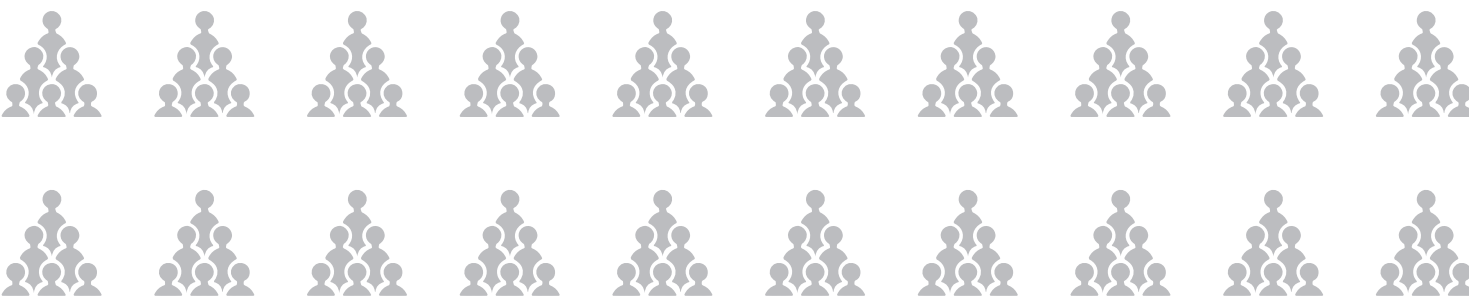




# Cost of Inaction in Family Planning in India

An Analysis of Health and  
Economic Implications





# **Cost of Inaction in Family Planning in India**

An Analysis of Health and Economic Implications

**A Research Study Commissioned by**



Population Foundation Of India  
New Delhi

October 2018

**Conducted by**

Institute of Economic Growth



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Delhi University Enclave  
Delhi 110007

**Suggested Citation:**

Population Foundation of India. (2018). Cost of Inaction in Family Planning in India: An Analysis of Health and Economic Implications. New Delhi, India

**Published by:****POPULATION FOUNDATION OF INDIA**

B - 28, Qutab Institutional Area

New Delhi – 110016

[www.populationfoundation.in](http://www.populationfoundation.in)

October 2018

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This study has been supported by the Bill & Melinda Gates Foundation (BMGF). The findings expressed in the study are those of the contributors and do not necessarily represent the opinion of the BMGF. The study may be quoted, in part or full, by individuals or organisations for academic and advocacy purposes, with due acknowledgements to the source. Prior permission is required from Population Foundation of India for other uses and distribution.

# Contents

List of Tables	vii
List of Figures	ix
Acronyms and Abbreviations	x
Acknowledgement	xi
<b>Executive Summary</b>	<b>1</b>
<b>1 Cost of Family Planning Inaction in India</b>	<b>7</b>
1.1. Family Planning:A Renewed Emphasis under SDGs	7
1.2. Family Planning in India:An Overview	9
1.3. Family Planning: Policies and Expectations	11
1.4. Need and Relevance of the Study	13
1.5. Scope and Objectives of the Study	15
1.6. Cost of Family Planning Inaction:A Framework	17
1.7. Report Outline	19
<b>2 Demographic Consequences of Inaction</b>	<b>20</b>
2.1. Motivation	20
2.2. Data and Methods	20
2.3. Results	25
2.4. Role of Fertility Decline in Reducing Maternal and Infant Deaths	32
2.5. Conclusions	35
<b>3 Economic Gains with Family Planning Investments</b>	<b>38</b>
3.1. Motivation	38
3.2. Fertility Reduction and Economic Growth: Pathways	39
3.3. Data and Methods	41
3.4. Results	44
3.5. Conclusion	51
<b>4 Budgetary Savings with Family Planning Investments</b>	<b>54</b>
4.1. Background	54
4.2. Data and Methods	56
4.3. Results	58
4.4. Conclusion	64
<b>5 Impact on Out-of-Pocket Healthcare Expenditure</b>	<b>66</b>
5.1. Background	66
5.2. Data and Methods	66
5.3. Results	68
5.4. Conclusion	83
<b>6 Conclusion and Recommendations</b>	<b>85</b>
6.1. Summary of Key Findings	85
6.2. Recommended Actions	87
References	90
Annexures	92



# List of Tables

1.1	Key Demographic and Family Planning Indicators, India	13
2.1	Calibrations to Match Total Populations for SELECTED States and India	22
2.2	Projected Populations for India by Different Agencies for the Year 2025	22
2.3	Life Expectancy at Birth for Males and Females for Different Scenarios	23
2.4	Projected Total Population (in millions), India and Selected States	25
2.5	Projected Growth Rate of Total Population, India and Selected States	26
2.6	Projected Child Population (in millions), India and Selected States	27
2.7	Projected Total Fertility Rate, India and Selected States	28
2.8	Projected Total Pregnancies and Births (in millions), India and Selected States	30
2.9	Projected Risk Adjusted Infant Mortality Rate, India and Selected States	31
2.10	Projected Averted Maternal Deaths (in 000's), India and Selected States	31
2.11	Cumulative Maternal Deaths and Unsafe Abortions Averted per 100000 Live Births between 2001 and 2031, India and Selected States	35
3.1	Key Assumptions for the Economic Growth Simulation Analysis	43
3.2	GDP and Per Capita GDP of India and Selected States, 2001-15	44
3.3	Growth Rate of GDP and PCGDP of India and Selected States, 2001-15	44
3.4	Social and Economic Outlay of India and Selected States, 2001-15	45
3.5	Growth Rate of Social and Economic Outlay of India and Selected States, 2001-15 (%)	45
3.6	Social and Economic Outlay as % of GDP and GSDP, India and Selected States, 2001-15	46
3.7	Mean Years of Schooling, LFPR and Dependency Ratio, India and Selected States for Selected Years	46
3.8	GDP (in Rs. billion at 2004-05 prices) under Current Trend and Policy Scenario based on Coale and Hoover Model, India and Selected States 2016-31	47
3.9	Per Capita GDP (at 2004-05 prices) under Current Trend and Policy Scenario based on Coale and Hoover Model, India and Selected States 2016-31	47
3.10	GDP Growth Rate under Current Trend and Policy Scenario based on Coale and Hoover Model, India and Selected States 2016-31	48
3.11	Per Capita GDP Growth Rate under Current Trend and Policy Scenario based on Coale and Hoover Model, India and Selected States 2016-31	48
3.12	GDP (Rs. billion at 2004-05 prices) under Current Trend and Policy Scenario based on Ashraf et al Model, India and Selected States 2016-31	50
3.13	Per Capita GDP (at 2004-05 prices) under Current Trend and Policy Scenario based on Ashraf et al Model, India and Selected States 2016-31	50

3.14	GDP Growth Rate under Current Trend and Policy Scenario based on Ashraf et al Model, India and Selected States 2016-31	<b>50</b>
3.15	Per Capita GDP Growth Rate under Current Trend and Policy Scenario based on Ashraf et al Model, India and Selected States 2016-31	<b>50</b>
4.1	NHM Components with Savings Potential due to Family Planning Policies	<b>56</b>
4.2	NHM Budget Statement for Different Activities, India 2016-17	<b>58</b>
4.3	NHM Budget with Fertility Reduction for the Period 2017-31, India and States	<b>63</b>
4.4	NHM Budget Savings Potential for the Period 2017-31, India and Selected States	<b>63</b>
5.1	OOP Expenditure Averted on Child Hospitalisation, All India, 2004 and 2014	<b>68</b>
5.2	Estimated Savings on Total Exp. on Child Hospitalisation (0 to 5 years), All India, 2020, 2025 and 2030	<b>69</b>
5.3	OOPE Expenditure Averted on Child Hospitalisation, Selected States, 2004 and 2014	<b>70</b>
5.4	Estimated Savings on Total Exp. on Child Hospitalisation (0 to 5 years), Selected States, 2020, 2025 and 2030	<b>71</b>
5.5	Total Exp. Averted on Child Outpatient Care (0 to 5 years), All India, 2004 and 2014	<b>73</b>
5.6	Estimated Savings on Total Exp. on Child Outpatient Care (0 to 5 years), All India, 2020, 2025 and 2030	<b>74</b>
5.7	Total Exp. Averted on Child Outpatient Care (0 to 5 years), Selected States, 2004 and 2014	<b>74</b>
5.8	Total (Medical and Non-Medical) Exp. Averted on Childbirth (0 to 5 years), All India, 2004 and 2014	<b>76</b>
5.9	Projected Total (Medical and Non-Medical) Exp. Averted on Childbirth, All India, 2020, 2025 and 2030	<b>76</b>
5.10	Total (Medical and Non-Medical) Exp. Averted on Childbirth (0 to 5 years), Bihar and Rajasthan, 2004 and 2014	<b>77</b>
5.11	Total (Medical and Non-Medical) Exp. Averted on Childbirth (0 to 5 years), Madhya Pradesh, 2004 and 2014	<b>78</b>
5.12	Projected Total (Medical and Non-Medical) Exp. Averted on Childbirth, Bihar and Rajasthan, 2020, 2025 and 2030	<b>79</b>
5.13	Projected Total (Medical and Non-Medical) Exp. Averted on Childbirth, Madhya Pradesh and Uttar Pradesh, 2020, 2025 and 2030	<b>80</b>
5.14	Percentage of Households Incurring Catastrophic Exp. on Child Hospitalisation (and Childbirth) above 100 Per cent of Annual Household Per Capita Consumption Exp. by Wealth Quintiles, All India, NSS, 2004 and 2014	<b>82</b>
6.1	Demographic and Health Consequences (in million)	<b>85</b>
6.2	NHM Budget Savings Potential (in million) for the period 2017-31, India and States	<b>87</b>

# List of Figures

1.1	The 5 SDG Themes of People, Planet, Prosperity, Peace and Partnership	8
1.2	Levels of Maternal Mortality Ratio (MMR), India 2001-13	10
1.3	Milestones in Family Planning Programme in India	11
1.4	Conceptual Framework to Analyse Cost of Family Planning Inaction	18
1.5	Benefits of Timely Implementation of Family Planning Policies	19
2.1	Projected Child Population under Current and Policy Scenario (in millions)	27
2.2	Projected TFR under Current and Policy Scenario, Selected States	29
2.3	Contribution of MMR and Fertility Reductions on the Potential Number of Maternal Deaths Averted in 2011, India and Selected States	33
2.4	Contribution of Decrease in Live Births on the Potential Number of Maternal Lives Saved in 2011, India and Selected States	33
2.5	Contribution of IMR and Fertility Reductions on the Potential Number of Infant Deaths Averted in 2011, India and Selected States	34
2.6	Contribution of Decrease in Live Births on the Potential Number of Infant Lives Saved in 2011, India and Selected States	34
3.1	Per Capita GDP (in Rs. at 2004-05 prices) under Current Trend and Policy Scenario based on Coale and Hoover Model, India 2016-31	47
3.2	Per Capita SDP (in Rs. at 2004-05 prices) under Current Trend and Policy Scenario based on Coale and Hoover Model, States 2016-31	48
3.3	Per Capita SDP Growth (at 2004-05 Prices) under Current Trend and Policy Scenario based on Coale and Hoover Model, States 2016-31	49
4.1	Details of Expenditure, National Health Mission, India 2012-13 to 2015-16	59
4.2	Percentage Distribution of Expenditure, NHM India 2012-13 to 2015-16	59
4.3	Breakup of RCH Flexible Pool Expenditure, NHM India 2012-13 to 2015-16	60
6.1	Additional Per Capita Income and Growth with Effective Policy Scenario	86

# Acronyms and Abbreviations

<b>FP</b>	Family Planning
<b>SDGs</b>	Sustainable Development Goals
<b>TFR</b>	Total Fertility Rate
<b>PFI</b>	Population Foundation of India
<b>NHM</b>	National Health Mission
<b>GDP</b>	Gross Domestic Product
<b>NSDP</b>	Net State Domestic Product
<b>GSDP</b>	Gross State Domestic Product
<b>LFPR</b>	Labour Force Participation Rate
<b>RBSK</b>	Rashtriya Bal Swasthya Karyakram
<b>NIDDCP</b>	National Iodine Deficiency Disorders Control Programme
<b>NPP</b>	National Population Policy
<b>NHP</b>	National Health Policy
<b>MMR</b>	Maternal Mortality Ratio
<b>IMR</b>	Infant Mortality Rate
<b>UHC</b>	Universal Health Coverage
<b>ICPD</b>	International Conference on Population and Development
<b>MDGs</b>	Millennium Development Goals
<b>EAG</b>	Empowered Action Group
<b>RCH</b>	Reproductive and Child Health
<b>NRHM</b>	National Rural Health Mission
<b>ASHAs</b>	Accredited Social Health Activists
<b>mCPR</b>	Modern Contraceptive Prevalence Rate
<b>NFHS</b>	National Family Health Survey
<b>SRS</b>	Sample Registration System
<b>ANS</b>	Age Not Stated
<b>WPP</b>	World Population Prospects
<b>UNPD</b>	United Nations Population Division
<b>ASFR</b>	Age Specific Fertility Rate
<b>UN</b>	United Nations
<b>CBR</b>	Crude Birth Rate
<b>JSY</b>	Janani Suraksha Yojana
<b>ICOR</b>	Incremental Capital Output Ratio
<b>GFCF</b>	Gross Fixed Capital Formation
<b>JSSK</b>	Janani Shishu Suraksha Karyakram
<b>OOPE</b>	Out-of-Pocket Expenditure
<b>NSSO</b>	National Sample Survey Office
<b>PAP</b>	Proportion of Ailing Persons

# Acknowledgment

This is a report of the research project on 'Cost of Inaction on Family Planning in India' commissioned by the Population Foundation of India, New Delhi. It provides estimated human and monetary costs incurred by inaction on family planning in both demographic and economic terms. It charts the budgetary and health expenditure consequences and its implications for India and for the four selected high focus states of Bihar, Madhya Pradesh, Rajasthan and Uttar Pradesh. The study has vital implications for policymaking and increasing investment in family planning, especially improving the quality of care, expanding contraceptive choices enabling access and strengthening the family planning programme in the country. In particular, we highlight that with timely action, India can avert a large number of maternal and infant deaths. The report also demonstrates how India's economy can benefit through a higher growth rate realised from a favourable population age structure and human capital accumulation. Besides, both governments and households can save considerable resources presently being allocated towards maternal and child healthcare.

Two young health economists: Abhishek Kumar and Sunil Rajpal have worked with us on this project and made significant contributions to data collection, estimation and analysis. We express our gratitude to them.

We have received valuable comments from project advisors, Professors K S James and Arvind Pandey on estimation approach and earlier drafts of this report for which we express our appreciation. We are grateful to Poonam Muttreja, Executive Director, PFI and Alok Vajpeyi, Head, Knowledge Management and Core Grants, PFI and J. Pratheeba, Health Economist, PFI for their support and feedback. We are also thankful to Richa Shankar (BMGF), Y.P. Gupta (Avenir Health), Sarang Deo (ISB), Gautam Chakraborty (USAID), Prerana (Accountability Initiative), Gautam Narayanan (9 dot 9), Amitabh Kundu (PFI), Francesca Barolo Shergill (PFI), Ritesh Laddha (PFI), Sanghamitra Singh (PFI), Sweta Das (PFI), Nitin Bajpai (PFI) and, Purnima Khandelwal (PFI) for their participation and useful comments and suggestions made during the discussion of the report organised by the Population Foundation of India in December 2017.

We express our thanks to the administrative and support staff of the Institute of Economic Growth for their full-hearted co-operation without which this work would have not been completed within the timeframe planned.

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# Executive Summary

## I. Cost of Inaction in Family Planning

Since the launch of Family Planning Programme in 1952 India has had varied success in achieving the envisaged goals and objectives, particularly those of population stabilisation and addressing the unmet need for family planning. Currently, India's population of 1.3 billion accounts for a 17 per cent share in the total global population of 7.6 billion. By 2022, India is set to become the most populated country in the world.

With population growth as a prominent developmental concern, India adopted a revised National Population Policy (NPP) in 2000 that derives its basic philosophy from the International Conference on Population and Development (ICPD 1994) Plan of Action. The NPP 2000 takes cognisance of the concerns raised by women's organisations in the country and considers the changing global understanding on population, reproductive health, equity and rights.

The NPP calls for a comprehensive approach to population stabilisation and recommends the addressing of the social determinants of health, promoting women's empowerment and education, adopting a target-free approach, encouraging community participation and ensuring a convergence of service delivery at the community level.

Effective family planning policies can have a discernible influence on all the 17 Sustainable Development Goals (SDGs). Investments on family

planning have also proven to be effective in terms of returns. However, inaction in implementation of family planning policies may directly and indirectly delay the progress towards the SDGs. It can lead to slow improvements in social, economic, demographic and health outcomes.

The cost of inaction in family planning can be understood as the loss of potential benefits to individuals, households, economy and society due to specific programme or policy inaction. Family planning inaction can have an adverse impact on the social and economic development of India, particularly in the demographically backward states. Many of these implications are apparent in the form of poor economic and health development in these states.

This study, aims to examine the cost of family planning inaction on: a) Demographic and health parameters; b) economic growth and per capita income; c) National Health Mission budgetary allocations; and, e) household out-of-pocket expenditure.

The broad objectives of the study are as follows: 1) To provide an estimate of the cost of inaction in family planning that results in the loss of health and economic well-being for India and the four selected states of Bihar, Madhya Pradesh, Rajasthan and Uttar Pradesh. 2) To inform advocacy efforts with study findings and evidence to strengthen and give priority to family planning within the country's socio-political and developmental agenda.

The cost of family planning inaction is calculated by comparing the projected estimates under two scenarios, namely: a) Current Scenario and b) Policy Scenario. The Current Scenario is defined as the 'business-as-usual' scenario whereby the Union and the State governments continue the existing strategies and approach towards family planning. In contrast, the Policy Scenario approach is an active strategic stance that gets reflected in improved demographic and family planning parameters. In our case, we have a set of targets envisioned by the national and respective state population policies to construct the policy scenario. All policy documents have laid out different strategies to achieve those set goals. However, these strategies are not properly monitored for their successful implementation, envisaged outcomes and goals. Implementing agencies were not briefed about corrective measures in a timely manner. This leads to differences in demographic and family planning outcomes across the two scenarios.

## II. Demographic and Health Costs of Inaction

The following would be the demographic and health costs of inaction if appropriate investments in family planning are not made over the next 15 years:

India will add an extra population of 149 million by 2031 with Bihar (24 million), Madhya Pradesh (14 million), Rajasthan (5 million) and Uttar Pradesh (31 million) accounting for one-half of this number.

India will have an increased child population (0-4 years) of 22.7 million by 2031 with Bihar (3.3 million), Madhya Pradesh (2.3 million), Rajasthan (1.1 million) and Uttar Pradesh (4.1 million) accounting for about one-half of it.

India will have to meet the cost of 69 million additional births during 2016-31. Bihar (13 million), Madhya Pradesh (9 million), Rajasthan (3 million) and Uttar Pradesh (18 million) will have to incur major costs as they jointly account for over 60 per cent of these births.

India will witness 2.9 million additional infant deaths with the bulk of these deaths occurring in Bihar (0.6 million), Madhya Pradesh (0.5 million), Rajasthan (0.2 million) and Uttar Pradesh (1.2 million).

1.2 million maternal deaths can be prevented in India in this period with half of it in Bihar (0.2 million), Madhya Pradesh (0.1 million), Rajasthan (0.1 million) and Uttar Pradesh (0.3 million).

**Table I: Demographic and Health Consequences (in million)**

Indicators	Bihar	MP	Rajasthan	UP	India
Additional Population 2031	24	14	05	31	149
Additional Child Population 2031	3.3	2.3	1.1	4.1	22.7
Additional Births 2016-31	13	09	03	18	69
Additional Infant Deaths 2016-31	0.6	0.5	0.2	1.2	2.9
Maternal Deaths Averted 2016-31	0.2	0.1	0.1	0.3	1.2
Unsafe Abortions Averted 2016-31	22.3	16.0	14.3	33.8	205.8

India can potentially avoid 206 million unsafe abortions with significant benefits for the four states, particularly Bihar (22 million) and Uttar Pradesh (34 million).

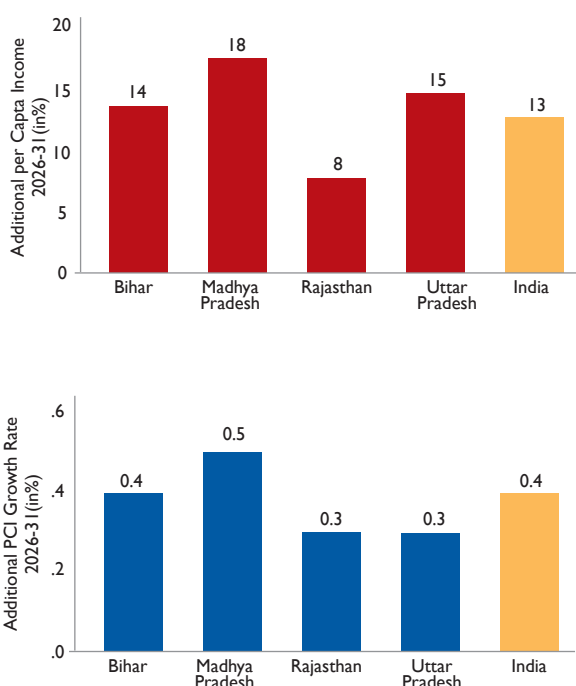
More than one third of the potential number of maternal lives saved across the country between 2001 and 2011 can be attributed to a decrease in the number of live births. For the populous states like Bihar and Uttar Pradesh, the effect of fertility decline on the potential number of maternal lives saved is estimated to be 62 per cent and 57 per cent, respectively.

### III. Impact on Per Capita Income and Economic Growth

The following would be the economic gains if appropriate investments in family planning are made over the next 15 years:

With active family planning policies, India will enjoy

**Figure I: Additional Per Capita Income (in %) and Growth with an Effective Policy Scenario**



an additional per capita income of 13 per cent during 2026-31. This implies that the Per Capita GDP (PCGDP in 2004-05 prices) for India could be Rs. 153,368 under the Policy Scenario compared to Rs. 135,924 under the Current Scenario.

India would also benefit from an additional 0.4 percentage point increase in per capita GDP growth rate during 2026-31.

Significant benefits for all the four states are noted but the largest gain could be experienced by Madhya Pradesh with an additional per capita income of 18 per cent during 2026-31. Madhya Pradesh could also benefit from an additional 0.5 percentage point increase in per capita GDP growth rate the same period.

### IV. National Health Mission (NHM) Budgetary Savings Potential

Substantial financial savings under the National Health Mission (NHM) Programme Components could accrue over the next 15 years if appropriate family planning measures are implemented. The following would be the potential NHM budgetary savings if appropriate investments in family planning are made over the next 15 years:

Cumulative savings of Rs. 270000 million in total budgetary allocations for health.

Cumulative savings of around Rs. 60000 million in the maternal health programme.

Cumulative savings of Rs. 3000 million from lower delivery costs on account of the reduced number of births.

Cumulative savings of Rs. 5500 million in the RBSK programme and cumulative savings of Rs. 790 million in the adolescent programme.

Cumulative savings of Rs. 13000 million under immunisation coverage on account of the reduced number of births.

## V. Reduction in Household Out-of-Pocket Expenditure

With an effective implementation of the NPP 2000, Indian households could achieve about a one-fifth reduction in total out-of-pocket expenditure on delivery care and child hospitalisation. The magnitude of savings in OOPE could be much larger for households in Madhya Pradesh (35 per cent) and Uttar Pradesh (30 per cent).

Over the period 2014-30, Indian households would have cumulatively saved Rs. 715320 million on account of reductions in household OOPE toward delivery care. Significant cumulative savings would arise from Uttar Pradesh (Rs. 11,2300 million) and Bihar (Rs. 62320 million).

Similarly, during 2014-30, Indian households would have cumulatively saved Rs. 6,0780 million on account of reduced household OOPE toward child hospitalisation. About one-fifth of such cumulative savings would come from Uttar Pradesh (Rs. 6900 million) and Bihar (Rs. 5880 million).

Currently, Indian households experience high level of financial hardships while seeking hospitalisation and delivery care. In 2014, about 14 per cent cases of delivery care and about 20 per cent cases of child

hospitalisation experienced catastrophic out-of-pocket expenditures.

## Recommended Actions

In the last three years, several new family planning programmes have been introduced and these include:

- A bigger basket of choice: Three new methods have been introduced in the National Family Planning programme: (i) Injectable Contraceptive DMPA (Antara) (ii) Centchroman pill (Chhaya) (iii) Progesterone only pill (POP).
- GoI has launched Mission Parivar Vikas for substantially increasing the access to contraceptives and family planning services in the 145 high fertility districts of seven High Focus States (HFS) with a TFR of 3 and above. These are the states of: Uttar Pradesh, Bihar, Rajasthan, Madhya Pradesh, Chhattisgarh, Jharkhand and Assam.
- The launch of a Logistics Management Information System (FP-LMIS) by the Government of India (GoI). This is a new software designed to provide robust information on the demand and distribution of contraceptives to health facilities and the ASHAs.

**Table II: NHM Budget Savings Potential (in millions) for the Period 2017-31, India and States**

Component	Bihar	MP	Rajasthan	UP	India
Maternal Health	7310	5690	2950	7060	59930
Child Health	180	330	170	130	3070
Adolescent	40	40	10	20	790
RBSK	140	490	160	490	5470
Training	280	210	190	140	4240
NRHM Additionalities	12970	9490	8940	22490	139720
Procurement	4130	1840	2020	2060	42500
Immunisation	1330	650	420	2520	13260
NIDDCP	40	10	10	10	160

However, each of these programmes requires a well-planned roll out strategy and goals which at the moment is not clear. Moreover, India has also pledged to provide universal access to reproductive health services including contraceptives by 2030 as part of its commitment to the Sustainable Development Goals (SDGs).

Some key recommendations to strengthen the family planning programme are:

**Specific strategies to address reproductive health needs of adolescents and youth:** While it is well recognized that adolescents and youth have distinctive needs, access to reproductive health services by adolescents and youth is mired in challenges of access to services; attitudinal barriers among providers and restrictive social norms. Greater investments and early interventions in their education, health including reproductive and sexual health needs and skill development activities will enhance their contribution to economic output and growth. To meet India's commitments to the SDGs and FP2020 and considering the huge demographic dividend, specific health strategies especially for adolescents and youth that address their health needs and priorities is critical. This strategy should underscore a voluntary, rights and choice-based approach for addressing their sexual and reproductive health concerns. Specific focus on increasing access to information and reproductive health services, delaying their age of marriage, first pregnancy and empowering them to take informed decisions on spacing between children is the only way to address population momentum.

**Increased allocations for family planning:** Planning and prioritisation of family planning budgets should adequately address the gaps in use of spacing contraceptives. Budget proposals should emphasise on making available at scale voluntary spacing methods that ensure effective reproductive health solutions for both the mother and the child. Availability of a greater resource envelope for family planning in the national and states' health budgets and accelerating its spending will contribute

to higher economic output, greater savings and investments as a result of reductions in fertility in the country, specifically across high TFR states such as Bihar and Uttar Pradesh. The budget allocations should factor in the growing need for contraceptive requirements of 53% of India's population in the reproductive age group. Further, the allocations and programmes should be synchronised to reflect the shift in focus from limiting to spacing methods and activities that drive demand and cater to unmet need.

**Multi-sectoral response and community engagements:** Family planning approaches are complex and are influenced by social, cultural, economic and environmental factors. It entails a huge component of influencing knowledge and behavior change in the population, which requires collective efforts from different sectors and the community. While there has been emphasis on the supply side aspects of the health system, it is equally important to address the demand side factors through greater community engagement and multi-sectoral response that address the critical gaps in implementation and scaling up of family planning programmes. Engagement with different stakeholders across different sectors will enable a leverage of the expertise, knowledge, skills, resources and reach for improving family planning outcomes. Best practices from Social and Behaviour Change Communication (SBCC) initiatives and convergence models such as state and district level working groups need to be scaled up.

**Quality family planning services under Universal Health Coverage:** Existing policies ensure free delivery of care services as well as postnatal care in public health facilities; however there are issues with quality and access to services, especially in remote and underserved areas. Increasing the availability and access to reproductive health services and addressing the unmet need for contraceptives should be a priority among other aspects that aim to achieve Universal Health Coverage (UHC). This will enable better reproductive maternal and child health care

outcomes. The study also reveals that households incur high and catastrophic healthcare payments for child birth as well as inpatient care for children. Such a high cost of treatment often acts as a deterrent for seeking quality healthcare. With provision of quality FP services and increasing its reach under the UHC, households will have fewer children and can save huge out of pocket expenditures on child birth and child hospitalization.

**Promote female education and labour force**

**participation:** The study observes that inaction in family planning can adversely affect per capita income and output of the economy. Reducing the fertility rates along with increasing women's education, delaying their marriage age and increasing opportunities for them in the labour market will

enable increased economic output and permit resources for alternative investments. Simulation analysis reveals that economic gains can be much higher when female education and labour force participation are promoted and enabled. At present, there are significant gender differentials in the average years of schooling across the four high focus study states. Besides, the huge gender gap in labour market participation reflects a lack of employment opportunities for females and is indicative of a gendered nature of economic activities in India. Development policies and initiatives in the country should actively promote avenues for economic empowerment of women by supporting their education and employment in skill-based industries and services.

# 1 Cost of Family Planning Inaction in India

## Introduction and Objectives

### 1.1. Family Planning: A Renewed Emphasis under SDGs

Family Planning is an important area for research, advocacy and policymaking in India. Since independence, the Union and State Governments have accorded high priority on family planning under various developmental policies and programmes. The intrinsic and instrumental relevance of family planning is widely acknowledged by the national and international community even as the latter assumes greater salience in policy discourse and communication.

India adopted the National Population Policy (NPP) in 2000. This takes its basic outline from the Programme of Action that emerged from the International Conference on Population and Development (ICPD 1994) and from the concerns of women's organisations in the country thereby taking into consideration the changing understanding on population, reproductive health, equity and rights. The policy calls for a comprehensive approach to population stabilisation and recommends addressing the social determinants of health, promoting women's empowerment and education, adopting a target-free approach, encouraging community participation and ensuring a convergence of service delivery at the community level. Socio-cultural factors such as marriage age, age at first birth and education of girls for maternal and infant well-being find a prominent place in the policy along with promoting a basket of contraceptive choices.

The Sustainable Development Goals (SDGs) of the 2030 Agenda reinforce the rights perspective, whereby all Member Nations reaffirm their commitment to "ensure universal access to sexual

and reproductive health and reproductive rights as agreed in accordance with the Programme of Action of the International Conference on Population and Development and the Beijing Platform for Action and the outcome documents of their review conferences".

To achieve this important goal, Member Nations are mandated to devise gender sensitive laws and regulations that guarantee women access to sexual and reproductive health care, information and education. They are authorised to systematically monitor the progress through periodic assessments of their autonomy in and information on decision-making with regard to sexual relations, contraceptive use and reproductive health care.

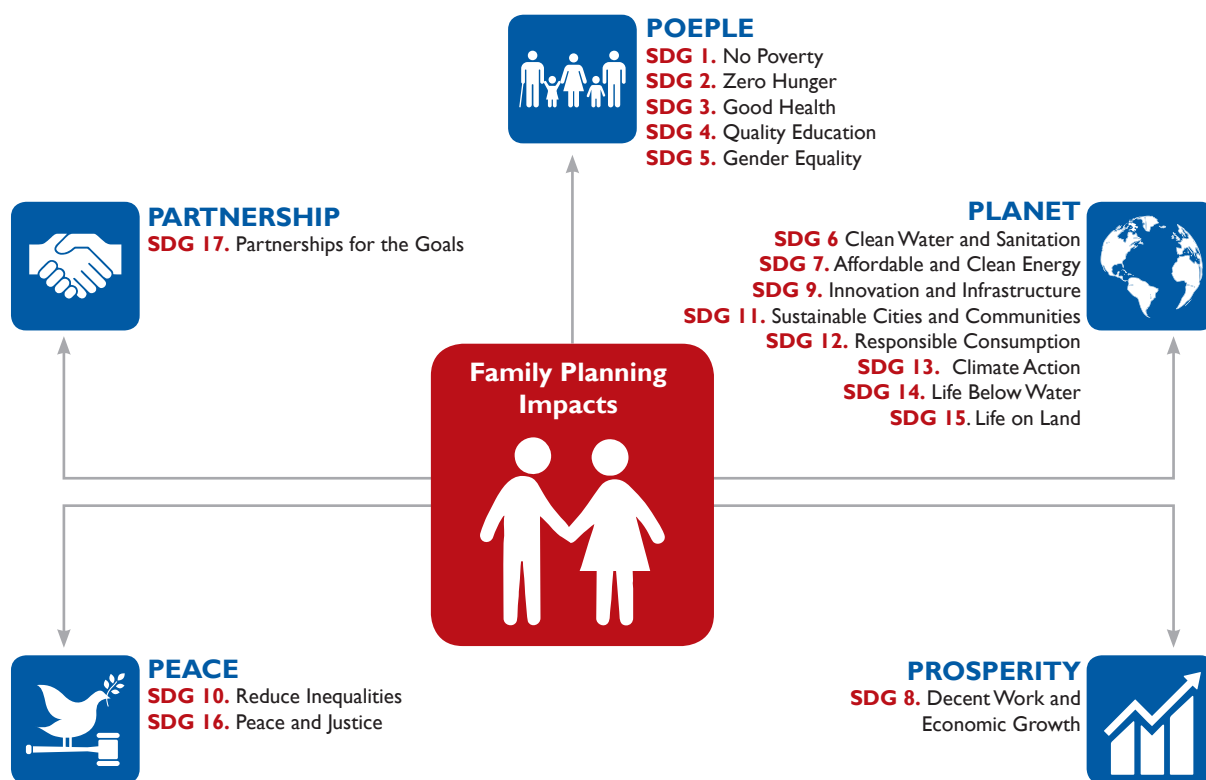
The SDGs Agenda 2030 reiterates the intrinsic value of family planning and unambiguously outlines its relevance for achieving the broader objective of gender equality and empowerment of women and girls. It further identifies the need for devising effective policies to achieve greater and equitable improvements in gender-related outcomes with a specific focus on the marginalised sections of the society.

Further, it is important to draw attention towards the direct as well as the implicit associations between Family Planning and the 17 SDGs.

In this regard, following Starbird et al (2016), Figure 1 shows that voluntary family planning is invariably linked to all the 17 SDGs and can render considerable impacts on all the five underlying themes of People, Planet, Prosperity, Peace, and Partnership.

The authors specifically outline that family planning can be instrumental in accelerating the progress

**Figure 1.1.** The 5 SDG themes of People, Planet, Prosperity, Peace and Partnership



Source: Starbird et al (2016)

across the five different themes underlying the SDGs Agenda. Also, better performance in the domain of family planning has direct as well as spill-over effects on several other goals and indicators which can further escalate the advancement of the post-2015 development agenda. Investments in family planning have a direct bearing on household poverty and the customary standard of living. This effect may occur through various direct or indirect ways. For instance, the household savings potential in terms of reduced healthcare costs is an elementary pathway, whereas an enhanced scope for human capital investments among children as well as improved female labour market participation are more dynamic pathways.

Similarly, at the macroeconomic level, fertility decline opens a window of opportunity to harness the demographic dividend associated with a higher share of a working age population with a reduced

dependency ratio. Besides, the environmental benefits of population stabilisation are also apparent in the form of mitigated pressure on natural resources including land and water.

Importantly, it is cautioned that in the absence of universal access to family planning and reproductive health services, the impact and effectiveness of other interventions will be less, will cost more, and will take longer to achieve. In particular, it is critical for the governments and the developmental community to ensure adequate investments in family planning with a focus on promoting knowledge and awareness to encourage informed discussions on access, choices and voluntary uptake.

Such unprecedented relevance of family planning in terms of global health and sustainable development invariably elevates population

policy as a prime objective in the development agenda of governments, national and international organisations as well as civil society. In particular, the issue has considerable bearing on states and regions with poor maternal and child health indicators and a disconcerting status of reproductive rights.

## 1.2. Family Planning in India: An Overview

India's population of 1.3 billion accounts for a 17 per cent share in the total global population of 7.6 billion. By 2022, India is projected to overtake China to become the most populated nation on the planet. However, unlike China, India's population is yet to achieve significant progress in terms of demographic, economic and health outcomes. These inter-country disparities in development progress have widened over the years.

For instance, during the 1950s, the TFR of China (6.1) was slightly higher than that of India (5.9) but since the 1970s, China's TFR declined at a faster rate than India's to provide an early demographic advantage. This steep decline in the fertility rates of China is majorly attributed to the adoption of the one-child policy (Aird 1978, Bongaarts and Greenhalgh 1985) whereas, India's fertility decline has been relatively slow (Bloom 2011, Bhat undated).

Prior to Independence, population growth in India was essentially viewed in a Malthusian framework that postulated disastrous consequences for economic growth and development. Since then, there has been greater consensus on reducing population growth through both positive and negative checks. In fact, India is the first nation to have formulated a national family planning programme in 1952 with explicit policy efforts and provisions under subsequent five-year plans. The programme was run through the Health Department with a strategy that was based on incentives, targets and female sterilisation.

However, during 1976-77, Family Planning in India encountered its most turbulent phase on account

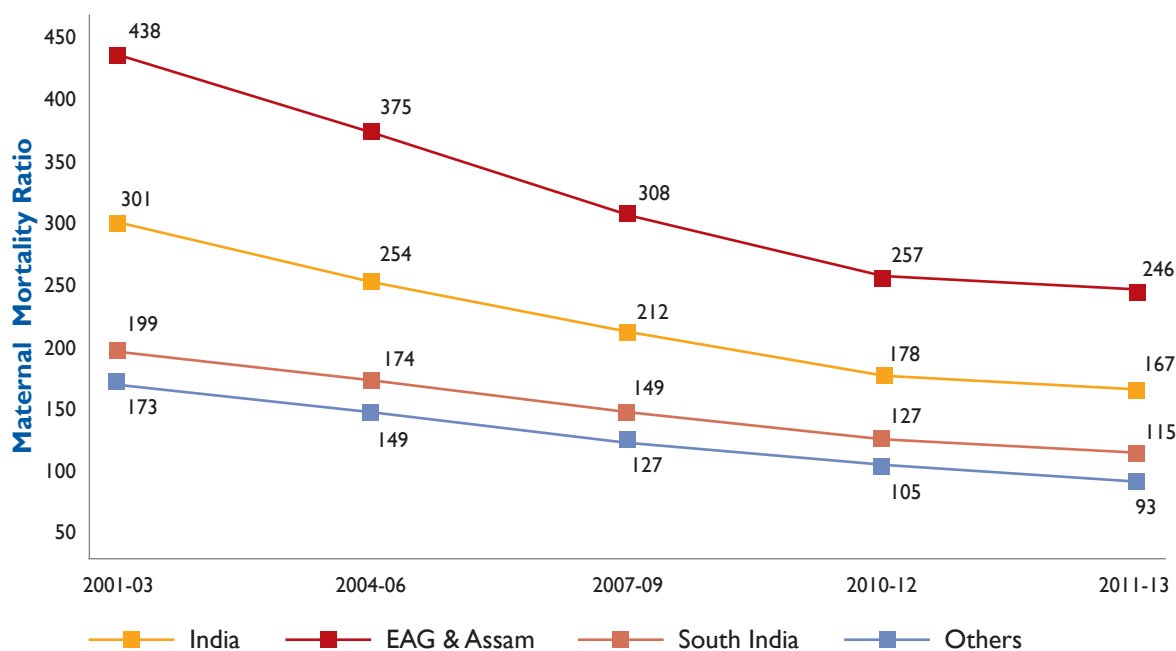
of a coercive policy approach towards population control. This had wide socio-political ramifications that rendered a long-lasting shock on family planning in India. In particular, family planning had to undergo a major strategic reinvention and recovery. The term family planning was replaced with family welfare and accompanied with an explicit policy assurance to dissuade various forms of compulsion associated with it, including female sterilisation. However, because of the severe backlash of the erstwhile coercive approach, family planning in India showed minimal progress during the 1980s and 1990s.

In particular, it may be noted that throughout the 1970s, 80s and 90s, India's population grew at the rate of about 2.5 per cent per annum. Such a high population growth rate implied an accelerated doubling of the population from the 1975 level of about 650 million. Further, at the current population growth rate of 1.2 per cent, it is projected that India's population will reach 1.5 billion by 2030 and 1.7 billion in 2050.

Family planning in India also displayed considerable regional as well as socioeconomic heterogeneity. The South Indian states were among the first to experience lower fertility rates and achieve a relatively stable population with favourable age composition. Similarly, the rich and the educated also benefited from family planning choices even as these lacked a gender perspective. On the other hand, the bulk of the population across the vast central, north and eastern region continued to sustain high fertility rates that prevented India to achieve replacement level fertility rates of 2.1 even after almost seven decades of family planning.

The absence of an effective approach towards voluntary family planning resulted in major health costs, particularly for women and children. For instance, the Maternal Mortality Ratio (MMR) in India was estimated to be more than 800 during the 1970s, 500 during the 1980s and 400 during the 1990s (Joe et al 2015). As such, India accounts for about one-fifth of the global figure of maternal deaths. Post-2000, the MMR reduction decelerated

**Figure 1.2: Levels of Maternal Mortality Ratio (MMR), India 2001-13**



Source: SRS Bulletin, Office of the Registrar General, India

with the result that India was unable to meet its targets in maternal health in the Millennium Development Goals (MDGs). Moreover, the MMR across the 8 Empowered Action Group (EAG) states and Assam continues to be much higher than the national average (Figure 1.2).

