cross sectional study	NRHM	In high focus states, Rural IMR fell by 15.6 points between 2004 and 2011, as compared to 9 points in urban areas.
Narwal et al ; 2013, [146]	International Journal of MCH and AIDS	2000-2009	Secondary data analysis	NRHM	IMR in rural India declined from 68 to 50/1000 live births between 2000 and 2009, with AARR of 3.0% (95% CI=2.6%-3.4%) .IMR decline with AARR of 3% in Pre NRHM & 3.3% in Post NRHM era.
Singariya et al ; 2013 [147]	Journal of Finance and Economic	2005-2012	Secondary data analysis	NRHM	Rural IMRs declined from 76 points – from 124 to 48 while urban IMRs 36 points decline in the same period (1980- 2011). Annual rate of reduction of IMR is much higher in the post NRHM period. It was near 2 percent in 2000 -05 and its previous years, but after implementation

Author ,Publication year,Area	Journal Name	Study period	Type of study	Intervention/ Strategy	Results
					NRHM it has been accelerated to 4 percent in 2005-10 and nearly 6 percent in 2011 .
Prasad et al ; 2017, Tertiary care hospital, Surat [148]	National Journal of Community Medicine	October 2016 to November 2017.	Cross sectional study	Infant deaths in tertiary hospital.	Total live births were 7677, 223 died within a year i.e. infant mortality rate is 29.04
Sudhir et al ; 2017, Tertiary hospital, Muzaffarpur [149]	Journal of Evidence-Based Medicine and Health Care	February 1, 2016, to January 31, 2017.	Longitudinal study	Infant deaths in tertiary hospital.	Infant mortality was highest 71 (56.8%) in maternal age of delivery <18 years (P<0.05). Infants on exclusive breastfeeding had lowest mortality 25 (20%) and infants on formula feed had 56 (44.8%) mortality (P=0.0001).
Rai et al, 2017, Ballagarh, North India [150]	BMJ	2008-2012	Cross sectional study	Health and Demographic Surveillance System	IMR was 46.5/1000 live births. Care-seeking was delayed among 50% of neonatal deaths and 41.2% of post-neonatal death.
Gopalkrishnan et al, 2018 [151]	International Journal of Community Medicine and Public Health	2005-2012	Secondary data analysis	NRHM	IMR 58-30/1000 live births(2005-2012). 10 states/UT achieved, 15 states in the range of 30-40/1000 LB .

Bills et al; 2018; AP, Assam, Gujarat, Karnathaka, Meghalaya [152]	BMJ	February to April 2014	Prospecti ve observatio nal study	Emergenc y medical services	Cumulative mortality rates at 2, 7 and 42 days follow-up were 43, 53 and 62 per 1000 births . At 42 days follow-up, preterm birth (OR 2.89, 95% CI 1.67 to 5.00) and twin deliveries (OR 2.80, 95% CI 1.10 to 7.15) were the strongest predictors of mortality
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Studies on secondary data analysis

Author, Year of Publication	Journal Name	Study Period	Results
Reddy et al ; 2012 [153]	WHO South-East Asia Journal of Public Health	1990-2010	Declining trend in IMR observed during 1990-2010 continues linearly, India's IMR would be 42 per 1000 live births (95% CI: 38-45) by 2015 and MDG 4 target level of '28' would be achieved in 2023–2024
Sahu et al ; 2015 [154]	Indian Journal of Medical Research	1992 to 2006	The hazard of infant mortality during 2005-2006 was 20 % less compared to period 1992-1993..Hazard of infant mortality was highest among births to mothers >/30 (HR=1.3) and 37% less among birth interval > 24 months.
Chowdhury et al ; 2017 [155]	BMJ	January 2008 - March 2010.	The odds of death at 29–180 days and at 181–365 days were 1.4 (95% CI 1.3 to 1.6) and 1.7 (95% CI: 1.4 to 2.0) higher in females compared with males, respectively. IMR - 67.1/1000 live births
Kaur et al ; 2017 [156]	International Journal of Community Medicine and Public Health	1998-2014	Total fertility rate (TFR), women who had institutional deliveries, safe deliveries and mean children ever born are statistically significantly associated with decline in infant mortality rate. (p<0.01)

Ranjan et al; 2017 [157]	International Journal of Population Studies	2004-2008	Infants born to rural women had 29% ($p < 0.05$) higher risk of death compared to infants born to urban women
Dhirar N et al; 2018 [158]	Indian Pediatrics	2005-2016	Reduction in IMR from 57 to 41/1000 live births. Initiation of breast feeding within one hour improved from – 23.4% to 41.6%, Exclusive breastfeeding of the infants less than 6 months of age improved from -46.3% to 54.9%..

5.2.10. Studies on evaluation of ASHAs under HBPNC (n=9).

Author, Publication year	Journal Name	Study period	Type of study	Intervention/ Strategy	Results
Srivastava et al ; 2012, Thane district of Maharashtra [119]	Rural and Remote Health	January 2011 to March 2011,	Cross sectional study	HBPNC	71 ASHAs (48.6%) were unaware of preventive actions to be taken for Vitamin A. Twenty-nine (19.9%) of the ASHAs did not feel the need for referral for a child with diarrhoea who is unable to drink or breast feed.
Das et al ; 2013, Primary health centers in Babina block [120]	Indian Journal of Paediatrics	November 2012- February 2013	Cross sectional study	HBPNC	ASHA-investigator agreement on the need to assess infants was intermediate ($\kappa=0.48$, $P<0.001$). ASHAs did not follow home-based newborn care formats and skipped critical signs. Overall ASHA-investigator agreement on diagnosis was poor ($\kappa=0.23$, $P=0.01$)
Shashank et al ; 2013, Bijapur taluk [121]	International Journal of Contemporary	June - October, 2012.	Cross sectional study	HBPNC	Regarding complete cessation of breast feeding 11(8.3%) said at 6 months, 45(34.1%) said by 1 years of age, 44(33.3%) said at 2 years of age, 32(24.3%) said at 3

	Research and Review				yrs of age. 58(43.9%) of ASHA were aware of the importance of immunization and the adverse events following immunization
Karol et al ; 2014, Rajasthan [122]	International Journal of Humanities and Social Science	Not mentioned	Cross sectional study	HBPNC	Average score of the ASHAs in child health care is 86.62 %. 80.61 % of children in immunization were motivated by ASHAs.
Fathima et al; 2015 Karnataka [37]	Journal of Health, Population, and Nutrition	February-May 2012.	Cross sectional study	HBPNC	Advice on breastfeeding (83.6%) , home-visits to see the puerperal mother (72.4%) and immunization at birth (84.2%) was reported to be high.
Author, Publication year	Journal Name	Study period	Type of study	Intervention/ Strategy	Results
Choudhary et al ; 2015, Jamnagar district, Gujarat [123]	National Journal of Community Medicine	March 2012 to Feb 2013	Cross sectional study	HBPNC	Four fifth of ASHA (80.93%) knew about exclusive breast feeding correctly and around three fifth (60.31%) of ASHA knew about the method of prevention of neonatal tetanus.
Gupta M et al, 2016 , urban slum areas, Chandigarh [[124]	Advances in Medical Education and Practice	August 2013 - December 2014.	Longitudinal study	HBPNC	Overall skill assessment score improved from 0.64 to 1.76, newborn examination skill from 0.52 to 1.63 after three rounds of video recording. Proportion of carrying PNC register increased from 50% at the baseline to 86% in the second round and 100% in the third round
Pandit at al ; 2016; Rural area of Maharashtra [125]	International Journal of Health	April 2016 to June 2016.	Cross sectional study	HBPNC	Home Based Newborn Care (5.41% of the ASHA had poor, 83.78% had average and 10.81% had good level of knowledge score respectively. Mean

	Sciences and Research				knowledge score of the ASHA for the area of HBNC was 3.94±1.05 and in Breast Feeding initiative was 2.54±0.55
Panda et al;2019 ;Odisha [126]	International Journal of Community Medicine and Public Health	March - June 2018	Cross sectional study	HBPNC	ASHA workers were aware regarding the responsibilities. 64.7% in HBNC. All of them (100%) ASHA's helped in immunization. 24.65% gave advice to mothers about breast feeding .

5.2.11 Studies under strategy IMNCI(n=5)

Author, Publication year	Journal Name	Study period	Type of study	Intervention/ Strategy	Results
Venkatachala J et al ; 2011 Panchkula district of Haryana stat [109]	Indian Journal of public health	2006-2009	Cohort study	IMNCI	Composite knowledge and skill scores for Auxilliary Nurse Midwives (ANMs) and Anganwari workers (AWWs) together declined significantly in the year 2009 from 74.6 to 58.0 in 8-day training group and from 73.2 to 57.0 in 5-day training group (P < 0.001).
Biswas B et al ; 2011.West Bengal [110]	Journal of Tropical Paediatrics	October 2008 to July 2009	Cross sectional study	IMNCI	Appropriate management for all associated conditions was given in one-third (33.6%) young infants and about one-fourth (23.9%) older children
Bhandari et al ; 2012,Haryana [94]	BMJ	June to October 2006	Cluster randomized trial	IMNCI	IMR (adjusted hazard ratio 0.85, 95% confidence interval 0.77 to 0.94) were significantly lower in the intervention clusters than in control clusters.

Chishty S et al ; 2016, Baran district of Rajasthan [111]	International Journal of Current Research	Two years	Longitudinal study	IMNCI	Baseline scores for IMNCI skills for assessing infants in age group of 0-2 months was 7.23 at the end of second visit the mean scores in the four blocks improved to 10.62 and further to 13.36 at the end of third visit
Thummakomma ; 2016, Kakatiya Medical College, Warangal [112]	Journal of Evidence Based Medicine and Healthcare	January 2013 to September 2014.	Prospective observational study	IMNCI	Sensitivity of IMNCI criterion in correctly identifying sick infants of age 0-2 months is 90.02%, specificity is 63.10%, positive predictive value being 92.44% and negative predictive value is 55.79%

5.2.12 Studies on Immunization(n=3) And Viamin A(n=1)

Author, Publication year	Journal Name	Study period	Type of study	Intervention/Strategy	Results
Gupta et al ; 2007 [259]	Journal of Urban Health	April to June 2006	Cross sectional study	Immunization	Fully immunized children at the age of 2 years were 30% in slums as compared to 74% and 62.5% in urban and rural areas (p<0.001), respectively.
Prinja et al ; 2010 [356]	Bulletin of the World Health Organization	July 2005 and December 2006.	Cohort design	Immunization	Proportion of children with 3 rd DPT dose by age of 4, 6 and 9 months was 22%, 70% and 88%, respectively, in the post-intervention cohort. This was significantly greater (P < 0.001) than in the pre-intervention cohort, where the proportions were 19%, 62% and 85%, respectively.

Verma et al ; 2017 [374]	Public Health Action	April 2013 to March 2016	Mixed methods	Immunization	Immunisation coverage- 100 % for BCG vaccination in both settlements by 2015, irrespective of the presence of the ASHAs. For DPT (or the pentavalent vaccine), coverage was 100% in the settlement with the ASHAs and 94% without ASHAs. Infant deaths from 11-6/1000 live births(2013-2015) in settlement with ASHAs.
<u>Study on Vitamin A(n=1)</u>					
Mazumdar et al ; 2015 [375]	Lancet	June 24, 2010 - July 1, 2012	Randomized control trial	Vitamin A supplementation	The risk difference between the vitamin A and placebo groups was – 3.1 deaths per 1000 (95% CI – 6.3 to 0.1) - 322 neonates need to be supplemented with vitamin A to prevent one infant death in the first 6 months of life.

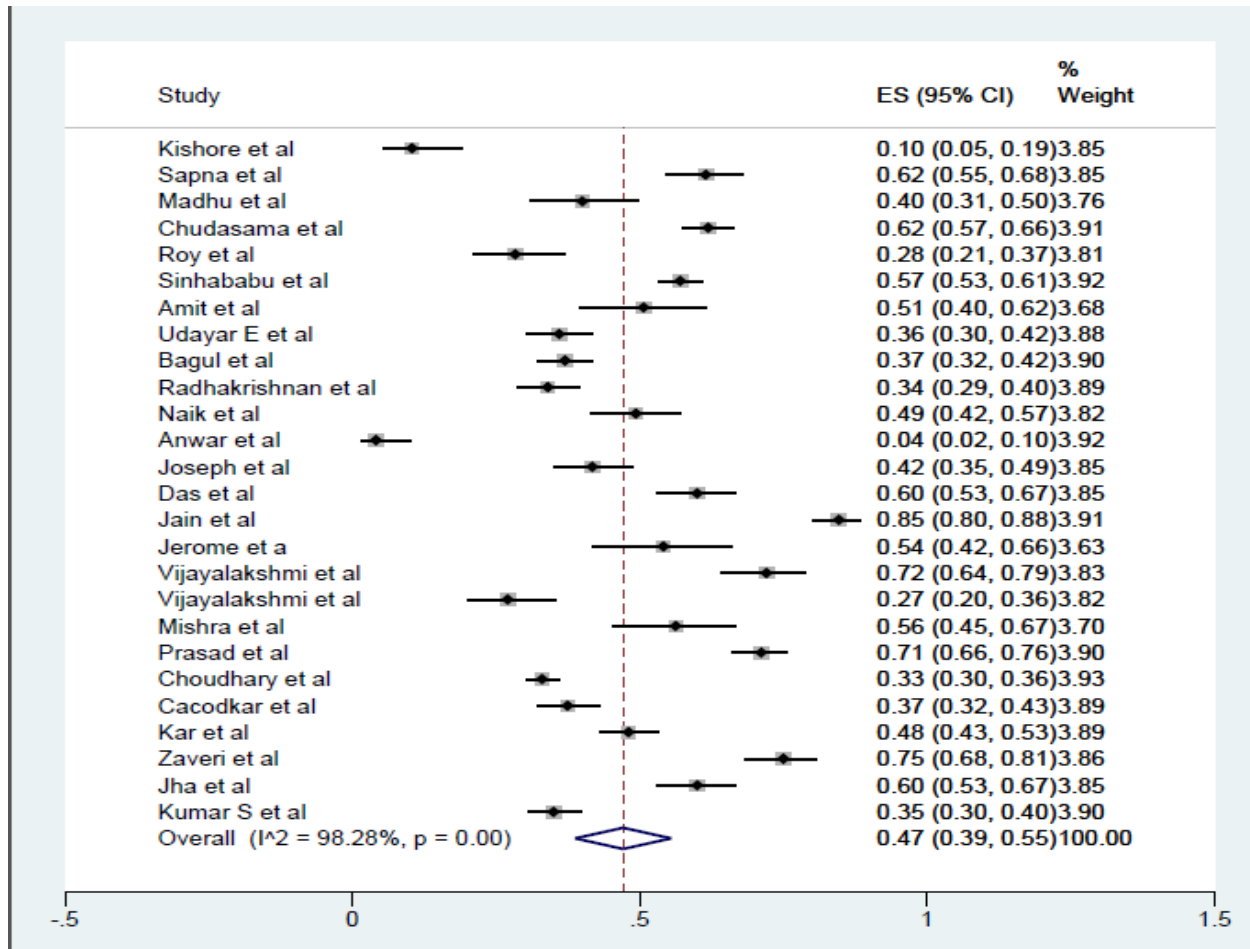
5.2.13 Studies included in forest plot with outcome as Exclusive Breastfeeding (n= 26)

Author, year of publication, Area	Journal Name	Study period	Study type	Intervention/Strategy	Results [Total Number of exclusive breast feeding babies[n,(N)]
Kishore et al; 2008 Panchkula district of Haryana [159]	Journal of Tropical Paediatrics	August 2007 (one month)	Cross sectional	Exclusive breast feeding	8(77)
S Sapna et al ; 2009 Urban Slum In Western India [160]	International e-Journal of Science, Medicine & Education	Six months	Cross sectional	Exclusive breast feeding	123(200)
K Madhu et al; 2009 Kengeri, Rural Bangalore [161]	Indian Journal of Community Medicine	January 2006 to April 2006	Cross sectional	Exclusive breast feeding	40(100)