The shift in thinking in India’s policies, approaches and strategies has been shaped by the International Conference on Population and Development (ICPD) held in Cairo in 1994, which argued for a paradigm shift from the earlier emphasis on population control to that of a rights-based approach and sustainable development. Being a signatory, India attempted to integrate population policies within the broader perspective of sexual and reproductive rights, gender and sustainable development. Family planning based on voluntary choice mechanisms was emphasised whereby health promotion through IEC and motivation activities was envisaged as the key

instrument. The policy approach post-1995 gradually aimed at providing comprehensive Reproductive and Child Health (RCH) services.

With the launch of the National Rural Health Mission (NRHM) in 2005, the RCH approach was expanded to include the Accredited Social Health Activists (ASHAs) in outreach activities. These community level female health workers are expected to work as an interface between the community and the public health system and engage in effective communication at the individual level. They are supported through financial incentives for their efforts and achievements. The RCH component under the NRHM continues to evolve in scope and coverage and has since developed into the Reproductive, Maternal, Newborn, Child and Adolescent Health (RMNCH+A) approach, which seeks to renew India’s commitment towards improving maternal health and child survival in the country.

In recent years, three major national and international policy declarations (SDGs Agenda 2030, the FP 2020 and the National Health Policy 2017) have influenced India's approach towards family planning. All these documents have stressed the importance of decentralisation in policy planning, community involvement in health planning, integration of healthcare services and the convergence of institutional efforts to achieve family planning objectives. However, in India, these aspects continue to be the Achilles heel in the policymaking on family planning.

### 1.3. Family Planning: Policies and Expectations

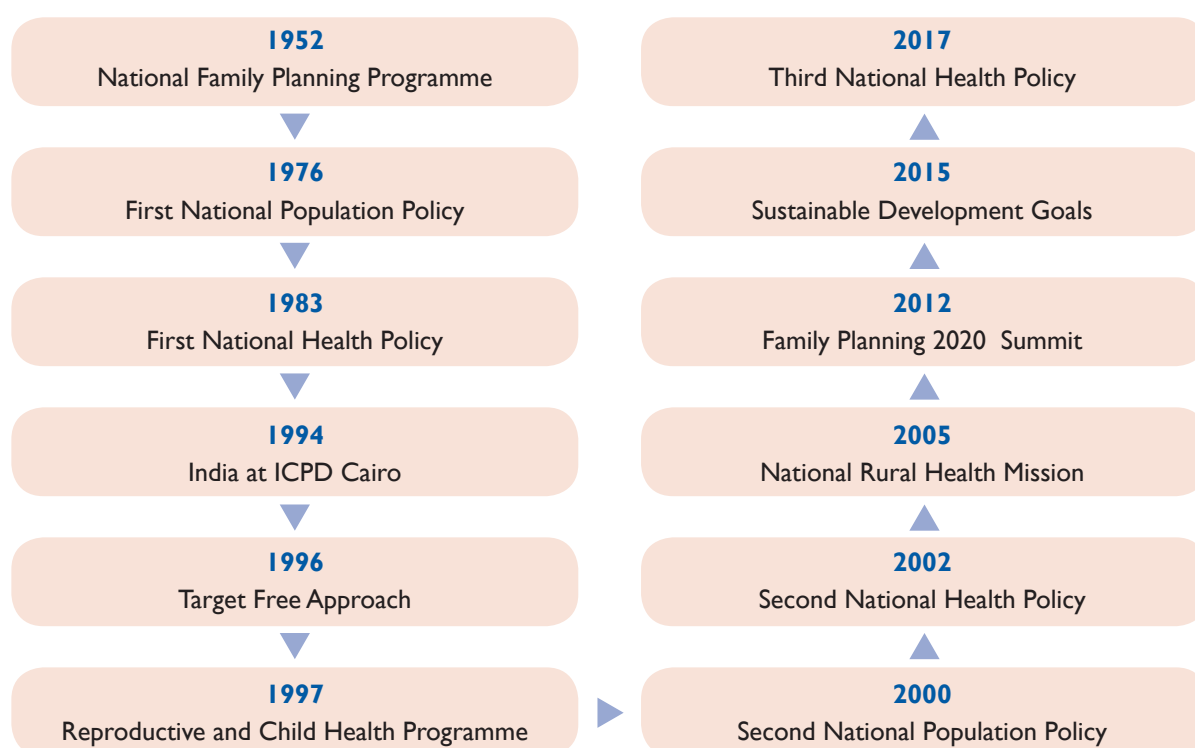
Policies on family planning in India have essentially aimed at achieving a stable population size commensurate with the level of resources and opportunities available (Figure 1.3). For this purpose, the achievement of replacement level TFR of 2.1

continues to be an important milestone for various national population policies and programmes (Srinivasan 2017).

Over the years, there have been two fundamental shifts in approach in family planning in India. First, the government has scaled back from excessive reference to the Malthusian theory on population growth and has acted positively on the heavily gender biased and target oriented approach; and second, there is an increased recognition of voluntary family planning based on community engagement and the provision of information and choices. In this regard, it is worthwhile to briefly review the major policy expectations from family planning in India.

The National Population Policy (NPP 1976) undermined the role of education and development in family planning and encouraged coercive means to reduce population growth that was deemed

**Figure 1.3: Milestones in the Family Planning Programme in India**



Source: Based on Family Planning Division, Government of India (2014)

inimical to economic growth. The NPP 1976 aimed at reducing birth rates from 35 per 1000 in 1975 to 25 per 1000 in 1984. This was expected to slow down the population growth rate to 1.4 per cent per annum in 1984 (Singh 1976).

While the NPP 1976 also highlighted the importance of female education, this could hardly be implemented in an environment, which was experiencing a severe backlash to a coercive policy stance on female sterilisation. The National Health Policy (NHP 1983) also refrained from making an exclusive reference to family planning though it advocated in favour of a new NPP for achieving the goal of a stable population.

The long-awaited National Population Policy 2000 was instrumental in reorienting the strategic approach towards family planning in India. In its policy statement, the NPP affirms its commitment towards a voluntary approach and informed choice and consent of citizens while availing of reproductive health care services; and continuation of the target-free approach in administering family planning services.

The NPP 2000 aimed to address the unmet needs for contraception, healthcare infrastructure, and health personnel, and to provide integrated service delivery for basic reproductive and child healthcare. The policy further intended to achieve replacement level TFR by 2010 and a stable population by 2045. The NHP 2002 further endorsed the policy approach and underscored the importance of population stabilisation in order to maximise socioeconomic well-being. However, it is clear that the ensuing policy efforts were inadequate to achieve these envisaged objectives.

In 2005, India launched the flagship scheme of the National Rural Health Mission (NRHM 2005) which had a major influence on family planning and health indicators. NRHM is much appreciated for boosting the supply-side through adequate provisions of technical, financial and managerial inputs and for devising incentive mechanisms to achieve

certain desirable objectives. Subsequently, various programme activities were brought under the umbrella of the National Health Mission (NHM) with specific components planned for rural and urban areas and implemented through the NRHM and the NUHM, respectively. However, evidence suggests that the total (central and state release) expenditure on family planning has stagnated at the same level since 2011. The total outlay on family planning was Rs. 4020 million in 2011-12, Rs 4200 million in 2012-13, which decreased to Rs. 3960 million in 2013-2014. Further, the estimated total expenditure in 2015-16 is Rs. 7420 million.

In 2012, India became a signatory to the Family Planning 2020 (FP 2020) goals, an outcome of the London Summit on Family Planning the same year. This helped rejuvenate the family planning programme in the country as it involved commitment towards enhanced financial allocations as well as strategic reforms to promote innovations and outreach activities on family planning and related sectors. Considerable emphasis is now placed on adolescent health, teenage pregnancies and other sociocultural barriers to health and family welfare. The RMNCH+A approach launched in 2013 can be instrumental in promoting choices in the use of various modern methods of contraception.

The FP 2020 commitments of India aim to ensure a modern Contraceptive Prevalence Rate (mCPR) of 65.9 per cent to achieve its FP 2020 targets and to reach an additional 48 million users. The Government has emphasised that “Vision FP 2020 for India is not just about providing contraceptive services to an additional 48 million users but avoid 23.9 million births, 1 million infants deaths and over 42000 maternal deaths by 2020” (Government of India 2014).

The SDGs Agenda 2030 as well as the National Health Policy 2017 endorse the FP 2020 strategic approach that outlines the need for gender sensitive and rights-based family planning with adequate public investments and community involvement.

## 1.4. Need and Relevance of the Study

In the last seven decades, India has launched various policies and programmes to promote voluntary and choice-based family planning to achieve a stable population size that is commensurate with the available resources and opportunities. However, despite considerable policy engagements, gaps remain in meeting the family planning requirements of the population. Such policy challenges are delaying the prospects of achieving the replacement level TFR.

The current demographic scenario of India varies with considerable heterogeneity between major Indian states (Table 1.1). In particular, Bihar, Madhya Pradesh, Rajasthan and Uttar Pradesh require concerted policy focus to improve upon their demographic, health and family planning situation. Clearly, accelerated progress in these states is necessary for India's demographic progress as well as giving a boost to the economic and social well-being of the country.

Table 1.1 presents the key demographic, health and family planning indicators for India and the four aforementioned major states based on information from the Sample Registration System (SRS) Bulletin 2015 and the most recent round of the National Family Health Survey (NFHS 2015-16). As per Census 2011, the four selected states of Bihar, Madhya Pradesh, Rajasthan and Uttar Pradesh have a total population of about 440 million and account for 37 per cent of the total population of the country. They continue to have a decadal growth of over 20 per cent which is much higher than the targets envisaged under the three NPPs. In fact, in 2015, the birth rates in these states are found to be higher than the target of 25 per thousand specified under the first NPP in 1976.

The TFR of these states is much higher than the replacement level fertility. In particular, Bihar and Uttar Pradesh require specific efforts to reduce TFR levels. Such increased exposure and probability of childbirth elevates the risk of maternal mortality. In fact, with a vulnerable health system and

**Table 1.1: Key Demographic and Family Planning Indicators, India**

Indicators	Bihar	MP	Rajasthan	UP	India
Population* (in million)	104	73	69	199	1210
Adolescent Pop. ** (in million)	23	15	15	44	238
Youth Pop.*** (in million)	18	16	15	46	237
Women Pop.* (in million)	49	38	33	91	587
Decadal Growth* (%)	25.1	20.3	21.4	20.1	17.6
Child Sex Ratio*	935	918	888	902	919
Child Population* (million)	19	11	11	30	159
Birth Rate 2015#	26.3	25.5	24.8	26.7	20.8
Death Rate 2015#	6.2	7.5	6.3	7.2	6.5
IMR 2015#	42	50	43	46	37
MMR 2011-13#	208	221	244	285	167
Total Fertility Rate^	3.4	2.3	2.4	2.7	2.2
mCPR^ (%)	23.3	49.6	53.5	31.7	47.8
Female Sterilisation^ (%)	20.7	42.2	40.7	17.3	36.0
Total Unmet Need^ (%)	21.2	12.1	12.3	18.1	12.9

**Note:** Figures and estimates based on: \*Census of India, 2011; #Sample Registration System; and, ^National Family Health Survey 2015-16. Population figures are rounded off to the nearest decimal.

developmental profile, these states display high maternal mortality ratios which may hamper the overall progress towards the SDGs 3 and 5 on health and gender equality respectively.

The uptake of modern methods of contraception needs both strategic and policy focus in Bihar and Uttar Pradesh. While Rajasthan and Madhya Pradesh have a relatively higher mCPR, the bulk of contraception options are in the form of limiting techniques singularly dominated by female sterilisation. Importantly, all these states report high levels of unmet need for family planning.

Nationally representative household surveys such as the NFHS and the District Level Household and Facility Survey (DLHS) have confirmed the socioeconomic gradient and spatial differentials in unmet need for family planning. The unmet need is particularly high among the marginalised socioeconomic groups including the poor (18 per cent total unmet need) and the Muslims (19 per cent total unmet need). Similarly, married women aged 15-19 years also report extremely high levels of unmet need (25 per cent unmet need for spacing). A comparison of NFHS 2005-06 and 2015-16 reveals that the overall level of the total unmet need and unmet need for spacing in India is almost invariant. A similar non-response in levels of unmet need is noted for Bihar and Madhya Pradesh whereas only marginal reductions are apparent in Rajasthan and Uttar Pradesh.

Furthermore, a skewed pattern of method-mix confirms that family planning in India is highly gendered and is almost synonymous with female sterilisation. NFHS 2015-16 confirms that about 75 per cent of the mCPR in India is in the form of female sterilisation whereas all other modern methods account for less than one-fourth share in the overall use of modern contraception. In fact, the uptake of male sterilisation has declined from 1.0 per cent in 2005-06 to 0.3 per cent in 2015-16. It is totally negligible across the four selected states and is almost zero per cent in Bihar and Uttar Pradesh. The issue of informed and choice-based method-mix

has hitherto remained a neglected aspect of family planning policies in India. In the past, the government has essentially focused on the promotion and provision of permanent methods, especially female sterilisation. The choice basket available to Indian men and women is also found to be more restrictive and until 2015 had not included options such as injectables which are available in countries such as Bangladesh, Bhutan, Nepal and Indonesia. Increasing the availability of the choice of contraceptives has the potential to drive demand. For instance, a study concluded that the addition of one method available to half of the population is associated with a 4 to 8 per cent increase in the use of modern contraceptives (Ross and Stover 2013).

Contraceptive use has been conventionally approached as an effective means to curb population growth. Cleland et al (2012) estimate that since the 1950s contraception use accounts for about 75 per cent of fertility decline observed across developing countries. However, since the 1980s there has been increased attention towards the intrinsic value of family planning and focus on its impact on maternal and child health and its relevance for ascertaining sexual and reproductive health rights. The research and development community is systematically engaged in advocating both the instrumental and intrinsic benefits of family planning. For instance, some of the earlier studies, such as Coale and Hoover (1958), have approached fertility reduction from an economic growth perspective whereas recent efforts such as the Lancet Series on Family Planning (Cleland et al 2012, Cottingham et al 2012) effectively highlight the intrinsic gains as well as its inter-linkages with gender equality and well-being framed within a rights perspective.

Cleland et al (2012) further estimate that if all unmet need is addressed through effective contraception, developing countries can achieve almost a one-third reduction in the number of maternal deaths. Women in developing countries are experiencing such risks is undeniably a major cause of concern and it unambiguously reflects the high global cost of family planning inaction. It

is worth noting that researchers and policymakers are usually preoccupied with the gains or benefits of a specific policy action but have, by and large, neglected the huge costs associated with policy inaction. Such inaction gets reflected in the slow pace of improvement in individual health and family well-being, and through various channels of savings, human capital accumulation and labour productivity, which affects the macroeconomic growth and sustainable development prospects of the country.

A systematic analysis and understanding of the cost of inaction on family planning has considerable relevance for research, advocacy and policymaking. The cost of inaction in family planning affects men and women in terms of not only the ability to plan their families, but also their overall well-being. This includes their ability to continue the education of children and participate in the workforce, their overall earnings, use of health services and ensuring a sustainable environment as there are well-documented complementarities among different actions (Starbird et al 2016). However, there is a dearth of research and analysis to comprehend the cost of family planning inaction in India. This present endeavour of the Population Foundation of India (PFI) is motivated by this elementary concern and aims to fill this gap by estimating the cost of inaction in the area of family planning and to highlight the high opportunity cost paid by society. It is expected that the study findings will support ongoing advocacy efforts of repositioning family planning and placing it as a key priority on the political, social and economic agenda of the country. PFI, in commissioning this study, believes that it will lead to an informed discourse and consensus among the policymakers, champions, the media and civil society on the need to take actions that will help the country to accomplish the SDGs and other development goals by 2030.

## 1.5. Scope and Objectives of the Study

The foregoing section outlines that the cost of family planning inaction can have significant influence over a range of developmental outcomes. In fact, the progress towards each of the 17 SDGs and

national goals is likely to be influenced by our policy approach and commitment towards family planning. However, because of time and resource constraints, a comprehensive analysis of the cost of family planning inaction is beyond the scope of the present effort.

This endeavour aims to examine the influence of family planning inaction on the following five selected dimensions: a) population growth; b) maternal and infant deaths; c) macroeconomic growth and per capita income; d) budgetary implications for NHM; and, e) potential household savings in terms of averted out-of-pocket expenditure on maternal care and child healthcare utilisation.

For analytical purposes, we describe the estimates for two situations: a) Current Trend and b) Policy Trend and present the projections for the period 2016-31. Current trend is defined as the “business as usual” scenario whereby the union and the state governments continue the past strategies and approach towards family planning. In contrast, the policy trend attempts to describe a scenario where the union and the state governments undertake greater efforts in the implementation of the respective population policies. In our case, we have a set of targets envisioned by national and respective state population policies to construct the policy scenario. All policy documents laid down different strategies to achieve those set goals. We do not perceive any lack in those. However, these strategies are not properly monitored for their successful implementation, envisaged outcomes and goals. Implementing agencies were not briefed about corrective measures in a timely manner. This leads to differences in demographic and family planning outcomes across the two scenarios.

Population growth can be examined through various dimensions such as the overall level, growth rates, age-sex distribution, sex-ratios, spatial patterns and social and religious composition. However, the present analysis essentially approaches the projection exercise to obtain the national and state-level total population and child population figures as a critical

input while analysing the other dimensions of the study. The exercise also facilitates a direct comparison of population differentials under current trend and policy trend based on the achievement of proactive replacement level TFR strategies under the national and state-level population policies that were adopted. Maternal and child health is examined through several critical indicators and outcomes which directly or indirectly affect household well-being and socioeconomic development. All these outcomes are affected differently by the family planning approach and policies pursued by the government. For analytical purposes, this study focuses on estimating the total maternal and infant deaths in the country and the selected states under both current and policy scenarios. The study also estimates the total number of pregnancies avoided and the total number of unsafe abortions averted. In addition, a decomposition analysis is presented to ascertain the contribution of fertility decline towards the overall reductions in the IMR and the MMR during the last decade.

Economic growth is a complex phenomenon and is an outcome influenced by a range of local and global factors, inputs and policies. Demographic, health and related factors are inextricably linked to macroeconomic growth and can influence the pace of growth through a variety of channels. It is well established that population growth and age structure have a direct impact on per capita income via channels such as savings, capital accumulation and labour productivity. This study projects the economic growth and per capita income changes expected under the two different scenarios. The policy scenario is based on projected changes in population growth and the associated age structure. In addition, assumptions regarding the educational level are included to capture the favourable impact of reduced population growth on human capital accumulation.

The study also presents the potential budgetary savings under the National Health Mission that can be attributable to a reduced number of pregnancies and childbirth nationally and for the four selected states. It may be noted that a reduced population

growth offers considerable scope for similar budgetary savings across a range of development programmes (such as ICDS and the Mid-Day Meal Scheme). But a comprehensive assessment of the fiscal dimension is presently beyond the scope of the study. Nevertheless, these figures can serve as a benchmark for comprehending the potential savings under various women and child oriented welfare programmes.

Finally, the study presents the potential aggregate household savings for the economy in terms of averted out-of-pocket expenditure on account of maternity care and child healthcare. For the latter subgroup, the analysis covers both inpatient and outpatient care but is restricted to child population aged 0 to 5 years only. It is worth noting that a similar nature of household savings can be realised via reduced requirements for consumption expenditure which can then provide greater resources to households for alternative purposes, including possibilities of higher investments for women and child well-being.

## Overall and Specific Objectives

The broad objectives of the study are as follows:

- To provide an estimate of the costs of inaction in family planning that result in a loss of health and economic well-being for India and for the four selected states of Bihar, Madhya Pradesh, Rajasthan and Uttar Pradesh.
- To inform the advocacy efforts with study findings and evidence to strengthen and give priority to family planning within the country's socio-political and developmental agenda.

The specific objectives of the study are as follows:

- To present the projections for the total population and child population and compare the current trends in vital parameters with those articulated in the national and state population policies.
- To estimate the cost of family planning inaction on measurable health and demographic parameters of India and selected states with a focus on maternal

- and infant deaths, unwanted pregnancies avoided and unsafe abortions averted.
- To quantify the loss to the GDP and per capita income of India and the four selected states based on a comparison of current change and policy trend in demographic and family planning indicators.
  - To compare the potential budgetary savings under the National Health Mission for India and the selected states based on the policy trend derived from the population policy oriented family planning scenario.
  - To discuss the potential household savings in terms of total out-of-pocket expenditure averted on account of reduced numbers of pregnancies and child birth and an associated equivalent reduction in the total health expenditure for maternity care and child healthcare.

## 1.6. Cost of Family Planning Inaction: A Framework

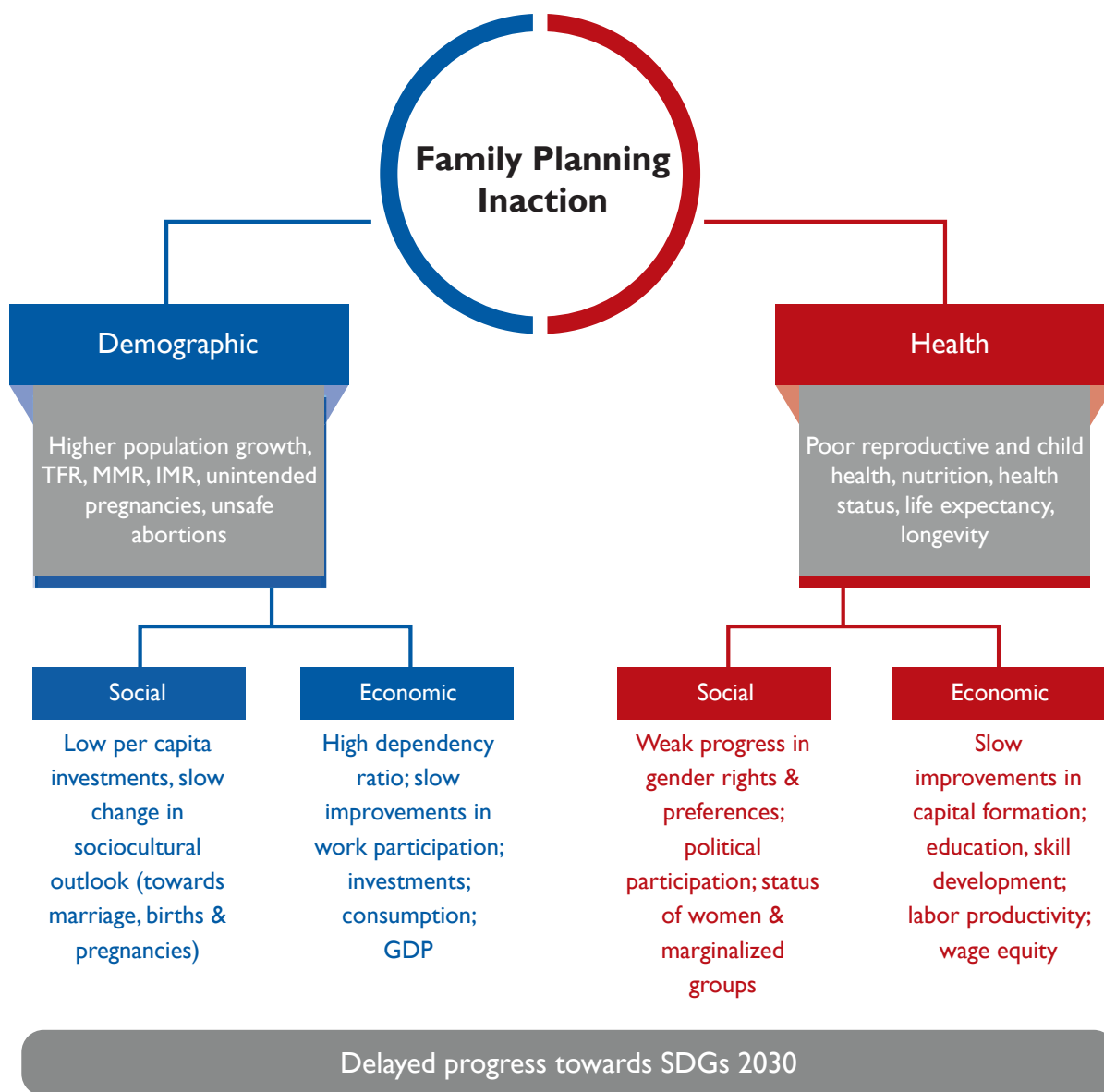
The cost of inaction in family planning can be understood as the loss of potential benefits to individuals, households, economy and society due to specific programme or policy inaction. Family planning inaction can have an adverse impact on the social and economic development of India, particularly the demographically backward states. Many of these implications are apparent in the form of high levels of maternal and child mortality across these states. However, a comprehensive assessment of the consequences of inaction needs to be guided by an analytical framework that outlines the nature of inaction and its implications. This critical concern is receiving increasing attention from researchers and policymakers and can facilitate an impactful understanding of the magnitude and varied dimensions of adversities associated with policy inaction.

Anand et al (2012), among others, attempted to develop a framework to guide such assessments across regions and contexts. This describes the various pathways and channels through which inaction can render a negative impact on individuals,

households, the economy and the society. The quantitative assessment of monetary and non-monetary implications of such inaction is ascertained through realistic assumptions derived from field observations or empirical evidence across similar contexts. Importantly, the cost of inaction approach needs to be distinguished from the conventional cost-benefit analysis that often underperforms in assessing diverse benefits and also fails to fully account for foregone benefits (opportunity costs). In the case of family planning inaction, a number of such benefits in the form of demographic and health outcomes, women empowerment and its impact on economic outcomes, are very clearly discernible. These benefits associated with policy action can be described as constitutive and consequential benefits. The former accrues more directly whereas the latter is not necessarily fully conceivable and can be apparent as unintentional but favourable change.

An important distinction between examining costs and cost-benefit ratios is the relative merit and perspective of comparing benefits across a range of policy options or investment alternatives. It must be cautioned that the selection of a policy action based on expected costs to overcome inaction cannot justify the implicit subjectivity in decision-making. For instance, a decision to invest in action A or action B cannot be arrived at in isolation without the perspective of all those who are affected by both these actions. While cost-benefit assessments may have merit in exploring issues related to the quality of life, they certainly cannot capture the enormity of benefits that may accrue because of lives saved or deaths averted. By extension, any cost-benefit analysis therefore is of little relevance wherever investments are meant for life-saving policy action. A complete assessment of costs and benefits of life saved and its relevance for the individual and the affected groups is therefore necessary to arrive at an overall judgment regarding the cost of inaction. Clearly, in this overall exercise it is important to recognise that a monetary valuation of benefits is not a straightforward task if individual preferences, particularly fundamental rights, including the right to life, are socially valued.

**Figure 1.4: Cost of Inaction in Family Planning: The Conceptual Framework**



Effective family planning policies can have a discernible influence on all the 17 SDGs. The investments on family planning are proven to be effective in terms of returns. For instance, in the cost-benefit analysis by the Copenhagen Consensus, family planning was recognised as the second most effective investment in terms of returns. It will be most appropriate for a developing economy like India to further its investments in family planning and lay the ground for improving the socioeconomic fabric of the nation. Further, the high rate of returns

on family planning investments can also accelerate the economic growth of the nation. But as described in the previous section, this analysis restricts the focus of the cost of inaction analysis to five selected dimensions: a) population growth; b) maternal and infant deaths; c) macroeconomic growth and per capita income; d) budgetary implications for NHM; and, e) potential household savings in terms of averted out-of-pocket expenditure on maternity care and child healthcare utilisation.

Figure 1.4 presents a conceptual framework to align the analysis with the study objectives. Overall, the net benefits from an active family planning scenario vis-à-vis the current trend is denoted as the net impact expected from policy action. This impact can be expected in terms of both direct and indirect channels and will be mediated through demographic factors, which in turn will influence the social and economic determinants underlying broader developmental outcomes.

Family planning policies can directly influence maternal and child health outcomes, particularly morbidity and mortality, thereby immediately contributing towards a reduced population growth. These improvements can lead to changes in economic factors, such as work participation, savings and investments in the economy to render a favourable impact on GDP growth. Further, it is expected that these demographic changes can be instrumental in bringing about social changes. In sum, an active policy environment to promote voluntary and choice-based family planning can make significant contributions towards bettering the society. Moreover, these are intricately linked to the SDGs, global peace, prosperity, gender equality, social justice and women empowerment.

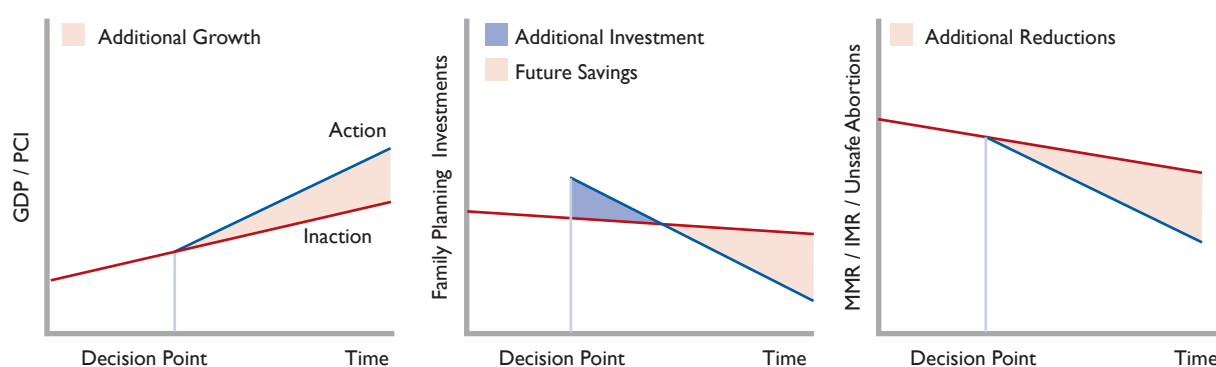
Figure 1.5 also presents a graphical assessment of potential gains associated with timely policy action to promote voluntary and choice-based family

planning. Panel (A) shows that in the absence of effective policies the economy tends to forego additional economic growth. In fact, the magnitude of such losses can significantly increase with time. However, from a public health investment perspective, the government will be required to initially incur an additional expenditure towards family planning policies though the magnitude of such expenses will gradually decline (panel B). Whereas in the absence of such investments, governments will be required to sustain high levels of expense for a long period of time. Finally, from panel (C) it is apparent that timely action can lead to faster reductions in maternal and infant mortality than what is feasible under the business as usual scenario.

## 1.7. Report Outline

The report is presented in six sections: Following the introduction, Section 2 presents the methods, results and limitations of the analysis on the demographic consequences of inaction. Section 3 analyses the economic impact of alternative population growth trajectories. Section 4 outlines the budgetary implications of family planning inaction on the NHM. Section 5 describes the out-of-pocket expenditure incurred by households and potential savings attributable to a reduced fertility rate. Section 6 concludes with policy recommendations.

**Figure 1.5: Benefits of Timely Implementation of Family Planning Policies**



# 2 Demographic Consequences of Inaction

## Inferences based on projection analysis

### 2.1. Motivation

Recognising the importance of maternal health, the United Nations member countries adopted the reduction of the Maternal Mortality Ratio (MMR) to below 70 and universal access to quality reproductive health services by 2030 as a Sustainable Development Goal. The relevance of reducing maternal mortality stems from the fact that the vicious circles of high fertility, early marriages, low income and illiteracy along with prevailing patriarchal and conventional sociocultural perceptions and ideologies have prevented married couples, particularly women, from voluntarily utilising quality family planning services for sexual and reproductive healthcare. A poor status of family planning can have significant adverse consequences on other aspects of development. Generally, women with poor access to and knowledge of family planning services have a higher proportion of unwanted pregnancies and an elevated risk of unsafe abortions.

The first pregnancy at an early age and inadequate birth spacing often poses risks to both maternal and child health and can affect the physical and cognitive outcomes among children. With inadequate provisions and access to family planning services, women constantly live under the shadows of health uncertainty and are exposed to a higher risk of various kinds of sexually transmitted infections and diseases. Consequently, both mother and child fail to realise their full potential and capabilities. In this case, the provision of voluntary family planning services can be instrumental in improving the pace

of empowering women and making the realisation of other SDGs, such as those related to the eradication of poverty, achieving universal education, reducing child mortality and promoting gender equality, a distinct possibility.

From a policy perspective, though the implications are crystal clear, there are certain regions and communities that have been left behind particularly those from economically backward states. Therefore, the emancipation, empowerment and development of the deprived people remain a question of social justice and equity. Against this backdrop, this section applies the cohort-component method<sup>1</sup> to outline the potential demographic consequences of family planning inaction across the high focus and economically backward states of Bihar, Madhya Pradesh, Rajasthan and Uttar Pradesh. The analysis particularly highlights the impact on key demographic indicators such as population growth, maternal and infant deaths, unwanted pregnancies and unsafe abortions. This section concludes by presenting a decomposition analysis to highlight the potential contribution of fertility reduction in the overall decline in the MMR and the IMR.

### 2.2. Data and Methods

#### Population Projections

This study features population projections carried out for the whole of India and the four high priority states of Bihar, Madhya Pradesh, Rajasthan and Uttar Pradesh for two scenarios. These represent two fertility trends which are constructed by taking

<sup>1</sup> When the cohort component method is used as a projection tool, it assumes the components of demographic change, mortality, fertility, and migration, will remain constant throughout the projection period.

the normal course of fertility trajectories and fertility decline if the state or the country follows its respective population policy. For the purpose of projections, the DemProj and FamPlan modules of the Spectrum suite of tools (version 5.571) are used. The Spectrum software mainly uses the “component method” of projection for making population forecasts. The rationale of the component method rests on the undisputable fact that population growth is determined by fertility, mortality and migration rates.

### Inputs and Assumptions

The task of projection primarily requires fixing of the base year and duration of the projection period. For the present analysis, 2001 is being considered as the base year as most of the input data are available for this year and the final year of the projection is being fixed at 2031. The time horizon for the projection is fixed at 30 years in view of the fact that most of the projections used to be medium range (25-30 years) without many hazards in using various assumptions to make projections. Further, it may be noted that any long-term (beyond 30 years) projections can induce biases in the assumptions of fertility, mortality and migration. In addition to this, the timeline for the SDGs is also till 2030. At this point, it is important to mention that information on the other two components (mortality and migration) are to be taken as it is from the respective data sources. Fixing the base year at 2001 also allows the fixing of fertility measures to match the projected population for the year 2011 with the corresponding population from the 2011 Census.

### Base Year Population

The population projection firstly requires information on population distribution and size by age and sex for the base year. For both males and females, the population is then divided into five-year age groups from 0-4 years to 75-79 years. The final age group comprises those people who are aged 80 years and above. The base year populations for

India and the states have been sourced from the Census of India. The base year five-year age group population by sex was taken from the Census, 2001. It is worth mentioning here that, ‘Age Not Stated’ (ANS) counts are equally distributed across all the age groups.

### Total Fertility Rate

The total fertility rate (TFR) is the average number of children that would be born alive to a woman (or a group of women) during her lifetime assuming she will pass through all her childbearing years conforming to the age-specific fertility rates of a given year. Also, the year-wise TFR is to be taken into the Spectrum model for the projection period (2001 to 2031).

The TFRs are sourced from the Sample Registration System (SRS) as one of the inputs for population projection. Time series data for TFRs for all-India and the states are available from the SRS. Additionally, model constants are required to further the projections for which the TFRs are fitted with the Gompertz model. With the help of this, the TFRs are further projected for the projection period beyond 2015. The Gompertz model for TFRs has been fitted separately for the states and the country using Stata software. The equation used is the following double exponential expression:

$$Y = b_0 \times e^{-e^{-(b_1 - b_2 \times X)}}$$

Where,  $b_0$ ,  $b_1$ ,  $b_2$  are model parameters obtained from the known values of  $Y$  and  $X$  for the period 2001 through 2015. The Gompertz curve describes the changes in fertility well and was used by Bhat (undated) and the RGI's<sup>2</sup> expert group projection in 2006. The projections curve was fitted with the differential forms of TFRs using the formula:

$$Y_t = \frac{TFR_t - a}{U - a}$$

Where,  $a$ , is the minimum value of TFR (lower asymptote),  $U$  is its maximum value (upper asymptote) during the time period considered. Bhat

<sup>2</sup>Registrar General of India

(undated) has assumed 1.7 as the lower asymptote for India and the states for projecting populations till 2050. However, for the present analysis, we assumed 1.8 as the lower asymptote since the projection ends in 2031. As previously mentioned, the TFRs are calibrated in order to match total populations between the projected and the actual census count for the year 2011. While using the actual TFRs from the SRSs and other inputs, it was observed that the projected population totals are much lower than the Census population for the year 2011 for all the four states and India. Therefore, Table 2.1 provides the level of calibrations carried out to match total populations for different states and India.

It is important to understand that population projections require a maximum level of precision about the current levels of fertility and mortality. Therefore, any underestimations regarding fertility and mortality information may lead to significant underassessment of future possible scenarios and growth (Bhat, undated). Several studies have supported the evidences of underestimation of fertility rates provided by the SRS: like 7 per cent during 1981-91 by Bhat (2002); two rounds of NFHS (Retherford and Mishra, 2001) data using the own-children method showed that the level of the general fertility rate was higher than the corresponding SRS estimate by 9.6 per cent during

**Table 2.1: Calibrations to Match Total Populations for SELECTED States and India**

State	TFR Calibrated from SRS <sup>^</sup> times	Population Projected, 2011 million	Population Census, 2011 million
Bihar	1.16*	n.c.	n.c.
Madhya Pradesh	1.04	72.74	72.63
Rajasthan	1.02	68.63	68.65
Uttar Pradesh	No adjustments	199.80	199.58
INDIA	1.10	1,210.85	1,210.33

<sup>^</sup>:TFR calibrations carried out on SRS estimates for the period 2001 to 2010 to match total populations for the year 2011.

\*: For Bihar, the TFR calibration took an unprecedented 1.16 times. The Expert Group felt that 2001 should not be considered as the base year for the state. Therefore, 2011 was considered as the base year for the Bihar state population projections.

n.c.: Not calculated

**Table 2.2: Projected Populations for India by Different Agencies for the Year 2025**

Sl. No.	Author/Organisation	Population in 2025 (Millions)
1	World Bank, 1994	1370
2	United Nations, 1998	1330
3	Visaria and Bhat, 1999	1393
4	Population Foundation of India, 1999	1400
5	Dyson and Hanchate, 2000	1381
6	Bhat, 2000	1380 (Optimistic Scenario) 1403 (Realistic Scenario)
7	RGI's Expert Group, 2006	1389
8	PFI & PRB <sup>3</sup> , 2007	1449 (Scenario B in 2026) 1464 (Scenario A in 2026)
9	WPP <sup>4</sup> , 2017 Revision (UNPD <sup>5</sup> )	1451 (Medium variant)
10	PFI (current study), 2017	1419.8 (Current Scenario)

<sup>3</sup>Population Reference Bureau

<sup>4</sup>World Population Prospects

<sup>5</sup>Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat

1978-92 and 6.8 per cent during 1984-99. The input of TFR is required for all the years during the projection period (2001 through 2031).

### Age Distribution of Fertility (%)

The age specific fertility rate (ASFR) has been accessed from NFHS 1998-99 and 2005-06 for India and the states. While projecting beyond 2005/06, it was assumed that the proportion of births is likely to reduce for the age groups 15-19 and 35 and beyond in view of an increase in the age of marriage and more and more women using contraception after completing their desired family size.

### Sex Ratio at Birth

The sex ratio at birth is the number of male births per 100 female births. The input for this indicator is the SRS. India's sex ratio at birth is 111 as per SRS 2015. The sex ratio at birth for India in 2031 was assumed to be 107 and the values for the intermediate years between 2015 and 2031 were interpolated based on the current and assumed values. To make projections for the four states, the value of sex ratio at birth for India for the year 2015 was taken into account assuming that these states will achieve a sex ratio at birth of 111 by 2031.

### Life Expectancy

The SRS provides five-year abridged life tables for India and the states and required inputs have been

accessed from these. Further, the values for male and female were considered from the table below under the "Normal Improvement" scenario to project for future years. These constants are provided by the UN by considering different country scenarios that have experienced demographic transitions.

### Model Life Tables

This is a one-time input that is required throughout the projections. A life table<sup>6</sup> is a table of values based on a series of related functions having to do with survivorship over intervals of time. Spectrum suite allows the selection of the appropriate life table from a list of nine in-built life tables – Coale-Demeny (West, East, North and South) and the United Nations (General, Latin America, Chile, South Asia, and East Asia). However, the selection of an appropriate life table depends on the current levels of IMR matched with the projected IMRs. Thus, for India this study adopts the Coale-Demeny (North), the UN model (Chile) for Bihar, Coale-Demeny (North) for Madhya Pradesh, Coale-Demeny (East) for Rajasthan and Coale-Demeny (North) for Uttar Pradesh.

### Migration

In general, migration refers to the number of migrants moving into (positive numbers) or out (negative numbers) of the area for which the population projection is being prepared. If the

**Table 2.3:** Life Expectancy at Birth for Males and Females for Different Scenarios

Initial Level (e0 in years)	Fast Improvement		Normal Improvement		Slow Improvement	
	Male	Female	Male	Female	Male	Female
60 -62.5	0.50	0.50	0.46	0.50	0.40	0.40
62.5 -65	0.46	0.50	0.40	0.50	0.40	0.40
65 -67.5	0.40	0.50	0.30	0.46	0.30	0.40
67.5 -70	0.30	0.46	0.24	0.40	0.20	0.30
70 -72.5	0.24	0.40	0.20	0.30	0.16	0.24
72.5 -75	0.20	0.30	0.16	0.24	0.10	0.20
75 -77.5	0.16	0.24	0.10	0.20	0.06	0.16

Source: <http://statsmauritius.govmu.org/English/Pages/2000/volumell/popu.htm>

<sup>6</sup> Life tables are tables of data on survivorship and fecundity of individuals within a population

projections are done at national level, it is said to be international migration. However, if the projection area is a region or a city, it is said to be interregional migration. More specifically, the input under this “tab” is that of total net migrants per year and their age distribution, which has been taken from Census 2001. The total number of net migrants (1991 to 2001) was assumed to be steady throughout the projection period for the states and India.

### 2.2.2. FamPlan Module

This model determines the family planning parameters required to meet specific fertility goals. It is a helpful tool to determine the number of family planning users, new acceptors, and commodities required by method as well as sources to achieve a total fertility rate (TFR) goal and given estimates of changes in the other proximate determinants of fertility (i.e., the proportion of women of reproductive age in union, and postpartum infecundability). Given the scope of the current work, inputs and assumptions related to the FamPlan module are to be viewed with limited importance than the inputs and assumptions related to the DemProj module.

## Inputs for FamPlan Module

### Method Mix for Projection Period

A method mix is the percentage of all users who are using a particular method of contraception and therefore these figures should sum to 100 per cent. The source for these inputs is the NFHS. While the method mix for the past years was considered from NFHS-2 to NFHS-3, for future years, the distribution of spacing methods has been increased in view of the government’s efforts to increase their uptake and the introduction of new spacing methods in the basket.

### Proximate Determinants for Projection Period

Proximate determinants are a set of variables which directly impinge on fertility outcomes; these include the proportion of women in sexual union, the duration of the period of inability to

conceive following a birth, and the level and quality of contraceptive practice; and to a lesser degree, the underlying capability to conceive, the levels of induced abortion, and the prevalence of pathological sterility. All values have been taken from the NFHS for the states and India, keeping the same value for the entire projection period.

## Child Survival – Onetime Values

Infant and under-five mortalities are correlated with the prevalence of risky births. Risky births are those that are too closely timed or occur in older women who have had many births. Apart from IMR and the Under-Five Mortality Rates (U5MR), the other four indicators are taken as default values. SRS based values have been considered for IMR and U5MR.

## Impact Rates, Method Attributes and Effectiveness

Under these three “tabs”, most of the values are kept as default values except for the female/male age at sterilisations, which are taken from the NFHS and (one-time) value for MMR from the SRS.

## Scenario Building

To estimate the cost of inaction, the study considered the following two scenarios to project the population – the current scenario and the policy scenario. Following this, the cost of inaction can be estimated by taking into account the outcomes that result as a lack of timely action, i.e., not achieving the policy goals and the population growing exponentially. Thus, the difference between the two population sizes can provide an insight into the cost of inaction. Under the normal scenario, fertility is allowed to move along the SRS values with an appropriate calibration to match the 2011 Census population for the states and India. The calibrated TFR values (from 2001 to 2015) have been fitted with the Gompertz model to estimate the model parameters. The future TFR values (2016 and beyond) have been estimated using this model. However, under the policy scenario, fertility trajectories were extracted from the state or India specific policy documents.

To elaborate, the NPP 2000 document had projected the CBR (from 27.2 in 1997 to 21.0 in 2010), IMR (from 71 in 1997 to 30 in 2010) and TFR (from 3.3 in 1997 to 2.1 in 2010) if the policy was fully implemented. The Uttar Pradesh Population Policy 2000 had projected the following: CBR from 28.2 in 2001 to 18.8 in 2016, IMR from 79.7 in 2001 to 60.8 in 2016, and TFR from 4.0 in 2001 to 2.1 in 2016. The Madhya Pradesh Population Policy 2000 had projected the following: CBR from 31.5 in 1997 to 21.1 in 2011, IMR from 97 in 1997 to 62 in 2011, and TFR from 4.0 in 1997 to 2.1 in 2011. The Rajasthan Population Policy 1999 had projected the following: CBR from 32.1 in 1997 to 18.4 in 2016, IMR from 85 in 1997 to 57 in 2016, and TFR from 4.1 in 1997 to 2.1 in 2016.

For Bihar, we consider the UP Population Policy scenario since the state is yet to adopt any population policy. The TFRs under the policy scenario fitted with the Gompertz curve were calculated by assuming a lower asymptote of 1.6 since fertility dropped much faster than the current scenario. Model parameters have been estimated and further TFRs projected for the period being considered. Thus, we have two sets of scenarios where TFRs are allowed to drop rapidly under the policy scenario, whereas under the current scenario,

the TFRs are following the natural course of decline. All other inputs were kept the same under the two scenarios.

## 2.3. Results

### 2.3.1. Total Population

Table 2.4 presents the projection for the total (male and female) population (all ages) for India and the selected states from 2006 to 2031. Overall, at the country level, the total population under the current trend is projected to be 1368 million and 1486 million in 2021 and 2031 respectively. On the other hand, the projections under the policy scenario show the total population at 1259 million in 2021 and 1337 million in 2031. The absolute difference between the two scenarios is estimated to be 110 million and 149 million in 2021 and 2031 respectively.

In Bihar, the total population is projected to be 125 million and 138.9 million in 2021 and 2031 respectively, under the current trend. However, under the policy trend, it is projected to be 107.6 million and 114.9 million in 2021 and 2031, respectively. The difference between the projected populations under the two trends in Bihar is

**Table 2.4:** Projected Total Population (in million), India and Selected States

Year	Scenarios	2006	2011	2016	2021	2026	2031
India	Current Trend	1122	1210	1294	1368	1432	1486
	Policy Trend	1093	1150	1205	1259	1304	1337
	Difference	29	61	89	110	127	149
Bihar	Current Trend	93.3	104.0	115.4	125.0	132.3	138.9
	Policy Trend	90.5	97.0	102.0	107.6	111.6	114.9
	Difference	2.8	7.0	12.6	17.4	20.8	24.0
Rajasthan	Current Trend	62.5	68.6	74.8	80.3	84.9	88.8
	Policy Trend	62.3	67.9	72.8	77.2	80.9	83.8
	Difference	0.2	0.7	2.0	3.1	4.0	5.0
Madhya Pradesh	Current Trend	66.4	72.7	79.3	85.3	90.4	95.0
	Policy Trend	65.0	69.0	72.5	75.7	78.4	80.8
	Difference	1.4	3.8	6.8	9.7	12.0	14.2
Uttar Pradesh	Current Trend	182	199.8	216.8	231.1	242.5	252.0
	Policy Trend	179.0	190.9	200.9	208.5	215.1	220.7
	Difference	3.4	8.9	15.9	22.6	27.5	31.4

**Table 2.5: Projected Growth Rate of Total Population, India and Selected States (in %)**

Year	Scenarios	2006	2011	2016	2021	2026	2031
India	Current Trend	1.81	1.58	1.39	1.15	0.92	0.76
	Policy Trend	1.24	1.05	0.97	0.89	0.72	0.50
	Difference	0.57	0.54	0.42	0.26	0.20	0.26
Bihar	Current Trend	2.48	2.30	2.21	1.65	1.18	0.99
	Policy Trend	1.81	1.45	1.20	0.93	0.73	0.61
	Difference	0.67	0.85	1.00	0.72	0.45	0.38
Rajasthan	Current Trend	1.81	1.58	1.39	1.15	0.92	0.76
	Policy Trend	1.24	1.05	0.97	0.89	0.72	0.50
	Difference	0.57	0.54	0.42	0.26	0.20	0.26
Madhya Pradesh	Current Trend	2.01	1.91	1.81	1.52	1.19	1.00
	Policy Trend	1.53	1.23	1.02	0.88	0.73	0.59
	Difference	0.47	0.68	0.79	0.63	0.46	0.41
Uttar Pradesh	Current Trend	2.00	1.86	1.70	1.32	0.99	0.78
	Policy Trend	1.59	1.28	1.04	0.76	0.63	0.52
	Difference	0.41	0.58	0.66	0.56	0.36	0.26

estimated to be 17.4 million in 2021, 20.8 million in 2026 and 24.0 million in 2031.

Similarly, in Rajasthan, the total population projected under the current trend exceeds projections under the policy trend by 3.1 million, 4.0 million and 5.0 million for 2021, 2026 and 2031 respectively. The projected difference between populations under the two trends for Madhya Pradesh is 9.7 million for 2021, 12 million for 2026 and 14.2 million for 2031. In Uttar Pradesh, the projected population under the current trend is 231.1 million in 2021 and 252.0 million in 2031, which is 22.6 million and 31.4 million higher than projections under the policy trend.

The total population in India under the current scenario is projected to grow at 0.92 and 0.76 per cent per annum between 2021 to 2026 and 2026 to 2031, respectively (Table 2.5). Whereas, under the policy scenario, the projected annual growth rate of population is 0.72 per cent between 2021 and 2026 and 0.50 per cent between 2026 and 2031.

The annual growth rate of the population in Bihar between 2026 and 2031 is projected to be 0.99 and 0.61 per cent under the current and policy scenarios, respectively. In Rajasthan, the annual growth rate of the population under the current

trend is estimated to be 0.92 and 0.76 per cent for 2021-2026 and 2026-31, respectively. It is projected to be 0.72 and 0.50 per cent respectively, under the policy scenario.

Similarly, in Madhya Pradesh, the population under the current trend is projected to grow at 1.15, 0.92 and 0.76 per cent annually for 2016-2021, 2021-2026 and 2026-2031, respectively. However, under the policy trend, it is projected to grow at 0.88 per cent for 2021-2026, 0.73 per cent for 2021-2026 and 0.59 per cent for 2026-2031. In Uttar Pradesh, the projections show 0.99 and 0.78 per cent annual growth in the total population under the current trend and 0.63 and 0.52 per cent under the policy trend for 2021-2026 and 2026-31, respectively.

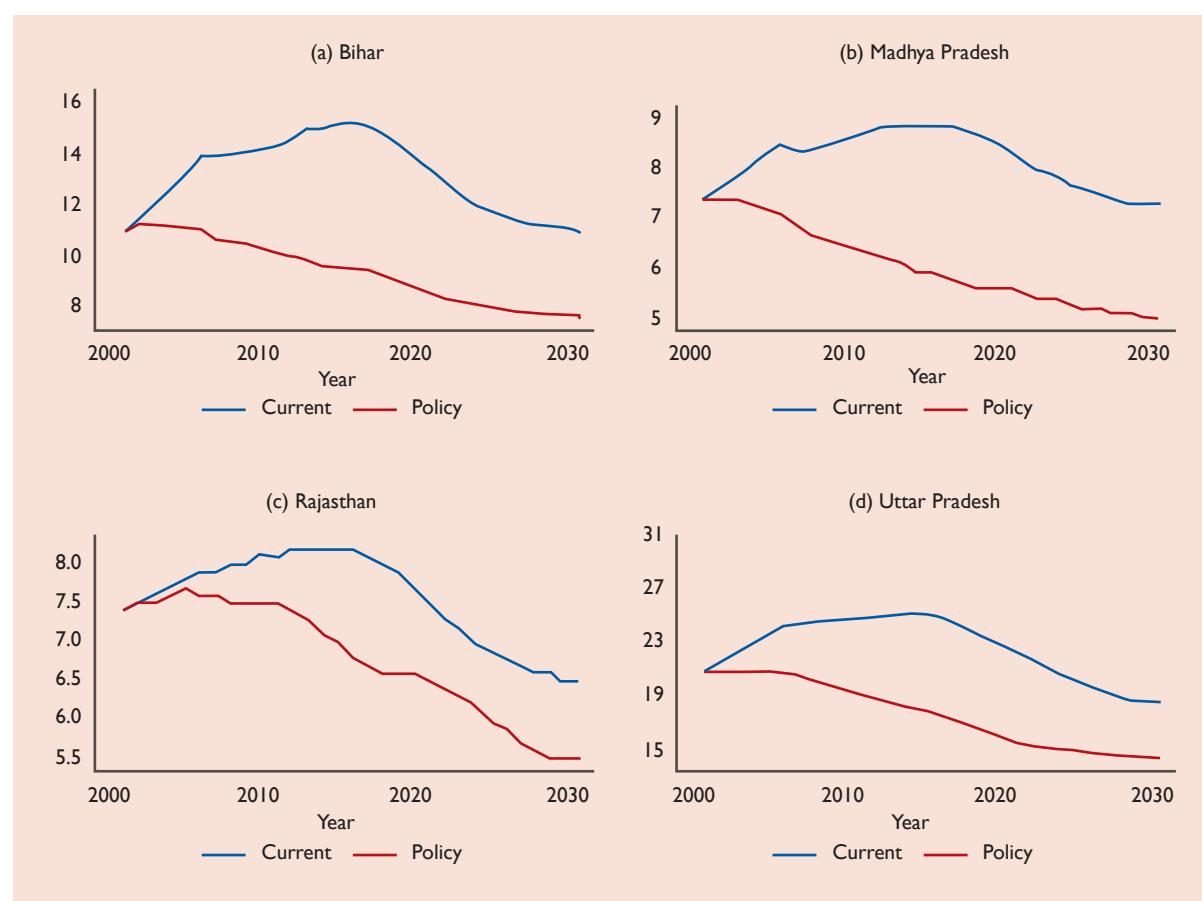
### 2.3.2. Child Population (0-4 years)

Table 2.6 presents child populations estimated under the current and policy trends from 2001 to 2031 for India and the selected states. The total child population in India is projected to be 117.6 million, 109.5 million and 104.8 million under the current trend in 2021, 2026 and 2031, respectively. The projected child population under the policy trend is 96.5 million in 2021, 91.2 million in 2026 and 82.1 million in 2031.

**Table 2.6:** Projected Child Population (in million), India and Selected States

Year	Scenarios	2006	2011	2016	2021	2026	2031
India	Current Trend	128.4	128.0	125.4	117.6	109.5	104.8
	Policy Trend	99.3	95.9	96.5	96.5	91.2	82.1
	Difference	29.1	32.1	28.9	21.1	18.3	22.7
Bihar	Current Trend	13.9	14.3	15.3	13.5	11.6	11.0
	Policy Trend	11.1	10.1	9.5	8.7	8.0	7.7
	Difference	2.8	4.2	5.7	4.8	3.5	3.3
Rajasthan	Current Trend	7.8	8.1	8.2	7.7	6.9	6.5
	Policy Trend	7.7	7.5	7.0	6.6	6.0	5.5
	Difference	0.2	0.6	1.3	1.1	0.9	1.0
Madhya Pradesh	Current Trend	8.5	8.7	8.9	8.4	7.6	7.3
	Policy Trend	7.1	6.4	5.9	5.6	5.2	5.0
	Difference	1.4	2.3	3.1	2.8	2.4	2.3
Uttar Pradesh	Current Trend	24.1	24.7	25.0	22.6	19.9	18.4
	Policy Trend	20.7	19.2	17.8	15.7	14.8	14.3
	Difference	3.4	5.6	7.2	6.9	5.0	4.0

**Figure 2.1:** Projected Child Population under Current and Policy Scenario (in million)



In Bihar, the total child population under the current trend is projected to be higher than the population under the policy trend by 4.8 million in 2021, 3.5 million in 2026 and 3.3 million in 2031. Further, the child population in Rajasthan is estimated to be 6.9 million and 6.5 million under the current scenario, and 6.0 million and 5.5 million under the policy scenario for 2021 and 2031, respectively.

The projected child population for Madhya Pradesh under the current and normal trend is 7.3 million and 5.0 million in 2031. The difference between the projected populations under these two trends is 2.4 million and 2.3 million for 2026 and 2031, respectively. The projected child population in Uttar Pradesh under the current trend exceeds the population under the policy trend by 6.9 million in 2021, 5.0 million in 2026 and 4.0 million in 2031. The child population for Uttar Pradesh in 2031 is projected to be 18.4 million and 14.3 million under the current and policy trends, respectively.

The trends of projected child population for the four states are shown in Figure 2.1. It is clear that the projected child population under the policy scenario is significantly lower than the population under the current scenario. However, as the fertility rates reduced in the future, the difference between

the projections made under the two trends are narrowed from 2021 to 2031. In all four states, the projections under the current scenario are higher than estimations made under the policy scenario. It can be observed that the trend of the child population projected under the current scenario shows an upward trend till 2018 and then downward up to 2030, whereas under the policy scenario, a smooth downward trend can be observed.

Similar observations are apparent from projections for Madhya Pradesh, but the difference between the estimations under the current and policy trends is much higher in this case. Further, in Rajasthan, the gap between the projections under the two scenarios is widening after 2025. In Uttar Pradesh, the projections under the policy trend are much lower than those under the current trend.

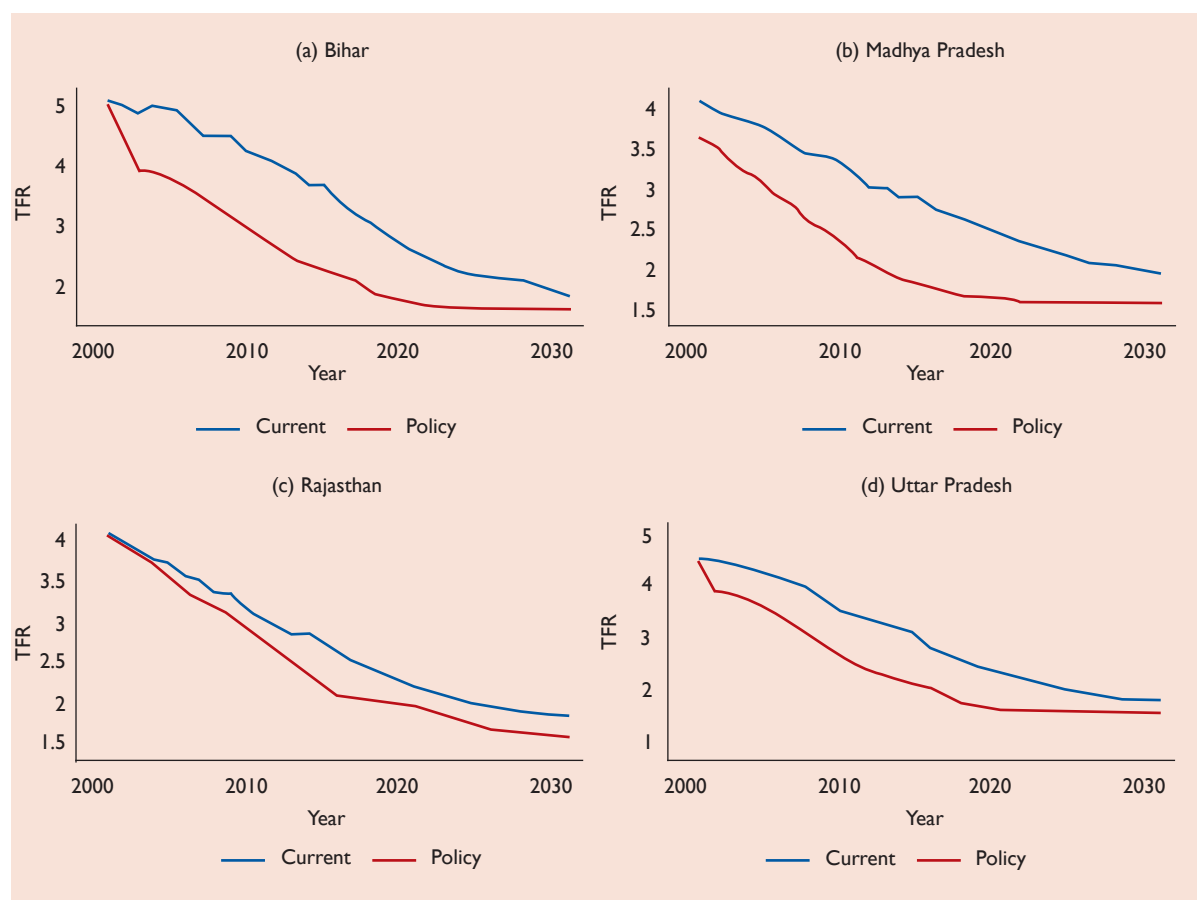
### 2.3.3. Total Fertility Rate

The projections for the total fertility rate for India and the selected states are presented in Table 2.7. Estimates show that the TFR projected under the current trend in India is projected to be 2.1 in 2021, 1.9 in 2026 and 1.8 in 2031. On the other hand, the TFR under the policy trend is estimated to be 1.8,

**Table 2.7: Projected Total Fertility Rate, India and Selected States**

Year	Scenarios	2006	2011	2016	2021	2026	2031
India	Current Trend	3.1	2.7	2.4	2.1	1.9	1.8
	Policy Trend	2.3	2.0	1.9	1.8	1.8	1.7
	Difference	0.8	0.7	0.5	0.3	0.2	0.1
Bihar	Current Trend	4.8	4.2	3.4	2.6	2.2	1.9
	Policy Trend	3.7	2.8	2.2	1.7	1.6	1.6
	Difference	1.2	1.4	1.3	0.9	0.6	0.3
Rajasthan	Current Trend	3.6	3.1	2.6	2.2	2.0	1.9
	Policy Trend	3.4	2.8	2.1	2.0	1.7	1.6
	Difference	0.2	0.3	0.5	0.2	0.3	0.3
Madhya Pradesh	Current Trend	3.7	3.2	2.8	2.4	2.1	2.0
	Policy Trend	2.9	2.2	1.8	1.7	1.6	1.6
	Difference	0.8	1.0	1.0	0.7	0.5	0.4
Uttar Pradesh	Current Trend	4.2	3.5	2.9	2.3	2.0	1.8
	Policy Trend	3.5	2.6	2.1	1.7	1.6	1.6
	Difference	0.7	0.9	0.8	0.7	0.4	0.2

**Figure 2.2: Projected TFR under Current and Policy Scenarios, Selected States**



1.8 and 1.7 for 2021, 2026 and 2031, respectively. Thus, the TFR projected under the current trend is projected to be higher than the TFR estimated under the policy scenario by 0.2 and 0.1 per woman for 2026 and 2031, respectively.

For 2031, the TFR in Bihar under the current and policy trends is projected to be 1.9 and 1.6, respectively. The difference between the TFR projected under the current and policy trends is 0.9, 0.6 and 0.3 per woman for 2021, 2026 and 2031 respectively. In Rajasthan, the TFR projected under the current trend is 2.2 in 2021, 2.0 in 2026 and 1.9 in 2031. However, under the policy scenario, it is projected to be 2.0, 1.7 and 1.6 for 2021, 2026 and 2031, respectively.

Furthermore, the TFR in Madhya Pradesh under the current trend is projected to be 2.4 in 2021, 2.1 in 2026 and 2.0 in 2031. Under the policy trend, it is

estimated to be 1.7 in 2021, 1.6 in 2026 and 2031. Similarly, in Uttar Pradesh, the difference between the TFR projected under the current and policy trends is 0.7, 0.4 and 0.2 per woman in 2021, 2026 and 2031, respectively.

Figure 2.2 presents the trends in the total fertility rate projected from 2001 to 2031 under the current and policy trends for India and the four states respectively. These show a noticeable difference between the TFR estimated under the two scenarios with the projected decrease being higher under the current scenario.

### 2.3.4. Total Pregnancies

Estimates regarding total pregnancies projected under the current and policy trends for India and the four states are depicted in Table 2.8. Overall, the total number of pregnancies under the current

**Table 2.8: Projected Total Pregnancies and Births (in millions), India and Selected States**

States	Scenarios	2001		2011		2021		2031	
		P*	B*	P*	B*	P*	B*	P*	B*
India	Current Trend	39.4	27.4	40.5	26.6	37.1	23.5	34.7	21.2
	Policy Trend	33.5	22.4	33.0	20.1	32.1	19.8	27.2	16.2
	Difference	5.9	5.0	7.5	6.5	5.0	3.7	7.5	5.0
Bihar	Current Trend	3.4	3.0	3.6	3.1	3.0	2.6	2.5	2.2
	Policy Trend	3.4	3.0	2.4	2.1	2.0	1.7	1.8	1.6
	Difference	0.0	0.0	1.2	1.1	1.0	0.9	0.7	0.6
Rajasthan	Current Trend	2.0	1.7	2.0	1.7	1.7	1.5	1.5	1.3
	Policy Trend	1.9	1.7	1.8	1.6	1.6	1.4	1.3	1.1
	Difference	0.0	0.0	0.2	0.1	0.1	0.2	0.2	0.2
Madhya Pradesh	Current Trend	2.2	1.9	2.2	1.9	1.9	1.7	1.7	1.5
	Policy Trend	1.9	1.7	1.5	1.3	1.3	1.1	1.2	1.0
	Difference	0.2	0.2	0.7	0.6	0.6	0.5	0.6	0.5
Uttar Pradesh	Current Trend	5.9	5.2	6.1	5.3	5.1	4.5	5.2	3.8
	Policy Trend	5.9	5.1	4.6	3.9	5.4	3.2	4.8	2.9
	Difference	0.1	0.1	1.04	1.4	-0.3	1.3	0.3	0.8

Note: P\* Number of Pregnancies and B\* refers to Number of Births.

scenario are estimated to be 37.1 million and 34.7 million for 2021 and 2031, respectively. However, under the policy trend, they are projected to be 32.1 million in 2021 and 27.2 million in 2031.

### 2.3.5. Total Births

The estimates regarding total childbirths for India and the four states are presented in Table 2.8. Under the current trend, the total births in India are projected to be 23.5 million and 21.2 million for 2021 and 2031, respectively. However, the births under the policy trend are estimated be 19.8 million in 2021 and 16.2 million in 2031. For Bihar, the total births are projected to decrease from 2.6 to 2.2 million under the current scenario and from 1.7 to 1.6 million under the policy scenario for 2021 and 2031, respectively.

Further, the number of births in Rajasthan are estimated to be 1.5 million in 2021 and 1.3 million in 2031 under the current scenario, whereas under the policy trend, they are projected to be 1.4 and 1.1 million in 2021 and 2031, respectively. The difference between the total births projected under the two trends in Madhya Pradesh is 0.5 million. for 2021 and 2031. Similarly, in Uttar Pradesh, the

number of births projected under the current trend is 1.3 million and 0.8 million higher than the births projected under the policy trend for 2021 and 2031, respectively.

### 2.3.6. Infant Mortality Rate

The risk adjusted infant mortality rate projected under the current scenario for India is 41 and 35.8 per thousand live births for 2021 and 2031, respectively (Table 2.9). Under the policy scenario, it is projected to decrease from 52 per thousand in 2006 to 40 per thousand in 2021 and 37.8 per thousand in 2031.

In Bihar, the IMR is projected to decrease from 36 per thousand in 2016 to 22 per thousand in 2021 and further still to 12 per thousand in 2031 under the current scenario. The projected IMR under the policy scenario is 7 per thousand for 2021 and 8 per thousand for 2031. Similarly, in Rajasthan, the projected IMR under the current trend is 34.8 and 29.3 per thousand against 31.1 and 24.7 per thousand under the policy scenario for 2021 and 2031, respectively.

**Table 2.9: Projected Risk Adjusted Infant Mortality Rate (per 1000 live births), India and Selected States**

Year	Scenarios	2006	2011	2016	2021	2026	2031
India	Current Trend	57.0	50.6	45.2	41.0	37.7	35.8
	Policy Trend	52.0	45.9	41.9	40.0	38.6	37.8
	Difference	5.0	4.7	03.3	1.0	-0.9	-2.00
Bihar	Current Trend	57.0	47.0	36.0	22.0	16.0	12.0
	Policy Trend	37.0	23.0	14.0	07.0	07.0	08.0
	Difference	20.0	24.0	22.0	15.0	9.0	4.0
Rajasthan	Current Trend	56.9	49.4	41.7	34.8	31.0	29.3
	Policy Trend	54.9	45.5	32.9	31.1	26.2	24.7
	Difference	2.0	3.9	8.8	3.7	4.8	4.6
Madhya Pra-desh	Current Trend	73.7	60.8	49.8	42	36.1	30.8
	Policy Trend	47.1	40.1	34.1	29.8	26.4	23.4
	Difference	26.6	20.7	15.7	12.2	9.7	7.4
Uttar Pradesh	Current Trend	61.0	46.0	41.0	31.0	24.0	17.0
	Policy Trend	47.0	27.0	24.0	15.0	15.0	12.0
	Difference	14.0	19.0	17.0	16.0	9.0	5.0

**Table 2.10: Projected Averted Maternal Deaths (in 000's), India and Selected States**

Year	Scenarios	2006	2011	2016	2021	2026	2031
India	Current Trend	55.99	66.63	75.76	84.01	91.23	96.51
	Policy Trend	55.27	65.56	73.50	76.82	78.43	79.19
	Difference	0.72	1.07	2.26	7.19	12.8	17.32
Bihar	Current Trend	4.15	5.57	7.27	9.63	11.45	13.25
	Policy Trend	5.81	7.88	9.53	10.93	11.51	11.76
	Difference	1.66	2.31	2.27	1.30	0.06	-1.49
Rajasthan	Current Trend	4.68	5.93	7.17	8.40	9.39	10.13
	Policy Trend	4.83	6.28	8.01	8.75	9.76	10.24
	Difference	0.16	0.35	0.84	0.35	0.37	0.12
Madhya Pradesh	Current Trend	4.95	5.87	6.90	8.00	9.07	9.96
	Policy Trend	5.40	6.78	7.87	8.46	8.81	8.92
	Difference	0.44	0.92	0.97	0.45	-0.26	-1.04
Uttar Pradesh	Current Trend	7.07	10.52	12.35	16.19	19.81	24.07
	Policy Trend	8.91	13.34	15.32	18.66	20.39	22.45
	Difference	1.84	2.82	2.96	2.48	0.58	-1.62

In Madhya Pradesh, the projected IMR under the current scenario is 12.2 per thousand and 7.4 per thousand higher than estimates under the policy scenario. In Uttar Pradesh, the IMR under the current scenario is projected to decrease from

61 per thousand in 2006 to 31 in 2021 and 17 per thousand in 2031. However, under the policy situation, the IMR is projected to decline from 47 per thousand to 15 per thousand in 2021 and 12 per thousand in 2031.

### 2.3.6. Maternal and Infant Deaths Averted

The risk adjusted infant mortality rate projected under the current scenario for India is 41 and 35.8 per thousand live births for 2021 and 2031, respectively (Table 2.10). Under the policy scenario, it is projected to decrease from 52 per thousand in 2006 to 40 per thousand in 2021 and 37.8 per thousand in 2031. In Bihar, the IMR is projected to decrease from 36 per thousand in 2016 to 22 per thousand in 2021 and further to 12 per thousand in 2031 under the current scenario. The projected IMR under the policy scenario in Bihar is 7 per thousand for 2021 and 8 per thousand for 2031. Similarly, in Rajasthan, the projected IMR under the current trend is 34.8 and 29.3 per thousand against 31.1 and 24.7 per thousand under the policy scenario for 2021 and 2031, respectively. In Madhya Pradesh, the projected IMR under the current scenario is 12.2 per thousand and 7.4 per thousand higher than estimates under the policy scenario. In Uttar Pradesh, the IMR under the current scenario is projected to decrease from 61 per thousand in 2006 to 31 in 2021 and 17 per thousand in 2031. However, under the policy situation, the IMR is projected to decline from 47 per thousand to 15 per thousand in 2021 and 12 per thousand in 2031.

### 2.4. Role of Fertility Decline in Reducing Maternal and Infant Deaths

This analysis is based on data from the Sample Registration System (SRS), Census of India and uses the decomposition technique suggested by Jain (2011). To estimate the number of maternal and infant deaths that were averted in the index year (2011), we first estimated the actual incidence of the total number of maternal deaths using the observed level of fertility and the MMR (Maternal Mortality Ratio) in 2011, factoring in the change observed in both fertility and MMR between 2001 and 2011. We have used the Crude Birth Rate (CBR) as an indicator of fertility. Further, total live births were calculated as the product of CBR and population size. The potential number of maternal deaths between 2001 and 2011 were estimated under three counterfactual scenarios related to changes in fertility and MMR: (1) No change in fertility and MMR, (2) decline in fertility and no change in MMR, and (3) decline in MMR and no change in fertility.

Similarly, the potential number of infant deaths was estimated using this approach under the following three scenarios: (1) No change in fertility and IMR, (2) decline in fertility and no change in IMR, and (3) decline in IMR and no change in fertility.

The gross effect of a change in fertility and MMR on the potential number of maternal and infant lives saved in 2011 has been calculated by taking the difference between the actual maternal deaths observed in 2011 and the potential number of maternal deaths estimated for 2011 under the different scenarios. The difference between the potential number of maternal deaths reflects the gross effect of MMR on the potential number of lives saved. Similarly, the gross effect of a decline in fertility on the potential number of maternal lives saved in 2011 has been estimated by subtracting the potential number of maternal deaths estimated in Scenario 3 from the number of deaths estimated under Scenario 1. To estimate the net effect of fertility and MMR decline on the number of maternal lives saved, the joint effect (overlap) of a decline in both was then calculated. Therefore, the net effect of these components on the number of maternal lives saved in 2011 can be segregated as those: Attributable to fertility decline, attributable to MMR decline, and attributable to both fertility and MMR decline jointly. A similar approach was adopted to decompose the potential number of infant lives saved by replacing the MMR with the IMR.

The combined effect of both fertility and MMR reductions on the potential number of maternal lives saved can be decomposed by approaching any of the following three pathways: Fertility declines cause a decline in MMR, MMR declines reduce fertility, or a combination of the two. An increase in income and educational level, a better standard of living, and a spread of health services and awareness can simultaneously lead to both a fertility decline and a decrease in MMR. Although there is no empirical evidence to support the suggestion that a fertility decline can cause a reduction in the MMR, it is a commonly accepted idea that because of associated changes in age-parity and composition of births, fertility decline can lead to an MMR reduction, even if the age and parity specific MMR remains constant (Jain 2011). However, there is no known mechanism that shows whether an MMR decline has any effect

on fertility reduction. The overlap effect is likely to elicit the share of effect of fertility reduction on the potential number of lives saved that is realised through changes in the composition of births.

Finally, the net effect of an MMR decline reflects that proportion of potential maternal lives saved, a result of safe motherhood initiatives like the Janani Suraksha Yojana (JSY), which indicate institutional deliveries, skilled medical staff and improved obstetric care services. On the other hand, the net effect of fertility decline reflects the share of maternal lives saved, which is the result of a decrease in the annual number of live births. A similar approach has been adopted to estimate the net effect of fertility and IMR decline on the potential number of infant lives saved.

### 2.4.1. Potential Number of Maternal Lives Saved

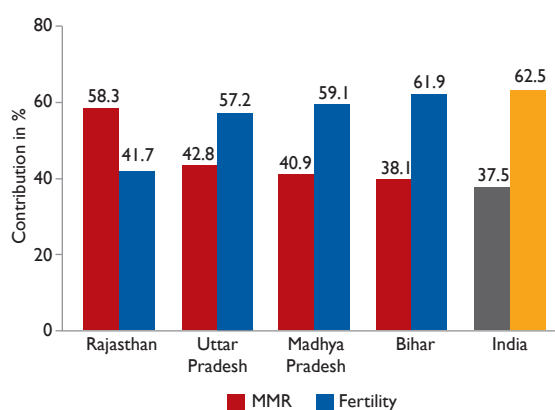
The potential number of maternal lives saved as the result of a decline in fertility and MMR between 2001 and 2011 for India is depicted in Table 2.11. It is worth mentioning here the crude birth rate (CBR) is used as an indicator for fertility changes. In India, the estimates from the first scenario with no changes in fertility and MMR show approximately 138461 maternal deaths for India during 2001 to 2011. On the other hand, about 44087 maternal deaths actually occurred with a decline in fertility and MMR.

Therefore, observed declines in both fertility and MMR potentially saved 94373 maternal lives. Further, about 37.5 per cent (35376) of maternal lives saved can be attributed to safe motherhood programmes and the remaining 62.5 per cent (32733) to fertility decline; out of which, approximately 35 per cent are the result of a decline in the number of births and 27 per cent to age-parity composition of births.

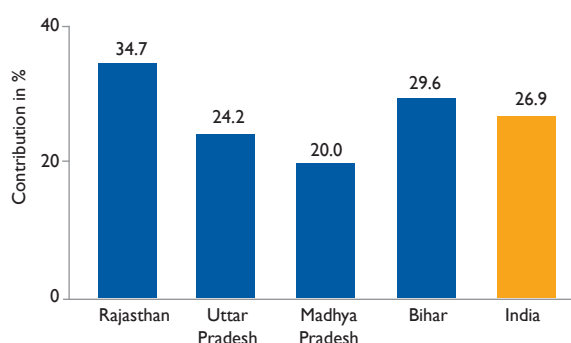
In Bihar, the contribution of fertility and MMR reduction on the potential number of maternal lives saved is about 38 per cent and 62 per cent respectively (Table 2.12). The contribution of fertility reduction on the potential number of

maternal deaths averted is relatively lower (41.6 per cent) and the contribution of safe motherhood initiatives, higher (58.4 per cent) in Rajasthan (Table 2.13).

**Figure 2.3: Contribution of MMR and Fertility Reductions on the Potential Number of Maternal Deaths Averted in 2011, India and Selected States**



**Figure 2.4: Contribution of Decrease in Live Births on the Potential Number of Maternal Lives Saved in 2011, India and Selected States**



Similarly, 59.1 per cent of maternal deaths averted in Madhya Pradesh can be attributed to fertility reduction, out of which, 30 per cent is ascribed to a reduction in live births (Table 2.14). In Uttar Pradesh, both fertility and MMR reduction respectively contribute to 57.2 and 42.8 per cent of potential maternal deaths averted (Table 2.15).

Further it is evident from Figure 2.3, that except for Rajasthan, the effect of fertility reduction is higher

than the effect of a decline in MMR on the potential number of maternal lives saved in all the states as well as India. Across selected states, the effect of fertility reduction on potential maternal lives saved is highest, whereas the effect of safe motherhood is highest in Rajasthan. Figure 2.4 shows the percentage contribution of a decline in the number of live births on the potential number of maternal lives saved. It can be observed that Rajasthan reflects the highest contribution with about 35 per cent of maternal lives saved, which can be attributed to a decrease in live births.

#### 2.4.2. Potential Number of Infant Lives Saved

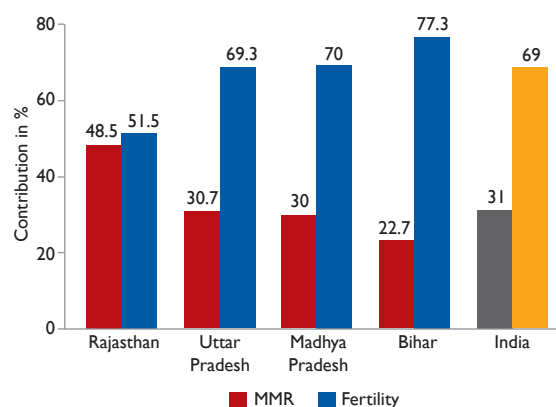
Table S2.6 (Annexure A) presents estimates regarding the contribution of fertility and IMR decline on the potential number of infant lives saved between 2001 and 2011 for India. The estimated number of infant deaths in the first scenario with no change in the CBR and IMR is about 30360, whereas the actual number of infant deaths observed is 11615. Altogether, about 18000 infant lives were potentially saved during this period. Overall, about 69 per cent of infant lives saved are attributable to fertility reduction and the remaining 31 per cent can be ascribed to improved conditions for childbirth as a result of several initiatives on maternal and child healthcare.

In Bihar, the contribution of fertility reduction on the potential number of infant lives saved is estimated to be about 77 per cent, out of which, 54 per cent was due to a decrease in live births (Table S2.7). The remaining 23 per cent of infant deaths averted is attributed to a decline in IMR through the provision of improved health facilities. Similarly, 51 per cent of the infant lives saved in Rajasthan is attributed to fertility reduction and 49 per cent to an improved health environment and facilities which lead to a decline in IMR (Table S2.8). In Madhya Pradesh, almost 70 per cent of infant deaths averted are the result of fertility reduction and 30 per cent, the result of a decline in IMR (Table S2.9). In Uttar Pradesh, the net effect of fertility reduction and a decline in IMR on the potential infant deaths averted are 69 and 31 per cent respectively (Table S2.10).