Chudasama et al ; 2009,Rajkot [163]	Ojhas online journal of Health and Allied sciences	1st January to 19th February, 2007	Prospective cohort	Exclusive breast feeding	286(462)
Roy et al; 2009 Urban Slum of Kolkata [162]	Indian Journal of Community Medicine	Not mentioned	Cross sectional	Exclusive breast feeding	34(120)
Sinhababu et al; 2010 Bankura District, West Bengal, [164]	Journal of Health Population and Nutrition	June-July 2008	Cross sectional	Exclusive breast feeding	369(647)
Dinesh et al ; 2012,District Anand,Gujarat [296]	National Journal of Community Medicine	Not mentioned	Cross sectional	Exclusive breast feeding	38(75)
Bagul et al ; 2012, Nagpur , Maharashtra [166]	Journal of Clinical and Diagnostic Research	June 2011 to December 2011	Cross sectional	Exclusive breast feeding	142(384)
Radhakrishnan et al; 2012, Tamil Nadu [167]	International Journal of Health & Allied Sciences	March 2011– June 2011	Cross sectional	Exclusive breast feeding	99(291)
D J Naik et al; 2013 GMC, Miraj, [168]	International Journal of Recent Trends in Science And Technology	September - October 2011	Cross sectional	Exclusive breast feeding	76(154)
Anwar et al ; 2013, Varanasi district, Uttar Pradesh [169]	Indian Journal of Preventive and Social Medicine	September 2011 to November 2011.	Cross sectional	Exclusive breast feeding	4(97)
Joseph et al ; 2013,South India [170]	Journal of Family Medicine and Primary Care	November 2004 to April 2006.	Longitudinal study	Exclusive breast feeding	81(194)
Das et al ; 2014, Rural medical college in Eastern Indi [171]	Journal of Evolution of Medical and Dental Sciences	Not mentioned	Cross sectional	Exclusive breast feeding	120(200)
Jain et al; 2014,Rural Madhya Pradesh [172]	National Journal of Community Medicine	March to Aug 2014.	Cross sectional	Exclusive breast feeding	254(300)
Vijayalakshmi et al; 2014, Rural Area of Puducherry [173]	Journal of Community Medicine and Health Education	1st April 2012 to 31st March 2013	Longitudinal study	Exclusive breast feeding	98(136)

Vijayalakshmi et al; 2015 [98]	International Journal of Health Sciences	January 2014 (one month)	Cross sectional	Exclusive breast feeding	33(122)
Mishra et al; 2015 jasra block of Allahabad district [176]	Indian Journal Child Health	November 2011 to April 2012	Cohort study	Exclusive breast feeding	45(80)
Prasad et al; 2015 Rural Community of Pondicherry [177]	Scholars Academic Journal of Bioscience	November and December 2014	Cross sectional	Exclusive breast feeding	249(350)
Choudhary et al; 2015, Tertiary care center in Bhopal [175]	International Journal of Medical Science and Public Health	January 2014 to June 2014	Cross sectional	Exclusive breast feeding	330(1000)
Cacodkar et al; 2016,Goa [174]	International Journal of Community Medicine and Public Health	One year	Cross sectional	Exclusive breast feeding	115(307)
Kar et al;2016,Odisha [179]	Journal of Epidemiological Research	July 15th to Oct 15th 2011.	Cross sectional	Exclusive breast feeding	173(360)
Jha et al ; 2016, Warangal, Telangana [180]	International Journal of Community Medicine and Public Health	September 2015 to November 2015	Cross sectional	Exclusive breast feeding	120(200)
Kumar S et al ; 2018, IGIMS, Patna, Bihar [181]	International Journal of Community Medicine and Public Health	January 2017 to June 2017	Cross sectional	Exclusive breast feeding	140(400)

Meta analysis of studies with outcome as Exclusive breast feeding



Interpretation of Forest Plot

Study design: Cross sectional, Longitudinal study

Year of publication: 2008 to 2018

Total studies pooled: 26

Sample size: 61 to 1000

Pooled exclusive breastfeeding: 47% (CI: 0.39, 0.55)

Heterogeneity - 98% (very high because of sample size variability)

5.2.14 Studies with outcome as under 5 mortality rate (U5MR), N=9

Author ,Publication year	Journal Name	Study period, Place	Type of study	Strategy/ Cause/Data source	Results
Semba R. et al, 2009 [186]	The Journal of Nutrition	2005-06, India	Secondary data analysis from NFHS 2005-06	Vitamin A	Proportion of U5 Mortality in Vitamin A supplemented children vs. Non supplemented : 8.4% vs.11.4%
Espie E et al, 2010 [183]	Journal of tropical pediatrics	2008, Bihar (Darbhanga Distt)	Cross sectional design	Survey	U5MR: 0.53 deaths/10,000 persons/day Global acute malnutrition:19.4%
Kumar C et al, 2013 [185]	Journal of Public Health	1990-2008, India	Secondary data analysis	Sample Registration System (1990-2008)	U5MR: Decline of 42% from 26/1000 in 1990 to 15/1000 in 2008 Average annual rate of reduction:3.2%
Ram U et al, 2013 [115]	Lancet Global Health	2001-12, India	Secondary data analysis	National demographic and mortality surveys[SRS(2009-11),NFHS 3(2005-06),DLHS2(2002-04),DLHS3(2007-08)]	U5MR: Fell at a mean rate of 3.7% per year between 2001-2012 , from 96/1000 live births to 57.3/1000 live births. Number of districts with >80 deaths/1000 live births also reduced from 384 to 80 districts.
Farooqui H et al, 2015 [184]	PLOS One	2010, India	Modelling based estimate from multicentric hospital based studies	Pneumonia	All cause pneumonia deaths occurred in children=0.35 million , Pneumococcal deaths = 105 thousand (92–119 thousand) Highest deaths-UP, BH,MP, RJ,JH

Wang H et al, 2016 (Multi-country study) [187]	Lancet	2000-13, India	Secondary data analysis	Global burden of disease,injuries ,risk factor study (GBD 2013)	Annualized rate of change in child mortality from 2000 to 2013= -3.2 to -5.1 (-4.3) in India
Dhirar N et al, 2018 [158]	Indian Pediatrics	2005-16, India	Secondary data analysis	Comparison of NFHS 3 Data with NFHS 4	U5MR: 74 to 50/1000live births [48% decline] Strategies: Increase in intake of ORS: 26% to 50%, Increase in immunization coverage: 43.5% to 62% ,Reduction in prevalence of stunting: 10%
Jha P et al, 2017 [180]	Lancet	2001-2015, India	Secondary data analysis	Combining the proportion of child death from Million Death survey 2001-13 with annual US estimates for 2000-15	Average annual decline from 2000-15: 5.4%,Annual decline from 2000-05: 4.5% , Annual decline from 2005-15: 5.9%, Decline was faster during 2005-15. Decline in mortality rate from pneumonia: 63%, Decline in diarrhea rate: 66%,Decline in measles mortality rate: 3.3 to 0.3/1000 live births. India avoided 1 million child deaths.
Gothankar J. et al, 2018 [188]	BMC Public Health	2015 (7 months),Urban and rural field practice area BVDU in Maharashtra	Cross sectional	ARI	U5MR: 3.81/1000 children Proportionate death rate for pneumonia: 21.42%

5.2.15 Studies included in forest plot with outcome as full immunization coverage, N=16

Author, year of publication	Journal Name	Study period, Place	Study type	Intervention/ Strategy	Results Total Number of fully immunized children [n,(N)]
Nath B et al, 2007 [194]	Indian journal of medical sciences	2005(4 months), Urban slums of Lucknow	Coverage survey	Immunization	244(510)
Mallika MC et al, 2014 [193]	Journal of Evolution of Medical and Dental Sciences	2013-14, Thiruvananthapuram Distt, Kerala	Cross sectional	Immunization	189(210)
Devasenapathy N et al, 2016 [190]	BMJ Open	2014(4 months), Delhi urban slums	Cross sectional	Immunization	863(1849)
Gill N et al, 2016 [191]	International Journal of Community Medicine and Public Health	2014(3 months), Mankhurd suburb, Mumbai	Descriptive study	Immunization	189(210)
Datta A et al, 2017 [189]	Journal of Clinical and Diagnostic Research	2013-14, Rural field practice area of Agartala GMC	Cross sectional	Immunization	304(303)
Srivastava A et al, 2017 [195]	Indian Journal of Forensic and Community Medicine	2016(3months), Urban field practice area SNMC Bagalkot, Karnataka	Cross sectional	Immunization	235(283)
Jain A et al, 2018 [172]	International Journal for Scientific Research and Development	2018(2 months), Rural area of Tikamgarh,MP	Descriptive research	Mission Indradhanush	114(204)

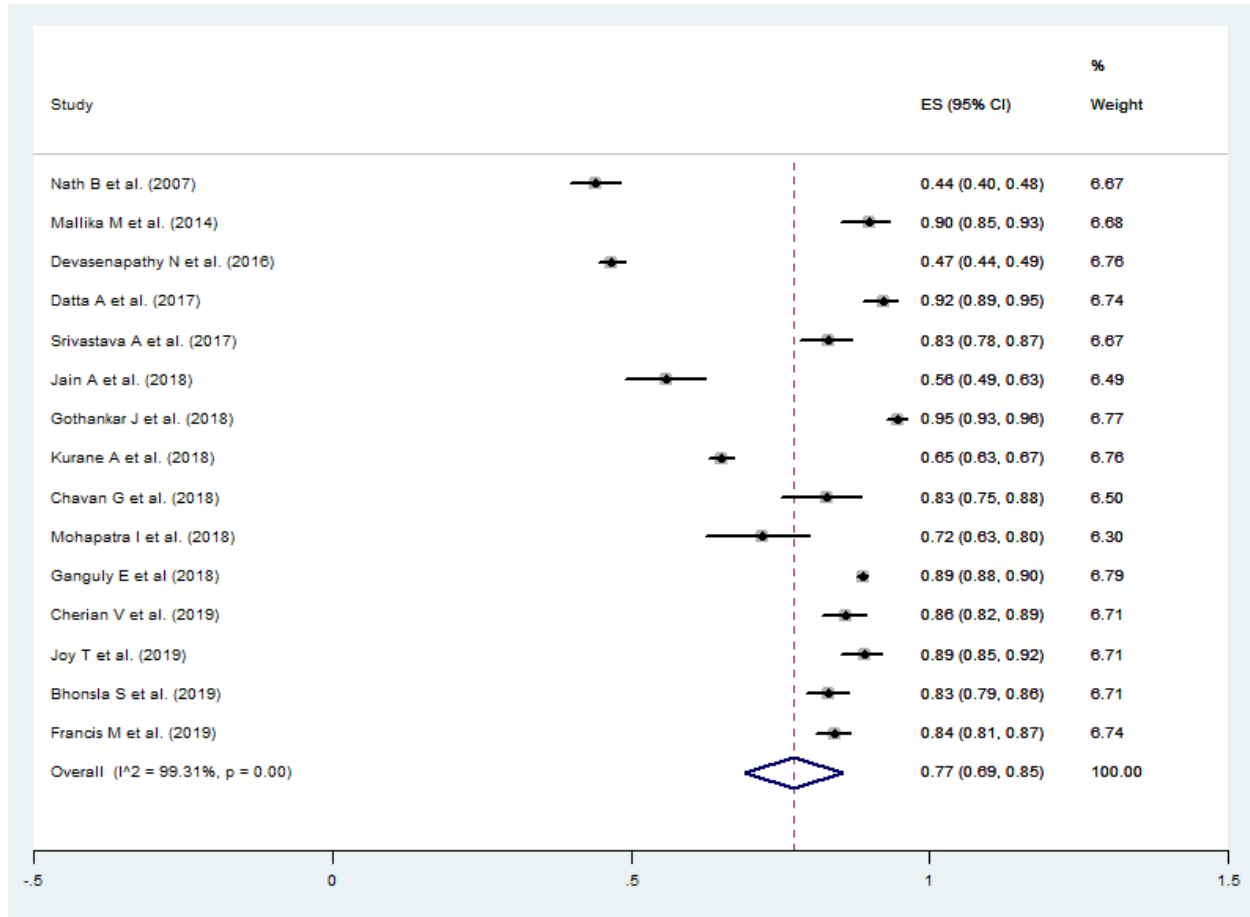
Gothankar J et al,2018 [188]	BMC Public Health	2015(7 months), Urban and rural field practice area BVDU in Maharashtra	Cross sectional	Immunization	605(639)
Kurane A et al, 2018 [201]	International Journal of Contemporary Pediatrics	2015-17, Pediatric ward in DY Patil hospital Kolhapur, Maharashtra	Hospital based study	Immunization	1303(2000)
Chavan G et al, 2018 [196]	National Journal of Community Medicine	2017, Mahabubnagar Distt of Telangana	Cross sectional	Immunization	101(122)
Mohapatra I et al, 2018 [202]	Journal of Family Medicine and Primary Care	2017 (4 months), Urban field practice area of KIMS Bhubaneswar	Cross sectional	Mission Indradhanush	72(100)
Ganguly E et al, 2018 [199]	INQUIRY: The Journal of Health Care	2008-09, Churu Distt Rajasthan	Household survey	REACH strategy	4441(5007)
Cherian V et al, 2019 [197]	International Journal of Community Medicine and Public Health	2015-17, Dallupura in East Delhi	Cross sectional	Immunization	301(350)
Joy T et al, 2019 [200]	Journal of Family Medicine and Primary Care	2017(3 months), Kochi metropolitan area of Kerala	Cross sectional	Immunization	276(310)
Bhonsla S et al, 2019 [203]	Indian journal of community health	2017(12 months),Urban and rural area of Ambala	Cross sectional	Immunization	349(420)
Francis M et al, 2019 [198]	Elsevier Science Direct	2017(2 months),Thimiri rural block of Distt Vellore	Cross sectional	Mission Indradhanush	509(606)

Other studies on immunization coverage not included in forest plot, N=6

Author ,publication year	Journal name	Study period, Place	Type of study	Intervention/ strategy	Results
Carvalho N et al, 2014 [6]	PLOS one	2007-08, India(34 states and UT)	Quasi experimental	Effect of financial assistance from JSY on immunization (Use of DLHS 3 data)	Increase in 9.1 % points in the proportion of fully vaccinated children, 3-8% point increase in coverage of most vaccines, reduction of 3.2 % points in the proportion of children who had not received a single vaccine.
Prinja S et al, 2017 [63]	Tropical Medicine and International Health	2015, Kaushambi Distt Uttar Pradesh	Pre- and post-quasi experimental design	ReMind(Reducing maternal and newborn deaths)	Full immunization increased in the range of 30-40% from 2011 to 2015.Full immunization in Intervention group vs. control group(%): Before matching AHS 2011(n=124 vs.186) : 7.7 vs.7.1 ,CEAHH 2015(n=1418 vs.1473) : 49 vs.55.5 After matching(n=1219), In AHS 2011= 44.40 vs. 46.50, CEAHH 2015= 47.20 vs. 55.70
Mathiarasu A.M et al, 2017 [207]	International Journal of Public health Research	2012-13, Kanyakumari Distt Tamilnadu	Cross-sectional	Immunization	Coverage of measles vaccination (n=210):81.4% with dropout of 18.6%.
Goel S et al, 2012 [205]	Indian Pediatrics	2009-10, Bihar		Secondary data analysis, comparison of immunization coverage before and after launch of	Proportion of fully immunized children in 2005-09: 19% to 49%

			Muskaan Ek Abhiyaan in Bihar with EAG states.	<p>Increase in BCG Coverage from 2005-09: 52.8% to 82.3% , in DPT-3 coverage: 36.5% to 59.3%</p> <p>Increase in OPV-3 coverage: 27.1% to 61.6% , in measles vaccination coverage: 28.4% to 58.2%</p>
Johri M et al, 2016 [206]	Bull World Health Organ	2009-13,India (12 states)	Modelling of impact of interventions , source of mortality data: million death study and Indian household survey	<p>Under 5 lives saved by measles vaccination in 12 states: 9346 (29% of India's Annual measles mortality)</p> <p>Lives saved by measles vaccine with add-on interventions=74367</p>
Bawankule R et al, 2017 [204]	PLOS one	2005-2006,India	Secondary data analysis from Demographic Health Survey	<p>Coverage of measles vaccination: 62%,</p> <p>Prevalence of ARI in measles vaccinated vs. unvaccinated: 5.6 vs. 7.3, Measles vaccination was associated with a reduction of 15% ARI ,12% diarrhoea</p>

Meta analysis of studies on full immunization coverage



Interpretation of forest plot

Study design: Cross sectional

Year of publication: 2007 to 2019

Total studies pooled: 15

Sample size: 100 to 5007

Pooled Full Immunization coverage: 77% (CI: 0.69, 0.85)

Heterogeneity: 99% (very high because of sample size variability)

5.2.16 Studies with focus on Vitamin A Strategy (n=4)

Author, Year of Publication	Journal Name	Study type	Study Period	Intervention/Strategy	Results
Semba R et al, 2009 [186]	The Journal of Nutrition	Secondary data analysis from NFHS 3	2005-06, India	Vitamin A	<p>Out of total 23008 children, 4459 (20.2%) received Vitamin A within last 6 months</p> <p>Characteristics of children who received Vitamin A vs. who did not received supplementation: - Severe underweight = 16.7% vs. 22.1% ($p < 0.0001$)</p> <p>- Severe wasting = 6.7% vs. 7.6%, Severe stunting = 24.6% vs. 32.2% ($p < 0.0001$)</p>
Agarwal S, 2013 [223]	Int J Med Public Health	Secondary data analysis from NFHS 3	2005-06, India	Vitamin A	<p>n=20802</p> <p>Only 25% (20802 of the children in India) received vitamin A supplementation, Rural children (71.8%) and children of educated mothers were more likely to receive vitamin A supplementation than others (urban - 28.2%). One-third of the children aged 12-23 months (61.2%) received vitamin A supplementation as compared with only one-fifth of the children aged 24-35 months (38.8%).</p>

Kapil U et al, 2013 [225]	Public Health Nutrition	Prospective cohort study	2011-12, Uttar Pradesh	Vitamin A	n=262 Resolution of Bitot spots after Mega Dose Vitamin A supplementation- At 6 months of follow up:51.1% (134)cured , At 1 year : 59.9%(157) cured
Aguayo V et al 2014 [224]	Public Health Nutrition	Secondary data analysis from DLHS	2006-2011,7 states (Bihar,Chhattisgarh,Jharkhand,Madhya Pradesh, Odisha, Rajasthan, UP)	Vitamin A	Increase in the mean full VAS coverage in seven states from 44.7% to 67.3% Annually decrease in number of poor children who did not receive two VAS doses-40.3%

5.2.17 Studies with outcome as ARI and Diarrhoea, N=9

Author, Publication year	Journal Name	Study period	Type of study	Results
Prajapati B et al, 2011 [376]	National Journal of community medicine	2008-09, urban and rural areas of Ahmedabad	Cross sectional study	n=500 Prevalence of ARI in last 1 month : 22%, prevalence in urban area: 17.2% and in rural are: 26.8%, It was higher in low social class: 26.56%, in Illiterate mothers:24.4%, Overcrowded houses: 28.5%.
Goel K , 2012 [377]	Journal of Community medicine and Health Education	2011-12, Urban and rural areas of Meerut	Cross sectional study	n=450 Prevalence of ARI: 52%, mean number of episodes of ARI -2.25 per child per year, It was higher in severe

				malnourished children: 26.49% than less malnourished: 09.82 %.
Mathew M et al, 2013 [378]	Indian pediatrics	2009-11, Ernakulam Distt Kerala	cross-sectional	n=1827 Overall prevalence of Rotavirus diarrhoea: 35.9%(648) ;prevalence of rotavirus diarrhea in children of 12- 23 months : 41.9%; 24- 35 months: 46.9% and 36- 59 months:33.3% in, Death:0
Kumar G et al, 2015 [379]	Journal of Natural Science, Biology and Medicine	2013-14, Kerala	cross-sectional	n=509 Overall prevalence of ARI: 59.1%(301),prevalence in urban areas: 63.7% and rural areas: 53.7% Prevalence of ARI in 13-24 months age group: 52.6% , in 25-60 months age group: 59.5%.
Gupta A ,2015 et al [380]	Journal of Global Infectious Diseases	1 month, West Bengal	cross-sectional	n=152 Overall prevalence of diarrhea:22.36%(34); prevalence of diarrhea was 21.83% in completely immunized children and 30% in partially immunized children.
Author, Publication year	Journal Name	Study period, Place	Type of study	Results
Farooqui H et al, 2015 [184]	PLOS One	2010,India	Secondary data anlysis,Data from DLHS-3	Incidence rate of severe pneumonia - 30.7/1000 children /year, Lower incidence :Southern state(Kerala, Tamil Nadu),North eastern states

				<p>annual incidence of severe pneumococcal pneumonia-4.8 episodes/1000 children</p> <p>Highest in Jharkhand(7.9) ,lowest in Manipur(1.1)</p>
Ramani V et al,2016 [381]	Journal of Clinical and Diagnostic Research	2006-07, Karnataka	longitudinal cohort	<p>n=400</p> <p>Overall incidence rate of ARI : 27.25%(109),Incidence of URTI and LRTI:19.25% and 8% respectively.</p> <p>Incidence of ARI in Type IV and Type V grade malnutrition: 53.85% and 66.67% respectively.</p>
Kumar B et al,2017 [382]	International journal of contemporary medical research	Andhra Pradesh	Longitudinal study	<p>n=650</p> <p>The ARI incidence: 3.33 episodes/child/year, it was declined with increasing age , maximum in the first year (2.66 episodes/ child/year) ,minimum in 20 -24 months (1.59 episodes/child/year) of life</p>
Gothankar J et al, 2018 [188]	BMC Public Health	2015(7 months), Maharashtra	Cross sectional	<p>n=3569</p> <p>Incidence of ARI in last one month: 0.49/child/month; in rural: 0.53,urban: 0.43;P= 0.05 [6 episodes of ARI in one year], reported incidence of pneumonia in last one year:0.075/child/year (281/3569)[Rural: 0.13(146),Urban: 0.07(135)]</p> <p>N=605 ;Cases of pneumonia in Full immunized vs. non immunized children :64 vs 541 (p < 0.05)</p>

Other Studies

Author, Publication year	Journal Name	Study Period	Study type	Data source/Intervention	Results
Reduction in geographical and socioeconomic inequalities post NRHM period					
Gupta M et al, 2016 [61]	PLOS One	2002-13, Haryana	Secondary data analysis	DLHS before(2002-04),during(2007-08),after(2012-13) the NRHM Implementation	<p>The geographical and socioeconomic differences between urban and rural areas, between rich and poor were significantly ($p < 0.05$) reduced for children with full vaccination :10% to 3.5%, 48.3% to 14% and who received oral rehydration solution(ORS) for diarrhea:11% to -2.2%; 41% to 5%.</p> <p>Inequalities between male and female children were significantly ($p < 0.05$) reversed for full immunization from 5.7% to -0.6%.</p>
Role of Frontline workers in improving child health					
Gupta M et al, 2017 [80]	BMC Public Health	2002-13, Haryana	Secondary data analysis	Demographic Health Survey post(2012-13),during(2007-08),pre(2002-04) NRHM implementation	Full extent of implementation for immunization by NRHM was found, Accredited social health activists act as an catalyst in

					acceptance of immunization.
Vir S et al, 2014 [354]	Food and Nutrition Bulletin	2011,Rural Chhattisgarh	Quasi-experimental mixed methods	Mitanin Programme	<p>Nutritional status of children up to 35mo[Project Group(n = 1,775) vs. Control Group(n = 1,749)]</p> <p>Severely underweight:13.8 vs.15.6 ,Severely wasted :11.1 vs. 15.3</p> <p>Annual average reduction rates (AARRs) for underweight , stunting and wasting</p> <p>-</p> <p>In 1998-2005 :1.45% , 1.93% and 0.4%</p> <p>In 2005-2011: 4.22%, 5.64% and 3.53%</p>

5.2.18 Studies with focus on RBSK, N=3

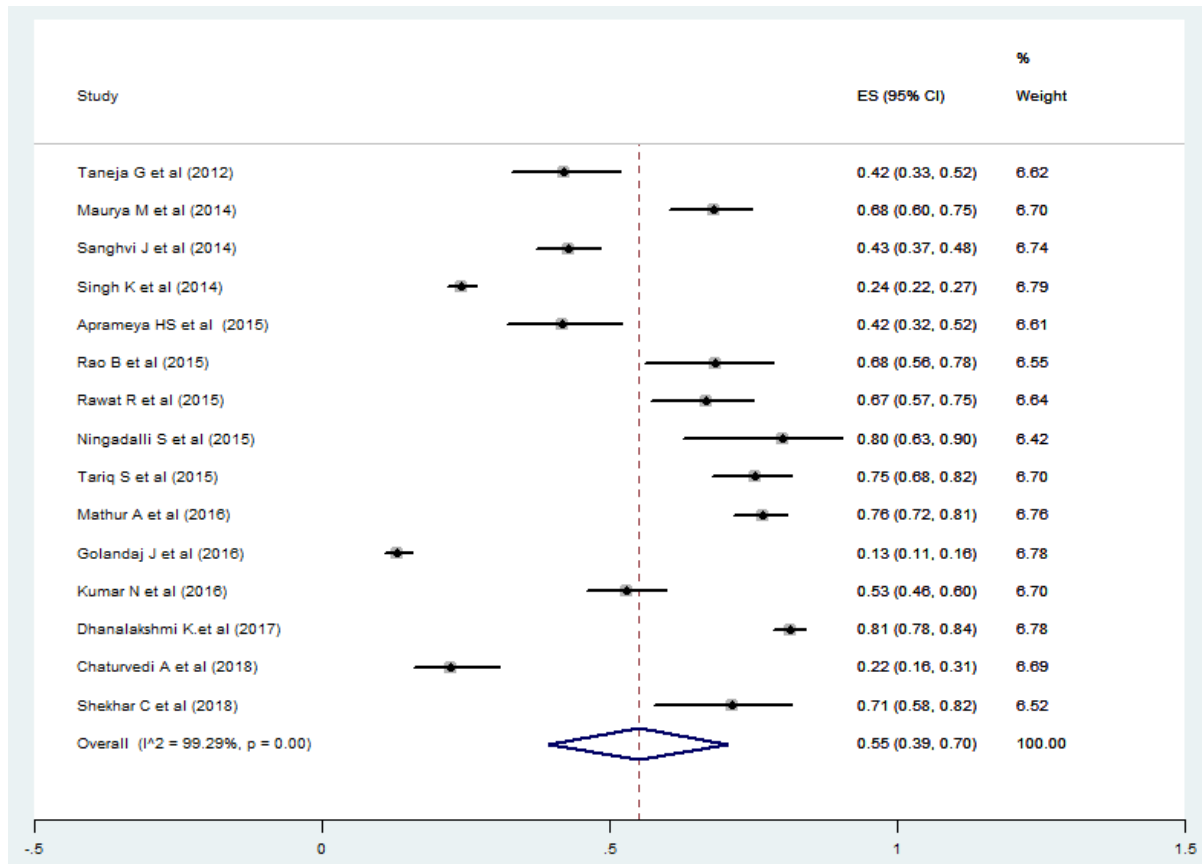
Author, Year of Publication	Journal Name	Study Period	Study Type	Intervention/ Strategy	Results
Singh P et al, 2011 [383]	National Journal of Community Medicine	January 2011-June 2011, Surat	Retrospective analysis	School health program	Total number of patients screened =24 children Incidence of heart diseases=14 children
Tiwari J et al, 2015 [227]	International Journal of Community Medicine and Public Health	6 months (August 2014-Januray2015), Panna Distt Madhya Pradesh	Cross sectional survey	RBSK	Number of children screened for birth defects, deficiency, developmental delays and other diseases=26977
Balat M et al, 2018 [226]	International Journal of Community Medicine and Public Health	June - October 2016, Ahmedabad	Cross sectional study	RBSK	Number of beneficiaries under RBSK=169 Children diagnosed for heart diseases=47.9%, Number of children operated =53%,Children given drug therapy=31.95%

5.2.19 Studies included in forest plot with outcome as recovered children under nutritional rehabilitation centers, N=15

Author ,Publication year	Journal Name	Study period, Place	Type of study	Intervention	Results Number of recovered children,[n,(N)]
Taneja G et al,2012 [211]	Indian Journal of Community Medicine	2008-09, Indore and Ujjain division Madhya Pradesh	Prospective study	NRC	42(100)
Maurya M et al,2014 [209]	Indian Pediatrics	2011(12 months), Allahabad Uttar Pradesh	Retrospective analysis	NRC	110(162)
Singh K et al,2014 [222]	Indian Pediatrics	2010-11, Uttar Pradesh(12 NRCs)	Secondary data analysis	NRC	286(1181)
Sanghvi J et al,2014 [210]	ISRN Pediatrics	2011-12, SAIMS hospital Indore	Prospective study	NRC	128(300)
Aprameya HS et al ,2015 [208]	International Journal of Health & Allied Sciences	2013-14, Wenlock Distt Hospital Mangalore	Prospective study	NRC	38(91)
Rawat R et al,2015 [216]	Journal of Evolution of Medical and Dental Sciences	2014(6 months), Bhopal	Observational study	NRC	68(102)
Ningadalli S et al,2015 [214]	International Journal of Science and Research	2013(10 months), Belgaum Distt Karnataka	longitudinal study	NRC	24(30)

Rao B et al, 2015 [215]	Journal of Evidence Based Medical Healthcare	2013, Visakhapatnam Andhra Pradesh	Retrospective analysis	NRC	43(63)
Tariq S et al, 2015 [212]	International Journal of Contemporary Pediatrics	2014-15, GMC Srinagar	Prospective study	NRC	110(146)
Mathur A et al, 2016 [213]	International Journal of Contemporary Pediatrics	2012-14, HRH hospital Delhi	Not mentioned	NRC	250(327)
Golandaj J et al, 2016 [217]	Nutrition and Food Science	Jan -Dec 2014, 4 Distt of Northern Karnataka	Cross sectional study	NRC	94(722)
Kumar N et al, 2016 [218]	Journal of Evolution of Medical Dental Sciences	2014-15, Ananthapuramu Andhra Pradesh	Prospective study	NRC	103(195)
Dhanalakshmi K. et al ,2017 [221]	International Journal of Contemporary Pediatrics	2014-15, Bangalore	Retrospective study	NRC	599(736)
Shekhar C et al, 2018 [220]	International Journal of Community Medicine and Public Health	2013(10 months), Urban Kurnool area Andhra Pradesh	Cross sectional	NRC	37(52)
Chaturvedi A et al, 2018 [219]	Nutrition Journal	2011-12, Jharkhand 48 MTCs	Prospective study	Malnutrition treatment center	26(116)

Figure: Meta analysis of studies with outcome as recovered children under NRC



Interpretation of forest plot

Study design: Cross sectional, Prospective study, Retrospective study

Year of publication: 2012 to 2018

Total studies pooled: 15

Sample size: 30 to 1181

Pooled Recovered Children under NRC: 55 % (CI: 0.39, 0.70)

Heterogeneity: 99% (very high because of sample size variability)

5.3 REPRODUCTIVE HEALTH

5.3.1 Results of studies with TFR as an outcome (N=9)

Author, year of publication	Study period	Outcome	Proportion
Mohanty et al, 2013 [384]	1991-2011 (respective rounds of DLHS, Census and NSS data)	TFR	The variance of TFR in districts of India has increased from 0.87 in 1991 to 0.91 in 2001 and declined to 0.71 by 2011.
Prasad et al, 2013 [254]	2001-2011	TFR	TFR declined from 3.81 to 2.58 after the implementation of NRHM in India
Barman, 2013 [251]	NFHS 3 report and SRS 2007-08	Unmet Need, TFR	TFR is maximum in EAG states (2.6 to 4.0).EAG states unmet need 33.1, South Indian States -27.7 and rest of Indian states 27.2, MMR EAG states 308, South Indian states 127, Rest Indian states 149.
Mohanty et al, 2014 [253]	2000-2011	TFR	TFR declined from 3.87 in 1991 to 2.66 in 2011
Sebastian et al, 2014 [252]	2000-2010 (SRS reports)	TFR	TFR in Bihar declined from 4.5 to 3.6 in 2011, Odisha 2.8 to 2.2 and MP 4 to 3.1 compared to national decline from 3.2 to 2.4 in 2011.
Chhetri et al, 2016 [255]	Post NRHM(2005-2014)		TFR has declined from 2.6 in 2006 to 2.4 in 2011. Rural TFR has declined from 3.1 to 2.7 and urban has declined from 2.0 to 1.9 in this period.
Bansod et al, 2016 [256]	NFHS 4		Most of the Indian states have achieved replacement level fertility of 2.1 except Bihar-3.4, Meghalaya 3.0, Manipur 2.6 and MP 2.3. CPR (any method) varies from 24% in Manipur to 71% in West Bengal. CPR (modern method) 13 % in Manipur to 69% in Andhra Pradesh.
Khan et al, 2017 [257]	1991-2011		Before NRHM TFR was 3.81 and after NRHM TFR 2.58 so mean difference is 0.6
Narwal et, 2017 [258]	2007-2015 (Pre and post evaluation of NRHM)		TFR declined from 2.9 in 2005 to 2.4 in 2011. TFR declined by 10.3 % in 2001-06 compared with 14.3% in 2006-11.