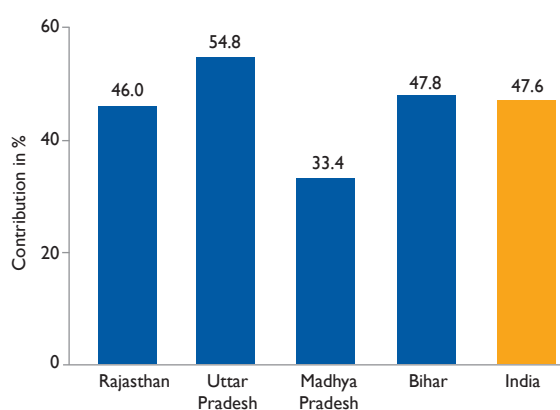
The effect of a decline in IMR and fertility on the potential number of infant lives saved is depicted

in Figure 2.3. The effect of fertility reduction on the potential number of maternal deaths averted is higher as compared to the effect of a decline in IMR across all selected states and India as well. Further, the effect of fertility reduction on the number of maternal lives saved is highest in Bihar. Evidently, the effect of a decline in live births on the potential number of maternal lives saved is estimated to be highest in Rajasthan and lowest in Madhya Pradesh (Figure 2.5). Figure 2.6 shows the

**Figure 2.5: Contribution of IMR and Fertility Reductions on the Potential Number of Infant Deaths Averted in 2011, India and Selected States**



**Figure 2.6: Contribution of a Decrease in Live Births on the Potential Number of Infant Lives Saved in 2011, India and Selected States**



effect of a decrease in live births on the potential number of infant deaths averted in India and selected states. Clearly, the effect of a decrease in live births is estimated to be highest in Uttar Pradesh and lowest in Madhya Pradesh.

**Table 2.11: Cumulative Maternal Deaths and Unsafe Abortions Averted per 100,000 Live Births between 2001 and 2031, India and Selected States**

States	Maternal Deaths Averted		Unsafe Abortions Averted	
	Current	Policy	Current	Policy
Bihar**	455	321	58589	58762
Rajasthan	447	525	45407	53296
Madhya Pradesh	401	584	47190	68631
Uttar Pradesh	280	412	30707	45192
India	292	343	49277	58266

\*\*The estimates for Bihar are from 2011 to 2031.

### 2.4.3. Cumulative Maternal Deaths and Unsafe Abortions Averted

Table 2.11 depicts the cumulative sum of maternal deaths averted per 100,000 live births under the current and policy trends between 2001 and 2031. Overall, the projected total number of maternal deaths averted estimated under the current trend is 292 per 100,000 births, whereas under the policy trend, it is projected to be 343 per 100,000 births. Similarly, 525 deaths per 100,000 births are projected to be saved in Rajasthan under the policy trend against 447 per 100,000 births estimated under the current scenario. Interestingly, the estimated cumulative number of maternal deaths averted under the policy trend is almost double of those estimated under the current trend for Uttar Pradesh.

Information regarding the total number of unsafe abortions averted per 100,000 births is presented in Table 2.11. At the national level, cumulatively, 49277 unsafe abortions per 100,000 births are projected to be saved under the current scenario. However, under the policy scenario, it is projected to be higher at 58266 per 100,000 births. In Rajasthan, the total number of infant deaths averted between 2001 and 2031 is projected to be 45407 and 53296 per 100,000 births under the current and policy scenarios, respectively. Similarly, in Uttar Pradesh, the difference between the cumulative infant deaths averted under the current and policy trends is almost 14485 per 100,000 births.

## 2.5. Conclusion

Overall, at the national level, the total population under the current trend is projected to be 1368 million and 1486 million in 2021 and 2031, respectively. On the other hand, the projections under the policy scenario show the total population at 1259 million in 2021 and 1337 million in 2031. The absolute difference between the two scenarios is estimated to be 110 million and 149 million in 2021 and 2031, respectively.

The total population in India under the current scenario is projected to grow at 0.92 per cent and 0.76 per cent per annum between 2021 to 2026 and 2026 to 2031 respectively (Table 2.5). Under the policy scenario, the projected annual growth rate of the population is 0.72 per cent between 2021 and 2026 and 0.50 per cent between 2026 and 2031.

The total child population in India is projected to be 117.6 million, 109.5 million and 104.8 million under the current trend in 2021, 2026 and 2031, respectively. Under the policy trend, this is projected to be 96.5 million in 2021, 91.2 million in 2026 and 82.1 million in 2031.

The projections for the total fertility rate for India and selected states are presented in Table 2.7. The estimates show that the TFR projected under the current trend in India is shown to be 2.1 in 2021, 1.9 in 2026 and 1.8 in 2031. On the other hand, the TFR under the policy trend is estimated to be 1.8, 1.8 and 1.7 for 2021, 2026 and 2031, respectively.

Overall, the total number of pregnancies under the current scenario in India are estimated to be 37.1 millions and 34.7 million for 2021 and 2031, respectively. However, under the policy trend, they are projected to be 32.1 million in 2021 and 27.2 million in 2031.

Under the current trend, total births in India are projected to be 23.5 million and 21.2 million for 2021 and 2031, respectively. However, births under the policy trend are estimated to be 19.8 million in 2021 and 16.2 million in 2031.

Overall, the projected total number of maternal deaths averted estimated under the current trend stands at 292 per 100,000 births, whereas under the policy trend, it is 343 per 100,000 births.

At the national level, cumulatively, 49277 unsafe abortions per 100,000 births are projected to be averted under the current scenario. However, under the policy scenario these are projected to be higher at 58266 per 100,000 births.

The most common indicators of maternal mortality are: The maternal mortality rate, the average number of times that a woman has faced risk of death due to pregnancy-related causes in her lifetime, and the total number of maternal deaths. It is to be noted that all these indicators change with change in fertility decline. However, in general, safe motherhood programmes like JSY are the focal point of studies for understanding the decline in maternal mortality (Lim et al 2010; Paul 2010). Against this backdrop, Jain (2011) in his study, proposed a simple decomposition method for estimating the effect of a decline in MMR and fertility on the decline in a potential number of maternal deaths. The present study extends this analysis to show the effect of a decrease in the number of live births on maternal deaths averted between 2001 and 2011 for all India and selected states.

Estimates from the decomposition analysis clearly show that against common perception, fertility decline has made substantial contributions towards a reduction in the potential number of maternal and infant deaths. It is globally understood that achieving low levels of fertility and MMR are priority goals, as also reflected in SDG 3.1.1. The fact that fertility

decline plays an important role in reducing MMR, is also corroborated by this analysis. At this point, it is important to note that the magnitude of the contribution of fertility decline depends directly on the pace at which fertility levels decline takes place in a particular region/state.

The decomposition estimates clearly reflect a substantial contribution of fertility decline in reducing maternal deaths from 2001 and 2011 for India as well as the selected states. The effect of total fertility reduction on the potential number of maternal and infant lives saved in 2011 is significantly higher as compared to the effect of a decline in MMR and IMR respectively, in India as well as the selected states, except for Rajasthan.

At the national level, almost 35 per cent of the potential numbers of maternal lives saved are attributable to a decrease in the number of live births resulting from fertility decline. In Bihar, the effect of a decline in MMR and live births on the potential numbers of maternal lives saved is 38.1 per cent and 24.2 per cent, respectively. In Rajasthan, almost 58 per cent and 20 per cent of maternal lives saved can be attributed to a decline in MMR and a decrease in the number of live births respectively. In Madhya Pradesh, the effect of safe motherhood and a decrease in live births on the number of maternal deaths averted is estimated to be 40 per cent and 29 per cent, respectively. In Uttar Pradesh, 42 per cent and 27 per cent of the potential number of maternal lives saved can be attributed to a decline in the MMR and the number of live births, respectively.

The potential number of maternal and infant deaths, which can be attributed to fertility decline is highest in Bihar and lowest in Madhya Pradesh. The contribution of a decrease in live births on the potential number of maternal lives saved is highest in Rajasthan and lowest in Madhya Pradesh. The potential number of infant deaths averted in 2011, attributed to a decrease in live births, is estimated to be highest in Uttar Pradesh and lowest in Madhya Pradesh.

It is worth recalling that promoting safe motherhood requires undertaking several simultaneous efforts, such as making improvements in emergency obstetric services, ensuring availability

of midwives in rural communities, enhancing medical infrastructure and strengthening of referral systems between the rural communities and health providers. However, coinciding improvements in all these services, especially in rural areas, are yet to reach a level of adequacy. In this regard, the literature that is available, do not establish any significant role played by safe motherhood initiatives such as JSY in maternal mortality decline (Lim et al 2010). The lack of association between the rise in numbers of institutional deliveries under initiatives like the JSY and a decrease in maternal mortality calls for facility-based studies to compile data on the proportion of women with complications among institutional deliveries, and the prevailing case fatality rate (CFR) among these. (Jain 2010).

However, the estimates regarding the decomposition analysis are limited by the fact that fertility is used as an independent variable in the statistical models used for estimating IMR. Therefore, it is important to understand that the potential contribution

of fertility decline can differ in cases of other independent estimates for MMR, fertility and other population indicators.

In conclusion, it may be noted that we do not place an emphasis on an analysis of the mCPR. While this has an instrumental relevance in improving family planning, it may not necessarily represent a direct cost of inaction. Besides, the CPR is only one of the many factors influencing fertility change. Our focus is to provide quality family planning methods to those who need it, focus on adolescents and early parity groups to make use of appropriate family planning methods in high focus states. The gains in implementing a quality family planning programme are analysed here – some of which are listed above. With NFHS-4 revealing that declining fertility is not necessarily associated with mCPR declines, an exclusive study on the impact of mCPR on population parameters can offer valuable insights for shaping family planning policies.

# 3 Economic Gains with Family Planning Investments

## Impact on growth and per capita income

### 3.1. Motivation

The association between population growth and economic growth is an important area of research and policy analysis (James 2011). Three kinds of views are apparent: a) The pessimist view (Malthusian legacy), that population growth negatively affects economic growth; b) the optimist view, that population growth is beneficial for economic growth and; c) the neutralist view, that population is unrelated to economic performance (Bloom et al 2003). While there are different perspectives about the effect of population growth on economic growth (Sinding 2009; Das Gupta, Bongaarts, and Cleland 2011), it is important to note that the causality between the two could run from either side. In other words, these could be endogenously determined within the system.

Population, if not productively employed can exert a negative influence on economic growth and development. Therefore, in large and populous countries such as China and India, policies have specifically aimed at achieving fertility decline and reductions in the population growth rate. However, achieving a faster decline in fertility rates is not a straightforward task as it is an outcome influenced by multiple economic and social factors such as institutions and culture which are marked by inertia.

It is difficult to quantify the effect of the reduction in fertility on economic growth as this is mediated by a range of factors and the impact is scattered over time with considerable lags. In this regard, it is worthwhile to engage with elementary growth economics to outline certain fundamental determinants of economic growth. Since the 18th

century, the question of growth and its determinants have attracted the attention of classical economists and policymakers alike. Nevertheless, in the last century more fundamental growth elements and mechanisms were outlined through various influential models including the Harrod-Domar and Solow models (Barro and Sala-i-Martin 2003).

The Harrod-Domar model is influenced by the Keynesian theory and assumes that the rate of growth is affected by the level of savings and the productivity of capital investment (capital-output ratio). Growth could be boosted either by increasing the level of savings or reducing the capital-output ratio. The Solow model (1957) is an improvement over the Harrod-Domar model and endogenises the capital output ratio.

During this period Coale and Hoover (1958) came up with a model which accentuated that rapid population growth can hamper economic growth, particularly in low-income countries. If the population growth rate was constant then the results of both these models would be the same. Coale and Hoover assume that in cases where people have more children, there will be greater amount of consumption, leading to the saving of a small fraction of the income, and resulting in lower growth. Similarly, in cases where the investment is higher in housing, education and medicine, less would be available for more productive investment such as infrastructure. The resultant rise in incremental capital output ratio (ICOR) will reduce growth. Other studies which have tried to prove the correlation between population and economic growth have tried to improve upon the Solow model. These include the growth models of Barro

(1991), Mankiw Romer and Weil (1992) and Bloom and Mahal (1997).

The implications of population growth are of grave concern to Indian policymakers, both because of its sheer size as well as features. India is undergoing a demographic transition but the fertility rates in some states are still very high and can lead to an ever-higher population in any country. As such, with a reduced dependency burden on a working age population it is possible to attain higher economic growth, but policies will need to singularly focus on developing the skills and productivity of the workforce. For instance, jobless growth and high levels of undernutrition are important concerns that call for immediate policy attention. There are plenty of other concerns such as high rural-to-urban migration, haphazard urban planning and proliferations of urban slums, disregard for regulations and environmental degradation, among many others.

All these factors restrict governmental capacity for effective public investments and also lead to a poor quality of life in both rural and urban areas. The other issue could be the future needs, particularly greater policy attention may be required for the increasing proportion of an elderly population post 2040. In the absence of social security and safety nets, elderly welfare can be a major concern for households and the governments. Clearly, India must do well to address the intrinsic population momentum\* and should design effective family planning policies to ensure and enhance the welfare of the people. An obvious impact of such effective policymaking can be realised in the form of higher economic growth and per capita incomes. With this as the central point, this section presents growth-theory informed projections to understand the possible impact of the cost of family planning inaction on economic growth.

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\* Due to a large proportion of population in the reproductive age group (53 per cent), India's population will continue to grow in terms of absolute numbers even after replacement level of fertility is achieved.

### 3.2. Fertility Reduction and Economic Growth: Pathways

The Malthusian view adhered to the basic reasoning that the more the number of people sharing the available goods and services, less will be available for each person. However, as observed through the lens of growth theories, the effect of the population size on future growth results from higher consumption today and improving human capital stock in an economy. In case the saving levels are lower today, the pace of capital formation will decline, which in turn will lead to a lower output in production in the future. Therefore, the capacity of the nation to produce more goods and services in future will be affected by the fertility decisions of the households today.

To analyse the overall effect of fertility on economic growth, the focus should be to first identify the possible channels through which fertility influences the path of growth. Clearly, there are resource constraints when the population growth rate is high. In the model of Coale and Hoover (1958) resources are diverted from saving towards current consumption due to a high demand from an ever increasing population. To elaborate, in case there are a larger number of children in the household it implies greater consumption and an inability to save a higher proportion of the income. A larger share of children in the population also implies that there is a greater demand for health and education, and governments, particularly in developing countries, have to incur higher public expenditure to meet these demands. Therefore, the investment in physical capital is diverted for other public purposes.

This pathway is effectively outlined in the neo-classical growth models. In particular, the Solow model (1956) indicates that while an increase in the population growth rate raises the growth rate of the aggregate output, it has no permanent effect on the

growth rate of the per capita output. Moreover, an increase in the population growth rate lowers the steady-state level of per capita output.

Ashraf et al. (2013) provides a comprehensive explanation of all the mechanisms through which the decline in fertility levels might affect economic growth. The first effect which they discuss is the Malthus effect. In his original model Malthus theorised that all life forms have a propensity for exponential population growth when resources are abundant but that actual growth is limited by available resources. In the present context, the effect of population on reduced per capita growth is on account of overcrowding of the fixed factor. To elaborate, suppose the amount of land is fixed but the population is increasing; therefore the utilisation and returns to land in production diminishes relative to the growth of the population, assuming that the output is produced using the Cobb-Douglas production function.

The Solow effect, also known as the phenomenon of capital shallowing, states that a rapid population growth lowers the ratio of capital to labour. The workforce thus works with less capital, consequent to which there is a poor rate of savings, which then reduces the productivity of labour. Also, the age structure of the population, which itself is a function of past fertility and mortality behaviours, is an important source of economic growth.

Four channels have been identified through which age structure affects economic growth: Dependency effect, life cycle saving effect, labour supply effect and experience effect. In this context, the phenomenon of the demographic dividend and its effect on growth is widely cited in literature. It occurs when due to a decline in fertility, the proportion of working people relative to dependents in the total population is high and indicates that more people have the potential to be productive and contribute to the growth of the economy.

The dependency effect is realised when the income per capita rises given the income per worker due

to an increase in the proportion of the working age population. Also, due to an increase in the share of the working age population and a lower dependency burden, the saving rate gets an impetus, which leads to a higher capital formation and a higher output known as the life cycle saving effect.

The experience effect arises on account of increase in the average age of the working age population which could boost productivity. Also, in case the proportion of the elderly in the workforce increase relative to the new workers, the labour supply can increase manifold. This effect is called the labour supply effect. These channels are interrelated. To elaborate, the increase in the proportion of the dependents implies a reduced labour supply. But in case the old age dependency increases then we can assume that there is a substantial experience effect provided the elderly are allowed to work. Similarly, the higher the proportion of working age people relative to the children and the elderly means that there is greater magnitude of a lifesaving effect.

Child care effect refers to the availability of more productive time for adults due to a reduction in the fertility rate and the associated child rearing time. There will be a greater impact of this effect on the females as presently they spend a large amount of time in child care and related domestic unpaid activities. Therefore, it is expected that as the child rearing time is reduced females can use their freed-up time to engage themselves in the workforce and the female labour participation rate could improve substantially. This effect has important implications from the perspective of policymaking in India as the female Labour Force Participation Rate (LFPR) is very low as compared to other countries.

A reduction in the number of siblings is often associated with an increase in parental investment in education per child. In case a couple have fewer children they are able to allocate their spending and investments more effectively on them. It can be assumed that human capital formation is higher in case there is higher investment per child. This is called the child-quality effect.

Finally, an increase in the size of the population may raise productivity directly, by allowing for economies of scale, or it may induce technological or institutional change that raises income per capita. This is called the Boserup effect. In this study since we are projecting the population till 2031 and looking at the effect on economic growth for achieving immediate fertility policy goals, only the dependency effect has been considered.

The realisation of other effects such as the Solow and Malthus effect are expected to be visible only after a period of 25-30 years; therefore, we do not consider those effects here.

### 3.3. Data and Methods

#### 3.3.1. Simulation Approach

There are three widely used approaches for estimating the effect of fertility on prospects for economic growth: macroeconomic analysis, microeconomic analysis and simulation exercises. In macroeconomic analysis, the historical relationship between population and per capita income is observed. In this field, the contributions of Kuznet (1967) and Kelly (1978) are important benchmarks. More recent methods use regression techniques in a growth accounting framework to establish a relationship between per capita income growth and demographic variables such as a dependency ratio and a population growth rate (Barro 1991, Mankiw, Romer and Weil 1992, Bloom et al 2010). However, the results using these approaches are questionable once we consider endogeneity and reverse causality.

On the other hand, microeconomic analysis focuses on households as the main entity which influence the fertility levels and hence the standard of living by affecting saving rates and investment. However, the limitation of these models is their inability to explain the macroeconomic effects of a reduction in fertility. The change in a household's decisions and its effect on the economy through various channels might happen with a considerable lag. Also, it is not possible to exactly pinpoint the channel through

which the major change might have resulted. To consolidate the limited microeconomic evidence with macroeconomic findings is problematic given the inconsistency of microeconomic estimates along different studies.

Simulation models are based on the relationship between economic and demographic variables. The Coale and Hoover model is treated as the cornerstone of the modern economic–demographic simulation models. The advantage of these is that they can be extended to include multiple sectors such as agriculture and industry. Also, fertility and savings could be made endogenous in these models. The saving decisions of households have important implications for capital formation and economic growth. Therefore, simulation models are useful in case the future effects of population on economic growth are to be considered. The recent development of the overlapping generations model (OLG) and the stress on saving and human capital has further increased the popularity of these models. Therefore, the elements of both macro and micro analysis are included and the results are more reliable than those through other approaches. The only problem with these models is the accuracy of assumptions regarding the households and the economy. Depending upon the objectives, the complexity can be quite high which could be difficult to capture. But from the viewpoint of policymakers, they are favoured in obtaining a meaningful estimate of the potential effect of demographic changes.

We follow the Coale and Hoover model and construct an economic–demographic simulation model in which fertility can be exogenously varied. The paths of per capita GDP are compared under the two scenarios starting from 2016 at an interval of 5 years: 2021, 2026 and 2031. In India's policy framework there are clear goals for fertility levels to be achieved by the next decade. Assuming that these targets will be met we create two scenarios: a “current trend” in which fertility is following the current trend pattern and will keep falling at the observed rate, and an “policy trend” in which fertility is lower and will decline at a faster pace

given the policy objectives and due to investment in family planning. The population forecasts based on these policy scenarios have been used to compare per capita income for the forecasted years.

The rate of output is assumed to be dependent on the resources that can be devoted for productive facilities and certain other developmental outlays. Total outlay (F) could be categorised as meant for direct growth (D) and welfare (W).

$$F = D + W$$

The amount of outlay will depend upon the base year output (Y<sub>0</sub>), the current output (Y), the number of consumers or population in the base year (C<sub>0</sub>) and current year (C). Also, the savings propensity, denoted by a, plays an important role. Based on these factors the outlay available for growth and welfare investments is estimated as follows:

$$F = C \left[ \frac{F_0}{C_0} + a \left( \frac{Y}{C} - \frac{F_0}{C_0} \right) \right]$$

The welfare outlays (W) could be further categorised as those required for the current needs of the population (W<sub>C</sub>) and those required for additional people (W<sub>i</sub>).

$$W = W_C + W_i$$

The outlay allocation for the purpose of welfare is dependent upon the population growth rate. Following Coale and Hoover, it is assumed that the welfare outlay for additional people is 10 times the outlay for the current needs i.e.,

$$W_i = 10pW_C$$

Where, p is the population growth rate. From here we can derive a relationship between W and W<sub>C</sub>,

$$W = W_C + 10pW_C$$

The above equation is rearranged to estimate the value of W<sub>C</sub> for a given level of expenditure W.

Further, the productive effect of the outlays of

various types is given by the following equation. It is being assumed that the effect of a certain portion of welfare outlays on output is felt after 10 years.

$$G = D + (e_c W_C + e_i W_i) L + (e_c W_C + e_i W_i) t - 10 (1 - L_t - 10)$$

Finally, the output projection is approximated by the following equation:

$$Y_{t+5} = Y_t + 5(G/R)$$

Where R is the ratio between outlays and increase in income. Therefore, the growth outlay has been estimated first and added to the output for that particular year to arrive at the figure for the output after 5 years. The capital output ratio has been assumed to be around 3 for the simulation exercise.

Following Ashraf et al. (2013), we construct another economic–demographic simulation model in which fertility can be exogenously varied and the human capital formation is given significant weight. Their methodology is an improvement over the existing model of Coale and Hoover (1958) and many others. We use a limited version of their work as we consider only the dependency effect, as the policy targets of fertility for different states are yet to be achieved. The realisation of other effects such as the Solow and Malthus effect is expected to materialise only after 25-30 years. To initialise the simulation exercise, we consider an aggregate production given by a standard Cobb–Douglas production function in a neo-classical growth framework. The factor inputs are physical capital, and effective labour, so that the aggregate output in period t is Y<sub>t</sub>. The original model of Ashraf (2013) uses land as a factor of production and assumes congestion of the fixed factor in accordance with the Malthusian predictions. But there is no clarity on whether land could be used productively as well or whether the returns could be positive. Furthermore, the type of land could also have different implications for exhaustion of the total product. To avoid all these complications, we consider only Labour and Capital.

Mathematically, the production function assumes the following form:

$$Y_t = A_t K_t^\alpha L_t^\beta$$

Where K is capital, L is labour, and A is total factor productivity (its growth rate is assumed to be zero). The physical capital has been assumed to be a constant proportion of the output.

Stock of effective labour is given by,

$$H_t = \sum_{15 \leq i \leq 59} h_{i,t}^s \times h_{i,t}^e \times LFPR_{it} \times N_{it}$$

Where,  $N_{it}$  is the number of individuals of age  $i$  in the population in period  $t$ . LFPR is the labour force participation rate.  $h_{i,t}^s$  and  $h_{i,t}^e$  are levels of human capital from schooling and experience. The years of schooling are aggregated into human capital from schooling using a log-linear specification.  $\theta$  is assumed to be 10 per cent.  $S_{i,t}$  is the mean year of schooling.

$$h_{i,t}^s = \exp[\theta, S_{i,t}]$$

Human capital from on-the-job experience for a worker of age  $i$  in period  $t$  is given by,

$$h_{i,t}^e = \exp[\phi(i-15) + \psi(i-15)^2]$$

Following Ashraf et al. (2013), the value of  $\Phi$  has been assumed to be .052 and  $\Psi$  as -.0009875. Using regression analysis, the values of  $\alpha$  and  $\beta$  have been estimated for each cross section: India and the four states. The estimated values of the parameters have been used in the production function to simulate

the value of GDP, given the assumptions about the factors of production based on previous trends.

### 3.3.2. Data Sources

We use the data for India and the four states: Rajasthan, Bihar, Madhya Pradesh and Uttar Pradesh for the period 1981-2016. The trends of GDP and state public spending (economic and social expenditure) as well as Gross Fixed Capital Formation (GFCF) over this period have been analysed to make specific assumptions about the parameters for the simulation exercise. The entire analysis has been done at 2004-05 prices. The data for GDP, NSDP<sup>1</sup> and public expenditure has been taken from Handbook of Economics, RBI for different years. The public expenditure for the India economy is categorised as capital and revenue expenditure. And, within these categories the expenditure could be incurred either on social services or economic services. Economic and social expenditure have been taken as proxy for development and welfare outlays in the Coale and Hoover model. It has been assumed that the total outlays are approximately 23 per cent of the GDP. A lag of 10 years has been assumed for the realisation of the effect of welfare outlays on the growth outlay. The ratio of outlays required for additional people ( $W_i$ ) to those for current needs of the population ( $W_c$ ) has been assumed to be 10 times the rate

**Table 3.1: Key Assumptions for the Economic Growth Simulation Analysis**

Parameter	Assumption
Return to an additional year of mean schooling ( $\theta$ )	10%
Return to education ( $\Phi$ )	0.052
Return to education ( $\Psi$ )	-0.0009875
Capital to GDP ratio	1.77
Rate of growth of capital	6-7%
Ratio of outlay for future needs to current needs	10
Lag effect of welfare outlays for future needs on output	10 years
Total outlay as a fraction of GDP	20-23%

<sup>1</sup> Net State Domestic Product

of growth of the population. The ratio of capital to GDP has been assumed to be 1.8 times and given the past trend, capital has been assumed to grow at 7 per cent per annum. Projections of GDP have been made from year 2016 onwards at an interval of 5 years.

The key assumptions for the economic growth simulation exercise are summarised as follows:

The major rounds of Employment and Unemployment Surveys of the National Sample Survey conducted during these years are the 50th Round (1993-94), 55th Round (1999-00), 61st Round (2004-05) and the 68th Round (2011-12). We have used these rounds to calculate and extrapolate the Labour Force Participation Rate (LFPR) and mean years of education for both males and females. The parameter depicting return to schooling has been assumed to be 10 per cent (Ashraf et al. 2013). The population projections presented in the previous chapter have been used to calculate the mean age of males and females in the labour force and the share of working age population. Data for divided states

have been considered in the simulation exercise to maintain consistency in analysis. The weights used in simulating growth rates are based on a panel of 80 observations for four Indian states and India. Each cross section containing 16 observations was used to generate weights for the respective entity using a Cobb-Douglas production function model with two factors: Labour and Capital.

### 3.4. Results

#### 3.4.1. Current Trends in Economic Growth

Table 3.2 presents the figures for the average GDP and per capita GDP for India and the four states for the period 2001-05, 2006-10 and 2011-15. The average GDP and the per capita GDP of India over the period 2011-15 is Rs. 59000 billion and Rs. 41,757 respectively. Across the states, the GDP of Uttar Pradesh (Rs. 4000 billion) during this period is relatively higher followed by Rajasthan (Rs. 2200 billion). But a higher GDP does not reflect the inequality, which is prevalent and is a poor measure

**Table 3.2: GDP and Per Capita GDP of India and Selected States, 2001-15**

States	GDP (in billion rupees)			PCGDP		
	2001-05	2006-10	2011-15	2001-05	2006-10	2011-15
Bihar	650	960	1400	7487	10170	13847
Madhya Pradesh	960	1300	1900	15120	19354	25760
Rajasthan	1100	1500	2200	17955	23685	31546
Uttar Pradesh	2200	3000	4000	12635	15721	19186
India	28000	42000	59000	23062	32051	41757

**Table 3.3: Growth Rate of GDP and PCGDP of India and Selected States, 2001-15**

States	GDP Growth Rate (%)			PCGDP Growth Rate (%)		
	2001-05	2006-10	2011-15	2001-05	2006-10	2011-15
Bihar	2.13	11.56	5.39	0.20	9.89	4.24
Madhya Pradesh	4.30	8.24	6.52	2.31	6.43	5.42
Rajasthan	6.84	9.12	5.88	4.94	7.25	4.49
Uttar Pradesh	4.24	7.23	4.61	2.18	5.28	3.62
India	6.75	8.62	6.67	5.21	6.84	5.21

**Table 3.4: Social and Economic Outlay of India and Selected States, 2001-15 (in millions)**

States	Social Outlay			Economic Outlay		
	2001- 05	2006 -10	2011-15	2001- 05	2006 -10	2011-15
Bihar	570	980	240	360	910	2200
Madhya Pradesh	630	970	2200	810	1000	2300
Rajasthan	870	1300	2200	530	850	1900
Uttar Pradesh	1300	2500	4700	1500	2300	3700
India	1700000	3000000	4400000	2500000	4100000	6000000

**Table 3.5: Growth Rate of Social and Economic Outlay of India and Selected States, 2001-15 (%)**

States	Social Outlay			Economic Outlay		
	2001- 05	2006 -10	2011-15	2001- 05	2006 -10	2011-15
Bihar	1.42	9.95	30.94	2.18	26.71	29.73
Madhya Pradesh	0.62	13.32	11.06	17.82	3.77	20.87
Rajasthan	2.91	9.05	17.41	13.01	7.47	25.87
Uttar Pradesh	8.46	14.18	18.68	30.25	9.32	26.94
India	6.11	13.24	10.07	7.48	12.27	9.67

of the standard of living. Therefore, we consider per capita GDP, which is the highest for Rajasthan (Rs. 31,546) and Madhya Pradesh (Rs. 25,760).

A glance at the average growth of GDP and per capita reveals that these growth rates for India have moderated over the period 2011-15 (Table 3.3). The growth rate of GDP is down by 2 per cent and per capita GDP by 1.6 per cent over the period 2011-15. The global financial crisis and sluggishness in investment are two of the major factors for this behaviour. The year-to-year variation in the observed Net State Domestic Product (NSDP) is quite high. The biggest impact was felt by Bihar where the average GDP growth rate came down to 5.39 per cent over 2011-15 from 11.56 per cent over the period 2006-10. A reduction of 2 to 3 per cent in the growth rate is observable for other states. Similarly, the highest decline in the per capita growth rate was observed in the case of Bihar (from 9.89 per cent over 2006-10 to 4.24 per cent over 2011-15).

Table 3.4 presents the figures for the social and economic outlays. Social outlays are the expenditure

of the government to enhance the welfare of the people and economic outlays are the expenditure incurred for augmenting the productive capacity of the economy. The figures for India include the expenditure by both the Centre and the states. At the India level, the expenditure on economic activities is higher than the social expenditure but no such pattern is apparent across states.

The growth rates of social and economic outlays in Table 3.5 show that the average expenditure for India during the period 2006-10 has been higher as compared to other periods. The explanation behind this behaviour could be the financial crisis and the resulting subdued demand. Comparing the trends at the state level we observe that the rate of growth of social outlays has been dramatically higher in the recent period (from 9.95 per cent in 2006-10 to 30.94 in 2011-15). Similarly, the growth rate of the economic expenditure in the case of Madhya Pradesh, Rajasthan and Uttar Pradesh has been quite favourable. But these figures need to be considered carefully as the year-on-year variation in these expenditures is high.

Table 3.6 presents the share of social and economic outlay in the total GDP for India and the NSDP for the states. Over the period 2006 -10, the share of social expenditure to the GDP for India increased from 5.98 to 6.96 per cent and to 7.36 per cent over 2011-15. The share of economic expenditure in the recent period seems to be increasing gradually at the national level, and at the state level, there appears to be an equal distribution of public expenditure. To elaborate, in the case of Madhya Pradesh, both types of expenditure are hovering at around 11 per cent for the period 2011-15 and, around 15 and 10 per cent in the case of Bihar and Uttar Pradesh, respectively.

One of the main determinants of economic growth is the availability of human capital and the number of effective workers, which is determined by the level of education and the labour force participation rate. A favourable age structure can result in a higher proportion of workers which can boost growth prospects. Table 3.7 presents the mean year of

schooling, labour force participation rate and the dependency ratio. The mean years of schooling are higher across males as compared to females. In the case of India, the mean year of schooling increased from 5.7 to 6.8 per cent in the case of males and from 3.6 to 4.8 per cent for females over the period 2004 -11. The figures for the states show a similar trend with the mean year of schooling being higher among females in Madhya Pradesh (4.2 per cent in 2011) and 6.3 per cent in the case of Rajasthan and Uttar Pradesh. The LFPR is also lower among females. As of 2011, this stood at 421 for females and 839 for males with it being higher among females in Rajasthan (542) and highest in the case of Bihar (856). The Dependency Ratio is defined as the proportion of the child and elderly population to the total population. In the case of India, this declined from 42 per cent in 2001 to 38 per cent in 2011 with a dramatic drop to around 40 per cent across the states, except in Bihar, where the dependency burden was relatively higher (48 per cent).

**Table 3.6: Social and Economic Outlay as % of GDP and GSDP, India and Selected States, 2001-15**

States	Social Outlay as a % of GDP			Economic Outlay as a % of GDP		
	2001-05	2006-10	2011-15	2001-05	2006-10	2011-15
Bihar	0.087	0.102	0.169	0.055	0.095	0.154
Madhya Pradesh	0.065	0.071	0.113	0.083	0.078	0.120
Rajasthan	0.082	0.082	0.096	0.050	0.055	0.083
Uttar Pradesh	0.058	0.082	0.116	0.068	0.075	0.092
India	5.984	6.968	7.360	8.894	9.657	10.022

**Table 3.7: Mean Years of Schooling, Labour Force Participation Rate and Dependency Ratio, India and Selected States for Selected Years**

States	Mean Year of Schooling				LFPR (per 1000)				Dependency Ratio	
	2004		2011		2004		2011		2001	2011
	M	F	M	F	M	F	M	F	All	All
Bihar	4.7	1.8	5.7	2.9	784	130	856	269	0.49	0.48
Madhya Pradesh	4.9	2.6	6.1	4.0	813	373	841	451	0.46	0.40
Rajasthan	4.9	2.1	6.3	3.2	762	428	829	542	0.47	0.40
Uttar Pradesh	5.4	2.7	6.3	3.9	802	251	840	354	0.48	0.41
India	5.7	3.6	6.8	4.8	798	312	839	421	0.42	0.39

Note: M - Males; F - Females

### 3.4.2. Economic Growth Projections: Coale-Hoover Model

The GDP for India and the NSDP for the states under the current trend and policy scenario is presented in Table 3.8. As expected, the GDP in absolute terms for India will be higher under the policy scenario with an active family planning environment. States like Bihar and Madhya Pradesh are on a lower base as compared to Rajasthan and Uttar Pradesh. Overall, Bihar and Rajasthan seem

to be the largest beneficiaries of the investment in family planning given the favourable demographic dynamics.

It is expected that under the policy scenario the average per capita GDP of India will be Rs. 1,42,363 over 2026 - 2031 as compared to Rs. 1,25,922 under current trends (Table 3.9). Across the states, the per capita GDP of Rajasthan over 2026-31 will be comparatively higher under both the current (Rs. 74214) and policy (Rs. 81793) scenarios followed by

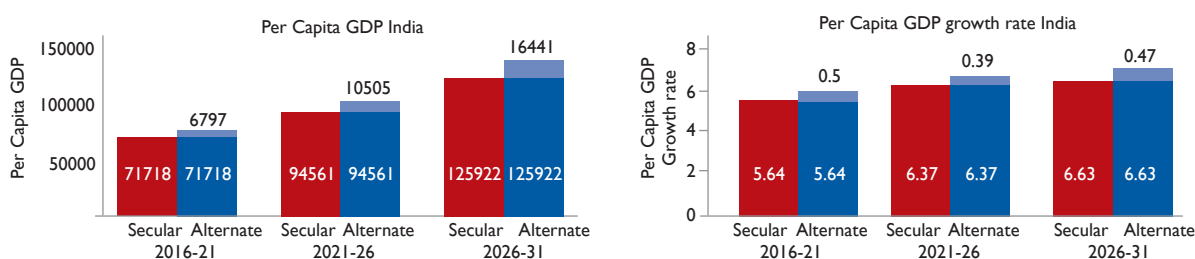
**Table 3.8:** GDP (in Rs. billion at 2004-05 prices) under Current Trend and Policy Scenario based on Coale and Hoover Model, India and Selected States 2016-31

States	Current Trend			Policy Scenario		
	2016-21	2021-26	2026-31	2016-21	2021-26	2026-31
Bihar	2302	3172	4382	2359	3331	4711
Madhya Pradesh	3263	4452	6093	3268	4465	6118
Rajasthan	3386	4718	6589	3433	4846	6854
Uttar Pradesh	6098	8081	10752	6221	8406	11394
India	98144	135368	187123	98847	137040	190312

**Table 3.9:** Per Capita GDP (in Rs. at 2004-05 prices) under Current Trend and Policy Scenario based on Coale and Hoover Model, India and Selected States 2016-31

States	Current Trend			Policy Scenario		
	2016-21	2021-26	2026-31	2016-21	2021-26	2026-31
Bihar	19318	25269	33270	21793	29621	40575
Madhya Pradesh	38241	49243	64163	43185	56926	75748
Rajasthan	42155	55606	74214	44451	59909	81793
Uttar Pradesh	26384	33323	42661	29838	39089	51633
India	71718	94561	125922	78515	105066	142363

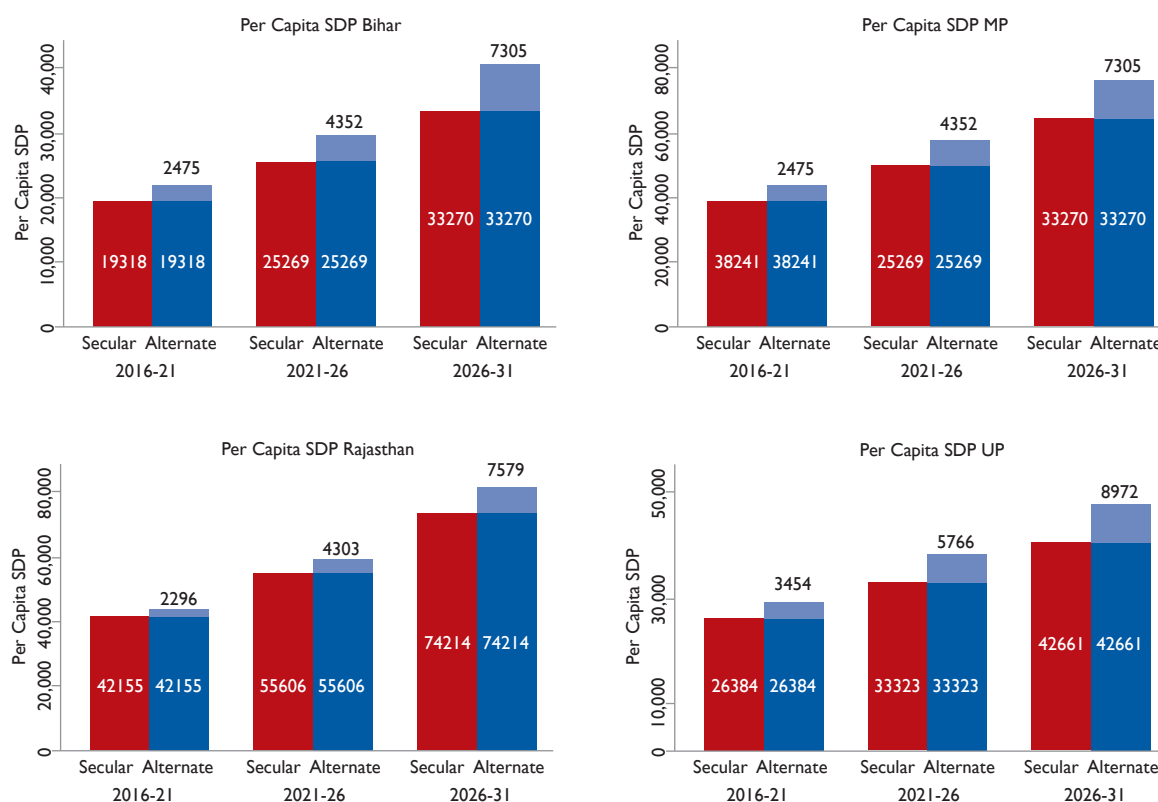
**Figure 3.1:** Per Capita GDP (in Rs. at 2004-05 prices) under Current Trend and Policy Scenario based on Coale and Hoover Model, India 2016-31



Note: Projection of Per capita GDP using fertility rates under secular and Alternate scenario

Note: Projection of Per capita GDP using fertility rates under secular and Alternate scenario

**Figure 3.2:** Per Capita SDP (in Rs. at 2004-05 prices) under Current Trend and Policy Scenario based on Coale and Hoover Model, States 2016-31



Note: Projection of Per capita SDP using fertility rates under Secular and Alternate scenario

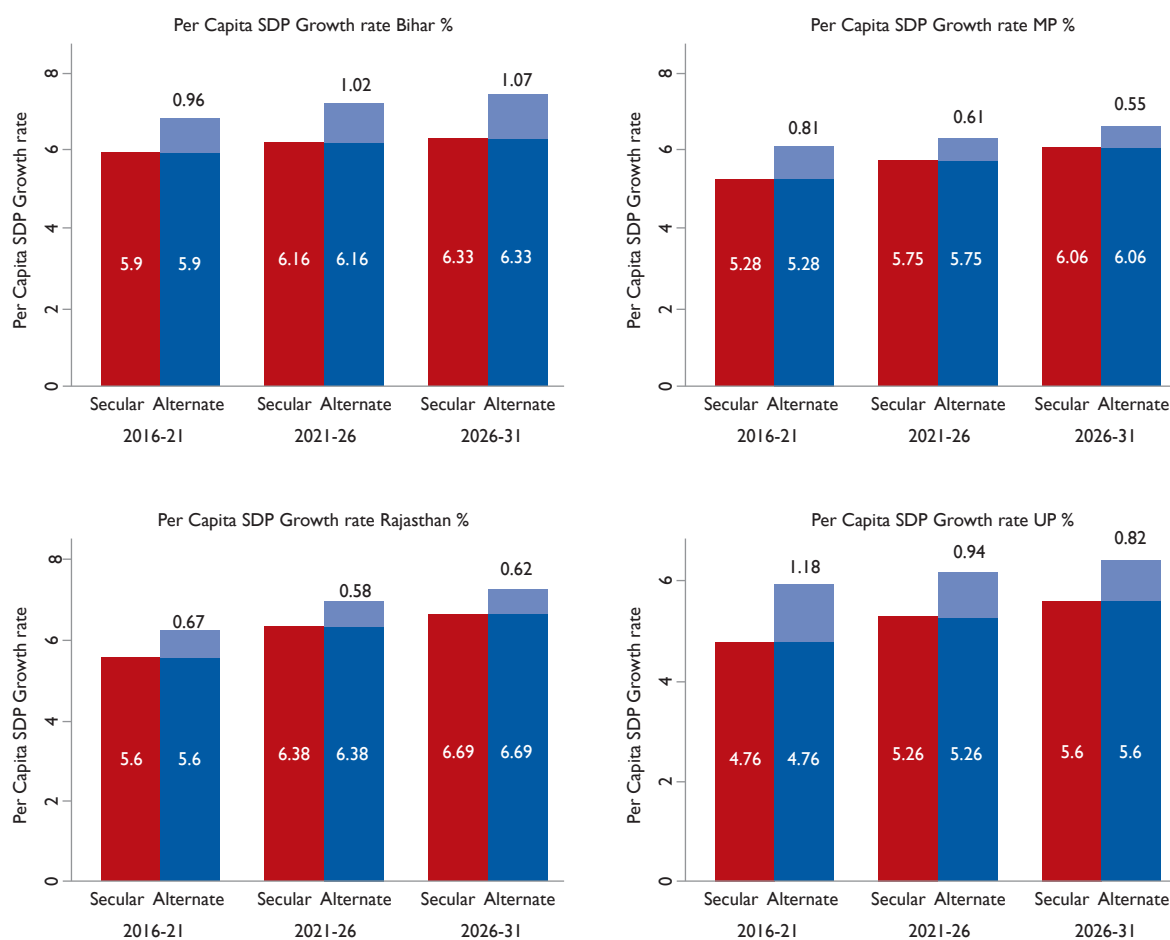
**Table 3.10:** GDP Growth Rate (%) under Current Trend and Policy Scenario based on Coale and Hoover Model, India and Selected States 2016-31

States	Current Trend			Policy Scenario		
	2016-21	2021-26	2026-31	2016-21	2021-26	2026-31
Bihar	7.48	7.56	7.63	8.17	8.23	8.28
Madhya Pradesh	7.20	7.29	7.37	7.24	7.33	7.40
Rajasthan	7.49	7.87	7.93	7.86	8.23	8.28
Uttar Pradesh	6.40	6.51	6.61	6.93	7.02	7.11
India	7.11	7.59	7.65	7.31	7.73	7.77

**Table 3.11:** Per Capita GDP Growth Rate (%) under Current Trend and Policy Scenario based on Coale and Hoover Model, India and Selected States 2016-31

States	Current Trend			Policy Scenario		
	2016-21	2021-26	2026-31	2016-21	2021-26	2026-31
Bihar	5.90	6.16	6.33	6.86	7.18	7.40
Madhya Pradesh	5.28	5.75	6.06	6.09	6.36	6.61
Rajasthan	5.60	6.38	6.69	6.27	6.96	7.31
Uttar Pradesh	4.76	5.26	5.60	5.94	6.20	6.42
India	5.64	6.37	6.63	6.14	6.76	7.10

**Figure 3.3: Per Capita SDP (in at 2004-05 prices) under Current Trend and Policy Scenario based on Coale and Hoover Model, States 2016-31**



Note: Projection of Per capita SDP growth rate using fertility rates under Secular and Alternate scenario

Madhya Pradesh (Rs. 64163 in the current scenario and Rs. 75748 in policy scenario).