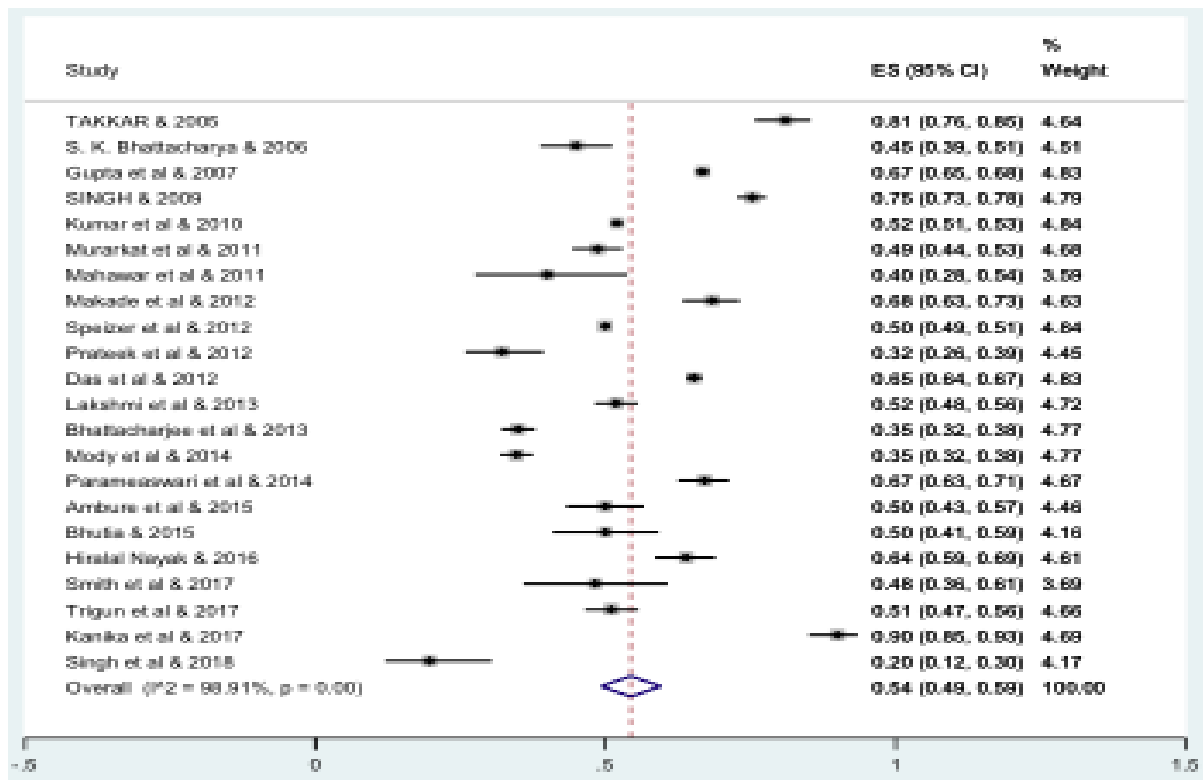
5.3.2 Studies included in forest plot with outcome as CPR (n=22)

Kumar et al, 2010 [263]	2010	Contraception usage: 52%. Most common age group was 23-27 years. Mean age of first delivery was 20 years. 62% of the non-contraceptive users were illiterate and usage increases with increase in education. 505 have the knowledge of male sterilization but they believe it will weaken the male. None had the correct knowledge of emergency contraception.
Makade et al, 2012 [264]	2012	234/342 (68.42%) participants were using any one contraceptive method
Speizer et al, 2012 [265]	2012	All the districts report about 50% of modern contraceptive use. Across all districts higher unmet need was found in slum population.
Prateek et al, 2012 [266]	2012	Participants having knowledge of contraception 52.2%, Participants using contraception 32.2%,
Das et al, 2012 [120]	2012	65.3 % contraceptive acceptance rate, OCP and female sterilization are most common methods used
Lakshmi et al, 2013 [308]	2013	Awareness 95%, Acceptance 87%, Followed contraception 71%, Users 52%
Bhattacharjee et al, 2013 [268]	2013	89.5% women had the knowledge of contraceptive measures, OCP knowledge (84%), only 35% women were using contraception. Religion, age, literacy and number of living children were associated with contraceptive usage.
Takkar et al, 2005 [270]	2005	81 % women were practicing contraception and 73% of them were regular users. Only 11% participants were aware of emergency contraceptive measures.
S. K. Bhattacharya, 2006 [269]	2006	proportion of women using contraception was 45%, 41.6% was the unmet need, major reason of high unmet need was opposition of family/husband.
Gupta et al, 2007 [259]	2007	contraceptive practices in slums were significantly low as compared to urban and rural areas in Chandigarh (53.4% vs 73% vs 75%).

Singh et al, 2009 [273]	2009	75.3 % were contraceptive users. Religion was found to be significantly associated with contraceptive use. Unmet need for contraception was more than 33% and unmet need for spacing was 23.5%.
Murarkat et al, 2011 [271]	2011	249(48.63%) women were contraceptive acceptors
Mahawar et al, 2011 [274]	2011	a) 18% KAP Gap was found in total subjects. Maximum KAP Gap was found in the 19-21 year age group.
		b) 98% of the subjects had the knowledge,
Mody et al, 2014 [275]	2014	65.3% women were not using any contraeption. Among the women who were using contraception condom was the most common choice (77.8%)
Parameaswari et al, 2014 [272]	2014	CPR was 67.1%. Unmet need 23.1
Bhutia, 2015 [276]	2015	TFR is 2.0 as compared to national 2.8, Knowledge and awareness about contraceptive methods is 99.1 %, contraceptive usage is 50%.
Ambure et al, 2015 [277]	2015	50% women were using contraceptives. contraception was more among Hindus and christians then muslims. Although women having full PNC were proportionally higher in using contraceptives but staistically no association was found
Hiralal Nayak, 2016 [278]	2016	98% of women were aware of a family planning method, 64% were using any method of contraception
Kanika et al, 2017 [279]	2017	90% clients were adequately utilizing the family planning services under NRHM and 100% satisfaction was there.

Smith et al, 2017 [280]	2017	Awareness about contraception- 93.1%, most common purpose of using contraception- maternal health benefits (65.5%) and birth spacing (60%), counselling regarding postpartum contraception (24%), postpartum contraception usage-48.3%
Trigun et al, 2017 [281]	2017	Contraceptive usage 51.1%
Singh et al, 2019 [385]	2019	contraceptive usage was 19.7%

Meta Analysis of studies on CPR



Interpretation of Forest Plot

Study design: Cross sectional

Year of publication: 2007 to 2017

Total studies pooled: 22

Sample size: 50 to 17643

Pooled CPR: 54% (CI: 0.49, 0.59)

Heterogeneity - 98% (very high because of sample size variability)

5.3.3 Studies with secondary data analysis where CPR is an outcome

Author & year of Publication	Source of data	Outcome focused	Results
Prusty et al & 2014 [386]	DLHS-RCH III:2007-08 (3 states with tribal population: Jharkhand, MP and Chhattisgarh)	Contraceptive Prevalence Rate	CPR: Jharkhand tribal 22.8, Non tribe 41.8, Chhattisgarh: Tribal 43.5, non tribal 56.2, MP: tribal 50.2 and non tribal 60.2
Sankariah et al & 2015 [387]	Data from DLHS 3 and NFHS 4	Modern family planning methods use	mCPR 47.5 (DLHS3) and 45.4 (NFHS 4) mean difference -2.1 (95% CI -3.2,-1.1)
Cahill et al & 2018 [388]	Family planning estimation tool (FPET) used in 68 countries (2012-2017)	estimates and projections of the modern contraceptive prevalence rate, unmet need for and demand satisfied with modern methods of contraception	In Asian countries the m CPR growth has been less than 1% since 2012
Unpublished presented in Bhopal	DLHS survey report	Contraceptive use	Use of Contraception is more in the age group of 30-34, 35-39 and 40-44 i.e. 51-68%. The contraception use was found to be very low in the age group of 20-24 i.e. 28%
Unpublished presented in Bhopal	NFHS 3 - NFHS 4 survey report	Gender gap in contraceptive use	Unmet need for family planning marginally decreased from 14 (2005-06) to 13% (2015-16), MCPR highest in HP (75%) and lowest in Bihar (34%), MCPPr is around 60% in 20% of the districts. Female family planning method usage (87.6%) and male FP method (12.6%)

5.3.4 Results of studies with ASHA as an intervention (N=4)

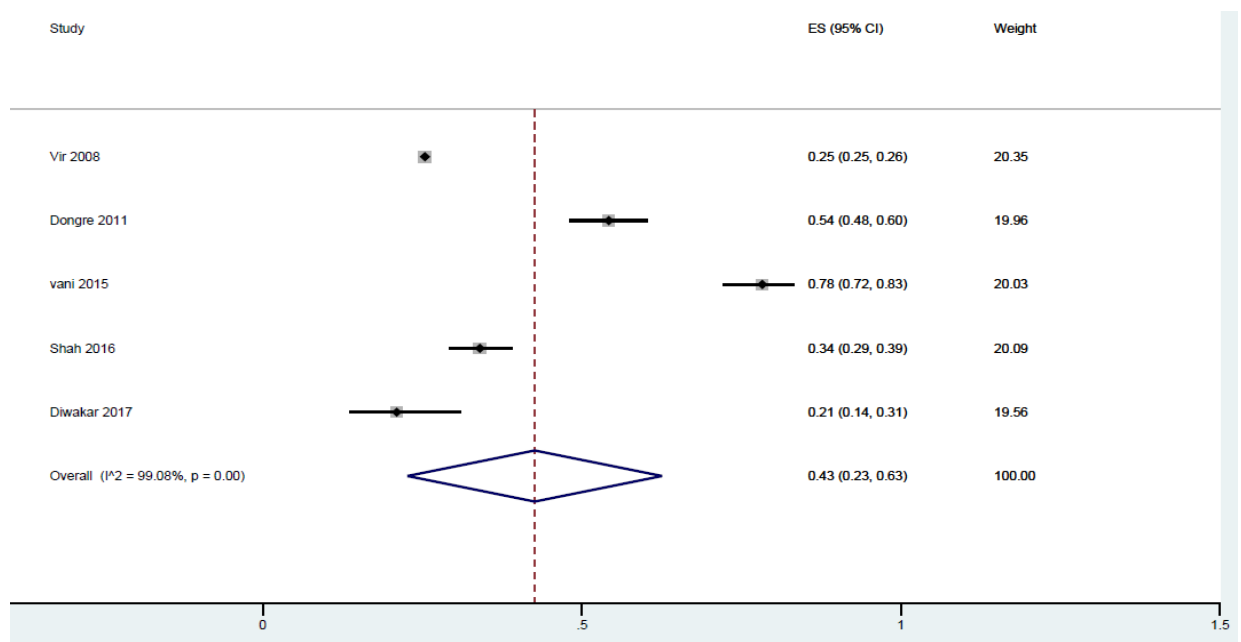
Author, year of publication	Objective/Intervention	Results and recommendations
Nimavat et al, 2013 [260]	To find out effects of new ASHA incentive scheme under NRHM on the performance of ASHA in motivating couples to undergo permanent sterilization method	ASHAs performance was increased; 1.13 times for eligible couples and 1.14 times for couples having two or less children after introduction of an incentive, and incentive showed a significant impact on motivation of eligible couples
Fotso et al, 2015 [262]	Engaging male CHWs to complement the work of ASHAs	the engagement of male counterparts have improved the performance of ASHA program (statistically non significant), and unveils the complementarity of male and female CHWs in increased demand for MNCH services.
Karol, 2014 [122]	Checking knowledge of ASHA workers	ASHA's capacity is low in motivating family planning cases for restricting high fertility in rural areas (30.49%)
Bajpai et al, 2009 [261]	ASHA, Pregnancy Tracking system	More than 90% ASHA workers interviewed informed that they are involved in promoting contraceptive usage and family planning measures and all other services, go training about doses and side effects of OCPs, 77% ASHAs help ANM and AWW in preparation of list of eligible couples, Tracking of married couples and pregnant women for family planning counselling became easy.

5.4 ADOLESCENT HEALTH

5.4.1 Studies included in forest plot with outcome as prevalence of Anemia

Author, year of publication	Study period	Impact	Results
Vir et al 2008 [282] (Cross sectional)	Sept 2001 to Dec 2006	Reduction in anaemia	overall prevalence of anaemia reduced from 73.3% to 25.4%
Dongre et al 2011 (Cross sectional) [364]	March to July 2008	Reduction in nutritional anaemia	Among adolescent girls, the prevalence of anemia declined significantly from 73.8% at baseline to 54.6% at endline ($p < .001$). The median hemoglobin level increased from 10 to 11 g/dL. There were significant declines in the prevalence of moderate anemia ($p = .003$) and severe anemia ($p = .002$)
Vani et al 2015 (Cross sectional) [284]	Jan to Dec 2004	Prevalence of Anaemia	78.3% adolescent girls had anaemia, only 11% girls had the knowledge about anaemia
Shah et al 2016 (Cross sectional) [285]	April to June 2013	Reduction in anaemia	anaemia in girl reduced from 79.5 % to 58% and in boys it declined from 64% to 9%.
Diwakar et al 2017 (Cross sectional) [286]	Not mentioned	Decline in anaemia	BMI does not improved much, No severe anaemia found

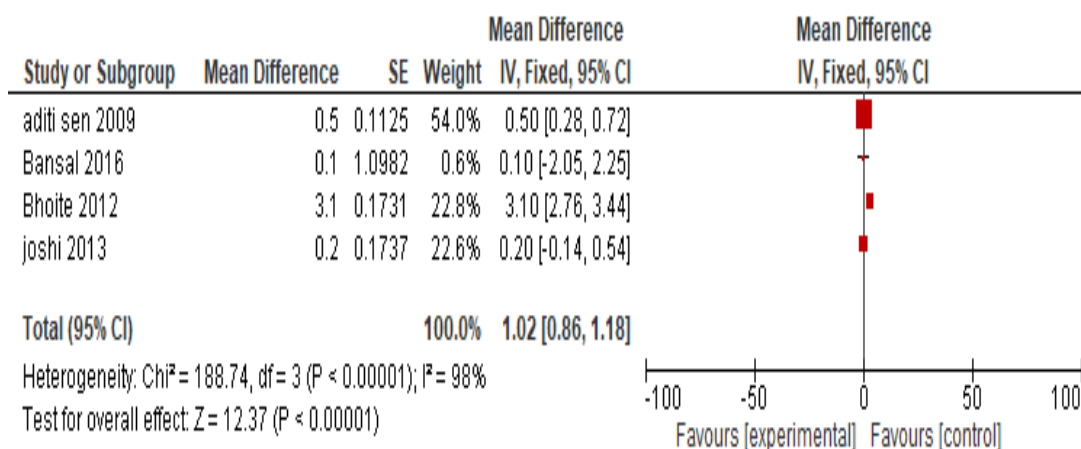
Meta-analysis of 5 cross sectional studies on WIFS



5.4.2 Studies included in forest plot with outcome as mean change in Hb levels

Author, year of publication	Study period	Impact	Results
Sen et al 2007 [288]	<i>Not mentioned</i>	Change in mean Hb levels post intervention (IFA daily vs IFA once weekly vs IFA twice weekly vs No IFA)	Highest change was found in IFA daily group (1.9g/dL) followed by IFA twice weekly group (1.6 g/dL)
Bhoite et al 2012 [287]	<i>Not mentioned</i>	IFA once weekly + deworming vs Deworming only	IFA + deworming showed 17.3% increase in Hb levels as compared to deworming only
Joshi et al 2013 [289]	June 2011 to October 2012	IFA daily vs IFA weekly	Mean rise in Hb was almost equal IFA daily (1.0+0.7 g/dL vs 1.0+0.8 g/dL)
Bansal et al 2016 [290]	January 2012 to March 2013	IFA + cynocobalamin vs IFA	Mean increase in similar in both the groups i.e. 108.9 ± 8.91 g/l and 106.7 ± 11.2 g/l respectively

Results of RCTs on WIFS (N=4)



5. 4.3 Studies included in forest plot with outcome as awareness about AFHCs

5.4.4. Studies included in forest plot with outcome as awareness about Menstrual Hygiene

Author, year of publication	Study period	Impact	Results
Kotecha et al, 2009 [312]	not mentioned	readiness to use AFCs if available	70% participants were ready to use the clinics
Nair et al, 2011 [313]	not mentioned	attitude of parents and teachers towards imparting RSH education to adolescents	8 (1.1%) parents and 6 teachers discussed the sexual health related issues with adolescents

Author, year of publication	Study period	Impact	Results
Prateek et al 2011 [266]	Sept 2010 to Novemeber 2010	knowledge, attitude, and practices regarding menstruation and menstrual hygiene among adolescent girls in rural areas.	49 (20.3%) have awareness about menstruation before menarche

Nair et al, 2012 [389]	not mentioned	gain in knowledge about RSH	Among girls, percentage of poor knowledge had reduced significantly from 64.1% to 8.3% and among boys from 37.7% to 3.5%. less than 20% of boys (17.7% 9th and 16.5% 11th standard) and less than 10% of girls (5.1% 9th and 1.2% 11 th standard) knew about symptoms of STDs before intervention. increase in knowledge was observed after intervention
Nair et al, 2013 [314]	Two years	Knowledge about Menstrual hygiene practices, knowledge attitude and practices of 10-20 age group regarding RSH issues	56% adolescents know the age of menarche
Nair et al, 2013 [315]	Two years	Knowledge about contraceptive measures, ideal age of pregnancy and other RSH indicators	92% boys had knowledge about condoms as compared to 56% girls having knowledge about cu-T.
Mehra et al, 2013 [319]	Jan to April 2012	knowledge and utilization of ARSH clinics	595 (78%) were aware of ARSH clinics, 61% adolescents visited ARSh clinics
Chauhan et al, 2015 [316]	Feb 2014-Aug 2014	awareness and utilization of AFHCs, barriers in utilization	14.1% were aware, 38.67% out of them visited, major reason of non utilization was shynessamong 54.35% girls
Ray et al 2012 [310]	3 months	issues and challenges of menstruation faced by adolescents	Presence of Pre-menarchial Knowledge Regarding Menstruation 80(42%)

Gupta et al, 2015 [363]	Feb to april 2011	Knowledge about ARSH and access to the ARSH clinics	76% were aware of balanced diet, 17% were aware of RTI/STI, utilization of ARSh was 7.4% only
Kamath et al, 2015 [317]	Aug2012 to Jan 2015	Knowledge about reproductive health	Only 8 (11%) boys were aware ARSH services
Mahalakshmy et al, 2018 [318]	Not mentioned	awareness and utilization of AFHCs	50% were aware, 2-10% utilized the services

Shah et al 2013 [298]	Jan-July 2011	awareness about menstrual hygiene practices	65 out of 164 were aware of menses before its onset, 59 subjects knew about sanitary pads, at baseline 90% girls were using old cloths but at the end of the study 68% chose fatalin cloths as first choice and 32% chose sanitary pads.
Paul et al 2014 [296]	2012	knowledge, attitude and practices during menstruation among the adolescent school girls	363 (72.6%) adolescent girls were aware about menstrualtion till its onset in 2012 as compared to 147 (29.4%) in 2007, use of sanitary napkins also increased from 23.8% to 74% from 2007 to 2012
Paria et al 2014 [295]	April 2013 - September 2013	knowledge, attitude and practices during menstruation among the adolescent school girls	Awareness about menstrual hygiene- 203 (37.52 %), Use of sanitary pads was more in urban girls as compared t0 rural girls (176 vs 120), Cleaning of genetilia was satisfactory

			in 47% urban and 38% in rural girls
Ramchandra et al 2016 [301]	not mentioned	impact of menstrual hygiene program under NRHM on knowledge and awareness on menstrual hygiene among adolescents	83 (34%) participants were aware about menstruation and 69% were using sanitary napkins
Nagaraj 2016 [390]	not mentioned	awareness about menarche, items used for menstruation, factors associated with school absence during menstruation	awareness before menarche 91 (29.93%), after health education campaign awareness about cause of menstruation increased from 34% to 80%, the awareness about source of discharge increased from 37.5% to 50.3%.
Vijaykeerthi et al 2016 [391]	Jan to Aug 2016	awareness about menarche, items used for menstruation	Awareness about menstrual hygiene- 45.7%
Dudeja et al 2016 [293]	Jan-16	Knowledge about menstruation hygiene	119 (56.4%) were aware about menarche before its onset, 191 (90%) use sanitary pads, 88% use dustbin for disposal
Kansal et al 2016 [294]	January to June 2011	Knowledge about menstruation hygiene	174 (29.4%) were aware about menarche before its onset, source of information was sister, 183 (31%) were using sanitary pads and 69% were using cloths, those who were following hygienic practices less no. of RTIs were there as compared to those who wer not following (5 vs 27)
Syed 2017 [392]	not mentioned	Knowledge about menstruation hygiene	67.5% participants were aware about menstruation before intervention as compared to 80% postintervention, 57% of subjects stated hat shout for help in case of any appropriate touch.
Deshpande et al 2018 [304]	June to August 2017	Knowledge about menstruation hygiene	only 24% girls had the knowledge of menarche prior to menstruation,

			60% of girls used sanitary pads
Sivakami et al 2019 [311]	2015	knowledge about menstrual hygiene	40% girls were aware of menstruation before its onset and 48% were aware at the time of 1st period. Parents were the major source (68%), 87% girls reported going to school during menstruation, 45% of the girls reported concentration problems at school during menstruation
Chaudhary & Gupta 2019 [305]	April to July 2018	knowledge about menstrual hygiene and HIV	Awareness about menstruation was more among urban girls (159, 67.7%) as compared to rural girls (127, 59%), usage of sanitary pads was more in urban areas (132, 56.2%) than rural area (63, 29.3%), awareness about subsidized sanitary pads was 30% in urban and 13% in rural girls.
Mamilla et al 2019 [306]	not mentioned	knowledge about menstrual hygiene	75 (60%) were ware about menstruation, mother was the major source, 84% used sanitary pads, 85 % used dustbin for disposal of absorbent, 47% used soap and water for cleaning genitals, 50% did not know about any contraceptive method

Studies included in forest plot with outcome as usage of sanitary napkins, n=16

Author, year of publication	Study period	Impact	Results
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Thakre et al 2012 [299]	Jan to March 2011	awareness about menstrual hygiene practices	191 (49.3%) used sanitary pads, more in urban as compared to rural, washing of genitalia was satisfactory with 34% of participants
Shah et al 2013 [298]	Jan-July 2011	awareness about menstrual hygiene practices	65 out of 164 were aware of menses before its onset, 59 subjects knew about sanitary pads, at baseline 90% girls were using old cloths but at the end of the study 68% chose fatalin cloths as first choice and 32% chose sanitary pads.
Paul et al 2014 [296]	2012	knowledge, attitude and practices during menstruation among the adolescent school girls	363 (72.6%) adolescent girls were aware about menstruation till its onset in 2012 as compared to 147 (29.4%) in 2007, use of sanitary napkins also increased from 23.8% to 74% from 2007 to 2012
Paria et al 2014 [295]	April 2013 - September 2013	knowledge, attitude and practices during menstruation among the adolescent school girls	Awareness about menstrual hygiene- 203 (37.52 %), Use of sanitary pads was more in urban girls as compared to rural girls (176 vs 120), Cleaning of genitalia was satisfactory in 47% urban and 38% in rural girls
Rana et al 2015 [297]	not mentioned	knowledge, attitude and practices during menstruation among the adolescent school girls	156 (39%) were using sanitary pads, 208 (54.7%) use only water to clean genitals
Udayar et al 2016 [178]	April to Sept 2015	prevalence of unhygienic practices in the study area	230 (78.5%) were using sanitary pads. 108 (37%) were changing the absorbent twice a day, 243 (82.9%) are using only water for cleaning external genitalia

Vijayshree et al 2016 [393]	1st to 15th October 2013	awareness about gender equity, abuse, violence	60% of the subjects were scared when they attained menarche, 78% subjects used sanitary napkins, 64% dispose the used napkin in dustbin, 87% wash their hands after changing the pads
Dudeja et al [293]	Jan-16	Knowledge about menstruation hygiene	119 (56.4%) were aware about menarche before its onset, 191 (90%) use sanitary pads, 88% use dustbin for disposal
Kansal et al 2016 [294]	January to June 2011	Knowledge about menstruation hygiene	174 (29.4%) were aware about menarche before its onset, source of information was sister, 183 (31%) were using sanitary pads and 69% were using cloths, those who were following hygienic practices less no. of RTIs were there as compared to those who wer not following (5 vs 27)
Agarwal et al 2017 [394]	Feb-16	Knowledge about menstruation hygiene	usage of sanitary napkins was 37 (14%), sanitary pads and cloths 91 (36%), the frequency of change was once in a day 129 (51.6%)
Ramchandra et al 2016 [301]	not mentioned	impact of menstrual hygiene program under NRHM on knowledge and awareness on menstrual hygiene among adolescents	83 (34%) participants were aware about menstruation and 69% were using sanitary napkins
Jain et al 2017 [302]	May-16	Knowledge about menstruation hygiene	222 (78%) subjects used sanitary pads during menstruation while washed clothes were used by 19%, mother is the main source of information followed by peer group

Krishnaleela 2018 [303]	not mentioned	knowledge and source of info about menstruation and its perceptions and practices	Dysmenoorhea was present in 90% of the participants, 55% used sanitary napkins, 15% were aware of frequency of change in sanitary napkins, only 3% were aware about nutritional status with menstrual irregularities
Deshpande et al 2018 [304]	June to August 2017	Knowledge about menstruation hygiene	only 24% girls had the knowledge of menarche prior to menstruation, 60% of girls used sanitary pads
Chaudhary & Gupta 2019 [305]	April to July 2018	knowledge about menstrual hygiene and HIV	Awareness about menstruation was more among urban girls (159, 67.7%) as compared to rural girls (127, 59%), usage of sanitary pads was more in urban areas (132, 56.2%) than rural area (63, 29.3%), awareness about subsidized sanitary pads was 30% in urban and 13% in rural girls.
Mamilla 2019 [306]	not mentioned	knowledge about menstrual hygiene	75 (60%) were ware about menstruation, mother was the major source, 84% used sanitary pads, 85 % used dustbin for disposal of absorbent, 47% used soap and water for cleaning genitals, 50% did not know about any contraceptive method
	Not mentioned	menstrual pattern and menstrual hygiene practices	41.2% in residential area and 45.5% in slum area - aware of menarche before its onset, girls in residential areas use sanitary napkins girls in the slum areas who use cloth.

			Social restrictions 4% in residential area and more than 45% in slums.
Bhudagaonkar 2014 [307]	Not mentioned	awareness generation about menstrual hygiene practices	Knowledge about staining of clothes increase from 48% to 85%, absorbent can provide media for organism growth increase from 41% to 94% and that it may spread infection increase from 31% to 70%
Patel et al 2016 [308]	Baseline in 2013-14 and intervention in 2016-17	Knowledge about menstruation hygiene, anaemia, reproductive and sexual health, program awareness and utilization	Awareness about nutritional status including anemia- increased in 15-18 years age group and decreased in 11-14 years age group, menstrual hygiene practice- there is increase in the use of sanitary napkins in intervention as well as control block (4.6% and 7% respectively). awareness about programs- increase in the awareness and compliance to WIFS, poor knowledge and access to AFHC was reported.

5.5 Studies on RCH Inequalities

Author	Journal name	Study area	Study Type	Intervention	Results
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Gupta M et al, 2017 [5]	PLOS one	Ambala and Mewat Districts of Haryana	Qualitative study	NRHM (MCH plans)	Geographic inequalities reduction- Increased utilization of MCH services like ANC, institutional deliveries and reduction in maternal and child death gaps in urban and rural parts. Socioeconomic inequalities between rich and poor decreased to some extent because of availability of free ambulances, medicines, and diet during hospital stay for the poor. However, it was reported that food security in general would reduce this. Gender Inequality between girls and boys- Small size of the families and increased educational status reported to have led to the changes in gender inequality; Gender inequality was less seen in Mewat district
Randive B, et al 2014 [73]	ELSEVIER, Social Science and Medicine	9 low performing states: RJ, MP, CG, BR, JH, UP, UK, OR and AS.	Secondary analysis of data (DLHS3)	JSY	Reduced inequalities in institutional deliveries during the JSY program, maternal mortality decline was slower in the poorest areas compared to richest ones. Absolute increase in proportion of institutional deliveries during JSY program was about similar across all socioeconomic groups, differential rate of relative increase (i.e. from 16% to 45% in poorest district quintile vs from 40% to 69% in richest ones). Degree of inequality in male literacy contribute to 30% of inequality in institutional delivery. Relative increase in institutional delivery= 29% increase in poorest districts also in richest district.
Jain R et al, 2016 [320]	India Human Development Survey Report	India	Pre post study, (IHDS 1 and IHDS 2)	JSY	Odds of receiving full ANC among women educated up to the high school level during the pre-JSY period was 3.651 times as great as for illiterate women whereas it was only 2.261 times as great during the JSY period. The relative odds of women receiving safe delivery had significantly gone down among women who were college graduates from 6.371 times as great as illiterate women during the pre-JSY period to 1.846 times during the JSY period.

					The odds of full ANC declined from 1.031 per asset in IHDS-I to 1.025 in IHDS-II. For postnatal care, the odds declined from 1.050 per assets in IHDS-I to non-significance in IHDS. Likelihood of safe delivery increased from IHDS 1 to IHDS 2 among Muslims and forward caste Hindus.
Vellakkal S et al, 2017 [64]	Health Policy and Planning, Oxford	8 EAG and 7 North-east states excluding Nagaland	Quasi-natural experiment study design using data from DLHS1, 2, 3, 4 and AHS	NRHM	Wealth-related relative index for inequalities for institutional delivery fell from 14.5 in 1995–99 to 11.7 in 2000–04 to 3.6 in 2007–08 to 1.3 in 2011–12. Inequities in institutional delivery and ANC were already declining between the pre-NRHM Period 1 (1995–99) and the pre-NRHM Period 2 (2000–04), but declined at steeper rates in the post-NRHM periods. effects were stronger for institutional delivery than ANC
Ali B. et al, 2018 [322]	Journal of Bio social Science	India	Secondary data analysis of NFHS 3 (2005-06) and NFHS 4 (2015-16), last two rounds were considered.	ANC, PNC, SBA	The usage gap of MCH services between the poor and non-poor remained large which was difference of <ul style="list-style-type: none"> - 4.3% (poor) and 15.3% (non poor) for utilization of ANC. Same for PNC <ul style="list-style-type: none"> - 43% (poor) and 38% (non poor) for SBA This gap was higher in urban areas in 2005–06, but more in rural areas in 2015–16. Poor women from SCs had higher utilization of SBA and PNC than women from OBCs and General Castes in 2015–16.
Seth A. et al, 2017 [45]	International Journal for Equity in Health	Uttar Pradesh	Survey study	ASHA	Women belonging to SC/ST and OBC castes were less likely, as compared to General Caste women, to participate in at least 4 ANC visits. Positive relationship between visits by a community health worker and likelihood of utilizing critical maternal health services. Contact with ASHA increased the odds of participation in at least 4 ANC among lower wealth women.