Table 3.10 shows that the long-term GDP growth rate of India under the policy scenario is 7.77 and 7.65 per cent under the current or business-as-usual scenario. Bihar and Rajasthan are expected to grow at a higher rate of 8.28 per cent under the policy scenario as compared to 7.63 and 7.93 under the business-as-usual scenario. There is an average difference of 0.5 per cent in the growth rate between the two scenarios. Uttar Pradesh could lag behind because of a lower allocation for the growth outlay.

As shown in Table 3.11, the per capita GDP growth rate is expected to be higher for Rajasthan and Bihar

under both the current (6.69 and 6.33 per cent) and policy scenarios (7.31 and 7.40 per cent). The sheer size of the population of Uttar Pradesh puts it at a disadvantage; the per capita GDP growth could be lower at 5.6 per cent and 6.42 when family planning measures are adopted. Similarly, Madhya Pradesh is expected to lag behind (6.06 and 6.61 per cent).

### 3.4.3. Economic Growth Projections: Ashraf et al Model

In Table 3.12, the GDP for India and the NSDP for the states is presented under the current and policy scenarios, using a more dynamic simulation model with a major focus on human capital formation. The GDP in absolute terms for India will be higher under

**Table 3.12: GDP (Rs. billion at 2004-05 prices) under Current Trend and Policy Scenario based on Ashraf et al Model, India and Selected States 2016-31**

States	Current Trend			Policy Scenario		
	2016-21	2021-26	2026-31	2016-21	2021-26	2026-31
Bihar	2314	3285	4731	2311	3293	4763
Madhya Pradesh	3351	4774	6898	3353	4782	6907
Rajasthan	2862	4038	5781	2876	4081	5866
Uttar Pradesh	6376	9235	13599	6414	9318	13745
India	100316	141665	201986	100617	142891	205022

**Table 3.13: Per Capita GDP (in Rs. at 2004-05 prices) under Current Trend and Policy Scenario based on Ashraf et al Model, India and Selected States 2016-31**

States	Current Trend			Policy Scenario		
	2016-21	2021-26	2026-31	2016-21	2021-26	2026-31
Bihar	19415	26175	35920	21339	29270	41030
Madhya Pradesh	39272	52806	72649	44307	60961	85520
Rajasthan	35632	47589	65116	37240	50447	70002
Uttar Pradesh	27590	38086	53964	30764	43322	62282
India	73304	98960	135924	79921	109552	153368

**Table 3.14: GDP Growth Rate (%) under Current Trend and Policy Scenario based on Ashraf et al Model, India and Selected States 2016-31**

States	Current Trend			Policy Scenario		
	2016-21	2021-26	2026-31	2016-21	2021-26	2026-31
Bihar	7.20	7.43	7.65	7.22	7.51	7.75
Madhya Pradesh	7.23	7.51	7.64	7.31	7.52	7.71
Rajasthan	7.06	7.29	7.52	7.20	7.41	7.60
Uttar Pradesh	7.58	7.88	8.14	7.70	7.95	8.18
India	7.10	7.31	7.52	7.21	7.43	7.65

**Table 3.15: Per Capita GDP Growth Rate (%) under Current Trend and Policy Scenario based on Ashraf et al Model, India and Selected States 2016-31**

States	Current Trend			Policy Scenario		
	2016-21	2021-26	2026-31	2016-21	2021-26	2026-31
Bihar	5.94	6.40	6.67	6.23	6.65	7.10
Madhya Pradesh	5.72	6.30	6.61	6.40	6.77	7.09
Rajasthan	5.59	6.15	6.57	5.97	6.44	6.86
Uttar Pradesh	6.27	6.90	7.32	6.92	7.24	7.64
India	5.93	6.36	6.73	6.30	6.69	7.13

the policy scenario. States like Bihar and Rajasthan are on a lower base as compared to Madhya Pradesh and Uttar Pradesh. Overall, Bihar and Rajasthan seem to be the largest beneficiaries as human capital investment in these states could contribute immensely to growth.

The PCGDP for India is expected to be 153368 rupees under the policy scenario and 135924 rupees under the business-as-usual case. This could be an underestimation because of the modest benefits which we are assuming. In fact, with better policies the mean years of schooling and LFPR could be higher which could result in higher growth.

GDP growth rate for India is expected to be 7.65 per cent under the policy scenario and 7.52 per cent under the normal scenario. The projected NSDP growth rate using this model is higher for Uttar Pradesh under both the scenarios (8.14 and 8.18 per cent respectively) followed by Bihar and Madhya Pradesh. The per capita GDP growth rate for India is expected to be around 7.13 per cent under the policy scenario and 6.73 per cent under current trends. The growth rate for Bihar and Madhya Pradesh is expected to be higher.

### 3.5. Conclusion

The following would be the economic gains if appropriate investments in family planning are made over the next 15 years:

- With active family planning policies, India will enjoy an additional per capita income of 13 per cent in 2026-31. This implies that the Per Capita GDP (PCGDP in 2004-05 prices) for India could be Rs. 153,368 under the policy scenario compared to Rs. 135,924 under the current scenario.
- India would also benefit from an additional 0.4 percentage point increase in the per capita GDP growth rate during 2026-31.
- Significant benefits for all the four states are also noted but the largest gain could be experienced by Madhya Pradesh with an additional per capita

income of 18 per cent in 2026-31. Madhya Pradesh could also benefit from an additional 0.5 percentage point increase in the per capita GDP growth rate during 2026-31.

The Lucas formula shows that if the GDP is growing at a stable rate then it takes 70/g years for the GDP to double provided that the rate is sustained. We are assuming that in the long run, the GDP growth rate will be around 7.5 per cent. But if this is sustained then the per capita GDP will get doubled within the next 10 years (70/7.5). The per capita GDP which is around 55,000 will be around 111,000 around 2026. This is approximately equal to the estimates which we are getting from the simulation models. In the Coale and Hoover model, the per capita GDP is Rs. 94,560 for 2026 while in Ashraf et.al. model the other model it is Rs. 98,960. Also, based on the given parameters, the growth rate of GDP will be 0.12 points higher than the growth rate observed under current trends. The per capita GDP growth using this model is 6.63 per cent under the business-as-usual scenario and 7.10 under the policy scenario with effective family planning. For a better understanding, the second simulation model also incorporates human capital into the model. Therefore, the per capita GDP growth using this simulation model is slightly higher under both the current (6.73 per cent) and policy scenarios (7.13 per cent).

At the state level, Uttar Pradesh is reporting the highest GDP followed by Rajasthan. It seems by 2031 the net increase in absolute GDP will be higher for Uttar Pradesh and Rajasthan as compared to the other states. The figure for absolute GDP estimated from the second model could be at a variance as the role of human capital plays an important role in this model. It may also be noted that in this model the net addition to GDP for Rajasthan is particularly lower as it fares badly on literacy indicators. If both the scenarios are considered under the Coale and Hoover model, then Uttar Pradesh seems to be the biggest beneficiary in terms of net addition to GDP.

Using the Caole and Hoover model we observe that the per capita GDP growth rate will be higher for Bihar and Rajasthan and above 7 per cent if family planning measures are adopted. On the other hand, using the Ashraf et al model we observe that the per capita GDP growth rate will be higher for Uttar Pradesh and Bihar.

Reduction in fertility rates translates into better education and employment opportunities. The mean year of schooling is lower for females across all the states reflecting the prevalent gender discrimination. The situation seems to be worse for Bihar where the mean year of schooling among females is only 2.9. In case, the number of households with more number of children declines then women have a better chance to complete their education. This in turn can have a favourable effect in the sense that educated women are more aware and better informed which translates into better care of the children. Time saved in child rearing due to fewer number of children further leads to higher efficiency in raising the children with an effective use of resources. The net impact of child caring could be derived in terms of higher human capital formation and a slight contribution towards the GDP growth rate. The entire process is further related to greater women empowerment.

It is not unexpected that there is a negative correlation between an education gap and the LFPR. In India, women with low education levels are usually employed as casual labourers, predominantly in agricultural activities. Better education attainments could open up a plethora of opportunities for them in non-agricultural settings. Time saved from not rearing children could be used to develop skills. We can expect higher female labour force participation when women are able to invest more time in improving their skills for better paid work. The additional income accruing to the household in this fashion could lead to a higher investment in the education of children. In the case of India, women are at a bigger disadvantage if the LFPR are observed. For Bihar, the female LFPR is as low as 269 as compared to 829 for males. The child care quality

effect arising from parental investment in children is boosted when females are also contributing monetarily. The major obstacles in the path are the patriarchal societal and institutional norms and practices, which hamper women's equal participation in all walks of life, including the home and the workplace.

The fertility rate of India today is around 2.4 and as per the National Population Policy of 2000, the target of 2.1 should have already been achieved. Similarly, the target of 2.1 for the states is expected to be met by 2025. The high fertility rates have grave implications for these states, which already lag behind on the growth front and have a large population dragging them further back. States such as Bihar, Rajasthan, Madhya Pradesh and Uttar Pradesh have huge economic potential because most of the resources are unutilised. But due to high birth rates and unwanted children, the resources, which could have been used for human capital development more effectively are getting wasted. It is expected that the per capita investment on education and health will be higher if family planning practices are adopted today. The costs and benefits we estimate are on the lower side as there are huge externalities involved, which cannot be measured in monetary terms.

### 3.5.1. Limitations

A major limitation of our approach is that we consider the unidirectional nature of fertility. It has been observed over the last decade that with increasing income per capita, the fertility rates have declined. Although it is hard to prove the causation, there is a strong correlation between the two. As the per capita capital stock gradually improves in the economy, the proportion of skilled labour is higher and higher, which leads to the gradual reduction of fertility. Given the lack of substantial evidence about the reduction in fertility due to higher income, we focus only on the effect of fertility reduction on economic growth. Also, because we are observing a modest increase in the growth rate of the per capita income, we assume the reduction in fertility will also be moderate.

In the simulation-based models the sensitivity of the results with respect to the parameterisation of the underlying economic relations is critical. To elaborate, we are assuming the growth outlay to be at 23 per cent of the GDP and the experience effect to be at 10 per cent. Furthermore, the mean year of schooling and the Labour Force Participation Rate are extrapolated at a constant rate. In the immediate future, due to a change in policies regarding education or employment generation, the value of these parameters can change rapidly. Therefore, the results could change depending upon the behaviour of these parameters.

The simulation based model is definitely an improvement over the Coale and Hoover approach as it considers the effect of human capital on economic growth. But this can be made more dynamic by modelling the household decision-making process. This will allow us to understand in greater detail the process of human and physical capital formation. The saving and investment potential of the Indian economy is higher and the growth could easily cross double digit figures. So the simulated per capita income values might be taken with a pinch of salt as we are expecting a better standard of living over the next decade.

We have taken into account only the dependency effect. However there are a number of other effects of the reduction in fertility, such as the Solow effect,

the Malthus effect, and the schooling and child care effect. But given the fact that we are projecting the population till 2031, these effects have not been considered. It will take a substantial amount of time (approximately 25 to 30 years) for these channels to provide an impetus to economic growth. It is expected that with an improvement in technology, the marginal productivity of the factors might improve. Also, there is limited evidence regarding the schooling effect and the child care effect in the case of developing countries. Accounting for these effects and studying each mechanism in greater detail could provide more clarity about the true effects of fertility reduction.

Another limitation of this model is that we have considered only the role of education and the favourable dynamics related to increasing the effectiveness of labour. There are other factors at play, like increased health expenditure, which could boost the productivity of labour. To elaborate, with a reduction in population and an investment in health, it is possible that the health infrastructure will be better and the accessibility per person will improve. The improvement in health in this manner could lead to an augmentation of human capital and higher growth. But due to the unavailability of data and vagueness about the potential impact on growth through this channel we have ignored the effect that an increased health expenditure would have on labour productivity.

# 4 Budgetary Savings with Family Planning Investments

## Case of National Health Mission

### 4.1. Background

NFHS 4 reveals that over one-fifth of Indian women and over one-fourth of Indian men get married before the ages of 18 and 21 years, respectively. Early marriage has a vital impact on sexual and reproductive health and is associated with a higher number of child births. In particular, a high proportion of unmet need for family planning and sizable incidences of unwanted pregnancies have a significant impact on the household and the society.

In India, the bulk of maternal and child health services are provided through the public health system. A large adult population along with high fertility rates in selected regions tends to increase the cost of health service provisioning. The budgetary consequences of such patterns are observed in the form of poor quality healthcare services and a thin spread of resources across those regions. As the government is resource constrained, the high economic and human cost of inaction in family planning crowds out the limited resources for less productive purposes and results in substantial economic losses.

There are three aspects of population growth which should be considered in analysing the cost - size of the population, its growth rate and age distribution. The cost due to high fertility largely falls on the households and the government. There could be two types of cost associated with inaction in family planning, the burden of which is borne by both - direct and indirect costs. Direct costs could be categorised as programme related costs and costs borne by households as indirect costs. At present, the National Health Mission (NHM) is the main

programme, which focuses on improving maternal and child health using different nutrition and care-based intervention policies.

By reducing fertility and pregnancy related complications, the public expenditure related to maternal and child health will be reduced. Households incur expenditure on drugs, provision of food, cleaning materials, transportation and service tips during pregnancy. It is being assumed that when the effectiveness of policy programmes improves, costs borne by the households will substantially reduce. The direct cost could be further categorised as a fixed and variable cost. It is imperative for the government to invest in family planning programmes to bring down both the social and economic costs, which could be freed up for investment in development projects thereby augmenting the productive capacity of the economy.

India was the first country in the world to adopt an official family planning programme way back in 1952. Since then, a number of programmes focussing on controlling the population have been undertaken in the country. Initially, the focus was to improve the health of the people rather than control the growing population. It was only after 1971 when the Census revealed an alarming growth in population levels that the family planning strategies started receiving attention. Since then, the policy discourse has moved in various trajectories and now focuses on population stabilisation as opposed to the former agenda of population control.

During these periods the policies started setting definite demographic goals in terms of birth rates. The idea was to curtail the number of births

by using family planning methods. But when the National Rural Health Mission (NRHM) was launched in 2005, the health rationale received so much attention that the demographic rationale was subsumed within it. The NRHM particularly aimed to address the health needs of High Focus States which were found to be reporting poor maternal and child health indicators.

Today, family planning efforts are just one of the many activities under the reproductive and child health component of the National Health Mission. Keeping in view the success of the NRHM, the focus on covering rural areas and the rural population will continue along with up scaling to include non-communicable diseases and expanding health coverage to urban areas. There were a number of new initiatives, taken with the launch of the NRHM, which include the creation of a community level workforce of ASHAs. They are the trained female frontline workers who are instrumental in creating the demand for health services acting as an interface between the community and the public health system. They build awareness about maternal and child health programmes and have been successful in increasing the utilisation of outpatient services, diagnostic facilities, institutional deliveries and inpatient care.

The NRHM was also instrumental in providing healthcare workers to underserved areas and involved in the capacity building of nursing staff and auxiliary workers such as the Auxiliary Nurse Midwives (ANMs). Schemes such as the Janani Suraksha Yojana (JSY) and the Janani Shishu Suraksha Karyakram (JSSK) have focussed on reducing maternal and child mortality by providing cash transfers, free drugs, free diagnostics and free transport. The Rashtriya Bal Swasthya Karyakram (RBSK) was launched in 2013 with the aim of screening diseases specific to childhood, developmental delays, disabilities, birth defects and deficiencies. Free drugs and diagnostic services are provided and immunisation of children undertaken

to reduce the out-of-pocket expenditure and improve their survival rates.

One of the important initiatives under the NRHM is the National Iron + Initiative, which has significant implications in improving and promoting the status of both maternal and child health. Given the high prevalence of anaemia all the beneficiaries receive iron and folic acid supplementation irrespective of their Iron/Hb status. Today the coverage of the NRHM has increased manifold and the benefits can be seen in terms of a reduction in maternal and child deaths and a decline in fertility.

The issue of an informed and choice-based method-mix has hitherto remained a neglected aspect of family planning policies in India. In the past, the government essentially focused on the promotion and provision of permanent methods, particularly female sterilisation. Though the choice basket available to Indian men and women has been found to be limited, it now includes options such as injectables. This addition to the available choices of contraceptive methods is encouraging. For instance, a study concluded that the addition of one method available to half of the population is associated with a 4 to 8 per cent increase in the use of modern contraceptives (Ross and Stover 2013<sup>8</sup>).

Although the government resources are constrained, it is critical to make greater investments, at least in the short-to-medium run, in order to achieve significant reductions in fertility levels. To elaborate, evidence suggests that the total (central and state release) expenditure on family planning has stagnated at the same level since 2011. For instance, the total outlay on family planning was Rs. 4020 million in 2011-12, Rs 4200 million in 2012-13, which decreased to Rs. 3960 million in 2013-2014. Further, the estimated total expenditure in 2015-16 is Rs. 7420 million.

It is anticipated that with effective voluntary family planning policies the fertility levels would not

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<sup>8</sup> Global Health: Science and Practice August 2013

only be lower but can also translate into sizeable monetary savings for other priority programmes. This section presents the savings potential that can be achieved, if India and the states were successful in following the National Population Policy goals and objectives related to the expansion of family planning services and TFR reduction.

## 4.2. Data and Methods

The data for the purpose of analysis have been taken from the website of the National Health Mission, which is available under the NHM finance head (<http://www.nhm.gov.in/nrhmc-components/nhm-finance.html>). The data for India has been taken for the financial year 2016-17 only because there are inconsistencies in the data layout, which have been used for the previous years. It is difficult to consolidate data for the same heads. The budget also has a huge variation for certain components. Within

these, there are particular items, for which the expenditure has been incurred in recent years.

Therefore, to maintain uniformity we have just considered data for the last available year. On the other hand, the data for the states have been obtained from the state PIPs. The budget sheets for the latest four years (2013-14 to 2016-17) have been considered as the data layout is similar across these years. The cost, due to high fertility, largely falls on the government and households. There could be two types of cost associated with inaction in family planning, the burden of which is borne by both: direct and indirect costs. We focus on the investment by government for the purpose of family planning here. There are government interventions for providing access to health facilities to reduce maternal and child mortality. By reducing fertility and pregnancy related complications, it is expected that the public expenditure related to maternal, and child

**Table 4.1: NHM Components with Savings Potential due to Family Planning Policies**

Component	Costs	Estimation Logic	Data and Assumptions
Maternal Health	There are a number of schemes, such as JSY <sup>9</sup> and JSSK <sup>10</sup> , to improve maternal health and promote safe deliveries. We also consider the costs incurred on integrated outreach schemes and maternal death reviews/audits to track programme improvements.	Cost = variable cost due to change in home and institutional births + fixed cost	The number of pregnant women will be projected for future years and the cost will be discounted by a rate of 3 per cent to arrive at the current cost estimate. We consider policy scenarios where fertility rates are both high and low (based on policy target).
Child Health (newborn)	Costs incurred for providing newborn care units, care of sick and severely malnourished children.	Cost = fixed cost assumed here for sick infants up to 1 year	The cost will be discounted at 3 per cent to arrive at the current cost estimate. Reduction of 10 per cent assumed under policy scenario due to lesser demand.
Adolescent Health	RKSK <sup>11</sup> focuses on adolescent health. The programme provides preventive, promotive, curative and counselling services, and routine check-ups at primary, secondary and tertiary levels to adolescents, married and unmarried, girls and boys.	Cost = fixed cost assumed here for facility based and community level services.	The cost will be discounted by a rate of 3 per cent to arrive at the current cost estimate. Reduction of 10 per cent assumed under policy scenario due to lesser demand.
Child Health (0-18 years)	RBSK <sup>12</sup> aims at identification and early intervention for children from birth to 18 years to cover defects at birth, deficiencies, diseases, development delays including disability.	Cost = fixed operational cost of the RBSK programmes considered here.	The cost will be discounted by a rate of 3 per cent to arrive at the current cost estimate. Reduction of 10 per cent assumed under policy scenario due to lesser demand.

<sup>9</sup> Janani Suraksha Yojana (JSY) is a safe motherhood intervention run by the Government of India's National Rural Health Mission (NRHM)

<sup>10</sup> Janani-Shishu Suraksha Karyakram (JSSK), a national initiative to make available better health facilities for women and child.

<sup>11</sup> Rashtriya Kishor Swasthya Karyakram (National Adolescent Health Programme)

<sup>12</sup> Rashtriya Bal Swasthya Karyakram (RBSK)

<sup>13</sup> Accredited Social Health Activist

Component	Costs	Estimation Logic	Data and Assumptions
Training	Cost of Training Institutes & Skill Lab, development of training packages, Maternal Health Training, IMEP Training, Child Health Training, Family Planning Training, Adolescent Health Trainings / RKSK Training, Programme Management Training etc.	Cost = fixed cost of providing training to personnel under different interventions is considered.	The cost will be discounted by a rate of 3 per cent to arrive at the current cost estimate. Reduction of 10 per cent assumed under policy scenario due to lesser demand.
Additionalities	Costs incurred for selection and training of ASHAs <sup>13</sup> , including procurement of drug kit, incentive, award and capacity building. Also costs incurred for the strengthening of BCC/IEC Bureaus (state and district levels), state BCC/IEC strategy.	Cost = Fixed cost for selection, training and incentives for ASHAs and strengthening the BCC/IEC strategy.	The cost will be discounted by a rate of 3 per cent to arrive at the current cost estimate. Reduction of 10 per cent assumed under policy scenario due to lesser demand.
Procurement	Costs incurred for the procurement of equipment; equipment for RKSK & RBSK; drugs; and consumables such as Zinc, Vitamin A, Vitamin K1, ORS, etc.	Cost = Fixed cost for procurement + variable costs computed for drugs & consumables.	The expenditure on supplements and therefore the variable cost on drugs will decline due to a reduction in the population under the policy scenario.
Immunisation	Costs incurred on vaccination of children. Vaccines protect children against diseases like measles, mumps, rubella, hepatitis B, polio, tetanus and diphtheria.	Cost for future years = per unit cost per newborn based on existing data and numbers of newborn.	For future years, the birth rate could be forecasted to estimate the target population. The resulting cost has been discounted at 3 per cent rate. This cost is incurred for providing services to the newly born children.
National Iodine Deficiency Disorders Control Programme	Costs related to: promotion & production of iodised salt, its monitoring, distribution & quality control at the production level through laboratories, could be used.	Cost: Fixed cost of the programme considered here.	The cost will be discounted by a rate of 3 per cent to arrive at the current cost estimate. Reduction of 10 per cent assumed under policy scenario due to lesser demand.

health will be significantly reduced. Furthermore, expenditure for the vaccination of children could also be minimised.

The expenditure of government is based on different components of the NRHM which have been implemented. Also, the main assumption underlying the analysis is that the costs have been kept constant for future years. It is however, expected to change on account of inflation or economies of scale achieved due to better management or organisation in implementing the schemes. Under the policy population growth scenario, it is expected that the fixed cost will decline but at a slower pace. For future years, we are assuming a deduction of 10 per cent in fixed cost.

A component-wise analysis gives us a better understanding about the pattern of the expenditure. In the following Table 4.1, we present the components which have been considered for the purpose of analysis, the main ones being:

Maternal Health, Child Health, Adolescent Health, Rashtriya Bal Swasthya Karyakram RBSK, Training, Additionalities under NRHM (Mission Flexible Pool), Procurement, Immunisation and National Iodine Deficiency Disorders Control Programme (NIDDCP).

To compute the variable cost associated with the components the target population was calculated using the population projections under both the normal and policy scenarios. The relevant variables which have been used are - the number of total pregnancies, women in the reproductive age group, population in age group 0 to 5 years, 5 to 10 years, 10 to 19 years, 20 to 49 years, home deliveries and deliveries in the public health facilities. The per unit cost for each intervention was obtained for the available years by dividing the total cost in the budget by the relevant population associated with that particular budget head. The estimation of cost for future years was calculated by applying these unit costs to the population figures for the normal

and policy scenarios beginning from 2017 to 2031. The present value of these costs was computed at a discount rate of 3 per cent.

### 4.3. Results

Table 4.2 presents the budget allocated for different activities and strategies within the National Health Mission in the financial year 2016-17. The major share of the budget has been allocated for RCH Flexible Pool (38.1 per cent) and additionalities under the Mission Flexible Pool (51.6 per cent). The components under RCH include maternal health, child health, family planning, RBSK, RKSK, human resources and management cost. A sizeable portion of the RCH flexible pool budget (13 per cent)

is allotted for improving maternal health related activities, such as the Janani Suraksha Yojana and the Janani Shishu Suraksha Karyakram to promote safe delivery. Also, expenditure is incurred on integrated outreach schemes and maternal death reviews/ audits, which are conducted to track improvement in the maternal health programmes.

51 per cent of the budget is for timeline activities. Here the cost is incurred for the selection and training of ASHAs, the procurement of drug kits, incentives and awards to ASHAs as well as capacity building of the ASHA Resource Centre. Additionally, costs are also incurred for the strengthening of the BCC/IEC Bureaus (state and district levels) and development of the state BCC/IEC strategy. The

**Table 4.2: NHM Budget Statement for Different Activities, India 2016-17**

S. No.	NRHM-RCH Flexible Pool	Rs. Millions	% Share
1	RCH - TECHNICAL STRATEGIES & ACTIVITIES (RCH Flexible Pool)	128281	38.1
2	MATERNAL HEALTH	44600	13.3
3	CHILD HEALTH	3819	1.1
4	FAMILY PLANNING	8953	2.7
5	RASHTRIYA KISHOR SWASTHYA KARYAKRAM	987	0.3
6	RBSK	6800	2.0
7	TRIBAL RCH	175	0.1
8	PNDT Activities	166	0.0
9	HUMAN RESOURCES	44259	13.2
10	TRAINING	5743	1.7
11	PROGRAMME / NRHM MANAGEMENT COST	12681	3.8
12	VULNERABLE GROUPS	949	0.0
13	TIME LINE ACTIVITIES - Additionalities under NRHM (Mission Flexible Pool)	173644	51.6
14	IMMUNISATION	14251	4.2
15	NIDDCP	196	0.1
16	IDSP	1223	0.4
17	NVBDCP	5877	1.7
18	NLEP	1539	0.5
19	RNTCP	11396	3.4
	<b>Grand Total</b>	<b>336408</b>	<b>100</b>

<sup>14</sup> Integrated Disease Surveillance Project

<sup>15</sup> National Vector Borne Disease Control Programme

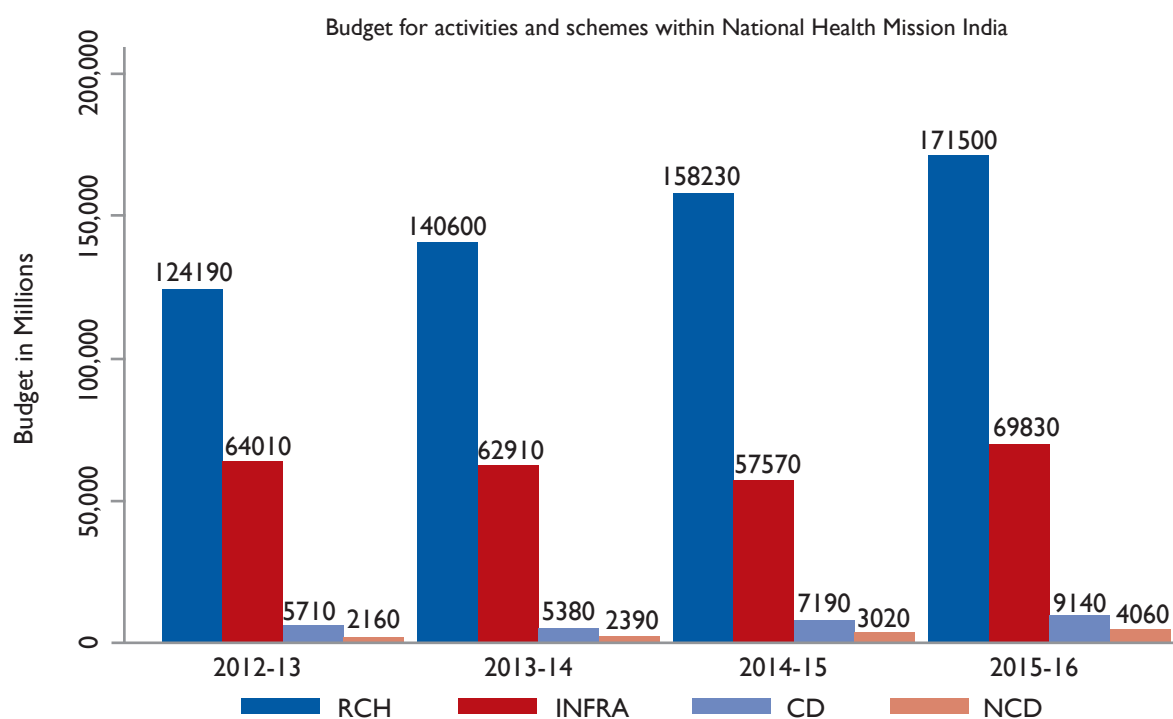
<sup>16</sup> National Leprosy Eradication Programme

share for immunisation related activities is around 4 per cent of the total budget.

Figure 4.1 presents the details of expenditure of different components such as Reproductive and Child Health (RCH), infrastructure, and the communicable and non-communicable disease

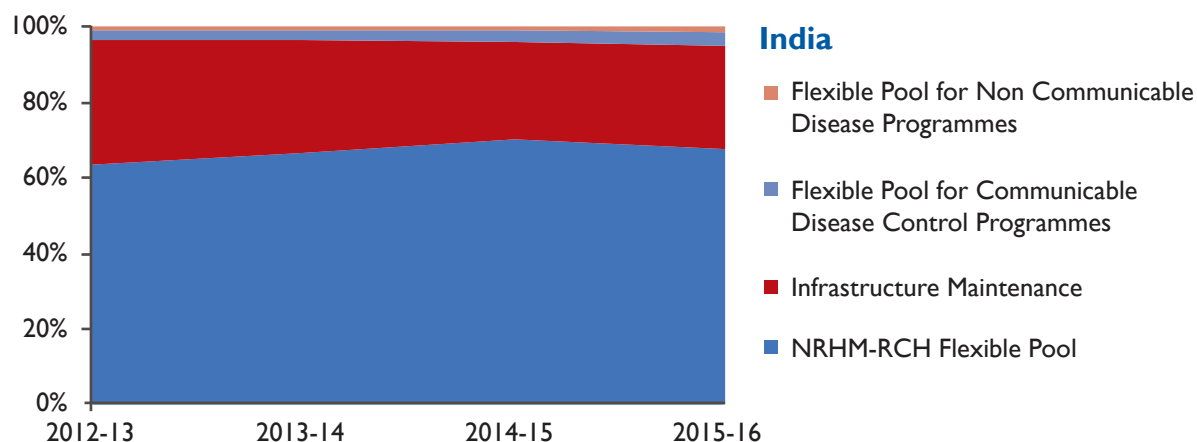
programme under the National Health Mission for the period 2012-13 to 2015-16. Clearly, the expenditure on RCH increased steadily over the period from Rs. 124190 million in 2012-13 to Rs. 171500 million in 2015-16. Surprisingly, till 2014-15, the expenditure incurred on infrastructure declined

**Figure 4.1: Details of Expenditure, National Health Mission, India 2012-13 to 2015-16**



Note: RCH - Reproductive Child Health, IF- Infrastructure, CD - Communicable Disease, NCD - Non-Communicable Disease

**Figure 4.2: Percentage Distribution of Expenditure, NHM India 2012-13 to 2015-16**



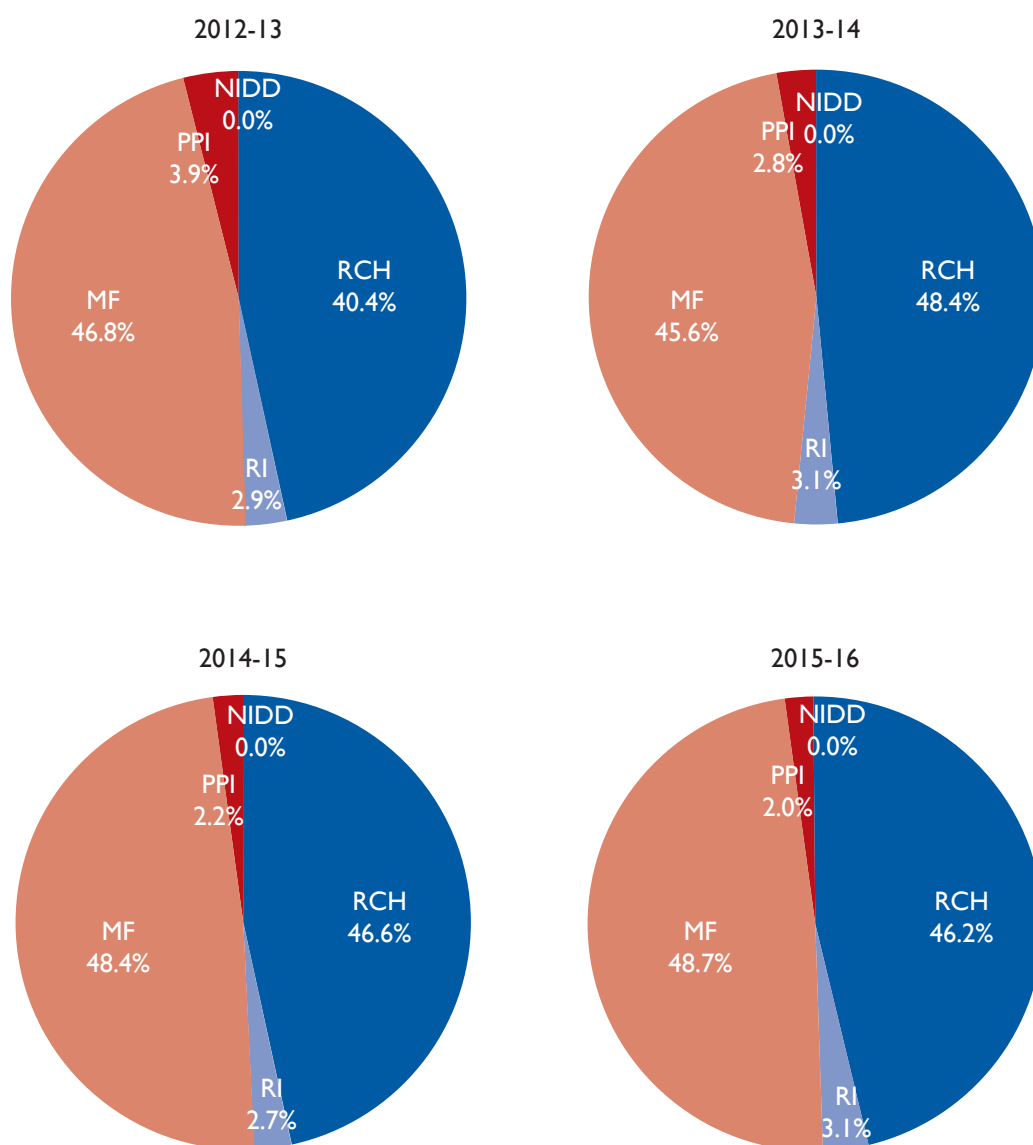
to Rs. 57570 million. But in 2015-16, it again increased to Rs. 69830 million. As of 2015-16, the expenditure on communicable and non-communicable diseases was Rs. 9140 million and Rs. 4060 million respectively.

Figure 4.2 shows the distribution of expenditure on different components of the NHM for the

period 2012-13 to 2015-16. A consistent trend could be observed for the entire period with the expenditure on RCH being the biggest component. This share increased steadily from around 63 per cent in 2012-13 to 67 per cent in 2015-16. There is a slight substitution of expenditure from RCH with infrastructure maintenance for the years

**Figure 4.3: Breakup of RCH Flexible Pool Expenditure, NHM India 2012-13 to 2015-16**

**Budget share for activities and schemes within National Health Mission India**



Note: RCH - RCH Flexible Pool, MF - Mission Flexible Pool, RI - Routine Immunization, PPI - Pulse Polio Immunization and NIDD - National I.D.D Control Programme

2013-14 and 2014-15. The expenditure incurred on communicable disease and non-communicable disease remained stable over the period.

Figure 4.3 shows the break-up of the NRHM-RCH Flexible Pool expenditure. The main items within the RCH are: RCH Flexible Pool, Mission Flexible Pool, Routine Immunisation, Pulse Polio Immunisation, and the National Iodine Deficiency Disorders Control Programme. The expenditure on different items remained stable. In 2015-16, 46 per cent of the total budget was spent on RCH Flexible Pool, 48.7 per cent on Mission Flexible Pool and around 5 per cent on Routine Immunisation, Pulse Polio Immunisation and the National Iodine Deficiency Disorders Control Programme. The share of allocation for the Mission Flexipool increased slightly over the last couple of years.