Gupta M. et al, 2016 [61]	PLOS One	Haryana	Secondary analysis of DLHS data	NRHM	<p>Geographic inequalities : Significant ($p < 0.05$) decline in difference of MCH indicators between urban and rural areas for pregnant women in urban and rural areas –</p> <ul style="list-style-type: none"> 3 ANCs from 23% to 5.4% Full ANC from 8% to 6.8% PNC from 2.8% to 1.5% Full child vaccination 10% to 3.5% ORS for diarrhoea from 11% to -2.2% <p>Socioeconomic inequalities : Significantly ($p < 0.05$) decline in difference of MCH indicators between rich and poor-</p> <ul style="list-style-type: none"> TT injections in pregnant women from 30.3% to 7% Institutional deliveries : 48.2% to 13% Fully immunized children from 48.3% to 14% ORS for diarrhoea from 41% to 5% <p>Although inequalities have been increased between lowest and highest wealth quintile groups related to ANC pre and post NRHM (0.2 to 23%)</p> <p>Gender inequalities : Difference of inequalities between male and female children was significantly ($p < 0.05$) reversed-</p> <ul style="list-style-type: none"> Full immunization (5.7% to -0.6%) BCG from 1.9 to -0.9 points Oral polio vaccine from 4% to 0% Measles vaccine from 4.2% to 0.1%
Gupta M et al, 2017 [80]	BMC public health	Haryana	Explanatory sequential mixed methods study	NRHM	<p>Significant reduction in inequalities pertaining to various MCH indicators between poor and rich (socioeconomic), rural and urban (geographical), and girls and boys (gender) across time period. But reduction in gender based inequalities was associated with increase in educational status and acceptance of small family size.</p>

Mújica JO et al, 2014 [323]	Bull world health organ	BRICS (Brazil, Russia, India, China, South Africa)	Secondary data analysis	MCH inequalities from 1990 to 2010	Maternal mortality- difference of 400 deaths per 1, 00,000 live births. Infant mortality- 32.4 deaths per 1000 live births. Child mortality- 50.8 deaths per 1000 live births
Pathak PK et al, 2010 [324]	PLOS one	UP, MH, TL	NFHS survey data analysis	PNC and SBA	Use of PNC among rural mothers in India increased by 8 percentage points (from 13% in 1992–1993 to 21% in 2005–2006). While it improved by 19 % points (33% in 1992–1993 to 52% in 2005–2006) among urban mothers during 1992–2006. Use of PNC remained significantly lower among poor mothers than among their non poor counterparts.
Gopichandra V et al, 2012 [325]	PUBLIC HEALTH ETHICS	UP	Review study (Data adapted from UNFPA's Concurrent Assessment of JSY)	JSY	JSY beneficiaries= Hindu = 38.8, Muslims = 23.5 SC/St = 32.5, others= 38.9 BPL= 38.1, Above BPL= 35.8 Living in huts= 33.5, living in cemented houses= 43.1
Singh A. et al, 2012 [326]	PLOS one	India	Secondary data analysis (DLHS)	PNC	Mothers received check up within 48 hours- Home= 18 %, Institution = 80.8% Newborn received check up - Home= 18.8%, Institution = 82% Newborn check in govt. facility - Home = 17%, facility = 52.7% Newborn check in private facility- Home = 83%, institutional = 47%
Patel P et al, 2018 [321]	Reproductive Health Matters	Purnia district, Bihar	Qualitative study	NRHM= ASHA, JSY , JSSK, ANM	27% women received facilities from ASHA. Only 5 % received PNC from ANM. SC caste women did not receive needed care. USHA were absents in urban slum due to caste discrimination. Participants did not receive JSY money and poor quality of service was offered at PHC due to belonging from lower caste. 16% women discussed only being treated at the PHC after women of higher caste.

Kant S et al, 2016 [330]	International Journal of Gynecology and Obstetrics	Haryana	Observational study	Delivery huts in rural areas	The services successfully reached pregnant women belonging to disadvantaged caste groups, in addition to those from higher castes. There was also a significant increase in the proportion of women attending the huts who were illiterate over the study period.
Saikia N. et al, 2016 [329]	Asian Population Studies	India	Trend analysis Secondary data analysis SRS data (1981-2011)	-	1981= NMR with difference of 37 between urban and rural India. 2011= NMR with difference of 17 between urban and rural.
Bhatia M et al, 2018 [327]	SSM - Population Health ELSEVIER	India	Secondary data analysis	-	Relative change in inequalities in infant and under five mortality over the survey periods from NHFS-I to 3, NHFS 3 to 4 and NHFS-1 to 4. IMR = -30 among poorest and -38 among richest. Which was -25 and -23 for NFHS 1 to 3 respectively? U5MR = -39 -38 among poorest and richest respectively during NFHS 3 to 4 and with no difference among poor and rich during NFHS 1-NFHS 3. The worst performing states (e.g. Chhattisgarh, Odisha, Uttarakhand), both in terms of high mortality and high differentials between rich and poor.
Motkuri V et al, 2018 [328]	Status of Maternal and Child Health (MCH) in Telangana	Telangana	Secondary data analysis (SRS and NFHS 4)	-	Rural urban difference in Telangana= 11, AP= 14 India=15 Inequalities across social groups in general and in the health dimension are very narrow- Rural and urban health inequalities(maternal and child) - 2002-04 =0.478 and 2012-13= 0.750 Fertility rates low and harmonized across social and religious groups in the state. Contraception rates are lower in Muslims tribe. IMR is high among ST and SC. Child vaccination do not vary much with respect to background. ANC is low among ST women and high among Muslims.

5.6 IMPACT OF OTHER VARIABLES ON HEALTH OUTCOMES

5.6.1 Results of studies on mobile connectivity (9 studies)

Author and year	Study area	Study Period	Study Type	Intervention	Results
Chib A, 2012 [332]	Udham Sing Nagar District, Uttrakhand	2008-09	Qualitative study	Mobile phone use by community health workers under NHM scheme (ICTH4H model)	Improved communication flow during emergencies. Increase in connectivity with higher medical officers regarding delivery and vaccination.
Balakrishnan R. et al 2016 [331]	Saharsa District, Bihar	July 2012 to March 2015	Case control	Continuum of Care Services (CCS) (Maternal and Child) by using an mHealth platform	Improved reporting and service delivery. 21% more ANC visits in intervention group in comparison to control group. 14% more cases of early breast feeding in intervention group.
Hazra A. et al 2018 [333]	Jhansi, Uttar Pradesh	April to May, 2014	Quasi-experimental	Voice messages to husbands of pregnant women on 5 health behaviours ; ANC check up, Postnatal check up, Early breastfeeding, Clean cord care, Bathing of baby	Improved knowledge. 39% asked their wives and 13% asked their mothers to follow the instructions. 80% of husbands knew the importance of ANC, 40% knew about early initiation of breast feeding. Uptake of one ANC, PNC within 7 days and delayed bathing with odd of 1.72, 3.02 and 1.93 respectively.

<p>Nair H. et al, 2018 [335]</p>	<p>Pune, Maharashtra</p>	<p>2015</p>	<p>Case control study</p>	<p>Smartphone with a track care app.</p>	<p>Under 5 children with diarrhoea and sought care ; Case= 75%, longitudinal Control = 80%, cross-sectional control =78%</p> <p>Under 5 children with fever who sought care; Case = 83%, longitudinal control = 79%, cross sectional control = 79%</p> <p>Under 5 children with fever and cough who sought care; Case = 88%, cross sectional control =84%, longitudinal control = 89%.</p> <p>No significant difference between case and control. This could be due to Hawthorne effect or due to repeated study contacts.</p>
<p>Pai N. et al, 2013 [336]</p>	<p>Low income area of Mumbai</p>		<p>Hospital based mixed method study (case control and qualitative study)</p>	<p>Voice calls for IFA supplement</p>	<p>The treatment group improved Hb by 0.43 g/dL (95% CI = -0.13 0.98 g/dL) more than the control group. This improvement is not statistically significant (p=0.13).</p> <p>Qualitative finding; Women offered positive feedback regarding the voice messages, describing them as informative, entertaining, and a service that they would recommend to friends.</p>
<p>Patel A. et al, 2018 [337]</p>	<p>Nagpur</p>	<p>2010 to 2012</p>	<p>Hospital based case control study</p>	<p>Cell phone counselling</p>	<p>The rates of exclusive breastfeeding were sustained above 95% at all visits in the cell phone group but dropped from 81% at 6 weeks to 48.5% at 6 months in the control group.</p> <p>Intervention group was 6 time more exclusively breastfed than control group. 13% higher rates of early breastfeeding in intervention group.</p>

Shah S. et al, 2018 [338]	Bharuch and Narmada districts of Gujarat	2016	Nested cross sectional study with a randomized controlled trial	ImTECHO	Significantly higher knowledge and skills of MNCH in the intervention arm compared to the control arm with difference of 18%. Intervention group demonstrated better skills for measuring temperature of new-borns and preventing hypothermia compared to the control group with difference of 30% and 15% respectively.
Spindler H. et al, 2017 [339]	Bihar	2015 to 2017	Cross sectional study	Mobile nurse mentoring programme	Communication with mother improved . 85 % improvement in debriefing. 77% complicated deliveries were conducted by nurses. Improvement in vaginal delivery, non vigorous infant and postpartum haemorrhage.
Modi D. et al, 2016 [334]	Bharuch district, Gujarat	April-May 2015	Cross sectional study	ImTECHO (Support and supervision of ASHA and PHC staff)	Higher sensitivity for registration of pregnancy, delivery and child death i.e. 97%, 99% and 100% respectively.

5.6.2 Results of studies on road connectivity (8 studies)

<u>Author and year</u>	<u>Study area</u>	<u>Study Period</u>	<u>Study Type</u>	<u>Intervention</u>	<u>Results</u>
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Bawdekar M, 2008 [340]	Maharashtra, 33 districts	2003	Secondary data analysis (DLHS-RCH Round II)	Road length Female literacy rate Health facilities Toilet facilities Temperature	Road length and percentage female literacy had an inverse relationship with severe malnutrition and the association was significant at $p < 0.05$. Children in the households with either a personal or public toilet facility are 11% less likely to suffer from severe malnourishment as compared with those with no toilet facility at all. Climate on health facilities have insignificant association with severe malnutrition.
Ghosh A. et al 2016 [341]	India	2016	Secondary data analysis ((DLHS-3)	Road connectivity Weather Health center Mother literacy Availability of ANM and ASHA	Indicators of village-level general infrastructure, like availability of electricity and all weather road connectivity with the sub center or PHC, are associated with both higher chances of receiving of at least one DPT dose and higher chances of completing the three-dose series among infants who have received at least one dose of DPT. 36% and 46 % difference in DPT 3 and DPT 1 coverage respectively among children of mothers educated up to 10th or higher education and mothers without any schooling.
Lalmalsawma KC et al, 2009 [342]	India		Secondary data analysis (NFHS 3, India's Year Book, Census of India 2001)	Road density	Positive correlations between surface road density and all the indicators of utilization of maternity services at a high 0.05 significant level with ranges from $(r=0.936)$ for institutional birth, $(r=0.950)$ for delivery assisted by health personnel, $(r=0.939)$ for any postnatal check-up and $(r=0.947)$ for postnatal check up within two days of birth. 1. Very high surface road density areas - ANC (36%), Institutional deliveries(70.8%), health personnel attended delivery(77.88%) , PNC (70.65%) 2. High density surface road areas- ANC(17.1%), Institutional deliveries(40.94%), health personnel; attended delivery(52.11%), PNC(48.24%). 3. Medium density surface road areas- ANC(17%), Institutional deliveries(41%), health personnel; attended delivery(48.38%), PNC(39.08%). 4. Low density surface road areas- ANC(9.72%),

					Institutional deliveries(28%), health personal; attended delivery(36%), PNC(26.08%). 5. Very low density surface road areas- ANC(10.2%), Institutional deliveries(41.87%), health personal attended delivery(45.8%), PNC(40.5%)
Kumar S. et al, 2012 [344]	India	2013	Secondary data analysis from DLHS 3 and Demographic health Surveys	Road connectivity and access to health facility focusing on delay 3	Distance to the nearest health facility is inversely associated with the probability of in-facility delivery. With in 5 km of health facility- 42% of IFD. With in 5 and 9 km- 32% of IFD More than 10 Km- 26% of IFD.
Banerjee R. et al, 2015 [345]	India		Secondary data analysis (DLHS 3), village directory of the 2001 Census data	Road connectivity/ Pradhan Mantri Gram Sadak Yojana (PMGSY)	Connecting villages with an all-weather road increases the usage of preventive healthcare. Women are 20% more likely to use ante-natal care. Women rely more on female sterilization and 12% less chances of use of withdrawal methods. 3% more likely to enroll in government health schemes. 30% and 25% likelihood of having ASHA and ANM in the village respectively.

Aggarwal S, 2018 [300]	India		Secondary data analysis (DLHS-3)	Road connectivity	Better quality prenatal care , more likely to receive micronutrient supplements, tetanus shots. Full road connectivity = 4% less chances of complications in delivery. Children are more likely to receive vaccination except polio, reason could be massive initiative to attain universal polio vaccination rates.
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Author	Study Location	Study Period	Study Type	Intervention	Results
Sahoo M. et al, 2017 [346]	Odisha	2014 to 2015	Descriptive study	Supply side barriers	The supply side barriers are; physical barriers faced by the service providers due to lack of proper roads and the absence of transportation to the interior villages. 38% respondents had travelled 5 km distance for delivery, 15.2% of respondents had travelled 10 km, 9.4% had travelled for 15km for delivery

Studies with road connectivity/distance as barrier, not as intervention

<p>Barman D. et al, 2009 [343]</p>	<p>Murshidabad district of West Bengal</p>	<p>2008</p>	<p>secondary data analysis (RCH-DLHS)</p>	<p>Supply side and demand side barriers</p>	<p>Supply side barriers- Distance to travel by health workers, Infrastructure Demand side barriers- mother education and awareness, use of private or government health sector. In comparison to illiterate mothers, educated mother's children were more likely to get fully immunized. Who used private sector were 28% less likely to be fully immunized.</p> <p>If ANM did not visit the household during the pregnancy or after child birth the child was 31% less likely to be fully immunized. Better village infrastructure score, child was more likely to be fully immunized. If a mother was employed her child was found to be 33% less likely to be fully immunized. Muslim children were found 45 % less likely to be completely immunized compared to their Hindu counterparts</p>
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5.6.3 Results of studies on water supply and sanitation (7 studies)

Author and year	Study area	Study Period	Study Type	Intervention	Results
Bajpai N. et al, 2006 [395]	Jalore and Chittorgarh districts, Rajasthan	April-May 2006	Cross sectional	NRHM coordination with sub sectors like sanitation, Nutrition, Safe drinking water.	<p>Usage of safe water- 68% to 70% of the households. Unsafe water practices- 30% of the household's Tap water facility- 2% to 3%. Toilet facility at home- none of the households. No regular waste removal facility.</p> <p>Percentage of sickness (2005)- 42% in Jalore and 43% in Chittorgarh.</p> <p>Incidence of hospitalization-</p> <p>11% in Jalore but only 5% in Chittorgarh.</p> <p>Institutional deliveries- 4% in Jalore and 8% in Chittorgarh district.</p> <p>ANC- 3% in Jalore and 9% in Chittorgarh received such care.</p> <p>Incidence of still birth-5.3% in Jalore and 3.3% in Chittorgarh.</p> <p>Vaccination of children-In Jalore 95% and in Chittorgarh 98% of the poor families got their children vaccinated. This could be due to polio eradication program</p>
Butala N M. et al, 2010 [352]	Ahmadabad	2001-08	Case and control design used secondary data (micro insurance provider VIMO	Slum Upgrading	Significant reduction in waterborne illness from 25% to 10%. Reduction in waterborne illness claims 32% before the intervention to 14% after the intervention.

			SEWA in the years 2001- 2008)		
Nandi A. et al, 2016 [349]	India		Secondary data analysis (DLHS-3)	Access to piped water and improved sanitation (Intervention 1; 95% coverage at random, Intervention 2; At least 95% coverage in each state)	Intervention 1 ; Diarrheal incidence averted- 43,126, deaths averted- 68. Intervention 2 ; Diarrheal incidence averted-43352, deaths averted- 68. Intervention could avert could avert 43,352 diarrheal episodes and 68 diarrheal deaths per 100,000 under-5 children per year, compared with the baseline.
Ercumen A. et al, 2015 [348]	Hubli-Dharwad, Karnataka	Nov 2010 to Feb 2012	Matched cohort study	Intermittent water supply and continuous water supply.	No significant overall association was found between continuous versus intermittent supply and diarrhea bloody diarrhea or weight for age. In continuous supply wards, 42% fewer households had at least one reported case of typhoid fever compared to intermittent supply wards. No significant association between continuous versus intermittent supply and cholera. Lower <2-y-old mortality associated with continuous versus intermittent supply. (No reason listed out because of small number of deaths).