The details of expenditure on different components under the National Health Mission for Bihar for the period 2012-13 to 2015-16 is presented in Annexure Fig. S1. We see that the expenditure on RCH increased steadily over the period from Rs. 9890 million in 2012-13 to Rs. 11740 million in 2015-16. The expenditure incurred on infrastructure declined to Rs. 2450 million in 2014-15, but again increased to Rs. 3630 million in 2015-2016. As of 2015-16, the expenditure on communicable and non-communicable diseases was Rs. 690 million and Rs. 110 million respectively. The flexible pool for noncommunicable disease increased substantially from Rs. 40 million in 2012-13 to Rs. 110 million in 2015-16

The distribution of expenditure on different components of the NHM for Bihar for the period 2012-13 to 2015-16 shows that the share of expenditure incurred on RCH was the biggest component followed by infrastructure (Annexure Fig. S2). The share of expenditure on RCH steadily increased from around 74 per cent in 2012-13 to 79.5 per cent in 2014-15 and then declined to 72.6 per cent in 2015-16. The expenditure for RCH was reduced and the expenditure on infrastructure and communicable diseases increased for 2014-15. The expenditure incurred on non-communicable disease remained stable over the period.

The break-up of the NRHM-RCH Flexible Pool expenditure for Bihar shows that the expenditure on different items has remained stable. In 2015-16, 63.5 per cent of the total budget was spent on the RCH Flexible Pool, 27.8 per cent on the Mission Flexible Pool and around 8 per cent on routine immunisation, pulse polio immunisation and NIDDCP (Annexure Fig. S3). The share of allocation for the Mission Flexible Pool shows a slight increase over the last couple of years and a decline in the pulse polio immunisation expenditure from 5 per cent in 2014-15 to 3.6 per cent in 2015-16.

The details of expenditure for the period 2012-13 to 2015-16 for Madhya Pradesh shows that the expenditure on RCH increased drastically over the period, rising from Rs. 8270 million in 2012-13 to Rs. 15540 million in 2015-16 (Annexure Fig. S4). The expenditure incurred on infrastructure remained stable at around Rs. 4000 million. But the expenditure on the non-communicable disease programme shows tremendous growth from 2013-14 onwards, reaching Rs. 260 million in 2015-16. As of 2015-16, the expenditure on communicable diseases was Rs. 500 million.

In Madhya Pradesh, the share of expenditure on RCH is the biggest component and has increased from around 67.6 per cent in 2012-13 to 77.2 per cent in 2015-16 (Annexure Fig. S5). A certain proportion of the expenditure for infrastructure has been reduced and substituted with expenditure on RCH for 2015-16. The expenditure incurred on communicable disease and non-communicable disease has remained stable over the period at around 2.6 per cent and 1.3 per cent, respectively.

Further, in 2015-16, 48.9 per cent of the total budget was spent on RCH Flexible Pool, 47.3 per cent on Mission Flexible Pool and around 4 per cent on routine immunisation, pulse polio immunisation and NIDDCP (Annexure Fig. S6). The share of allocation for the Mission Flexible Pool has shown a slight increase over the last couple of years. We see a decline from 5.3 per cent in 2012-13 to 2.8 per cent in 2015-16 in the share of expenditure on routine immunisation.

In the case of Rajasthan, the expenditure on RCH has stagnated at around Rs. 12000 million for the last two years (Annexure Fig. S7). The expenditure incurred on infrastructure declined by Rs. 100 million in 2015-16 from 2014-15. As of 2015-16, the expenditure on communicable and noncommunicable diseases was Rs. 290 million and Rs. 410 million respectively. Rajasthan seems to be focussing on increasing the expenditure for the flexible pool for the non-communicable diseases programme, which has increased by Rs. 300 million years.

However, a consistent trend could be observed for the entire period with the share of expenditure on RCH being the biggest component. It has remained steady at around 69 per cent from 2013-14 onwards (Annexure Fig. S8). Interestingly, the share of expenditure on the non-communicable diseases programmes increased to 2.8 per cent in 2015-16 from 0.8 per cent in 2012-13.

In Rajasthan, the expenditure on the RCH Flexible Pool declined from 58 per cent in 2012-13 to 40.9 per cent in 2015-16 (Annexure Fig. S9). On the other hand, the expenditure on the Mission Flexible Pool increased significantly from 36.6 per cent in 2012-13 to 56.6 per cent in 2015-16. The share of allocation for Mission immunisation and pulse polio immunisation has declined over the last couple of years.

In Uttar Pradesh, the expenditure on RCH increased from Rs. 21340 million in 2012-13 to Rs. 26660 million in 2015-16 (Annexure Fig. S10). The expenditure incurred on infrastructure increased to Rs. 14810 million in 2015-16 from Rs. 13530 million in 2014-15. As of 2015-16, the expenditure on communicable and non-communicable diseases was Rs. 1330 million and Rs. 350 million respectively. The expenditure on both these components has shown a big jump in the last few years.

A consistent trend could be observed for the entire period with the share of expenditure on RCH being the biggest component. It has steadily increased

from around 42.3 per cent in 2012-13 to 61.8 per cent in 2015-16 (Annexure Fig. S11). It seems there has been a substitution of expenditure for RCH with expenditure from infrastructure, which shows a steady decline from 56.6 per cent in 2012-13 to 34.3 in 2015-16. The expenditure incurred on communicable and non-communicable diseases has remained stable over the period.

In 2015-16, 38.3 per cent of the total budget was spent on RCH Flexible Pool, 54.3 on Mission Flexible Pool and around 7 per cent on routine immunisation, pulse polio immunisation and NIDDCP in Uttar Pradesh (Annexure Fig. S12). The share of allocation for the Mission Flexible Pool increased from 36.2 per cent in 2012-13 to 54.3 per cent in 2015-16.

Tables 4.3 and 4.4 present the results of the analysis of NHM components. The cost for the period 2017-2031 for each component has been estimated under both current patterns and policy scenario. The net present discounted value has been calculated using a discount rate of 3 per cent. It is estimated that over the next 15 years, India can save around Rs. 59930 million in the maternal health programme. The savings in fixed cost (Rs. 910 million) might be lesser than the variable cost (Rs. 59020 million).

At the state level, the highest amount of savings could be realised by Bihar (Rs. 7310 million) followed by Uttar Pradesh (Rs. 7060 million). The cost of child health is assumed to be fixed in nature. We have considered here the expenditure incurred for newborn care units, care of sick children up to one year and severely malnourished children. We can save up to Rs. 3070 million for this component as the number of births are expected to be lower under the policy scenario as compared to the normal scenario. Also, there will be a reduction in the number of cases of malnourished and sick children.

There will be a fallout of the reduction in the number of additional children entering adolescence. The government incurs sizeable expenditure

**Table 4.3: NHM Budget with Fertility Reduction for the Period 2017-31, India and States**

Component (in million)		Rajasthan		MP		UP		Bihar		India	
		C*	P*	C*	P*	C*	P*	C*	P*	C*	P*
Maternal Health	TC	23730	20780	19530	13840	47250	40190	36250	28940	334400	274470
	FC	1300	1180	120	110	2060	1870	1230	1120	9740	8830
	VC	22440	19600	19400	13730	45200	38320	35020	27820	324660	265640
Child Health	TC	1900	1730	3580	3250	1390	1260	1970	1790	32920	29850
Adolescent	TC	150	140	410	370	150	130	350	310	8510	7720
RBSK	TC	1740	1580	5300	4810	5370	4880	1600	1460	58630	53160
Training	TC	2110	1920	2370	2160	1490	1350	3060	2780	45440	41200
NRHM Additionalities	TC	97300	88360	103260	93770	244770	222280	141240	128270	1496940	1357220
Procurement	TC	20680	18660	21370	19530	42390	40330	31430	27300	355730	313230
	FC	16430	14920	19470	18130	21580	20370	17980	16330	231860	210220
	VC	4250	3740	1900	1400	20820	19960	13440	10980	123870	103010
Immunisation	TC	4220	3800	4750	4100	19790	17270	10770	9440	118860	105600
	FC	3180	2890	3670	3340	15150	13750	8020	7280	96530	87520
	VC	1040	910	1080	760	4610	3510	2730	2160	22330	18090
NIDDCP	TC	50	40	80	70	40	30	380	340	1690	1530

**Note:** TC- Total Cost; FC – Fixed Cost;VC –Variable Cost; S\* - Current Trend,A\* - Alternative Trend

**Table 4.4: NHM Budget Savings Potential for the Period 2017-31, India and States**

Component (in Million)		Rajasthan	MP	UP	Bihar	India
Maternal Health	Total Cost	2950	5690	7060	7310	59930
	Fixed Cost	120	10	190	110	910
	Variable Cost	2840	5670	6880	7200	59020
Child Health	Total Cost	170	330	130	180	3070
Adolescent	Total Cost	10	40	20	40	790
RBSK	Total Cost	160	490	490	140	5470
Training	Total Cost	190	210	140	280	4240
NRHM Additionalities	Total Cost	8940	9490	22490	12970	139720
Procurement	Total Cost	2020	1840	2060	4130	42500
	Fixed Cost	1510	1340	1210	1650	21640
	Variable Cost	510	500	860	2460	20860
Immunisation	Total Cost	420	650	2520	1330	13260
	Fixed Cost	290	330	1400	740	9010
	Variable Cost	130	320	1100	570	4240
NIDDCP	Total Cost	10	10	10	40	160

on the health of adolescents through two main programmes on which the major part of the expenditure is apportioned: Rashtriya Kishor Swasthya Karyakram (RKSK) and Rashtriya Bal

Swasthya Karyakram (RBSK).The focus of the RKSK scheme is on reorganising the existing public health system in order to meet the service needs of adolescents.A core package under this includes

preventive, promotive, curative and counselling services, a regular provision of routine check-ups at primary, secondary and tertiary levels of care for adolescents, married and unmarried, girls and boys during the clinic sessions. The RBSK is an important initiative aimed at an early identification and early intervention for children from birth to 18 years to cover defects at birth, deficiencies, diseases and development delays including disability. As much as Rs. 5470 million can be saved in this programme and Rs. 790 million in the adolescent programme through the adoption of family planning methods. At the state level, the main beneficiaries will be Madhya Pradesh and Uttar Pradesh in the case of RBSK.

Additionalities is another major component of the NHM programme. Here the expenditure is incurred for training the ASHAs, buying drug kits for them and providing them different types of incentives. Approximately, Rs. 140000 million could be saved as the demand for ASHAs will decline substantially with a reduction in the target population. The fixed cost of procurement is due to the purchase of equipment for RBSK and RSKS and the variable cost through the buying of drugs and supplements for mother and children. The cost saving is approximately equal under both these heads. Bihar stands to benefit immensely through investment in family planning. The budget for immunisation includes expenditure on cold chains<sup>18</sup>, review meetings to strengthen the project, pulse polio operating costs and other activities. A net saving of Rs. 13260 million could be realised by investing in family planning and a major reduction would be observed in the case of fixed costs. Among the states, the major beneficiary would be Uttar Pradesh (Rs. 2520 million).

#### 4.4. Conclusion

Family planning programmes have been unable to achieve the required targets. Given the historical background and the fact that India was the first country to officially adopt a family planning

programme, it seems that the desired outcomes have not been realised and that there continues to be an urgent need for accelerated action. While the goal of the family planning programme has been to reduce fertility and birth rates ever since it began, the results have been disappointing and are perhaps largely due to inadequate investments in key aspects of family planning. These include making improvements in the quality of care, building the capacity of service providers and increasing the variety of contraceptive choices.

It can be safely affirmed that although the required targets with respect to the demographic and health goals have not been achieved, the NRHM has on the other hand been successful in achieving other significant outcomes. Public health services which had fallen into a state of abeyance and were dysfunctional for a period of time, have now been revived. The achievement of the programme has been clearing blockages that hindered the timely and adequate provision of drugs at primary health care units and the deployment of key health workers to meet the needs of specific age groups and beneficiaries such as lactating and pregnant mothers, children aged 0-5 years and adolescents. Still huge gaps exist and these pertain mainly to the allocation of an abysmal budget and low utilisation of the funds available.

As of 2015-16, the fertility rates of Uttar Pradesh and Madhya Pradesh are higher at 3.1 and 2.91 respectively. These states will not be able to reach the replacement levels of fertility before 2026. Under the policy scenario they should have obtained the target by 2015. The inability to control the fertility and birth rates will have repercussions in terms of a higher population growth, which will add to the population momentum.

Under the National Health Mission, over the period 2012-13 to 2015-16, there seems to be a shift in the pattern of expenditure on different

<sup>18</sup> The purpose of the vaccine "cold chain" is to maintain product quality from the time of manufacture until the point of administration by ensuring that vaccines are stored and transported within WHO-recommended temperature ranges.

components such as reproductive and child health (RCH), infrastructure, and the communicable and non-communicable disease programme. It was observed that during this time the expenditure on RCH increased steadily and that on infrastructure declined, particularly in the years 2013-14 and 2014-15. Interestingly, in the case of Bihar, Uttar Pradesh and Rajasthan the expenditure on non-communicable diseases rose substantially.

The share of expenditure on different components also gives us an idea about the significance of the components. A consistent trend could be observed across all the states for the entire period with the expenditure on RCH being the biggest component followed by infrastructure. The expenditure incurred on communicable and non-communicable disease remained stable over the period except for Rajasthan where the share increased to 2.8 per cent in 2015-16 from 0.8 per cent in 2012-13.

Within the NRHM-RCH Flexible Pool, the main programmes on which expenditure was incurred were the RCH Flexible Pool, the Mission Flexible Pool, routine immunisation, pulse polio immunisation and the NIDDCP. The expenditure on different items remained stable and the share of allocation for the Mission Flexible Pool increased slightly over the last couple of years. Surprisingly, all the states recorded a decline in expenditure on pulse polio immunisation over the study period.

According to UN population projections, inaction in family planning and policy failure will lead to an increase in India's population till 2065. The effects of an uncontrolled population explosion have been present in almost all policy discussions. It is the government, which suffers the most as given its responsibility to enhance the welfare of the population its task is to incur expenditure for the purpose of development. But there is a huge opportunity cost of the resources, which can be fruitfully used to augment the productive capacity of the economy. As per our estimates, India can save Rs. 270 billion over the next 15 years if family planning measures are implemented effectively. The greatest beneficiary will be Uttar Pradesh which is the most populous of all the considered states.

There are related benefits on the quality of life and the well-being of people. The public discourse usually treats family planning policies as different from development policies, focusing only on birth and fertility when we talk about them. When the National Health Mission was launched the focus shifted towards health from demography. Therefore, in order to achieve the desired results, it is imperative that when family planning strategies are implemented they should be viewed in the larger social and development context, and the interlinkages of demographic factors with these processes understood within the various geographical areas.

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<sup>19</sup> The 2017 Revision of World Population Prospects is the twenty-fifth round of official United Nations population estimates and projections prepared by the Population Division of the Department of Economic and Social Affairs of the UN Secretariat

# 5 Out-of-Pocket Healthcare Expenditure

## Insights from NSS Health Surveys

### 5.1. Background

Out-of-pocket (OOP) expenditure is the predominant mode of health care financing in India and accounts for 70 per cent of the total health care expenditure in the country (NHSRC 2016). Such a high share of OOP expenditure is a major policy concern and has catastrophic implications on household living standards and well-being (Sauerborn et al 1996; Kruk et al. 2009).

It is estimated that in 1999-2000, OOP expenditure pushed about 32.5 million persons below the poverty line (Garg and Karan 2008). Similarly, in 2004, this again drove 11.9 million households (63.2 million persons) into poverty (Berman et al 2010). Also, in the same year, 60 per cent of rural households and 40 per cent of urban households had to use distress means, such as borrowings or sale of household assets to finance inpatient care services (Joe 2014). Given such intricacies and amidst persistently low health insurance coverage (about 15 per cent, NSSO 2015), the issue of financial protection in health assumes high policy relevance for India and similar other countries.

In India, public spending on health as a proportion of GDP is lower in comparison to other neighbouring countries such as Sri Lanka and Bangladesh, which is worrying. The public health spending in India is 1.4 per cent of the GDP as against 2.5 per cent envisaged in the National Health Policy 2017. Such is the state of affairs that certain vulnerable groups have no option but to delay or put off decisions related to their health. These social groups rank the lowest on the socio-economic ladder and are geographically isolated and socially excluded from the mainstream

population. They have low income and lack health care financing sources. There is no denying the fact that in reality, the principle of health equity does not hold and inequalities continue to foster inequities, despite the Government of India's persistent efforts to promote inclusive growth.

Not surprisingly, the higher burden of maternal and child healthcare costs among low-income households, particularly in backward states, is a prominent concern in healthcare financing. These expenditures are regressive and can be avoided with basic health care financing mechanisms such as public provisioning and universal health coverage for maternal and child healthcare. For instance, it is estimated that a fully functioning, maternal and child healthcare package cannot only save households from incurring catastrophic expenditure but also has the cumulative potential of averting maternal deaths and disability in developing countries.

The Sustainable Development Goals, therefore, strongly encourage the international development community to design and implement effective health financing policies to achieve universal coverage while providing reproductive and child healthcare services. This section presents insights regarding the potential OOP expenditure reductions that can be attributable to reduced fertility rates across India and four selected high focus states.

### 5.2. Data and Methods

#### 5.2.1. National Sample Survey Data

The analysis is based on data from two consecutive waves of nationally representative surveys, namely

the Morbidity and Healthcare Survey (60th round, 2004) and Social Consumption: Health Survey (71st round, 2014) conducted by the National Sample Survey Office (NSSO), Ministry of Statistics and Programme Implementation (MOSPI), Government of India.

These surveys collect comparable data from sample households selected randomly from a multistage stratified survey design. The first strata (First Stage Units) include census villages as rural areas and urban blocks as urban areas across India; whereas the second strata (Second Stage Units) are sample households.

Data on aspects of morbidity, treatment-seeking and financing of hospitalisation (inpatient) and ambulatory (outpatient) care services for the reference period of 365 days and 15 days, respectively are available from these surveys. The ailments for which such medical care is sought, the extent of use of Government hospitals, and the expenditure incurred on treatment received from the public and private sectors, is also available. In addition to this, these surveys also provide comparable information on aspects of maternity and child healthcare, including the financing of hospitalisation services (public and private) for the reference period of 365 days.

Additionally, the survey also provides household level information on demographics and access to services and utilities as well as individual level data on age, sex, education, monthly per capita expenditure and primary occupation of households. It also elicits information on the first and second major sources of financing the expenditure on inpatient and outpatient healthcare.

The present analysis is based on a total pooled sample of 73,868 households (47,302 rural + 26,566 urban) in 2004 and 65,932 households (36,480 rural + 29,452 urban) in 2014. Altogether, data on 385,055 and 335,499 individuals is available from 2004 and 2014, respectively.

## 5.2.2. Statistical Analyses and Outcomes

### Child Inpatient Care

The estimates for average and total out-of-pocket (OOP) medical and non-medical expenditure on child (0 to 5 years) inpatient care under the normal and policy scenario are reported for 2004 and 2014. The reference period for data on child inpatient care is 365 days. The medical expenditure mainly includes information on doctor's/surgeon's fee, expenditure on medicines, diagnostic tests, bed charges and other miscellaneous expenses (like attendant charges, physiotherapy charges, personal medical appliances, blood and oxygen). The total expenditure is the sum of medical expenditure, transportation charges for the patient, food and other miscellaneous costs.

The projections for the total OOP expenditure on child inpatient care are also presented for 2020, 2025 and 2030 for all India and selected states. The projections are simple assuming constant increase in hospitalisation rates as observed between 2004 and 2014. Further, the average total OOP expenditure per hospitalised case is assumed constant as observed in 2014 for state level projections.

### Child Outpatient Care

The estimates for average and total OOP expenditure on child outpatient care for all India and selected states are reported through cross tables. These are presented separately for the current and policy scenarios for both the years (2004 and 2014). The reference period for data on outpatient care is 15 days. The proportion of ailing persons (PAP) per thousand is reported along with total expenditure estimates. Because of data specific limitations, only the total (medical and non-medical) expenditure is presented for child outpatient treatment. Moreover, it is important to understand that the PAP include only those persons who have received outpatient care at least once, hereby excluding those who haven't got treatment on any medical advice.

The estimates for the total OOP expenditure are also projected for 2020, 2025 and 2030 by using total birth projections under the current and policy trends. The projections are made assuming constant increase/decrease in PAPs as observed between 2004 and 2014. However, because of data specific limitations, the average total expenditure on per ailing person is assumed constant for projections.

### Expenditure on Childbirth

The estimates for average and total out-of-pocket expenditure on institutional and home-based birth under the current and policy scenario are presented through cross tables. These are presented separately for 2004 and 2014. Further, the average total expenditure is the sum of medical and non-medical expenditure. In this regard, the medical expenditure covers information on the doctor's/ surgeon's fee, spending on medicines, diagnostic tests, bed charges and other miscellaneous expenses (like attendant charges, physiotherapy charges, personal medical appliances, blood and oxygen). The non-medical expenditure captures information on transport charges for the patient, food, transport of others, costs incurred on escorts and their lodgings.

The projections for the total OOP expenditure on births under the current and policy scenarios are also estimated. To enable these, it is assumed that 100 per cent births by 2030 will be institutional. Additionally, the increase in the unit cost of institutional births is assumed to be constant as observed between 2004 and 2014 for all India as well as state level projections. However due to data specific limitations, the unit cost of home-based births is assumed to be constant as estimated in 2014 for state level projections. It is worth mentioning here that these assumptions will not affect the relative difference between estimates under the current and policy trends of total births.

## 5.3. Results

### 5.3.1. Out-of-Pocket Expenditure: Child Inpatient Care

Table 5.1 shows estimates regarding OOP expenditure on child hospitalisation (0-5 years) under the current and policy scenarios and the difference between these for 2004 and 2014. The observed hospitalisation rate among children is 22 and 31 per 1000 for 2004 and 2014 respectively.

**Table 5.1: OOP Expenditure Averted on Child Hospitalisation, All India, 2004 and 2014**

Variables	2004			2014		
	C*	P*	Net*	C*	P*	Net*
Number per 1000 persons hospitalised*	22	22	22	31	31	31
Total number of births (in millions)	27.2	21.0	6.1	26.2	20.1	6.1
Total number of hospitalised cases	599901	463891	136010	814322	623311	191011
Average medical expenditure per hospitalised child*++ (Rs. in millions)	74000	74000	74000	106850	106850	106850
Total medical expenditure on child hospitalisation (Rs. in millions)	4439	3432	1006	8701	6660	2041
Average total expenditure per hospitalised child*++ (Rs. in millions)	76930	76930	76930	122530	122530	122530
Total expenditure on child hospitalisation (Rs. in millions)	4620	3570	1050	9980	7640	2340
Total expenditure on child hospitalisation averted (%)			22.7			23.5

++ Estimates adjusted for inflation

C\* Current Trend; P\* Policy Trend; Net\* Expenditure Averted

Following this, the difference between total hospitalised cases between both scenarios is 136010 in 2004 and 191011 in 2014. The estimated total OOP expenditure (medical and non-medical) in the current and policy situation is Rs. 4615 million and Rs. 3568 million respectively, for 2004 and Rs. 9977 million and Rs. 7637 million, respectively in 2014. The estimated relative difference between the two scenarios is about 22.67 per cent and 23.45 per cent for 2004 and 2014, respectively.

Similarly, the information regarding the projected OOP expenditure on child hospitalisation under the two different scenarios for 2020, 2025 and 2030 is depicted in Table 5.2. It is worth mentioning that an increase in the hospitalisation rate, and the average medical and non-medical expenditure is assumed to be constant as observed between 2004 and 2014. The projected total (medical and non-medical) OOP expenditure under the current scenario is Rs. 14116 million, Rs. 20741.4 million and Rs. 30967 million for 2020, 2025 and 2030, respectively. Similarly, the projected OOP expenditure under the policy scenario is Rs. 11789 million, Rs. 16992 million

and Rs.23956 million for 2020, 2025 and 2030, respectively. The estimates clearly show a relative difference of 16.49 per cent for 2020, 18.09 per cent for 2025 and 22.64 per cent for 2030 between the current and policy trends.

Table 5.3 presents estimates for OOP expenditure on child hospitalisation in selected states for 2004 and 2014. In Bihar, the total OOP expenditure on child hospitalisation under the current trend is almost 7.11 per cent and 18.48 per cent higher than the expenditure estimated under the policy scenario for 2004 and 2014, respectively. Similarly, for 2004 and 2014, the total OOP expenditure under the current scenario is 0.90 per cent and 16.84 per cent higher than the policy scenario in Rajasthan. In Madhya Pradesh, the relative difference between the expenditure estimates under the current and policy trends is 16.21 per cent and 34.71 per cent for 2004 and 2014, respectively. Finally, in Uttar Pradesh, the total OOP expenditure estimated under the current scenario is 13.63 per cent and 30 per cent higher than estimates under the policy scenario for 2004 and 2014, respectively.

**Table 5.2. Estimated Savings on Total Expenditure on Child Hospitalisation (0 to 5 years), All India, 2020, 2025 and 2030**

Variables	2020			2025			2030		
	C*	P*	Net*	C*	P*	Net*	C*	P*	Net*
Hospitalised per 1000 persons	37.3	37.3	37.3	45.0	45.0	45.0	54.2	54.2	54.2
Total number of births (in millions)	23.8	19.9	3.9	22.4	18.3	4.1	21.4	16.6	23.8
Total hospital cases (in millions)	0.88	0.74	0.14	1.00	0.82	0.18	1.16	0.89	0.26
Average. medical expenditure per hospitalisation ++ (Rs. in millions)	128700	128700	128700	155020	155020	155020	186720	186720	186720
Total medical expenditure child hospitalisation (Rs. in millions)	11440	9550	1890	15620	12790	2830	21660	16760	4900
Average total expenditure per hospitalised child*++ (Rs. in millions)	158840	158840	158840	205900	205900	205900	266910	266910	266910
Total child hospitalisation expenditure (Rs. in millions)	14120	11790	2330	20740	16990	3750	30970	23960	7010
Total child hospitalisation expenditure averted (%)			16.49			18.09			22.64

++ Estimates adjusted for inflation

**Note:** Trend in average medical and total exp. is projected by taking an observed increase of 20.19 % and 29.63 % per five years respectively between 2004 and 2014 (assuming constant increase). Increase in hospitalisation rate is assumed constant at observed 20.45% per five years. C\* Current Trend; P\* Policy Trend; Net\* Expenditure Averted

**Table 5.3: OOP Expenditure Averted on Child Hospitalisation, Selected States, 2004 and 2014**

	2004			2014		
	C*	P*	Avt*	C*	P*	Avt*
<b>Uttar Pradesh</b>						
Number per 1000 persons hospitalised*	12	12	12	17	17	17
Total number of births (in millions)	5.2	4.5	0.7	5.3	3.7	0.15
Total number of hospitalised cases	62,578	54,045	8,533	89690.9	62783.6	26,907
Average medical expenditure per hospitalised child*++ (Rs. in millions)	109950	109950	109950	137120	137120	137120
Total medical expenditure on child hospitalisation (Rs. in millions)	688.0	594.2	93	1229.8	860.8	368.9
Average total expenditure per hospitalised child*++ (Rs. in millions)	111710	111710	111710	152350	152350	152350
Total expenditure on child hospitalisation (Rs. in millions)	699.0	603.7	95.3	1366	956.5	409.9
Total expenditure on child hospitalisation averted (%)			13.63			29.99
<b>Madhya Pradesh</b>						
Number per 1000 persons hospitalised*	13	13	13	21	21	21
Total number of births (in millions)	1.82	1.53	0.29	1.85	1.21	0.64
Total number of hospitalised cases	23,782	19,925	3,857	38986	25452.3	13534
Average medical expenditure per hospitalised child*++ (Rs. in millions)	81910	81910	81910	52200	52200	52200
Total medical expenditure on child hospitalisation (Rs. in millions)	194.7	163.2	31.58	203.5	132.8	70.6
Average total expenditure per hospitalised child*++ (Rs. in millions)	83620	83620	83620	66700	66700	66700
Total expenditure on child hospitalisation (Rs. in millions)	198.8	166.6	32.2	260.0	169.71	90.2
Total expenditure on child hospitalisation averted (%)			16.21			34.71
<b>Rajasthan</b>						
Number per 1000 persons hospitalised*	15	15	15	20	20	20
Total number of births (in millions)	1.65	1.64	0.14	1.74	1.45	0.29
Total number of hospitalised cases	24,892	24,668	224	34881.74	29007	5875
Average medical expenditure per hospitalised child*++ (Rs. in millions)	74820	74820	74820	59070	59070	59070
Total medical expenditure on child hospitalisation (Rs. in millions)	186.2	184.5	1.6	206.0	171.3	34.7
Average total expenditure per hospitalised child*++ (Rs. in millions)	86610	86610	86610	72150	72150	72150
Total expenditure on child hospitalisation (Rs. in millions)	215.5	213.6	1.9	251.6	209.2	42.3
Total expenditure on child hospitalisation averted (%)			0.90			16.84

	2004			2014		
<b>Bihar</b>						
Number per 1000 persons hospitalised*	5	5	5	16	16	16
Total number of births (in millions)	2.49	2.31	0.18	2.42	1.97	4.4
Total number of hospitalised cases	12469	11582	887	38781	31611	7167
Average medical expenditure per hospitalised child*++ (Rs. in millions)	89740	89740	89740	108340	108340	108340
Total medical expenditure on child hospitalisation (Rs. in millions)	111.8	103.9	7.9	420.1	342.5	77.6
Average total expenditure per hospitalised child*++ (Rs. in millions)	90030	90030	90030	124190	124190	124190
Total expenditure on child hospitalisation (Rs. in millions)	112.2	104.2	8.0	481.6	392.6	89.0
Total expenditure on child hospitalisation averted (%)			7.11			18.48

\* Estimated using National Sample Survey 2004 and 2014

++ Estimates adjusted for inflation

C\* Current Trend; P\* Policy Trend; Avt \* Expenditure Averted

**Table 5.4:** Estimated Savings on Total Expenditure on Child Hospitalisation (0 to 5 years) Selected States, 2020, 2025 and 2030

Variables	2020			2025			2030		
	C*	P*	Net*	C*	P*	Net*	C*	P*	Net*
<b>Bihar</b>									
Number per 1000 persons hospitalised*	33.6	33.6	33.6	70.56	70.56	70.56	109	109	109
Total number of births (in millions)	2.2	1.8	0.4	2.2	1.7	0.5	2.2	1.6	0.6
Total number of hospitalised cases (in millions)	0.07	0.06	0.01	0.15	0.12	0.03	0.24	0.17	0.06
Average medical expenditure per hospitalised child*++ (Rs. in millions)	108340	108340	108340	108340	108340	108340	108340	108340	108340
Total medical expenditure on child hospitalisation (Rs. in millions)	805	649	156	1663	1283	380	2617	1910	707
Average expenditure per hospitalised child*++ (Rs. in millions)	124190	124190	124190	124190	124190	124190	124190	124190	124190
Total expenditure on child hospitalisation (Rs. in millions)	923	743	179	1906	1470	435	3000	2189	811
Total expenditure on child hospitalisation averted (%)			19.42			22.84			27.02
<b>Rajasthan</b>									
Number per 1000 persons hospitalised*	23.3	23.3	23.3	27.2	27.2	27.2	31.7	31.7	31.7
Total number of births (in millions)	1.6	1.4	0.2	1.4	1.2	0.2	1.3	1.1	0.2
Total number of hospitalised cases (in millions)	0.036	0.032	0.005	0.038	0.033	0.005	0.042	0.035	0.007

Variables	2020			2025			2030		
Average medical expenditure per hospitalised child*++ (Rs. in millions)	59070	59070	59070	59070	59070	59070	59070	59070	59070
Total medical expenditure on child hospitalisation (Rs. in millions)	216	188	27	224	194	30	249	209	40
Average expenditure per hospitalised child*++ (Rs. in millions)	72150	72150	72150	72150	72150	72150	72150	72150	72150
Total expenditure on child hospitalisation (Rs. in millions)	263	230	34	273	237	36	304	255	49
Total expenditure on child hospitalisation averted (%)			12.75			13.32			16.05
<b>Madhya Pradesh</b>									
Number per 1000 persons hospitalised*	27.4	27.4	27.4	35.9	35.9	35.9	46.9	46.9	46.9
Total number of births (in millions)	1.7	1.2	0.6	1.6	1.1	0.5	1.5	1.0	0.5
Total number of hospitalised cases (in millions)	0.047	0.032	0.015	0.056	0.039	0.017	0.071	0.048	0.023
Average medical expenditure per hospitalised child*++ (Rs. in millions)	52200	52200	52200	52200	52200	52200	52200	52200	52200
Total medical expenditure on child hospitalisation (Rs. in millions)	2470	1660	810	2910	2020	890	3690	2490	1190
Average expenditure per hospitalised child*++ (Rs. in millions)	66700	66700	66700	66700	66700	66700	66700	66700	66700
Total expenditure on child hospitalisation (Rs. in millions)	315	212	103	372	258	113	471	319	152
Total expenditure on child hospitalisation averted (%)			32.64			30.46			32.35
<b>Uttar Pradesh</b>									
Number per 1000 persons hospitalised*	20.5	20.5	20.5	24.8	24.8	24.8	30.0	30.0	30.0
Total number of births (in millions)	4.6	3.2	1.4	4.0	3.0	1.0	3.8	2.9	0.9
Total number of hospitalised cases (in millions)	0.095	0.066	0.029	0.100	0.076	0.024	0.114	0.088	0.026
Average medical expenditure per hospitalised child*++ (Rs. in millions)	137120	137120	137120	137120	137120	137120	137120	137120	137120
Total medical expenditure on child hospitalisation (Rs. in millions)	1302	900	402	1367	1038	329	1565	1211	354
Average expenditure per hospitalised child*++ (Rs. in millions)	152350	152350	152350	152350	152350	152350	152350	152350	152350
Total expenditure on child hospitalisation (Rs. in millions)	1447	1000	447	1519	1153	366	1739	1346	394
Total expenditure on child hospitalisation averted (%)			30.88			24.09			22.64

\* Estimated using National Sample Survey 2004 and 2014

++ Estimates adjusted for inflation

C\* Current Trend; P\* Policy Trend; Avt\* Expenditure Averted

Note: Average medical and total expenditure is assumed to be constant as observed in 2014. The increase in hospitalisation rate is assumed to be constant as observed between 2004 and 2014.

The projected estimates for OOP expenditure on child inpatient care in selected states for 2020, 2025 and 2030 are presented in Table 5.4. At this point, it is important to note that despite an increase in hospitalisation rate, the average medical and non-medical expenditure is assumed to be constant as observed between 2004 and 2014.

In Bihar, the projected expenditure under the current scenario is about 19.42 per cent higher than the policy scenario for 2020, 22.84 per cent higher for 2025 and 27.02 per cent higher for 2030. In Rajasthan, the OOP expenditure on inpatient care under the current scenario is projected to be 12.75 per cent more than that projected under the policy trend for 2020. Similarly, these estimates are 13.32 per cent higher in 2025 and 16.05 per cent higher in 2030. For Madhya Pradesh, the difference between the OOP expenditure estimates under the current and policy situations is about 32.64 per cent in 2020, 30.46 per cent in 2025 and 32.35 per cent in 2030. Similarly, the projected expenditure on child inpatient care in Uttar Pradesh is 30.88 per cent higher under the current scenario compared to the policy trend for 2020. Furthermore, these estimates are 24.09 per cent higher for 2025 and 22.64 per cent higher for 2030.

### 5.3.2. Out-of-Pocket Expenditure: Child Outpatient Care

Table 5.5 shows information on the OOP expenditure on child (0 to 5 years) outpatient care in India for 2004 and 2014 taking into consideration the total number of births under the current and policy scenarios. The observed proportion of ailing persons (PAP) in 2004 and 2014 are 77 per thousand and 89 per thousand, respectively. Under the current scenario, the total expenditure on outpatient care is Rs. 1474 million in 2004 and Rs. 1634 million in 2014. The total expenditure under the policy scenario is Rs. 1139 million and Rs. 1251 million in 2004 and 2014, respectively.

Similarly, Table 5.6 presents the total expenditure projected on child outpatient care for 2020, 2025 and 2030. An increase in the proportion of ailing persons is assumed to be constant as observed between 2004 and 2014. Estimates show that the total medical and non-medical expenditure under the current scenario exceeds that of the policy scenario by Rs 263 million in 2020, Rs. 293 million in 2025 and Rs. 378 million in 2030.

**Table 5.5: Total Expenditure Averted on Child Outpatient Care (0 to 5 years) All India, 2004 and 2014**

	2004			2014		
	C*	P*	Avt*	C*	P*	Avt*
PAP (per 1000 persons)	77	77	77	89	89	89
Total number of births (in millions)	27.2	21.0	6.1	26.2	20.1	6.1
Total number of ailing persons (in millions)	2.1	1.62	0.48	2.3	1.8	0.55
Average total expenditure per ailing child*++ (Rs. in millions)	7020	7020	7020	6990	6990	6990
Total medical and non-medical expenditure (Rs. in millions)	1474	1139	334.2	1634	1251	383.3
Total expenditure on child hospitalisation averted (%)			22.67			23.46

\* Estimated using National Sample Survey 2004 and 2014

++ Estimates adjusted for inflation

C\* Current Trend; P\* Policy Trend; Avt\* Expenditure Averted

**Table 5.6: Estimated Savings on Total Expenditure on Child Outpatient Care (0 to 5 years) All India, 2020, 2025 and 2030**

	2020			2025			2030		
	C*	P*	Avt*	C*	P*	Net*	C*	P*	Net*
PAPs (per 1000 persons)	95.9	95.9	95.9	103.4	103.4	103.4	111.5	111.5	111.5
Total number of births (in millions)	23.8	19.9	3.9	22.4	18.3	4.1	21.4	16.6	4.8
Total number of ailing persons (in millions)	2.3	1.9	0.4	2.3	1.9	0.4	2.4	1.8	0.5
Average total expenditure per ailing child*++ (Rs. in millions)	6990	6990	6990	6990	6990	6990	6990	6990	6990
Total medical And non-medical expenditure (Rs. in millions)	1596	1333	263	1619	1326	293	1669	1291	378
Total expenditure on child hospitalisation averted (%)			16.49			18.09			22.64

\* Estimated using National Sample Survey 2004 and 2014

++ Estimates adjusted for inflation

Note: An increase in PAPs is assumed to be constant at the observed figure of 7.79% per five years.

C\* Current Trend; P\* Policy Trend; Avt\* Expenditure Averted

**Table 5.7: Total Expenditure Averted on Child Outpatient Care (0 to 5 years) Selected States, 2004 and 2014**

	2004			2014		
	C*	P*	Avt*	C*	P*	Avt*
<b>Bihar</b>						
PAP (per 1000 persons)	44	44	44	55	55	55
Total number of births (in millions)	2.5	2.3	0.2	2.4	2.0	0.4
Total number of ailing persons (in millions)	0.11	0.10	0.01	0.13	0.11	0.02
Average total expenditure per ailing child*++ (Rs. in millions)	7380	7380	7380	8720	8720	8720
Total medical and non-medical expenditure (Rs. in millions)	810	752	5.8	116.2	94.8	21.5
Total expenditure on child hospitalisation averted (%)			7.11			18.48
<b>Rajasthan</b>						
PAP (per 1000 persons)	54	54	54	56	56	56
Total number of births (in millions)	1.7	1.6	0.01	1.7	1.5	0.3
Total number of ailing persons (in millions)	0.09	0.09	0.001	0.10	0.08	0.02
Average total expenditure per ailing child*++ (Rs. in millions)	13260	13260	13260	7870	7870	7870
Total medical and non-medical expenditure (Rs. in millions)	118.8	117.8	1.1	76.9	63.9	12.9
Total expenditure on child hospitalisation averted (%)			0.90			16.84
<b>Madhya Pradesh</b>						
PAP (per 1000 persons)	56	56	56	52	52	52
Total number of births (in millions)	1.8	1.5	0.3	1.9	1.2	0.6

	2004			2014		
Total number of ailing persons (in millions)	0.10	0.09	0.02	0.10	0.06	0.03
Average total expenditure per ailing child*++ (Rs. in millions)	6220	6220	6220	9240	9240	9240
Total medical and non-medical expenditure (Rs. in millions)	63.7	53.4	10.3	89.2	58.2	31.0
Total expenditure on child hospitalisation averted (%)			16.2			34.7
<b>Uttar Pradesh</b>						
PAP (per 1000 persons)	81	81	81	67	67	67
Total number of births (in millions)	5.2	4.5	0.7	5.3	3.7	1.6
Total number of ailing persons (in millions)	0.42	0.36	0.06	0.35	0.25	0.11
Average total expenditure per ailing child*++ (Rs. in millions)	7320	7320	7320	9210	9210	9210
Total medical and non-medical expenditure (Rs. in millions)	309	267	42	326	228	98
Total expenditure on child hospitalisation averted (%)			13.6			30.0

\* Estimated using National Sample Survey 2004 and 2014

++ Estimates adjusted for inflation

C\* Current Trend; P\* Policy Trend; Avt\* Expenditure Averted

The information on medical and non-medical expenditure incurred on child outpatient care in selected states for 2004 and 2014 is depicted in Table 5.7. The estimated PAP below five years in Bihar is 44 per thousand and 55 per thousand in 2004 and 2014, respectively. The total expenditure averted on child hospitalisation is estimated at 7.11 per cent in 2004 and 18.48 per cent in 2014. Similarly, in Rajasthan, the PAPs is estimated at 54 and 56 per thousand for 2004 and 2014, respectively.

The total expenditure averted on child hospitalisation estimated for 2004 and 2014 is 1 per cent and 16.48 per cent respectively. The PAPs below five years in Madhya Pradesh decreases from 56 to 52 per 1000 persons between 2004 and 2014. The estimated total expenditure is 16.2 per cent and 34.7 per cent higher in 2004 and 2014, respectively, under the current trend as opposed to the policy trend. In Uttar Pradesh, the total expenditure under the current situation is estimated to be Rs. 42 million higher than the policy situation for 2004 and Rs. 98 million higher for 2014.

### 5.3.3. Out-of-Pocket Expenditure: Childbirth

Table 5.8 presents information on the total OOP expenditure on institutional as well as home-based births in India for 2004 and 2014. The estimated proportion of institutional and home-based births is 43.3 per cent and 56.7 per cent respectively in 2004 and 82.5 and 17.5 per cent respectively in 2014. The absolute difference between the total expenditure (institutional and home-based) on births under the current and policy scenarios is Rs 22469 million in 2004 and Rs. 45948 million in 2014. The total OOP expenditure (medical and non-medical) estimated under the current trend is 22.6 per cent and 23.4 per cent higher compared to estimates under the policy scenario for 2004 and 2014, respectively. Similarly, simple projections of total expenditure on births for 2020, 2025 and 2030 are portrayed in Table 5.9. It has been assumed that all the deliveries will be institutional by 2030. Further, assuming a constant increase in the proportion of institutional deliveries and unit cost of births, the total expenditure, taking total births under the current scenario, is Rs. 33788 million higher in 2020, Rs. 40330 million in 2025 and Rs. 55684 million in 2030.

**Table 5.8: Total (Medical and Non-Medical) Expenditure Averted on Childbirth (0 to 5 years) All India, 2004 and 2014**

	2004			2014		
	C*	P*	Avt*	C*	P*	Avt*
Total number of births (in millions)	27.2	21	6.1	26.2	20.1	6.1
Proportion of institutional births (%)	43.3	43.3	43.3	82.5	82.5	82.5
Proportion of home-based births (%)	56.7	56.7	56.7	17.5	17.5	17.5
Total institutional births (in millions)	11.8	9.1	2.7	21.7	16.6	5.1
Total home-based births (in millions)	15.5	12.0	3.5	4.6	3.5	1.1
Average total expenditure per institutional birth <sup>++</sup> (Rs. in millions)	70200	70200	70200	85070	85070	85070
Average total expenditure per home birth <sup>++</sup> (Rs. in millions)	10490	10490	10490	25080	25080	25080
Total institutional birth expenditure (Rs. in millions) (a)	82886	64094	18791	184359	141115	43244
Total home-based birth expenditure (Rs. in millions) (b)	16218	12541	3677	11529	8824	2704
Total expenditure on birth (Rs. in millions) (a + b)	99104	76635	22469	195888	149940	45948
Total expenditure on birth averted (%)			22.7			23.4

α - Exp. on Home-based Childbirth are assumed to be constant

++ Estimates adjusted for inflation

C\* Current Trend; P\* Policy Trend; Avt\* Expenditure Averted

**Table 5.9: Projected Total (Medical and Non-Medical) Expenditure Averted on Childbirth All India, 2020, 2025 and 2030**

	2020			2025			2030		
	C*	P*	Avt*	C*	P*	Avt*	C*	P*	Avt*
Total births (in millions)	23.8	19.8	3.9	22.4	18.3	4.0	21.4	16.5	4.8
Proportion of institutional births (%)	88	88	88	94	94	94	100	100	100
Proportion of home-based births (%)	12	12	12	6	6	6	0	0	0
Total institutional births (in millions)	20.9	17.5	3.5	21.1	17.2	3.8	21.4	16.6	4.8
Total home-based births (in millions)	2.9	2.4	0.5	1.3	1.1	0.2	0.0	0.0	0.0
Average expenditure per institutional birth <sup>++</sup> (Rs. in millions)	94070	94070	94070	103940	103940	103940	114850	114850	114850
Average expenditure per home-based birth <sup>++</sup> (Rs. in millions)	27710	27710	27710	30620	30620	30620	33830	33830	33830
Total expenditure on institutional births (Rs. in millions) (a)	197030	164550	32480	218860	179280	39590	245970	190290	55680
Total expenditure on home-based births (Rs. in millions) (b)	7910	6610	1300	4120	3370	740	0	0	0
Total expenditure on births (Rs. in millions) (a + b)	204950	171160	33790	222980	182650	40330	245970	190290	55680
Total expenditure on births averted (%)			16.49			18.09			22.64

\*Estimated using National Sample Survey 2004 and 2014

++ Estimates adjusted for inflation

Note: Trend in unit cost of childbirth (both institutional and home-based) has been projected by taking an observed average increase of 10.5 per cent per five years between 2004 and 2014 (assuming constant increase). It has been assumed that all childbirths will be institutional by 2030.

C\* Current Trend; P\* Policy Trend; Avt\* Expenditure Averted

**Table 5.10: Total (Medical and Non-Medical) Expenditure Averted on Childbirth (0 to 5 years) Bihar and Rajasthan, 2004 and 2014**

	2004			2014		
	C*	P*	Avt*	C*	P*	Avt*
<b>Bihar</b>						
Total number of births (in millions)	2.4	2.3	0.17	2.4	1.9	0.4
Proportion of institutional births (%)	18.45	18.45	18.45	71	71	71
Proportion of home-based births (%)	81.55	81.55	81.55	29	29	29
Total number of institutional births (in millions)	0.46	0.42	0.03	1.72	1.40	0.32
Total number of home-based births (in millions)	2.03	1.89	0.14	0.70	0.57	0.13
Average total expenditure per institutional child birth*++ (Rs. in millions)	48880	48880	48880	68700	68700	68700
Average total expenditure per home-based childbirth <sup>a</sup> *++ (Rs. in millions)	23060	23060	23060	23060	23060	23060
Total expenditure on institutional childbirth (Rs. in millions) (a)	2249	2089	160	11822	9637	2185
Total expenditure on home-based childbirth (Rs. in millions) (b)	4690	4356	333.7	1621	1321	299.6
Total expenditure on childbirth (Rs. in millions) (a + b)	6939	6445	493	13443	10959	2484
Total (Medical and Non-Medical) Expenditure on Childbirths Averted (%)			7.11			18.48
<b>Rajasthan</b>						
Total number of births (in millions)	1.65	1.64	0.01	1.74	1.45	2.9
Proportion of institutional births (%)	32.75	32.75	32.75	85	85	85
Proportion of home-based births (%)	67.25	67.25	67.25	15	15	15
Total number of institutional births (in millions)	0.543	0.539	0.005	1.482	1.233	0.250
Total number of home-based births (in millions)	1.116	1.106	0.010	0.262	0.218	0.044
Average total expenditure per institutional childbirth*++ (Rs. in millions)	72680	72680	72680	45030	45030	45030
Average total expenditure per home-based childbirth <sup>a</sup> *++ (Rs. in millions)	27200	27200	27200	27200	27200	27200
Total expenditure on institutional childbirth (Rs. in millions) (a)	3950	3914	35.6	6675	5551	1124
Total expenditure on home-based childbirth (Rs. in millions) (b)	3035	3008	27.3	711	591	119
Total expenditure on childbirth (Rs. in millions) (a + b)	6985	6922	62.9	7387	6143	1244
Total (Medical and Non-Medical) Expenditure on Childbirths Averted (%)			0.90			16.84

<sup>a</sup> - Exp. on home-based childbirth is assumed to be constant

\* Estimated using National Sample Survey 2004 and 2014

++ Estimates adjusted for inflation

C\* Current Trend; P\* Policy Trend; Avt\* Expenditure Averted

**Table 5.11: Total (Medical and Non-Medical) Expenditure Averted on Childbirth (0 to 5 years) Madhya Pradesh, 2004 and 2014**

	2004			2014		
	C*	P*	Avt*	C*	P*	Avt*
<b>Madhya Pradesh</b>						
Total number of births	0.182	0.153	0.029	0.185	0.121	0.064
Proportion of institutional births (%)	42	42	42	83	83	83
Proportion of home-based births (%)	58	58	58	17	17	17
Total number of institutional births (in millions)	0.77	0.64	0.12	1.54	0.100	0.053
Total number of home-based births (in millions)	1.05	0.88	0.17	0.31	0.20	0.10
Average total expenditure per institutional childbirth*++ (Rs. in millions)	75910	75910	75910	41170	41170	41170
Average total expenditure per home-based childbirth <sup>a</sup> ++ (Rs. in millions)	25020	25020	25020	25020	25020	25020
Total expenditure on institutional childbirth (Rs. in millions) (a)	5849	4900	948.5	6343	4141	2202
Total expenditure on home-based childbirth (Rs. in millions) (b)	2649.2	2219.6	429.6	789.6	515.5	274.1
Total expenditure on childbirth (Rs. in millions) (a + b)	8498.4	7120.3	1378.1	7133.4	4657.1	2476.3
Total (Medical and Non-Medical) Expenditure on Childbirths Averted (%)			16.22			34.71
<b>Uttar Pradesh</b>						
Total number of births (in millions)	5.21	4.50	0.71	5.27	3.69	1.58
Proportion of institutional births (%)	16.57	16.57	16.57	71	71	71
Proportion of home-based births (%)	83.43	83.43	83.43	29	29	29
Total number of institutional births (in millions)	0.86	0.74	0.11	3.74	2.62	1.12
Total Number of home-based births (in millions)	4.35	3.75	0.59	1.53	1.07	0.45
Average total expenditure per institutional childbirth*++ (Rs. in millions)	86440	86440	86440	67900	67900	67900
Average total expenditure per home-based childbirth <sup>a</sup> ++ (Rs. in millions)	30350	30350	30350	30350	30350	30350
Total expenditure on institutional childbirth (Rs. in millions) (a)	7469.3	6450.8	1018.5	25434.8	17804.3	7630.4
Total expenditure on home-based childbirth (Rs. in millions) (b)	13204.6	11404	1800.6	4643.6	3250.5	1393.1
Total expenditure on childbirth (Rs. in millions) (a + b)	20674	17854.7	2819.2	30078.4	21055	9023
Total (Medical and Non-Medical) Expenditure on Childbirths Averted (%)			13.64			30.00

<sup>a</sup> Expenditure on home-based childbirth is assumed to be constant

\* Estimated using National Sample Survey 2004 and 2014

++ Estimates adjusted for inflation

C\* Current Trend; P\* Policy Trend; Avt\* Expenditure Averted

**Table 5.12.: Projected Total (Medical and Non-Medical) Expenditure Averted on Childbirth Bihar and Rajasthan, 2020, 2025 and 2030**

	2020			2025			2030		
	C*	P*	Avt*	C*	P*	Avt*	C*	P*	Avt*
<b>Bihar</b>									
Total births (in millions)	2.2	1.7	0.4	2.1	1.6	0.4	2.2	1.6	0.5
Institutional births (%)	81	81	81	91	91	91	100	100	100
Home-based births (%)	19	19	19	9	9	9	0	0	0
Total institutional births (in millions)	1.8	1.4	0.3	2.0	1.5	0.5	2.2	1.6	0.6
Total home-based births (in millions)	0.4	0.3	0.1	0.2	0.2	0.0	0.0	0.0	0.0
Average expenditure per institutional birth*++ (Rs. in millions)	82630	82630	82630	99370	99370	99370	119520	119520	119520
Average expenditure per home-based birth*++ (Rs. in millions)	23060	23060	23060	23060	23060	23060	23060	23060	23060
Total expenditure on institutional births (Rs. in millions) (a)	14796	11923	2873	19668	15175	4493	26486	19330	7156
Total expenditure on home-based births (Rs. in millions) (b)	968.6	780.5	188.1	451.4	348.3	103.1	0.0	0.0	0.0
Total expenditure on births (Rs. in millions) (a + b)	15764.5	12703.5	3061	20119.6	15523.4	45960.3	26486.4	19330	7156.4
Total Expenditure on Births Averted (%)			19.42			22.84			27.02
<b>Rajasthan</b>									
Total births (in millions)	1.56	1.36	0.19	1.39	1.20	1.85	1.32	1.11	0.21
Institutional births (%)	90	90	90	95	95	95	100	100	100
Home-based births (%)	10	10	10	5	5	5	0	0	0
Total institutional births (in millions)	1.4	1.2	0.2	1.3	1.1	0.2	1.3	1.1	0.2
Total home-based births (in millions)	0.2	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0
Average expenditure per institutional birth*++ (Rs. in millions)	36465.3	36465.3	36465.3	29529.6	29529.6	29529.6	23913.1	23913.1	23913.1
Average expenditure per home-based birth*++ (Rs. in millions)	27200	27200	27200	27200	27200	27200	27200	27200	27200
Total expenditure institutional births (Rs. in millions) (a)	5135.8	4480.9	655	3910.5	3389.7	520.8	3173	2663.6	509.4
Total expenditure home-based births (Rs. in millions) (b)	425.7	371.4	5403	189.6	164.3	25.2	0.0	0.0	0.0
Total expenditure on births (Rs. in millions) (a + b)	5561.5	4852.2	709.2	4100.1	3554.0	546.1	3173	2663.6	509.4
Total Expenditure on Births Averted (%)			12.75			13.32			16.05

++ Estimates adjusted for inflation

**Note:** Trend in unit cost of institutional childbirth is projected by taking an observed average decrease between 2004 and 2014 and unit cost of home-based births is assumed to be constant. It has been posited that all births will be institutional by 2030.

C\* Current Trend; P\* Policy Trend; Avt\* Expenditure Averted

**Table 5.13.: Projected Total (Medical and Non-Medical) Expenditure Averted on Childbirth Madhya Pradesh and Uttar Pradesh, 2020, 2025 and 2030**

	2020			2025			2030		
	C*	P*	Avt*	C*	P*	Avt*	C*	P*	Avt*
<b>Madhya Pradesh</b>									
Total births (in millions)	1.7	1.2	0.56	1.5	1.18	0.47	1.5	1.0	4.87
Institutional births (%)	89	89	89	95	95	95	100	100	100
Home-based births (%)	11	11	11	5	5	5	0	0	0
Total institutional births (in millions)	1.5	1.0	0.5	1.5	1.0	0.4	1.5	1.0	0.5
Total home-based births (in millions)	0.19	0.13	0.06	0.08	0.05	0.02	0.0	0.0	0.0
Average expenditure per institutional birth*++ (Rs. in millions)	31750	31750	31750	24490	24490	24490	18880	18880	18880
Average expenditure per home-based birth*++ (Rs. in millions)	25020	25020	25020	25020	25020	25020	25020	25020	25020
Total expenditure institutional births (Rs. in millions) (a)	4870	3280	1590	3610	2510	1100	2840	1920	920
Total expenditure home-based births (Rs. in millions) (b)	470	320	150	190	140	60	0	0	0
Total expenditure on births (Rs. in millions) (a + b)	5340	3600	1740	3810	2650	1160	2840	1920	920
Total Expenditure on Births Averted (%)			32.64			30.46			32.35
<b>Uttar Pradesh</b>									
Total births (in millions)	4.6	3.1	0.15	4.0	0.30	0.9	3.8	2.9	0.9
Institutional births (%)	81	81	81	91	91	91	100	100	100
Home-based births (%)	19	19	19	9	9	9	0	0	0
Total institutional births (in millions)	3.7	2.6	1.2	3.7	2.8	0.9	3.8	2.9	0.9
Total home-based births (in millions)	0.9	0.6	0.3	0.4	0.3	0.1	0	0	0
Average expenditure per institutional birth*++ (Rs. in millions)	60620	60620	60620	54120	54120	54120	48320	48320	48320
Average expenditure per home-based birth*++ (Rs. in millions)	30350	30350	30350	30350	30350	30350	30350	30350	30350
Total expenditure institutional births (Rs. in millions) (a)	22710	15690	7010	19790	15020	4770	18400	14230	4170
Total expenditure home-based births (Rs. in millions) (b)	2670	1840	820	1100	830	260	0	0	0
Total expenditure on births (Rs. in millions) (a + b)	25370	17540	7830	20880	15850	5030	18400	14230	4170
Total Expenditure on Births Averted (%)			30.88			24.09			22.64

++ Estimates adjusted for inflation

Note: Trend in unit cost of institutional childbirth is projected by taking an observed average decrease between 2004 and 2014 and unit cost of home-based births is assumed to be constant. It has been posited that all births will be institutional by 2030.

C\* Current Trend; P\* Policy Trend; Avt\* Expenditure Averted

The estimated OOP expenditure on institutional and home-based births for Bihar and Rajasthan are depicted in Table 5.10. In Bihar, the proportion of institutional births was estimated at 81.55 per cent and home-based births is estimated at 18.45 per cent in 2004, which increased to 71 per cent institutional births and 29 per cent home-based births in 2014. The OOP expenditure in births in Bihar is Rs. 493.6 million (7.11 per cent) higher under the current scenario than the policy scenario for 2004 and Rs. 2484.6 million (18.48 per cent) higher for 2014. Similarly, in Rajasthan, 32.75 per cent of total births are estimated to be institutional and 67.25 per cent births to be home-based for 2004. This proportion increased to 85 per cent and reduced to 15 per cent, respectively in 2014. The difference between OOP expenditure estimated under the current and policy scenarios is Rs. 63 million (0.90 per cent) and Rs. 1244 million (16.84 per cent) for 2004 and 2014 respectively.

Table 5.11 presents estimates of OOP expenditure on total births in Madhya Pradesh and Uttar Pradesh for 2004 and 2014, respectively. In 2004, 42 per cent and 58 per cent of total births in Madhya Pradesh are estimated to be institutional and home-based, respectively. However, in 2014, the proportion of institutional births increased to 83 per cent and home-based births decreased to 17 per cent. The total expenditure on births in Madhya Pradesh under the policy scenario is Rs. 7120.3 million in 2004 and Rs. 4657.1 million in 2014. On the other hand, the total OOP expenditure estimated under the current scenario is Rs. 8498.4 million (16.22 per cent higher) and Rs. 7133.4 million (34.71 per cent higher) in 2004 and 2014, respectively.

Similarly, in Uttar Pradesh, the proportion of institutional births increased from 16.57 per cent to 71 per cent between 2004 and 2014, whereas the proportion of home-based births decreased from 83.43 per cent in 2004 to 29 per cent in 2014. In Uttar Pradesh, the estimated total OOP expenditure on births under the current scenario is Rs. 2819.2 million (13.64 per cent) higher than the policy scenario in 2004 and Rs. 9023.5 million (30 per cent) higher for 2014.

Information regarding the total OOP expenditure in selected states for 2020, 2025 and 2030 is presented in Tables 5.12 and 5.13. An increase in the proportion of institutional deliveries is assumed to be constant as observed between 2004 and 2014. Also, all births are assumed to be institutional by 2030. The total expenditure on births in Bihar under the current scenario is projected to be 19.42 per cent higher than the policy scenario in 2020, 22.84 per cent higher in 2025 and 27.02 per cent higher in 2030. Similarly, in Rajasthan, the projected total expenditure under the current scenario exceeds the policy scenario by 12.75 per cent in 2020, 13.32 per cent in 2025 and 16.05 per cent in 2030. In Madhya Pradesh, the expenditure estimates under the current births trend is projected to be higher than the policy trend estimates by Rs. 1743.4 million (32.64 per cent) in 2020, Rs. 1159.6 million (30.46 per cent) in 2025, and Rs. 920 million (32.33 per cent) in 2030. These estimates for Uttar Pradesh are projected to be 30.88 per cent higher under the current scenario in 2020, 24.09 per cent in 2025 and 22.6 per cent higher in 2030.

#### 5.3.4. Catastrophic Expenditure on Inpatient Care and Institutional Births

We also present an alternative approach to estimate the incidence of catastrophic expenditure by accounting for variations in the household size in the estimation process. Under the conventional approach, a household can be classified as incurring catastrophic expenditure if  $\frac{THE}{HCE} > Ca$  (where  $Ca = 0.1$ ). Where, THE stands for total health expenditure and HCE for household consumption expenditure and Ca denotes the threshold used for identifying catastrophic expenditure where threshold values can be set at various levels such as 10%, 20% and so on.

However, we propose a slight modification in approach, one that retains the NHP formulation but replaces the denominator with per capita annual household consumption expenditure.

Therefore, health expenditure can be considered catastrophic if  $\frac{THE}{PHCE} > Ca$  (where  $Ca = 1$ ). It may be noted that varying levels of thresholds can be used to understand the patterns and intensity of such payments. Besides, it is straightforward to extend this approach in the context of food-based expenditure.

In this study, we employ expenditure thresholds of 100 per cent of annual household per capita consumption expenditure to discern the magnitude and socio-economic patterns of such catastrophic expenditure related to child hospitalisation and institutional births in India and selected states. The estimates for the percentage of households incurring such expenditures for 2004 and 2014 are reported.

Table 5.14 displays information on the proportion of households incurring catastrophic expenditure on child inpatient care for 2004 and 2014. Overall, the estimated proportion of households spending

more than one member's per capita expenditure on child inpatient care increased from 5.3 per cent to 20.1 per cent between 2004 and 2014. Further, 6.9 per cent households in 2014 against 2.9 per cent in 2004, were estimated to incur catastrophic expenditure on child hospitalisation in public facilities. On the other hand, 26.0 per cent households incurred catastrophic expenditure in private hospitals in 2014 against 6.6 per cent in 2004. In 2004, 9.8 per cent households among the lowest quintile and 2.8 per cent among the highest quintile are estimated to be spending more than one member's consumption expenditure. Similarly, 31.1 per cent of the poorest households and 10.6 per cent of the richest households incurred catastrophic expenditure on child hospitalisation in 2014.

The percentage of households incurring catastrophic expenditure on institutional births for 2004 and 2014 are presented in Table 5.14. Overall, 8.5 per cent households in 2004 and 14.3 per cent in 2014, incurred catastrophic expenditure on institutional

**Table 5.14: Percentage of Households Incurring Catastrophic Expenditure on Child Hospitalisation (and Childbirth) above 100 Per cent of Annual Household Per Capita Consumption Expenditure by Wealth Quintiles All India, NSS, 2004 and 2014**

Wealth Quintiles	2004			2014		
	Public (%)	Private (%)	All (%)	Public (%)	Private (%)	All (%)
<b>Child Hospitalisation</b>						
Lowest Quintile	4.6	16.0	9.8	12.1	48.6	31.1
Second Quintile	2.4	8.0	5.9	7.7	30.5	22.5
Third Quintile	3.3	6.5	5.4	5.9	24.9	19.0
Fourth Quintile	0.5	2.6	2.1	1.7	20.5	15.9
Highest Quintile	2.3	2.8	2.8	1.0	12.6	10.6
All	2.9	6.6	5.3	6.9	26.0	20.1
<b>Institutional Deliveries</b>						
Lowest Quintile	2.7	23.5	10.2	3.6	58.4	13.7
Second Quintile	2.8	21.3	9.6	1.7	45.2	14.0
Third Quintile	1.6	11.7	6.9	1.4	36.3	14.8
Fourth Quintile	0.2	19.0	10.7	0.9	28.8	14.6
Highest Quintile	0.9	6.6	5.5	0.6	20.0	14.5
All	1.8	14.7	8.5	2.1	35.8	14.3

deliveries. Further, 1.8 per cent in 2004 and 2.1 per cent of households in 2014 were estimated to spend more than one member's consumption expenditure on deliveries in public facilities. Furthermore, 2.7 per cent of households from the poorest quintile and 0.9 per cent of households from the richest quintile incurred catastrophic expenditure on public hospital births in 2004. Similarly, in 2014, 0.6 per cent of the richest 20 per cent households and 3.6 per cent of the poorest 20 per cent households spent above their per capita annual household expenditure on public hospital deliveries.

#### 5.4. Conclusion

Overall, the total OOP expenditure on child healthcare (inpatient and outpatient) estimated under the current scenario is 22.67 per cent and 23.45 per cent higher than the expenditure gauged under the policy scenario for 2004 and 2014, respectively. The projected difference between the total OOP expenditure on child healthcare (inpatient and outpatient) estimated under the current and policy scenarios is 16.49 per cent in 2020, 18.09 per cent in 2025 and 22.64 per cent in 2030 for all India.

With the effective implementation of the National Population Policy 2000, Indian households could achieve about a one-fifth reduction in the total out-of-pocket expenditure on delivery care and child hospitalisation. The magnitude of savings in OOP expenditure could be much larger for households in Madhya Pradesh (35 per cent) and Uttar Pradesh (30 per cent).

During 2014-30, Indian households would have cumulatively saved Rs. 715320 million on account of household OOP expenditure toward delivery care. Significant cumulative savings arise from Uttar Pradesh (Rs. 112300 million) and Bihar (Rs. 62320 million).

Similarly, during 2014-30, Indian households would have cumulatively saved Rs. 60780 million on account of household OOP expenditure toward child hospitalisation. About one-fifth of such cumulative savings arise

from Uttar Pradesh (Rs. 6900 million) and Bihar (Rs. 5880 million).

Currently, Indian households experience high financial hardships while seeking hospitalisation and delivery care. In 2014, about 14 per cent cases of delivery care and about 20 per cent cases of child hospitalisation experienced catastrophic out-of-pocket-expenditures.

In Bihar, the total expenditure on child healthcare and births estimated under the current situation exceeds the estimates under the policy situation by 7.11 per cent in 2004 and 18.48 per cent in 2014. Further, it is projected to exceed by 19.42 per cent in 2020, 22.84 per cent in 2025 and 27.02 per cent in 2030.

In Rajasthan, the total expenditure on child healthcare and births estimated under the current situation exceeds the estimates under the policy situation by 0.90 per cent in 2004 and 16.84 per cent in 2014. Further, it is projected to exceed by 12.75 per cent in 2020, 13.32 per cent in 2025 and 16.05 per cent in 2030.

In Madhya Pradesh, the total expenditure on child healthcare and births estimated under the current situation exceeds the estimates under the policy situation by 16.21 per cent in 2004 and 34.71 per cent in 2014. Further, it is projected to exceed by 32.64 per cent in 2020, 30.46 per cent in 2025 and 32.33 per cent in 2030.

In Uttar Pradesh, the total expenditure on child healthcare and births estimated under the current situation exceeds the estimates under the policy situation by 13.63 per cent in 2004 and 29.99 per cent in 2014. Further, it is projected to exceed by 30.88 per cent in 2020, 24.09 per cent in 2025 and 22.64 per cent in 2030.

Overall, 5.3 per cent and 20.1 per cent of households are estimated to incur catastrophic expenditure on child hospitalisation in 2004 and 2014, respectively. The incidence of catastrophic

expenditure on child inpatient care in public hospitals increased from 2.9 per cent in 2004 to 6.9 per cent in 2014. Further, for those seeking care in private hospitals, the proportion of households incurring catastrophic expenditure increased almost four times from 6.6 per cent to 26 per cent between 2004 and 2014.

The incidence of catastrophic expenditure on child hospitalisation is significantly higher among poor households compared to richer households, both in the public and private facilities. The increase in the proportion of households with catastrophic spending is higher among those seeking care in private hospitals than in public hospitals.

The proportion of households with catastrophic spending on childbirth in public hospitals increased from 1.8 per cent in 2004 to 2.1 per cent in 2014. The proportion of households with catastrophic spending on childbirth in private hospitals increased from 14.7 per cent in 2004 to 35.8 per cent in 2014.

The results elicit a clear socio-economic gradient in the incidence of catastrophic spending on childbirth. Therefore, catastrophic expenditure on deliveries

is significantly higher among poor households as compared to richer households, in both public and private hospitals.

The increase in the proportion of households incurring catastrophic expenditure on childbirth is significantly higher for those seeking delivery in private facilities than those in public facilities.

### 5.5. Limitations

The increase in hospitalisation rate among children is assumed to be constant for expenditure projections. The unit cost of child inpatient and outpatient care and institutional births is also assumed to be constant for state level projections. The total expenditure on child healthcare and births are not estimated separately for public and private hospitals because of data specific limitations.

The sample size for both NSS rounds (60th and 71st) is different. The present analysis does not cover information on disease-centric OOP expenditure. Further, the present estimates do not capture the information on SES<sup>22</sup> distribution of total OOP expenditure.

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<sup>22</sup> Socioeconomic status

# 6 Conclusions and Recommendations

## 6.1. Summary of Key Findings

### 6.1.1. Demographic and Health Costs

The study finds the following demographic and health costs if appropriate investments in family planning are not made over the next 15 years:

India will have an additional population of 149 million by 2031 with Bihar (24 million), Madhya Pradesh (14 million), Rajasthan (5 million) and Uttar Pradesh (31 million) accounting for one-half of this additional population.

There will be an additional child population (0-4 years) of 22.7 million by 2031 with Bihar (3.3 million), Madhya Pradesh (2.3 million), Rajasthan (1.1 million) and Uttar Pradesh (4.1 million) accounting for about one-half of this additional child population. India would have to meet the costs of 69 million additional births during 2016-31. Bihar (13 million), Madhya Pradesh (9 million), Rajasthan (3 million) and Uttar Pradesh (18 million) will have to incur major

costs as they jointly account for over 60 per cent of these births.

India would witness 2.9 million additional infant deaths with the bulk of these occurring in Bihar (0.6 million), Madhya Pradesh (0.5 million), Rajasthan (0.2 million) and Uttar Pradesh (1.2 million).

India could prevent 1.2 million maternal deaths with about half of these being averted across Bihar (0.2 million), Madhya Pradesh (0.1 million), Rajasthan (0.1 million) and Uttar Pradesh (0.3 million).

India could avert 206 million unsafe abortions with significant benefits for the four states, particularly Bihar (22 million) and Uttar Pradesh (34 million).

More than one third of the potential number of maternal lives saved across the country between 2001 to 2011 can be attributed to a decrease in the number of live births. For the populous states like Bihar and Uttar Pradesh, the effect of fertility

**Table 6.1: Demographic and Health Consequences (in million)**

Indicators	Bihar	MP	Rajasthan	UP	India
Additional Population 2031	24	14	05	31	149
Additional Child Population 2031	3.3	2.3	1.1	4.1	22.7
Additional Births 2016-31	13	09	03	18	69
Additional Infant Deaths 2016-31	0.6	0.5	0.2	1.2	2.9
Maternal Deaths Averted 2016-31	0.2	0.1	0.1	0.3	1.2
Unsafe Abortions Averted 2016-31	22.3	16.0	14.3	33.8	205.8

declines on the potential number of maternity lives saved is estimated to be 62 per cent and 57 per cent, respectively.

### 6.1.2. Impact on Per Capita Income and Economic Growth

The following would be the economic benefits if appropriate investments in family planning are made over the next 15 years:

With active family planning policies, India will enjoy an additional per capita income of 13 per cent in 2026-31. This implies that the Per Capita GDP (PCGDP in 2004-05 prices) for India could be Rs. 153,368 under the policy scenario compared to Rs. 135,924 under the current scenario.

India would also benefit from an additional 0.4 percentage point increase in per capita GDP growth rate during 2026-31.

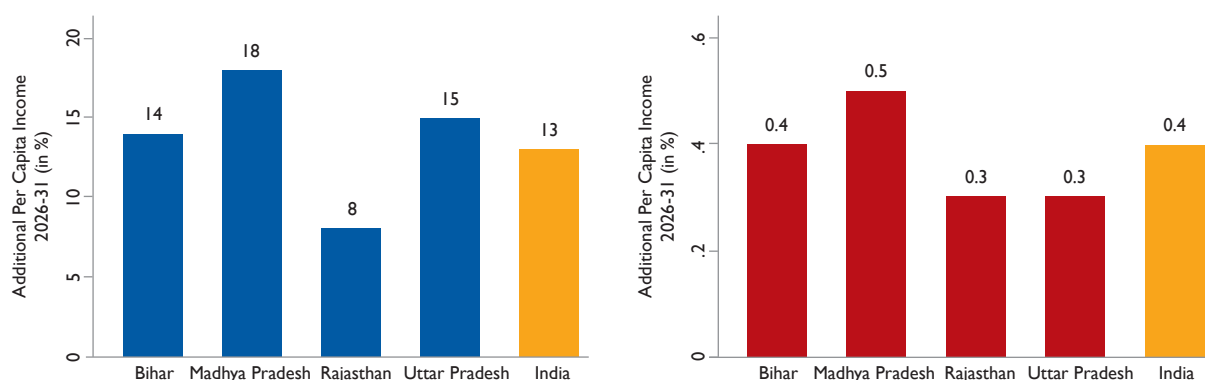
Significant benefits for all the four states are noted but the largest gain could be experienced by Madhya Pradesh with an additional per capita income of 18 per cent in 2026-31. Madhya Pradesh could also benefit from an additional 0.5 percentage point increase in per capita GDP growth rate during 2026-31.

### 6.1.3. National Health Mission (NHM) Budgetary Savings Potential

Substantial financial savings under the National Health Mission (NHM) Programme Components could accrue over the next 15 years if appropriate family planning measures are implemented. The following would be the potential NHM budgetary savings if appropriate actions in family planning are made over the next 15 years:

- Cumulative savings of Rs. 27,0000 million in total budgetary allocations for health
- Cumulative savings of around Rs. 6,0000 million in the maternal health programme
- Cumulative savings of Rs. 3000 million from lower delivery costs on account of the reduced number of births
- Cumulative savings of Rs. 5500 million in the RBSK programme
- Cumulative savings of Rs. 790 million in the adolescent programme
- Cumulative savings of Rs. 13000 million under immunisation coverage on account of the reduced number of births

**Figure 6.1: Additional Per Capita Income and Growth with Effective Policy Scenario**



**Table 6.2. NHM Budget Savings Potential (in million) for the period 2017-31, India and States**

Component	Bihar	MP	Rajasthan	UP	India
Maternal Health	7310	5690	2950	7060	59930
Child Health	180	330	170	130	3070
Adolescent	40	40	10	20	790
RBSK	140	490	160	490	5470
Training	280	210	190	140	4240
NRHM Additionalities	12970	9490	8940	22490	139720
Procurement	4130	1840	2020	2060	42500
Immunisation	1330	650	420	2520	13260
NIDDCP	40	10	10	10	160

#### 6.1.4. Reduction in Household Out-of-Pocket Expenditure

With the effective implementation of the NPP 2000, Indian households could achieve about a one-fifth reduction in total out-of-pocket expenditure on delivery care and child hospitalisation. The magnitude of savings in OOPE could be much larger for households in Madhya Pradesh (35 per cent) and Uttar Pradesh (30 per cent).

During 2014-30, Indian households would have cumulatively saved Rs. 71,5320 million on account of household OOPE toward delivery care. Significant cumulative savings arise from Uttar Pradesh (Rs. 11,2300 million) and Bihar (Rs. 62320 million).

Similarly, during 2014-30, Indian households would have cumulatively saved Rs. 6,0780 million on account of household OOPE toward child hospitalisation. About one-fifth of such cumulative savings would come from Uttar Pradesh (Rs. 6900 million) and Bihar (Rs. 5880 million).

Currently, Indian households experience high level of financial hardships while seeking hospitalisation and delivery care. In 2014, about 14 per cent cases of delivery care and about 20 per cent cases of child hospitalisation experienced catastrophic OOPE.

#### 6.2. Recommended Actions

In the last three years, several new family planning programmes have been introduced and these include:

- An bigger basket of choice: Three new methods have been introduced in the National Family Planning programme: (i) Injectable Contraceptive DMPA (Antara) (ii) Centchroman pill (Chhaya) (iii) Progesterone only pill (POP).
- Gol has launched Mission Parivar Vikas for substantially increasing the access to contraceptives and family planning services in the 145 high fertility districts of seven High Focus States (HFS) with a TFR of 3 and above. These are the states of: Uttar Pradesh, Bihar, Rajasthan, Madhya Pradesh, Chhattisgarh, Jharkhand and Assam.
- The launch of a Logistics Management Information System (FP-LMIS) by the Government of India (Gol). This is a new software designed to provide robust information on the demand and distribution of contraceptives to health facilities and the ASHAs.

However, each of these programmes requires a well-planned roll out strategy and goals which at the moment is not clear. Moreover, India has also pledged to provide universal access to reproductive health services including contraceptives by 2030 as part of its commitment to the Sustainable Development Goals (SDGs).

Some key recommendations to strengthen the family planning programme are:

**Specific strategies to address reproductive health needs of adolescents and youth:** While it is well recognized that adolescents and youth have distinctive needs, access to reproductive health services by adolescents and youth is mired in challenges of access to services; attitudinal barriers among providers and restrictive social norms. Greater investments and early interventions in their education, health including reproductive and sexual health needs and skill development activities will enhance their contribution to economic output and growth. To meet India's commitments to the SDGs and FP2020 and considering the huge demographic dividend, specific health strategies especially for adolescents and youth that address their health needs and priorities is critical. This strategy should underscore a voluntary, rights and choice-based approach for addressing their sexual and reproductive health concerns. Specific focus on increasing access to information and reproductive health services, delaying their age at marriage, first pregnancy and empowering them to take informed decisions on spacing between children is the only way to address population momentum which contributes to 70 per cent of the population growth.

**Increased allocations for family planning:** Planning and prioritisation of family planning budgets should adequately address the gaps in use of spacing contraceptives. Budget proposals should emphasise on making available at scale voluntary spacing methods that ensure effective reproductive health solutions for both the mother and the child. Availability of a greater resource envelope for family planning in the national and states' health

budgets and accelerating its spending will contribute to higher economic output, greater savings and investments as a result of reductions in fertility in the country, specifically across high TFR states such as Bihar and Uttar Pradesh. Budget allocations should factor in the growing need for contraceptive requirements of 53% of India's population in the reproductive age group. Further, the allocations and programmes should be synchronised to reflect the shift in focus from limiting to spacing methods and activities that drive demand and cater to unmet need.

**Multi-sectoral response and community engagements:** Family planning approaches are complex and are influenced by social, cultural, economic and environmental factors. It entails a huge component of influencing knowledge and behavior change in the population, which requires collective efforts from different sectors and the community. While there has been emphasis on the supply side aspects of the health system, it is equally important to address the demand side factors through greater community engagement and multi-sectoral response that address the critical gaps in implementation and scaling up of family planning programmes. Engagement with different stakeholders across different sectors will enable a leverage of the expertise, knowledge, skills, resources and reach for improving family planning outcomes. Best practices from Social and Behaviour Change Communication (SBCC) initiatives and convergence models such as state and district level working groups need to be scaled up.

**Quality family planning services under Universal Health Coverage:** Existing policies ensure free provisioning of delivery care services as well as postnatal care in public health facilities; however there are issues with quality and access to services, especially in remote and underserved areas. Increasing the availability and access to reproductive health services and addressing the unmet need for contraceptives should be a priority among other aspects that aim to achieve Universal Health Coverage (UHC). This will enable

better reproductive maternal and child health care outcomes. The study also reveals that households incur high and catastrophic healthcare payments for child birth as well as inpatient care for children. Such a high cost of treatment often acts as a deterrent for seeking quality healthcare. With provision of quality FP services and increasing its reach under the UHC, households will have fewer children and can save huge out of pocket expenditures on child birth and child hospitalization.

**Promote female education and labour force participation:** The study observes that inaction in family planning can have a slowing down effect on per capita income and output of the economy for the nation and the states. Reducing fertility rates along with increasing women's education, delaying

their marriage age and increasing opportunities for them in the labour market will enable increased economic output and permit resources for alternative investments. Simulation analysis reveals that economic gains can be much higher when female education and labour force participation are promoted and enabled. At present, there are significant gender differentials in the average years of schooling across the four high focus study states. Besides, the huge gender gap in labour market participation reflects a lack of employment opportunities for females and is indicative of a gendered nature of economic activities in India. Development policies and initiatives in the country should actively promote avenues for economic empowerment of women by supporting their education and employment in skill-based industries and services.