Berends D et al, 2017 [347]	Vellore, India	2010 to 2014	Cohort study	Household sanitation (toilets)	Risk of enteric infection was 9% lower in children in households with toilets compared to those without toilets. Risks of bacterial and protozoal infections for children in households with toilets were 13% and 36% lower than for children in households without toilets. But these relationships were not significant.
Patil S R. et al, 2014 [351]	Dhar and Khargone districts, Madhya Pradesh	2011	Cluster randomized control trial	Total Sanitation Program	Diarrhea prevalence did not differ between groups (7.4% intervention versus 7.7% control).
Padhi B K, et al, 2015 [350]	Odisha		Population based prospective cohort study	Sanitation	58.2%) had no access to a latrine and reported open defecation at recruitment. About half (45.8%) of the pregnant women living in a household with latrine access. 32% reported rare use of the facility. Compared to latrine access, open defecation was associated with higher odds of APO, preterm birth, and low birth weight. Other factors associated with higher odd of APO are ; Occasional use of toilets, non availability of water in latrines, washing of body with water from open sources.

Other study (Self-help group)

Author and year	Study area	Study Period	Study Type	Intervention	Results
Saha S. et al, 2013 [396]	India		Secondary data analysis (DLHS-3)	Self Help Groups	The presence of a SHG in a village is associated with 19 % higher odds of mother's delivering in an institution. 8 % higher odds of an increase in colostrum feeding. Presence of a health and sanitation committee in a village or accessibility of a CHC/RH does not appear to influence the outcome.

5.6.4 Impact of food availability on health outcomes (N=6)

Author and year	Study area	Study Period	Study Type /Intervention	Results
Singh V et al,2017	Barabanki and Unnao ditrict of Uttar Pradesh	May-Aug 2005	quasi experimental randomized longitudinal study/ Integrated nutriron and health program	Impact on breastfeeding practices: Early initiation was more frequently reported in the intervention arm (17.4% vs. 2.7%)In the intervention group, 34.7% of the women reported giving colostrum to their babies versus 8.4% in the comparison district (p<0.001) Impact on complementary feeding practices: Improvement in total quantity of food given in the intervention area from 12±18 months, whereas, no such increase in the comparison district was observed .
Passi R et al	22 VHSNCs of Chandigarh	January and May 2015	cross- sectional mix method study	The villages showed good performance regarding the nutritional status of children aged 0–3 years but performance of providing complimentary feeding to children of age 6–12 months was average.
Alim F et al, 2012	16 Anganwadis in 5 villages in Aligarh, Uttar Pradesh (U.P.)	January-June, 2011	Survey based study/ ICDS	Only76.4% of children had received the supplementary nutrition through ICDS and 23.6% of children did not received supplementary nutrition. Children who received supp nutrition:62.7 % of children, were having normal weight for age, 13.7% were underweight, and 49.4% of the children were of normal height for their age. Children who did not received supplementary nutrition: majority 14.3 % of their children was

				underweight, 68% children were stunted.
Thakur J et al, 2010	45 Anganwadi centres (AWCs) in Chandigarh	April to August 2007		Prevalence of underweight among under-five children remained almost stagnant in the last one decade from 51.6% (1997) to 50.4% (2007). There was insignificant difference (P=0.3) in prevalence of underweight among children registered under ICDS program (52.1%) and those not registered (48.4%) in 2007.
Vaid S et al, 2005	Resham Ghar colony of Jammu city (Jammu and Kashmir State)	-	Cross sectional study	children who attended Anganwadi centres had good health or appearance as compared to their counterparts, also ICDS children had good dietary intake as compared to the children who did not attend ICDS centres.
Kumar A et al, 2009	field practice area encompassing 35 Anganwadis in 11 villages by the Community Medicine Department of Kasturba Medical College situated in	July 2009	cross-sectional study/ICDS	Assessment of the growth chart revealed that malnourishment was evident in 189 (32.3%) of the children, of which 166 children were grade I malnourished and 23 children were grade II malnourished. Proportionally girls (46.2%) were more malnourished than boys (33.6%).

	Southern India			
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ANNEXURE 6: LIST OF GOOD QUALITY STUDIES INCLUDED IN THE SYSTEMATIC REVIEW.

Journal	Geographic area	Study design	Intervention	Target Population	Sample size	Outcom
	India	Secondary data analysis	JSY	Pregnant females		Institutio deliverie
	India	Secondary data analysis	JSY	pregnant females		Institutio births
Health	West Bengal	Cross sectional community based study	JSY	pregnant females		Institutio deliverie
Health	West Bengal	Cross sectional study	JSY	JSY eligible women	946	Institutio deliverie
search	Orissa	Mixed method design	JSY	Pregnant females		Institutio deliverie
iology	Ballabgarh, Haryana	Quasi experimental study	JSY	Post-natal females	1884	Institutio deliverie
h	Ujjain	Cross sectional study	JSY	Pregnant females	418	Institutio deliverie
	Madhya Pradesh	Continuous time series	JSY	Reproductive age group females		MMR re
resentation	EAG states	Survey		Women of institutional and home delivery		Institutio delivery
icine	9 states(RJ, MP, CG, BR, JH, UP, UK, OR, AS)	Ecological study with secondary data analysis	JSY			MMR re and inst deliverie Inequali institutio deliverie

ed Medicine and	M.P.	retrospective hospital based, observational comparative study	JSY			Perinata mortality
	34 states and union territories in India (excluding Nagaland)	Secondary data analysis (District Level Household Survey (DLHS-3))	JSY	12–23 months children	37289	Immuniz rate
Community Health	Punjab	Secondary data analysis (DLHS , SRS for Punjab)	Institutional deliveries	Postnatal women		IMR
COMMUNITY	Malwa region of Punjab	survey	ASHA	PREGNANT women		PNMR
	Five rural districts of Jharkhand and Odisha	RCT	ASHA	women of reproductive age (15–49 years)		PNMR
	Five rural districts of Jharkhand and Odisha	RCT	ASHA	women of reproductive age (15–49 years)		NMR
Equity in Health		Secondary data analysis	ASHA	women who gave birth in one year	4912	ANC and Institutional deliveries
NUTR	Karnatka	Cross sectional study	ASHA	Mothers and ASHAs	1800 mothers, 300 ASHAs	Institutional deliveries
	Haryana	Secondary data analysis	ASHA			Immuniz
	India(21 states)	Secondary data analysis(DLHS)	ASHA	12-23 months children		Immuniz

International Health	Community development blocks of Kaushambi district.	pre- and post-quasi-experimental design	ASHA (m-health)	12-23 months	3201	Immunization rate
in	Chhattisgarh	Quasi-experimental mixed methods	Mitanin programme (Nutritional Security Innovation project)	Under 3 yrs children	3628 children under 3 yrs of age	Nutritional status, A
	Haryana	Mixed method study	NRHM MCH plans: ASHA, JSY, JSSK			MMR
	Haryana	Comparative study of DLHS 2, 3, 4	NRHM	Currently married women	18,227	MMR
	Haryana	Mixed method study	NRHM MCH plans: ASHA, JSY, JSSK			IMR
	Haryana	Comparative study of DLHS 2, 3, 4	NRHM	Currently married women	18,227	ORS, D uptake i children
ation, and Nutrition	Karnataka	Cross sectional study	ASHA	ASHA	300	Knowledge regarding practice
	Haryana, Ambala, Hisar, Narnaul	3 districts= Secondary data analysis	National ambulance system utilization		116562	Institutional deliveries
	Andhra Pradesh, Assam, Gujarat, Karnataka and Meghalaya	Prospective observational study	free of charge ambulance transport	women in third trimester of pregnancy calling with a 'pregnancy-	1684	Method of delivery Death.

				related' problem for free of charge ambulance		
	MP	cross-sectional study	JEY(Janani Express Yojna) State Run Public Private Emergency Transportation Service	women who delivered in hospital		Utilization of JEY and its role
	Haryana	cluster randomised trial	Quality management activities	Pregnant females approaching to PHC	7345	Quality management
sciences	Urban slums of Lucknow	survey	Immunization	12-23 months Children	510	Full Immunization
	Urban poor community in the Southeast district of Delhi, India	cross-sectional study	Immunization	1-3.5 years	1849 children	Full Immunization
Community Health	Mumbai	Descriptive	Immunization	1-2 years	210	Full Immunization
Contemporary	Paediatric OPD, immunization clinics and children admitted in Paediatric ward in D. Y. Patil hospital, Kolhapur.		Immunization	2-5 years	2000 children	Full Immunization
Direct	Thimiri, a rural administrative block comprising 67 villages in Vellore district in Tamil Nadu	cross-sectional household survey	Immunization	12-23 months	606 children	Full Immunization
	Bihar	Observational study,	Immunization	12-23 months children		Increase in proportion

		Comparison of the immunization coverage before and after launch of campaign with other (EAG) states in the corresponding period				immunization rate
	India	Secondary data analysis from NFHS 3	Immunization	12-59 months.	27354	Occurrence of ARI and diarrhoea
Health Organization	Khizrabad in the Yamunanagar district of Haryana	Cohort design	Immunization	12-18 months	4336	Immunization rate
	12 functional NRCs of Uttar Pradesh.	Review of data of all children with SAM	NRC	6-59 months	1181	Recovery
Contemporary	NRC At Vani Vilas children's Hospital, attached to Bangalore Medical College and Research Institute, Bangalore, Karnataka	retrospective hospital based study	NRC	1m to 59 m	736	Recovery
	29 states of India	secondary data analysis (NFHS)	Vitamin A	Preschool children(12-59 mo)	4459 children	Under 5 mortality Vitamin supplement
	India	Secondary data analysis	Vitamin A	12-35 months	20,802 children	Vitamin A supplement

		NFHS 3(2005-2006)				
	Seven Indian states (Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Odisha, Rajasthan, Uttar Pradesh) with the highest burden of mortality in children	Analysis of VAS programme coverage data, data from India's District Level Household Survey, India's Office of the Registrar General and Census Commissioner	Vitamin A	under 5 children (6–59 months)		VAS Co
		Randomized control trial	Vitamin A supplementation	Children upto 6 months of age	44 984	IMR
R	Nagaur district in Rajasthan and Chhatarpur district in Madhya Pradesh	Record review	Essential new born care			SBR
	India	Before-and-after intervention trial	Essential new born care	Neonates	7938	NMR
Health	CHC, Bharatpur district, Rajasthan	Cross sectional study	Essential new born care	CHC	13	ENC Pra
dbirth	Rajasthan, India	Quasi-experimental	Essential new born care	Healthcare facilities	16	ENC

Matrics	Ballabgarh, Faridabad District, Haryana	Cross sectional study	Essential new born care	Healthcare facilities	45	ENC, SN
Medicine and	Dharmapuri district, Tamil Nadu	Descriptive-retrospective study	Facility based new born care	Neonates	2350	NMR
Health Organization	Uttar Pradesh	Quasi experimental study	HBPNC			NMR
ence and Response	Mewat, Haryana	Cross sectional study	HBPNC	Postnatal mothers	320	Newborn practice
n	Thane district of Maharashtra	Cross sectional study	HBPNC	ASHA	150	Knowledge regarding health p
umanities and	Rajasthan	Cross sectional study	HBPNC	ASHA	200	Knowledge regarding practice
Health Sciences	Rural area of Maharashtra	Cross sectional study	HBPNC	ASHA	37	Knowledge regarding practice
Community lth	Odisha	Cross sectional study	HBPNC	ASHA	1218	Knowledge regarding practice

	Faridabad, Haryana	Cluster randomised trial.	IMNCI	Live births	60 702	NMR
ation and Nutrition	12 districts of India	Mixed methods study	IMNCI	Training of health workers		BF, Immuni
	Faridabad, Haryana	Cluster-randomized controlled trial	IMNCI	Live births	30000	NMR, IM newborn practice
Health Sciences &	Odisha	Cross sectional	IMNCI	AWWs	381	AWWs knowlec
Health	Panchkula district of Haryana stat	Cohort study	IMNCI	HCWs(ANM, AWW)	85	Knowled Skills of
iatrics	West Bengal	Cross sectional study	IMNCI	FLWs	155	Skills of
	Palwal and Faridabad distr. If Hariyana	Secondary data analysis	IMNCI	Infants	60 480	IMR
	India	Secondary data analysis NFHS 3	IMNCI	Neonates		NMR
sed Medicine and	Kakatiya Medical College, Warangal	Prospective observational study	IMNCI	Infants	500	IMR

ng Journal	India	Secondary data analysis	BF	Postnatal women		NMR
MCH and AIDS	India	Secondary data analysis	NRHM			IMR
Medical Science	Shimoga, Karnataka	Cross sectional		females who had delivered in the last-36 months	210	Prevalence of Contraception and its association with postnatal checkups
Medical Science	Gujarat	Cross sectional	ASHA incentive scheme	ASHA workers of ten talukas and PHCs		Permanent sterilization
and Practice	Bihar	Quasi-experimental evaluation	PRACHAR strategies			Contraceptive usage
Bulletin of the medicine	Chandigarh	Cross sectional		women in the age group of 15-49 years		Contraceptive practice
Bulletin of the medicine	Six districts of UP	Cross sectional	NRHM and Urban health Initiative funded by BMGF	women in the age group of 15-49 years	17643	Contraceptive practice
	Urban health centre in South India	Cross sectional		Married women in reproductive age group (15-49years)	180	Awareness of contraceptive practice, reasons for adoption of non-adoptive methods, 46of 47nter
Scientific Study	Guwahati	Cross sectional	Cu-T	currently married women	260	Cu-T uterine stateu

elfare	Patiala, Punjab	Cross sectional		Married women in the age group of 15-49years	1123	Contract usage
acists	Kerala	Quasi experimental	Saheli program	women in age group of 15-45 years	140	Knowledge about family planning care and maternal
	Bihar	Quasi experimental	Ananya program	married women 15-49 years with 0-5 months old child	Baseline-7191 and follow up-6143	Improvement postpartum contraceptive use

	Kerala	Cross sectional	ARSH	Adolescents and young adults (10-24 years)	4223	Knowledge about MCH hygiene practice knowledge attitude practice 2 age groups regarding issues
	Kerala	Cross sectional	ARSH	Adolescents and young adults (10-24 years)	4220	Knowledge about contraceptive measure age of pregnancy other RSI indicators
Health	Chandigarh	Cross sectional	ARSH	Adolescent age group(10-19 years)	854	Knowledge about A and acc the ARS clinics

Community Health	Panna Distt Madhya Pradesh	Cross sectional survey	RBSK	Children up to 18 years	26977	Early diagnosis and screening
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Community Health	Ahmedabad	Cross sectional survey	RBSK	Children up to 3 years	169	Early diagnosis and screening
Nutrition Bulletin	UP	Community based intervention study	WIFS	Adolescents 10-19 years	150700	Reduction in iron deficiency anaemia
Nutrition Bulletin	Wardha, Maharashtra	participatory action research	IFA prophylaxis for 100 days in a year through community participation	Adolescent girls 12-19 years	249	Reduction in iron deficiency anaemia
Health Matters	Gujarat	cross sectional		Adolescents girls	164	Awareness about menstrual hygiene practices
	Maharashtra, Chhatisgarh, Tamilnadu	cross sectional		Adolescent girls above 12 years of age	2564	Knowledge about menstrual hygiene
	Ambala and Mewat Districts of Haryana	Qualitative study	NRHM (MCH plans)	Program officers, community representatives, mothers, health service providers	72	Maternal and child health inequalities
King, Oxford	8 EAG and 7 North-east states	quasi-natural experiment study design using data from DLHS1, 2, 3, 4 and AHS	NRHM	Married women		socioeconomic inequalities, uptake of institutional delivery, antenatal care (ANC)

Equity in Health	Uttar Pradesh	Survey	ASHA	Women who gave birth in last 12 months	4912	Social in and hea disparities
	Haryana	Secondary analysis of DLHS data	NRHM	Currently married women	18227	Geograp socioeco and gen inequali MCH pr post NR
	Haryana	Explanatory sequential mixed methods study	NRHM	Currently married women and Health workers, health managers		MCH inequali
ELSEVIER	India	NFHS data analysis				child he inequali
ters	Purnia district, Bihar	Qualitative study	NRHM= ASHA, JSY , JSSK, ANM	SC caste women	18	Utilizatio
ce and Medicine	Rajasthan, Madhya Pradesh, Chhattisgarh, Bihar, Jharkhand, Uttar Pradesh, Uttarakhand, Orissa and Assam	Ecological study, secondary analysis of data (DLHS3)	JSY	JSY beneficiaries		Inequali institutio deliverie materna mortality
	India	secondary analysis of data (DLHS3)				NMR
	India	Secondary data analysis Comparison of NFHS 3 Data with NFHS 4				U5MR
	India	Secondary data analysis				NMR

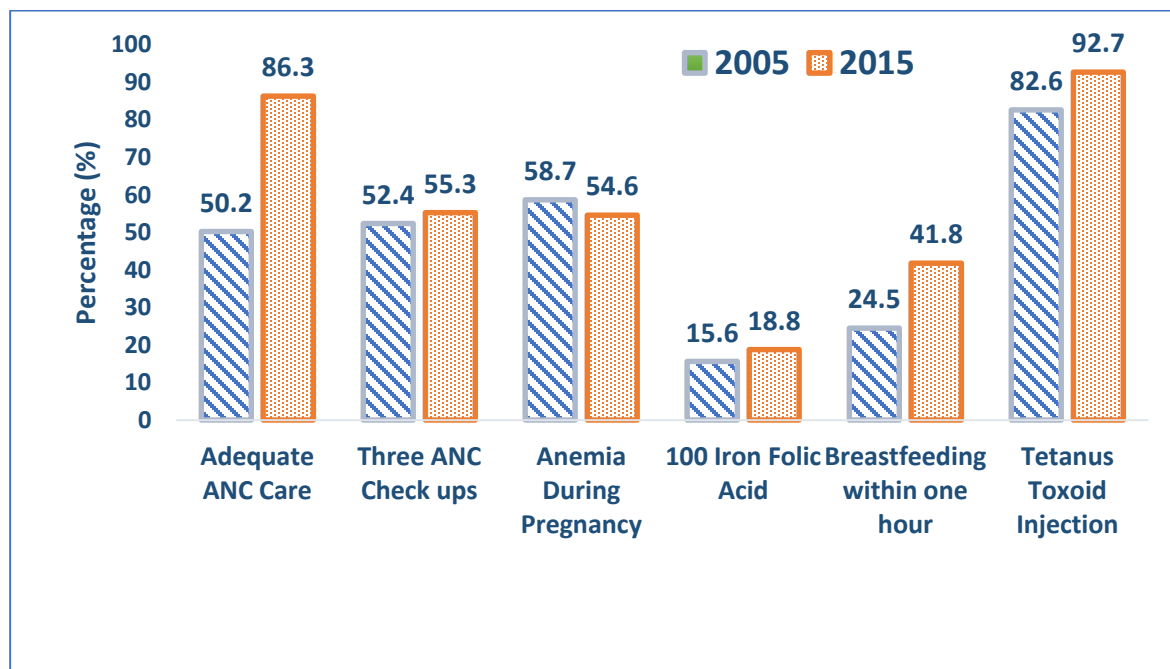
		Comparison of NFHS 3 Data with NFHS 4				
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ANNEXURE 7. MATERNAL HEALTH INDICATORS OF WOMEN AGED 15-49 YEARS WHO HAD A LIVE BIRTH IN THE FIVE YEARS PRECEDING THE SURVEY.

Maternal Health	Pre NHM (%)	Post NHM# (%)	Adjusted Odds Ratio	95% Confidence Interval	p-value
Adequate ANC Care	50.2	86.3	6.3	(5.837, 6.648)	<0.01*
Three ANC Check ups	52.4	55.3	1.1	(1.072, 1.177)	<0.01*
Anaemia During Pregnancy	58.7	54.6	0.9	(0.765, 0.936)	<0.01*
100 Iron Folic Acid	15.6	18.8	1.3	(1.195, 1.318)	<0.01*
Breastfeeding within one hour	24.5	41.8	2.2	(2.115, 2.310)	<0.01*
Tetanus Toxoid Injection	82.6	92.7	2.7	(2.524, 2.800)	<0.01*

*Significant; #adjusted percentage of NFHS4; Source: NFHS data round 3 and 4; adjusted for place of residence, maternal age, education, religion, caste, wealth index, type of housing, availability of toilet, safe water supply, cooking fuel, health worker density, road density, telephone-density.

Proportion of women for various maternal health indicators in 2005 and 2015.

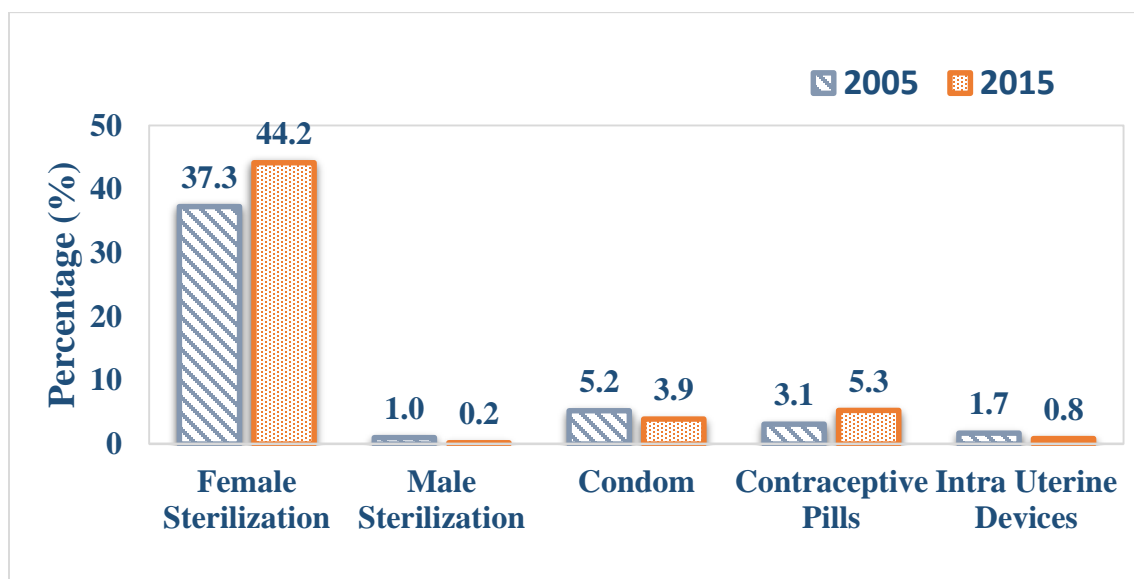


ANNEXURE 8. CONTRACEPTIVE METHODS CURRENTLY USED FOR FAMILY PLANNING BY MARRIED WOMEN AGED 15-49 YEARS.

Family Planning	Pre NHM (%)	Post NHM# (%)	Adjusted Odds Ratio	95% Confidence Interval	p-value
Female Sterilization	37.3	44.2	1.3	(1.293, 1.370)	<0.01*
Male Sterilization	0.1	0.2	0.2	(0.167, 0.241)	<0.01*
Condom	5.2	3.9	0.7	(0.710, 0.778)	<0.01*
Contraceptive Pills	3.1	5.3	1.7	(1.616, 1.857)	<0.01*
Inter Uterine Device	1.7	0.8	0.5	(0.444, 0.519)	<0.01*

* Significant; # adjusted percentage of NFHS4; Source: NFHS data round 3 and 4; adjusted for place of residence, maternal age, education, religion, caste, wealth index, type of housing, availability of toilet, safe water supply, cooking fuel, health worker density, road density, Telephone-density.

Proportion of women by contraceptive methods used for family planning in 2005 and 2015

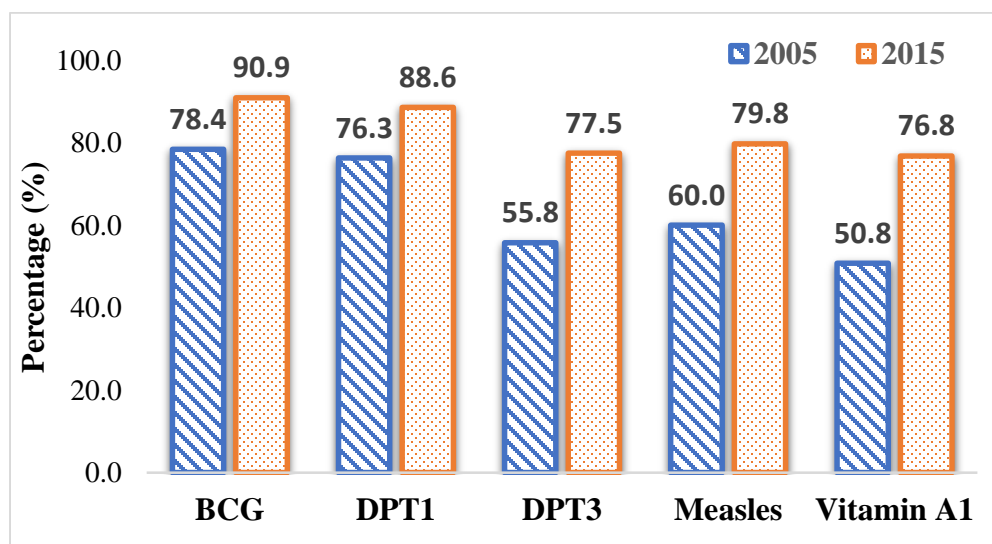


ANNEXURE 9. IMMUNIZATION OF CHILDREN AGED 12-23 MONTHS WHO RECEIVED SPECIFIC VACCINES AT ANY TIME BEFORE THE SURVEY.

Child Health Indicators	Pre NHM (%)	Post NHM# (%)	Adjusted Odds Ratio	95% Confidence Interval	p-value
BCG	78.4	90.9	2.8	(2.435, 3.125)	<0.01*
DPT1	76.3	88.6	2.5	(2.152, 2.690)	<0.01*
DPT3	55.8	77.5	2.7	(2.484, 2.985)	<0.01*
Measles	60.0	79.8	2.6	(2.391, 2.897)	<0.01*
Vitamin A1	50.8	76.8	3.3	(2.932, 3.510)	<0.01*

* Significant; # adjusted percentage of NFHS4; Source: NFHS data round 3 and 4; adjusted for institutional delivery, place of residence, maternal age, education, religion, caste, wealth index, type of housing, availability of toilet, safe water supply, cooking fuel, health worker density, road density, telephone- density.

Percentage of children aged 12-23 months who received specific vaccines at any time before the survey

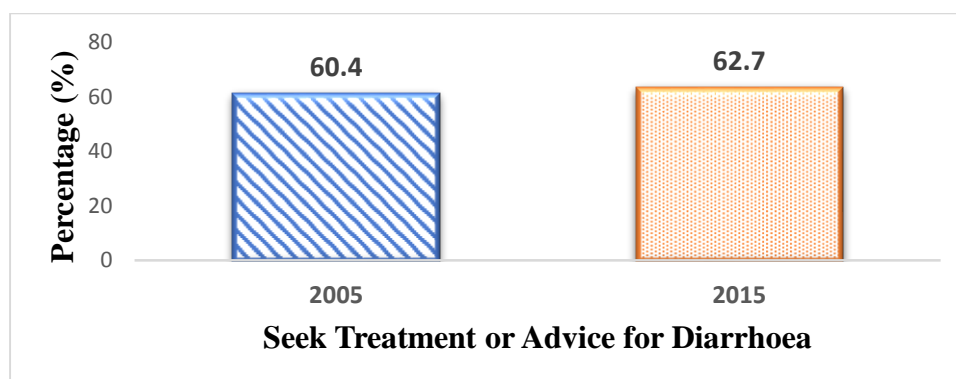


ANNEXURE 10. CHILD HEALTH INDICATORS OF CHILDREN UNDER 5 YEARS OF AGE IN 2 WEEKS PRECEDING THE SURVEY.

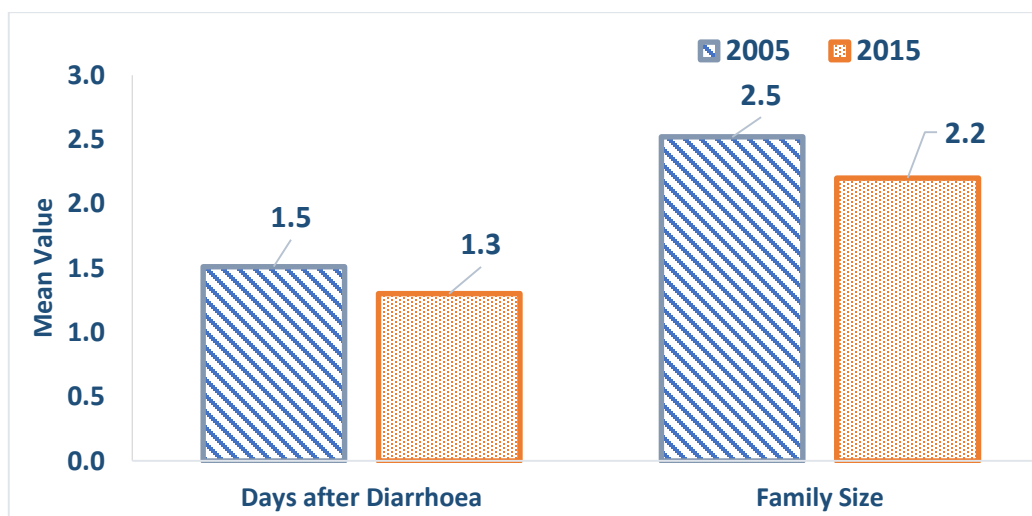
Child Health	Pre NHM (%)	Post NHM# (%)	Adjusted Odds Ratio	95% Confidence Interval	p-value
Diarrhoea Treatment	60.4	62.7	1.1	(0.974, 1.248)	0.122
Number of days after Diarrhoea Treatment	1.5	1.3	0.9	(0.774, 0.889)	<0.01*
Family Size	2.5	2.2	0.9	(0.881, 0.895)	<0.01*

* Significant; # adjusted percentage of NFHS4; Source: NFHS data round 3 and 4; adjusted for place of residence, maternal age, education, religion, caste, wealth index, type of housing, availability of toilet, safe water supply, cooking fuel, health worker density, road density, telephone-density.

Proportion of children under age 5 years in 2005 and 2015



Proportion of children under 5 years of age in 2005 and 2015



ANNEXURE 11: THE ITS ESTIMATES OF PRE SLOPE, POST SLOPE AND CHANGE AT STATE AND NATIONAL LEVEL

State	Pre-Slope	Post-Slope	Change	P-Value	LCI	UCI	Remark
India	-1.6	-2.2	-0.7	0.058	-1.41	0.033744	Significant
Andhra Pradesh	-1.0	-2.2	-1.2	0.068	-2.49	0.11	Significant
Assam	-0.9	-2.5	-1.6	0.007	-2.72	-0.47	Significant
Bihar	-1.0	-1.4	-0.4	0.472	-1.47	0.71	Non-Significant
Delhi	-0.5	-2.2	-1.7	0.122	-3.98	0.53	Non-Significant
Gujrat	-1.1	-2.3	-1.3	0.045	-2.55	-0.016	Significant
Haryana	-1.0	-2.5	-1.6	0.017	-2.84	-0.30	Significant
Karnataka	-1.5	-2.3	-0.8	0.328	-2.49	0.89	Non-Significant
Kerala	-0.2	-0.4	-0.2	0.633	-0.87	0.54	Non-Significant
Madhya Pradesh	-2.4	-2.4	-0.1	0.811	-0.80	0.64	Non-Significant
Maharashtra	-1.5	-1.4	0.1	0.745	-0.77	1.05	Non-Significant
Orissa	-2.9	-2.7	0.2	0.757	-1.29	1.74	Non-Significant
Punjab	-1.0	-2.3	-1.3	0.019	-2.44	-0.22	Significant

Rajasthan	-1.3	-2.6	-1.3	0.191	-3.26	0.71	Non-Significant
Tamil Nadu	-1.6	-1.5	0.2	0.827	-1.359	1.68	Non-Significant
Uttar Pradesh	-1.8	-3.1	-1.2	0.021	-2.30	-0.20	Significant
West Bengal	-1.8	-1.2	0.6	0.191	-0.35	1.60	Non-Significant

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