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# Annexure A

**Table S2.1:** Effect of Declines in MMR and Fertility on Maternal Deaths Averted in 2011, India

Decomposition Inputs	Symbol	Source/ Estimation	Estimates
Population (Million): 2001	P1	Census	1,029
Population (Million): 2011	P2	Census	1,211
Annual Population Growth Rate: 2001	r1	SRS	2.11
Annual Population Growth Rate: 2011	r2	SRS	1.76
Crude Birth Rate (births per 1000 population): 2001	CBR1	SRS	25.4
Crude Birth Rate (births per 1000 population): 2011	CBR2	SRS	21.8
MMR (maternal deaths per 100000 births): 2001	M1	SRS	301
MMR (maternal deaths per 100000 births): 2011	M2	SRS	167
<b>Population and Births</b>			
Estimated population in 2016 assuming constant annual growth since 2001	EP1	$P1*r2$	1811
Population in 2011	P2	P2	1211
Projected births in 2016 assuming constant fertility	EB2	$EP1*CBR1*1000$	46000416
Actual births in 2011	B2	$P2*CBR2*1000$	26399800
<b>Estimated Number of Maternal Deaths</b>			
No change in CBR and no change in MMR	D1	$EB2*M1/100000$	138461.25
MMR declined but CBR not declined	D2	$EB2*M2/100000$	76820.69
CBR declined but MMR not declined	D3	$B2*M1/100000$	79463.4
Both CBR and MMR declined	D4	$B2*M2/100000$	44087.67
<b>Potential Number of Maternal Lives Saved in 2016 from:</b>			
Total effect of decline in MMR	Y	$D1-D2$	61640.56
Total effect of fertility decline	X	$D1-D3$	58997.85
Total effect of declines in both fertility and MMR	Z	$D1-D4$	94373.59
Overlap between the effect of declines in fertility and MMR	XZ	$Y+X-Z$	26264.83
Net effect of decline in MMR		$Y-XZ$	35376
Net effect of fertility decline		$X-XZ$	32733
<b>Per cent Distribution of the Potential Number of Lives Saved in 2016</b>			
Effect of safe motherhood		$[(Y-XZ)/Z] * 100$	37.5
Effect of decrease in births		$[(X-XZ)/Z]*100$	34.7
Effect of fertility reduction realised through its effect on MMR reduction		$(XZ/Z)*100$	27.8

**Table S2.2: Effect of Declines in MMR and Fertility on Maternal Deaths Averted in 2011, Bihar**

Decomposition Inputs	Symbol	Source/ Estimation	Estimates
Population (Million): 2001	P1	Census	83
Population (Million): 2011	P2	Census	104
Annual Population Growth Rate: 2001	r1	SRS	2.48
Annual Population Growth Rate: 2011	r2	SRS	2.21
Crude Birth Rate (births per 1000 population): 2001	CBR1	SRS	31.2
Crude Birth Rate (births per 1000 population): 2011	CBR2	SRS	27.7
MMR (maternal deaths per 100000 births): 2001	M1	SRS	531
MMR (maternal deaths per 100000 births): 2011	M2	SRS	208
<b>Population and Births</b>			
Estimated population in 2016 assuming constant annual growth since 2001	EP1	$P1*r2$	183
Population in 2011	P2	P2	104
Projected births in 2016 assuming constant fertility	EB2	$EP1*CBR1*1000$	5723016
Actual births in 2011	B2	$P2*CBR2*1000$	2880800
<b>Estimated Number of Maternal Deaths</b>			
No change in CBR and no change in MMR	D1	$EB2*M1/100000$	30389.21
MMR declined but CBR not declined	D2	$EB2*M2/100000$	11903.87
CBR declined but MMR not declined	D3	$B2*M1/100000$	15297.05
Both CBR and MMR declined	D4	$B2*M2/100000$	5992.06
<b>Potential Number of Maternal Lives Saved in 2016 from:</b>			
Total effect of decline in MMR	Y	$D1-D2$	18485.34
Total effect of fertility decline	X	$D1-D3$	15092.17
Total effect of declines in both fertility and MMR	Z	$D1-D4$	24397.15
Overlap between the effect of declines in fertility and MMR	XZ	$Y+X-Z$	9180.36
Net effect of decline in MMR		$Y-XZ$	9305
Net effect of fertility decline		$X-XZ$	5912
<b>Per cent Distribution of the Potential Number of Lives Saved in 2016</b>			
Effect of safe motherhood		$[(Y-XZ)/Z]*100$	38.1
Effect of decrease in births		$[(X-XZ)/Z]*100$	24.2
Effect of fertility reduction realised through its effect on MMR reduction		$(XZ/Z)*100$	37.6

**Table S2.3: Effect of Declines in MMR and Fertility on Maternal Deaths Averted in 2011, Rajasthan**

Decomposition Inputs	Symbol	Source/ Estimation	Estimates
Population (Million): 2001	P1	Census	57
Population (Million): 2011	P2	Census	69
Annual Population Growth Rate: 2001	r1	SRS	1.81
Annual Population Growth Rate: 2011	r2	SRS	1.39
Crude Birth Rate (births per 1000 population): 2001	CBR1	SRS	31.1
Crude Birth Rate (births per 1000 population): 2011	CBR2	SRS	26.2
MMR (maternal deaths per 100000 births): 2001	M1	SRS	508
MMR (maternal deaths per 100000 births): 2011	M2	SRS	244
<b>Population and Births</b>			
Estimated population in 2016 assuming constant annual growth since 2001	EP1	$P1*r2$	79
Population in 2011	P2	P2	69
Projected births in 2016 assuming constant fertility	EB2	$EP1*CBR1*1000$	2464053
Actual births in 2011	B2	$P2*CBR2*1000$	1797320
<b>Estimated Number of Maternal Deaths</b>			
No change in CBR and no change in MMR	D1	$EB2*M1/100000$	12517.39
MMR declined but CBR not declined	D2	$EB2*M2/100000$	6012.29
CBR declined but MMR not declined	D3	$B2*M1/100000$	9130.39
Both CBR and MMR declined	D4	$B2*M2/100000$	4385.46
<b>Potential Number of Maternal Lives Saved in 2016 from:</b>			
Total effect of decline in MMR	Y	$D1-D2$	6505.1
Total effect of fertility decline	X	$D1-D3$	3387
Total effect of declines in both fertility and MMR	Z	$D1-D4$	8131.93
Overlap between the effect of declines in fertility and MMR	XZ	$Y+X-Z$	1760.18
Net effect of decline in MMR		$Y-XZ$	4745
Net effect of fertility decline		$X-XZ$	1627
<b>Per cent Distribution of the Potential Number of Lives Saved in 2016</b>			
Effect of safe motherhood		$[(Y-XZ)/Z]*100$	58.3
Effect of decrease in births		$[(X-XZ)/Z]*100$	20
Effect of fertility reduction realised through its effect on MMR reduction		$(XZ/Z)*100$	21.6

**Table S2.4: Effect of Declines in MMR and Fertility on Maternal Deaths Averted in 2011, Madhya Pradesh**

Decomposition Inputs	Symbol	Source/ Estimation	Estimates
Population (Million): 2001	P1	Census	60
Population (Million): 2011	P2	Census	73
Annual Population Growth Rate: 2001	r1	SRS	2.01
Annual Population Growth Rate: 2011	r2	SRS	1.81
Crude Birth Rate (births per 1000 population): 2001	CBR1	SRS	31
Crude Birth Rate (births per 1000 population): 2011	CBR2	SRS	26.9
MMR (maternal deaths per 100000 births): 2001	M1	SRS	441
MMR (maternal deaths per 100000 births): 2011	M2	SRS	221
<b>Population and Births</b>			
Estimated population in 2016 assuming constant annual growth since 2001	EP1	$P1*r2$	109
Population in 2011	P2	P2	73
Projected births in 2016 assuming constant fertility	EB2	$EP1*CBR1*1000$	3366600
Actual births in 2011	B2	$P2*CBR2*1000$	1955630
<b>Estimated Number of Maternal Deaths</b>			
No change in CBR and no change in MMR	D1	$EB2*M1/100000$	14846.71
MMR declined but CBR not declined	D2	$EB2*M2/100000$	7440.19
CBR declined but MMR not declined	D3	$B2*M1/100000$	8624.33
Both CBR and MMR declined	D4	$B2*M2/100000$	4321.94
<b>Potential Number of Maternal Lives Saved in 2016 from:</b>			
Total effect of decline in MMR	Y	$D1-D2$	7406.52
Total effect of fertility decline	X	$D1-D3$	6222.38
Total effect of declines in both fertility and MMR	Z	$D1-D4$	10524.76
Overlap between the effect of declines in fertility and MMR	XZ	$Y+X-Z$	3104.13
Net effect of decline in MMR		$Y-XZ$	4302
Net effect of fertility decline		$X-XZ$	3118
<b>Per cent Distribution of the Potential Number of Lives Saved in 2016</b>			
Effect of safe motherhood		$[(Y-XZ)/Z]*100$	40.9
Effect of decrease in births		$[(X-XZ)/Z]*100$	29.6
Effect of fertility reduction realised through its effect on MMR reduction		$(XZ/Z)*100$	29.5

**Table S2.5: Effect of Declines in MMR and Fertility on Maternal Deaths Averted in 2011, Uttar Pradesh**

Decomposition Inputs	Symbol	Source/ Estimation	Estimates
Population (Million): 2001	P1	Census	166
Population (Million): 2011	P2	Census	191
Annual Population Growth Rate: 2001	r1	SRS	2
Annual Population Growth Rate: 2011	r2	SRS	1.7
Crude Birth Rate (births per 1000 population): 2001	CBR1	SRS	32.1
Crude Birth Rate (births per 1000 population): 2011	CBR2	SRS	27.8
MMR (maternal deaths per 100000 births): 2001	M1	SRS	606
MMR (maternal deaths per 100000 births): 2011	M2	SRS	285
<b>Population and Births</b>			
Estimated population in 2016 assuming constant annual growth since 2001	EP1	$P1*r2$	282
Population in 2011	P2	P2	191
Projected births in 2016 assuming constant fertility	EB2	$EP1*CBR1*1000$	9058620
Actual births in 2011	B2	$P2*CBR2*1000$	5307020
<b>Estimated Number of Maternal Deaths</b>			
No change in CBR and no change in MMR	D1	$EB2*M1/100000$	54895.24
MMR declined but CBR not declined	D2	$EB2*M2/100000$	25817.07
CBR declined but MMR not declined	D3	$B2*M1/100000$	32160.54
Both CBR and MMR declined	D4	$B2*M2/100000$	15125.01
<b>Potential Number of Maternal Lives Saved in 2016 from:</b>			
Total effect of decline in MMR	Y	$D1-D2$	29078.17
Total effect of fertility decline	X	$D1-D3$	22734.7
Total effect of declines in both fertility and MMR	Z	$D1-D4$	39770.23
Overlap between the effect of declines in fertility and MMR	XZ	$Y+X-Z$	12042.64
Net effect of decline in MMR		$Y-XZ$	17036
Net effect of fertility decline		$X-XZ$	10692
<b>Per cent Distribution of the Potential Number of Lives Saved in 2016</b>			
Effect of safe motherhood		$[(Y-XZ)/Z]*100$	42.8
Effect of decrease in births		$[(X-XZ)/Z]*100$	26.9
Effect of fertility reduction realised through its effect on MMR reduction		$(XZ/Z)*100$	30.3

**Table S2.6: Effect of Declines in IMR and Fertility on Maternal Deaths Averted in 2011, India**

<b>Decomposition Inputs</b>	<b>Symbol</b>	<b>Source/ Estimation</b>	<b>Estimates</b>
Population (Million): 2001	P1	Census	1,029
Population (Million): 2011	P2	Census	1,211
Annual Population Growth Rate: 2001	r1	SRS	2.11
Annual Population Growth Rate: 2011	r2	SRS	1.76
Crude Birth Rate (births per 1000 population): 2001	CBR1	SRS	25.4
Crude Birth Rate (births per 1000 population): 2011	CBR2	SRS	21.8
IMR (infant deaths per 1000 births): 2001	M1	SRS	66
IMR (infant deaths per 1000 births): 2011	M2	SRS	44
<b>Population and Births</b>			
Estimated population in 2016 assuming constant annual growth since 2001	EP1	$P1*r2$	1811
Population in 2011	P2	P2	1211
Projected births in 2016 assuming constant fertility	EB2	$EP1*CBR1*1000$	46000416
Actual births in 2011	B2	$P2*CBR2*1000$	26399800
<b>Estimated Number of Maternal Deaths</b>			
No change in CBR and no change in IMR	D1	$EB2*M1/1000$	30360.27
IMR declined but CBR not declined	D2	$EB2*M2/1000$	20240.18
CBR declined but IMR not declined	D3	$B2*M1/1000$	17423.87
Both CBR and IMR declined	D4	$B2*M2/1000$	11615.91
<b>Potential Number of Maternal Lives Saved in 2016 from:</b>			
Total effect of decline in IMR	Y	$D1-D2$	10120.09
Total effect of fertility decline	X	$D1-D3$	12936.41
Total effect of declines in both fertility and IMR	Z	$D1-D4$	18744.36
Overlap between the effect of declines in fertility and IMR	XZ	$Y+X-Z$	4312.14
Net effect of decline in IMR		$Y-XZ$	5808
Net effect of fertility decline		$X-XZ$	8624
<b>Per cent Distribution of the Potential Number of Lives Saved in 2016</b>			
Effect of decline in IMR		$[(Y-XZ)/Z]*100$	31
Effect of decrease in births		$[(X-XZ)/Z]*100$	46
Effect of fertility reduction realised through its effect on IMR reduction		$(XZ/Z)*100$	23

**Table S2.7: Effect of Declines in IMR and Fertility on Maternal Deaths Averted in 2011, Bihar**

Decomposition Inputs	Symbol	Source/ Estimation	Estimates
Population (Million): 2001	P1	Census	83
Population (Million): 2011	P2	Census	104
Annual Population Growth Rate: 2001	r1	SRS	2.48
Annual Population Growth Rate: 2011	r2	SRS	2.21
Crude Birth Rate (births per 1000 population): 2001	CBR1	SRS	31.2
Crude Birth Rate (births per 1000 population): 2011	CBR2	SRS	27.7
IMR (infant deaths per 1000 births): 2001	M1	SRS	62
IMR (infant deaths per 1000 births): 2011	M2	SRS	44
<b>Population and Births</b>			
Estimated population in 2016 assuming constant annual growth since 2001	EP1	$P1*r2$	183
Population in 2011	P2	P2	104
Projected births in 2016 assuming constant fertility	EB2	$EP1*CBR1*1000$	5723016
Actual births in 2011	B2	$P2*CBR2*1000$	2880800
<b>Estimated Number of Maternal Deaths</b>			
No change in CBR and no change in IMR	D1	$EB2*M1/1000$	3548.27
IMR declined but CBR not declined	D2	$EB2*M2/1000$	2518.13
CBR declined but IMR not declined	D3	$B2*M1/1000$	1786.1
Both CBR and IMR declined	D4	$B2*M2/1000$	1267.55
<b>Potential Number of Maternal Lives Saved in 2016 from:</b>			
Total effect of decline in IMR	Y	$D1-D2$	1030.14
Total effect of fertility decline	X	$D1-D3$	1762.17
Total effect of declines in both fertility and IMR	Z	$D1-D4$	2280.72
Overlap between the effect of declines in fertility and IMR	XZ	$Y+X-Z$	511.6
Net effect of decline in IMR		$Y-XZ$	519
Net effect of fertility decline		$X-XZ$	1251
<b>Per cent Distribution of the Potential Number of Lives Saved in 2016</b>			
Effect of decline in IMR		$[(Y-XZ)/Z]*100$	22.7
Effect of decrease in births		$[(X-XZ)/Z]*100$	54.8
Effect of fertility reduction realised through its effect on IMR reduction		$(XZ/Z)*100$	22.4

**Table S2.8: Effect of Declines in IMR and Fertility on Maternal Deaths Averted in 2011, Rajasthan**

Decomposition Inputs	Symbol	Source/ Estimation	Estimates
Population (Million): 2001	P1	Census	57
Population (Million): 2011	P2	Census	69
Annual Population Growth Rate: 2001	r1	SRS	1.81
Annual Population Growth Rate: 2011	r2	SRS	1.39
Crude Birth Rate (births per 1000 population): 2001	CBR1	SRS	31.1
Crude Birth Rate (births per 1000 population): 2011	CBR2	SRS	26.2
IMR (infant deaths per 1000 births): 2001	M1	SRS	80
IMR (infant deaths per 1000 births): 2011	M2	SRS	52
<b>Population and Births</b>			
Estimated population in 2016 assuming constant annual growth since 2001	EP1	$P1*r2$	79
Population in 2011	P2	P2	69
Projected births in 2016 assuming constant fertility	EB2	$EP1*CBR1*1000$	2464053
Actual births in 2011	B2	$P2*CBR2*1000$	1797320
<b>Estimated Number of Maternal Deaths</b>			
No change in CBR and no change in IMR	D1	$EB2*M1/1000$	1971.24
IMR declined but CBR not declined	D2	$EB2*M2/1000$	1281.31
CBR declined but IMR not declined	D3	$B2*M1/1000$	1437.86
Both CBR and IMR declined	D4	$B2*M2/1000$	934.61
<b>Potential Number of Maternal Lives Saved in 2016 from:</b>			
Total effect of decline in IMR	Y	$D1-D2$	689.93
Total effect of fertility decline	X	$D1-D3$	533.39
Total effect of declines in both fertility and IMR	Z	$D1-D4$	1036.64
Overlap between the effect of declines in fertility and IMR	XZ	$Y+X-Z$	186.69
Net effect of decline in IMR		$Y-XZ$	503
Net effect of fertility decline		$X-XZ$	347
<b>Per cent Distribution of the Potential Number of Lives Saved in 2016</b>			
Effect of decline in IMR		$[(Y-XZ)/Z]*100$	48.5
Effect of decrease in births		$[(X-XZ)/Z]*100$	33.4
Effect of fertility reduction realised through its effect on IMR reduction		$(XZ/Z)*100$	18

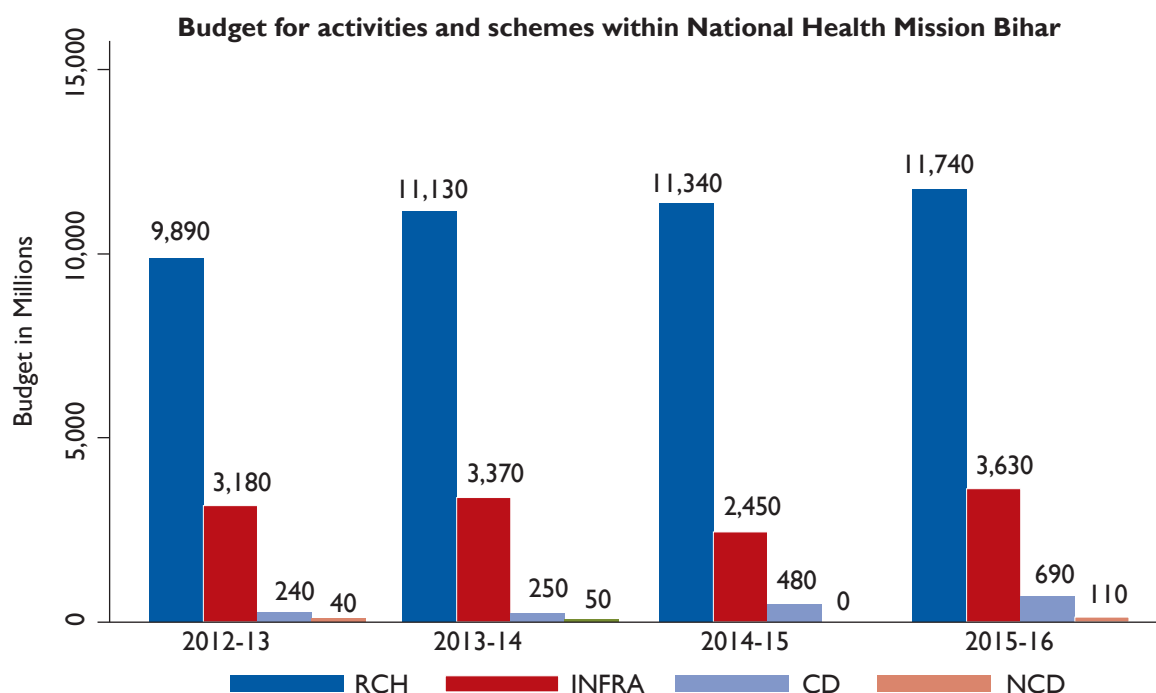
**Table S2.9: Effect of Declines in IMR and Fertility on Maternal Deaths Averted in 2011, Madhya Pradesh**

Decomposition Inputs	Symbol	Source/ Estimation	Estimates
Population (Million): 2001	P1	Census	60
Population (Million): 2011	P2	Census	73
Annual Population Growth Rate: 2001	r1	SRS	2.01
Annual Population Growth Rate: 2011	r2	SRS	1.81
Crude Birth Rate (births per 1000 population): 2001	CBR1	SRS	31
Crude Birth Rate (births per 1000 population): 2011	CBR2	SRS	26.9
IMR (infant deaths per 1000 births): 2001	M1	SRS	86
IMR (infant deaths per 1000 births): 2011	M2	SRS	59
<b>Population and Births</b>			
Estimated population in 2016 assuming constant annual growth since 2001	EP1	$P1*r2$	109
Population in 2011	P2	P2	73
Projected births in 2016 assuming constant fertility	EB2	$EP1*CBR1*1000$	3366600
Actual births in 2011	B2	$P2*CBR2*1000$	1955630
<b>Estimated Number of Maternal Deaths</b>			
No change in CBR and no change in IMR	D1	$EB2*M1/1000$	2895.28
IMR declined but CBR not declined	D2	$EB2*M2/1000$	1986.29
CBR declined but IMR not declined	D3	$B2*M1/1000$	1681.84
Both CBR and IMR declined	D4	$B2*M2/1000$	1153.82
<b>Potential Number of Maternal Lives Saved in 2016 from:</b>			
Total effect of decline in IMR	Y	$D1-D2$	908.98
Total effect of fertility decline	X	$D1-D3$	1213.43
Total effect of declines in both fertility and IMR	Z	$D1-D4$	1741.45
Overlap between the effect of declines in fertility and IMR	XZ	$Y+X-Z$	380.96
Net effect of decline in IMR		$Y-XZ$	528
Net effect of fertility decline		$X-XZ$	832
<b>Per cent Distribution of the Potential Number of Lives Saved in 2016</b>			
Effect of decline in IMR		$[(Y-XZ)/Z]*100$	30.3
Effect of decrease in births		$[(X-XZ)/Z]*100$	47.8
Effect of fertility reduction realised through its effect on IMR reduction		$(XZ/Z)*100$	21.9

**Table S2.10: Effect of Declines in IMR and Fertility on Maternal Deaths Averted in 2011, Uttar Pradesh**

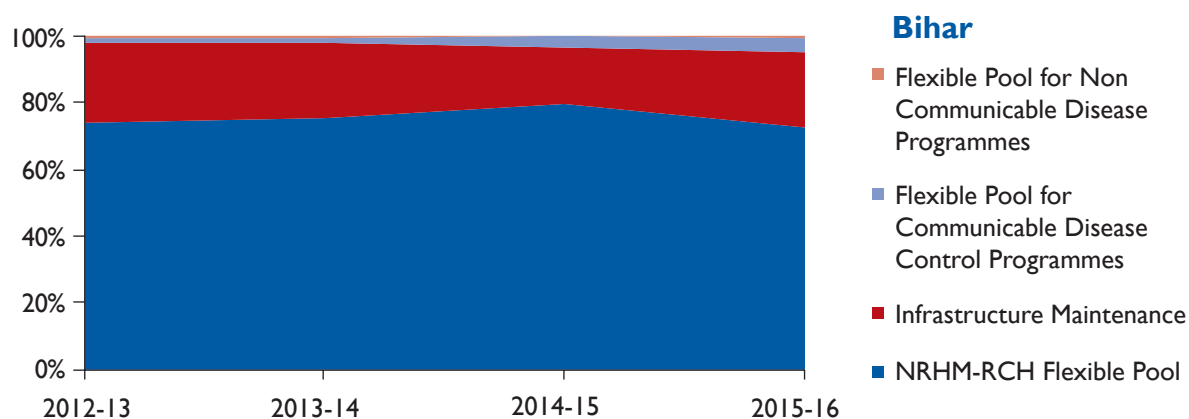
Decomposition Inputs	Symbol	Source/ Estimation	Estimates
Population (Million): 2001	P1	Census	166
Population (Million): 2011	P2	Census	191
Annual Population Growth Rate: 2001	r1	SRS	2
Annual Population Growth Rate: 2011	r2	SRS	1.7
Crude Birth Rate (births per 1000 population): 2001	CBR1	SRS	32.1
Crude Birth Rate (births per 1000 population): 2011	CBR2	SRS	27.8
IMR (infant deaths per 1000 births): 2001	M1	SRS	83
IMR (infant deaths per 1000 births): 2011	M2	SRS	57
<b>Population and Births</b>			
Estimated population in 2016 assuming constant annual growth since 2001	EP1	$P1*r2$	282
Population in 2011	P2	P2	191
Projected births in 2016 assuming constant fertility	EB2	$EP1*CBR1*1000$	9058620
Actual births in 2011	B2	$P2*CBR2*1000$	5307020
<b>Estimated Number of Maternal Deaths</b>			
No change in CBR and no change in IMR	D1	$EB2*M1/1000$	7518.65
IMR declined but CBR not declined	D2	$EB2*M2/1000$	5163.41
CBR declined but IMR not declined	D3	$B2*M1/1000$	4404.83
Both CBR and IMR declined	D4	$B2*M2/1000$	3025
<b>Potential Number of Maternal Lives Saved in 2016 from:</b>			
Total effect of decline in IMR	Y	$D1-D2$	2355.24
Total effect of fertility decline	X	$D1-D3$	3113.83
Total effect of declines in both fertility and IMR	Z	$D1-D4$	4493.65
Overlap between the effect of declines in fertility and IMR	XZ	$Y+X-Z$	975.42
Net effect of decline in IMR		$Y-XZ$	1380
Net effect of fertility decline		$X-XZ$	2138
<b>Per cent Distribution of the Potential Number of Lives Saved in 2016</b>			
Effect of decline in IMR		$[(Y-XZ)/Z]*100$	30.7
Effect of decrease in births		$[(X-XZ)/Z]*100$	47.6
Effect of fertility reduction realised through its effect on IMR reduction		$(XZ/Z)*100$	21.7

**Figure S1.** Details of Budget Expenditure, NHM Bihar 2012-13 to 2015-16



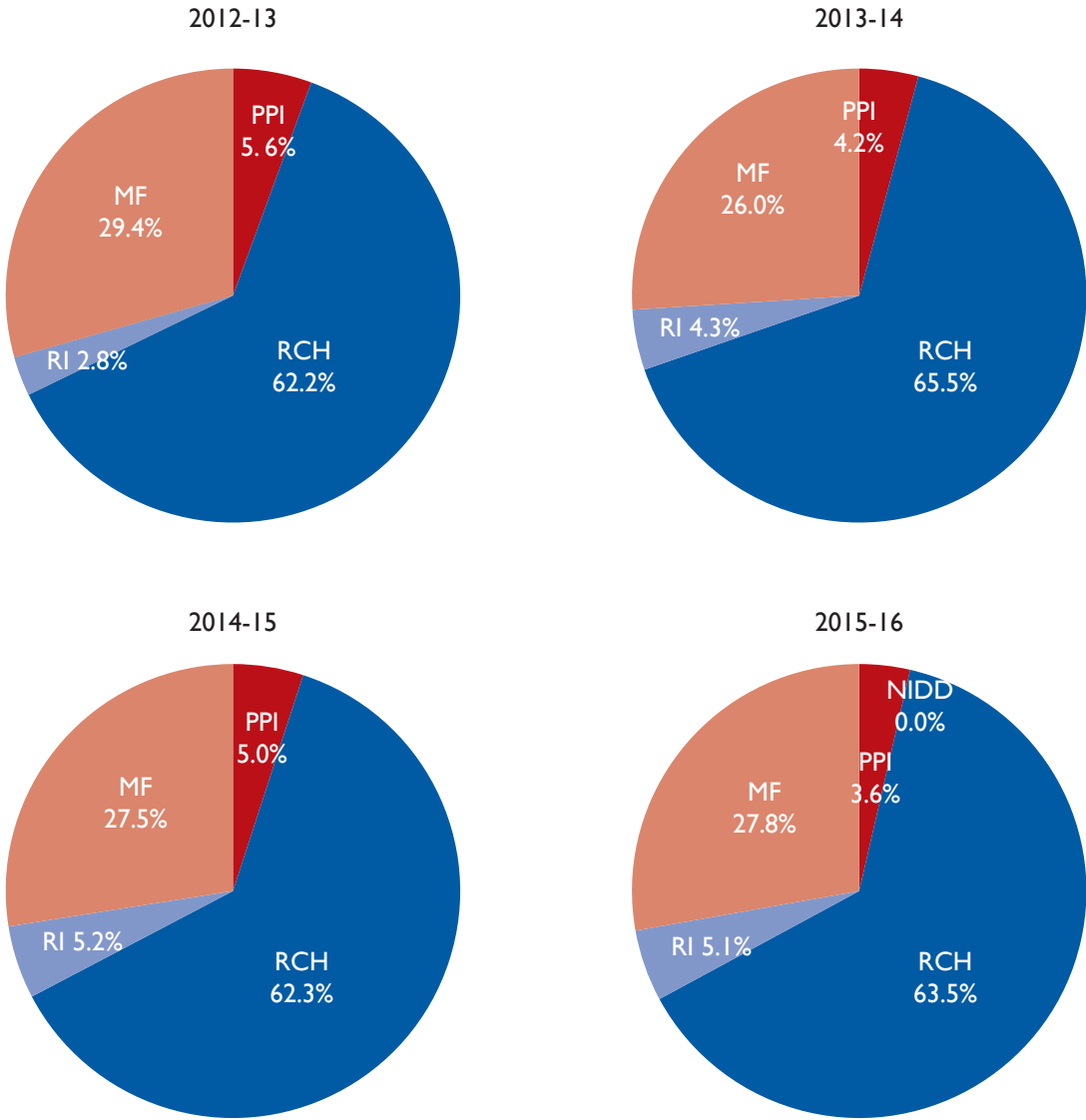
Note: RCH - Reproductive Child Health, IF - Infrastructure, CD - Communicable Disease, NCD - Non - Communicable Disease

**Figure S2.** Distribution of Expenditure, NHM Bihar 2012-13 to 2015-16



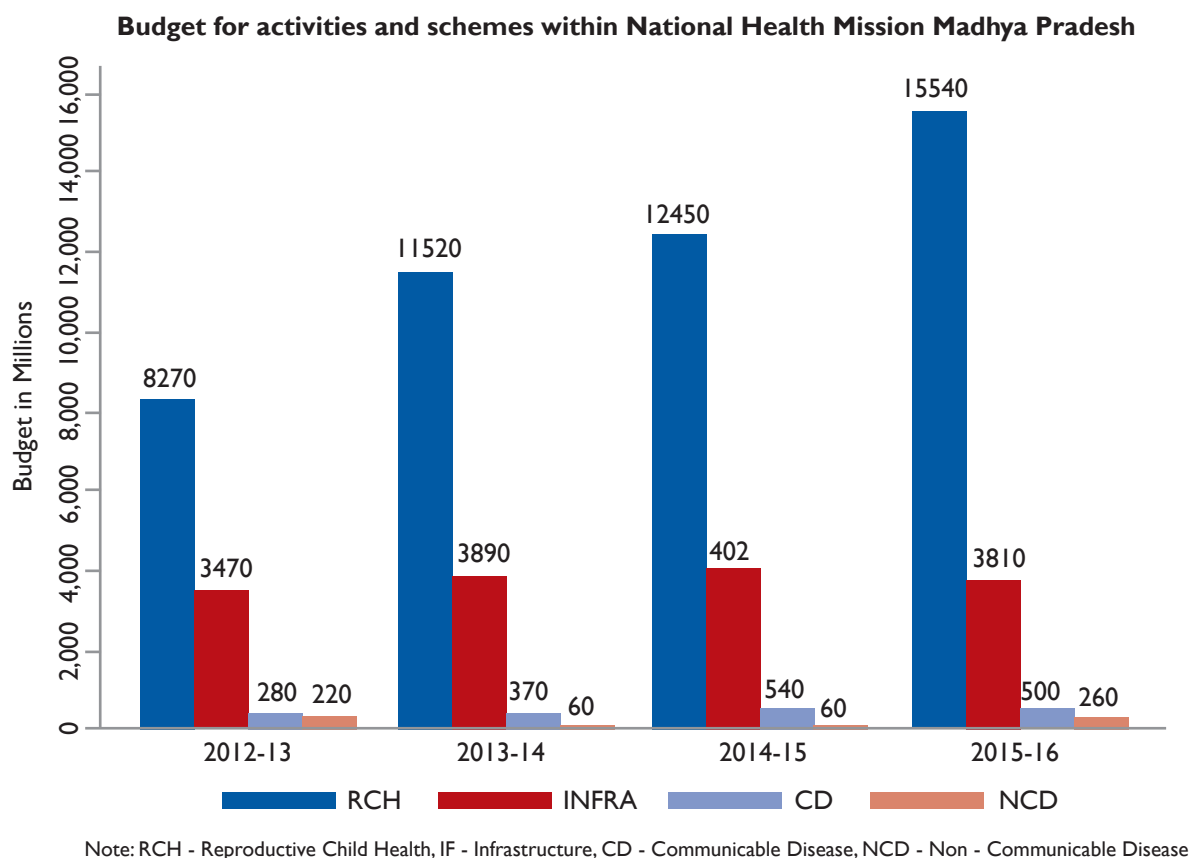
**Figure S3.** Breakup of RCH Flexi-Pool Expenditure, NHM Bihar 2012-13 to 2015-16

**Budget share for activities and schemes within National Health Mission Bihar**

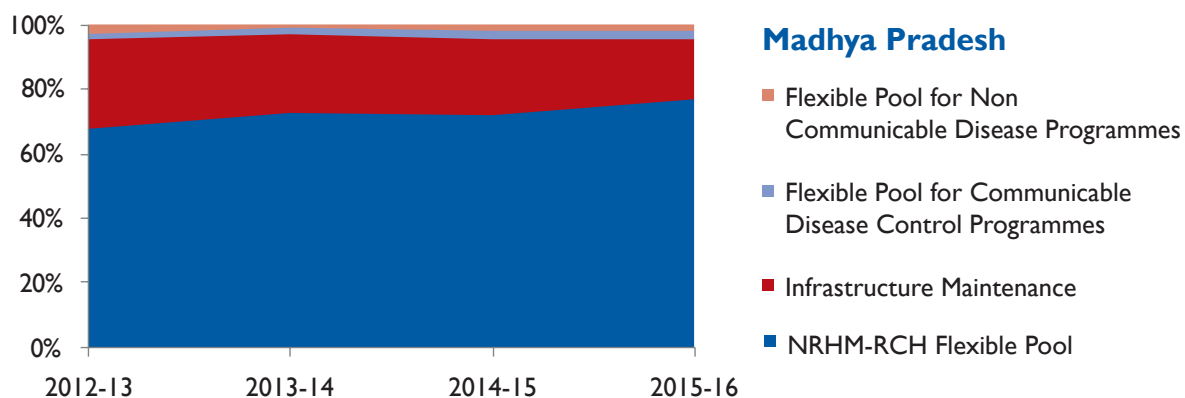


Note: RCH - RCH Flexible Pool, MF - Mission Flexible Pool, RI - Routine Immunization, PPI - Pulse Polio Immunization and NIDD - National I.D.D Control Programme

**Figure S4:** Details of Budget Expenditure, NHM Madhya Pradesh 2012-13 to 2015-16

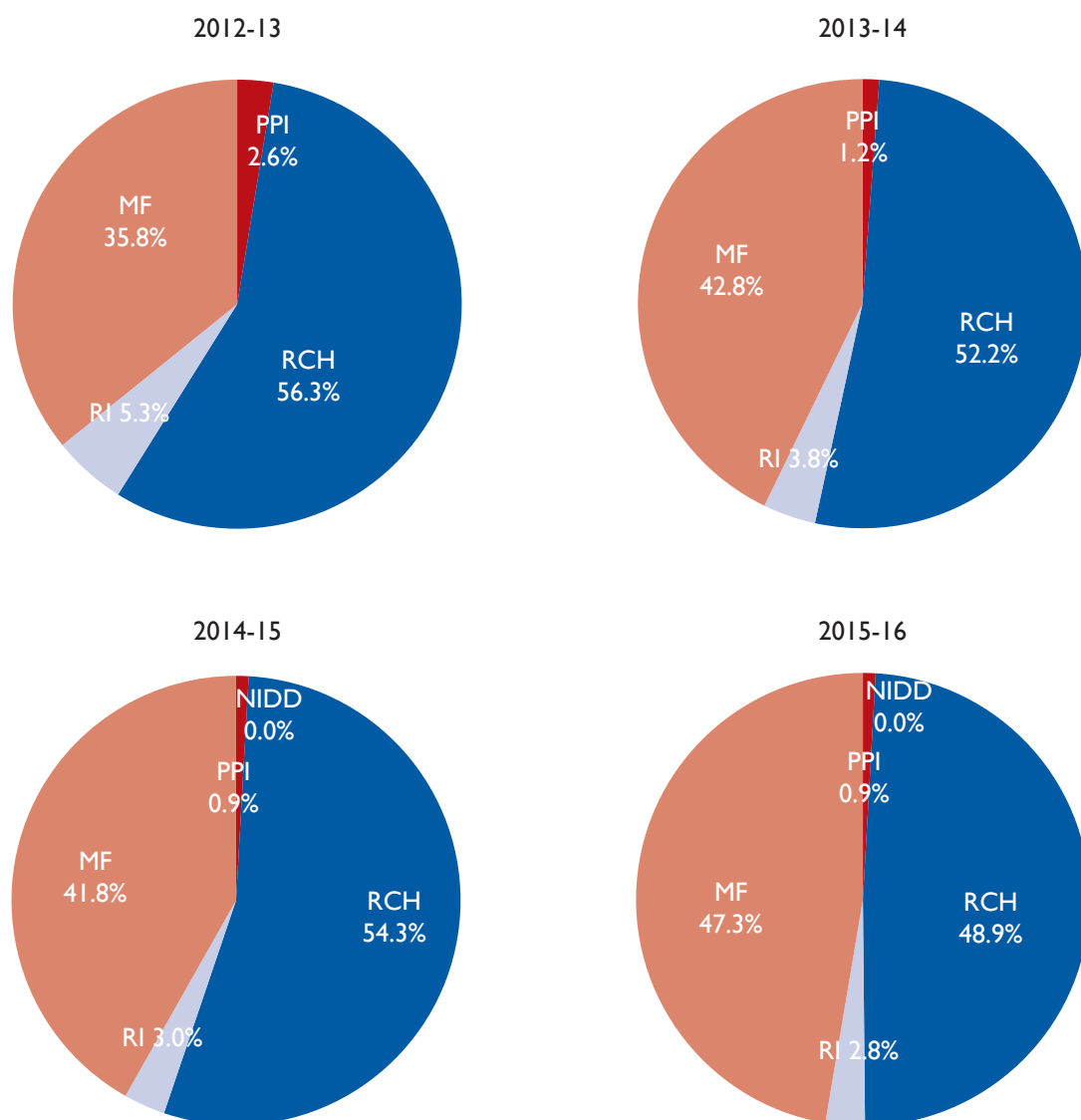


**Figure S5:** Distribution of Expenditure, NHM Madhya Pradesh 2012-13 to 2015-16



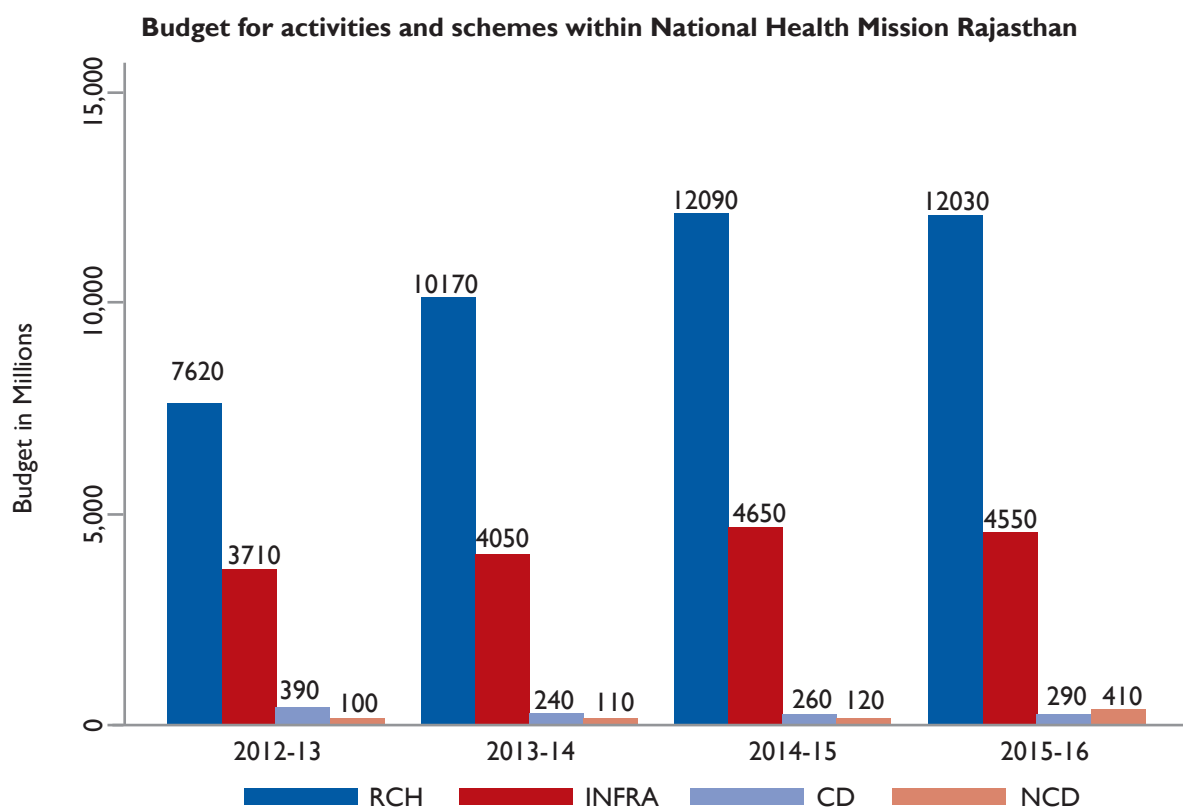
**Figure S6:** RCH Flexi-Pool Expenditure, NHM Madhya Pradesh 2012-13 to 2015-16

**Budget share for activities and schemes within National Health Mission Madhya Pradesh**



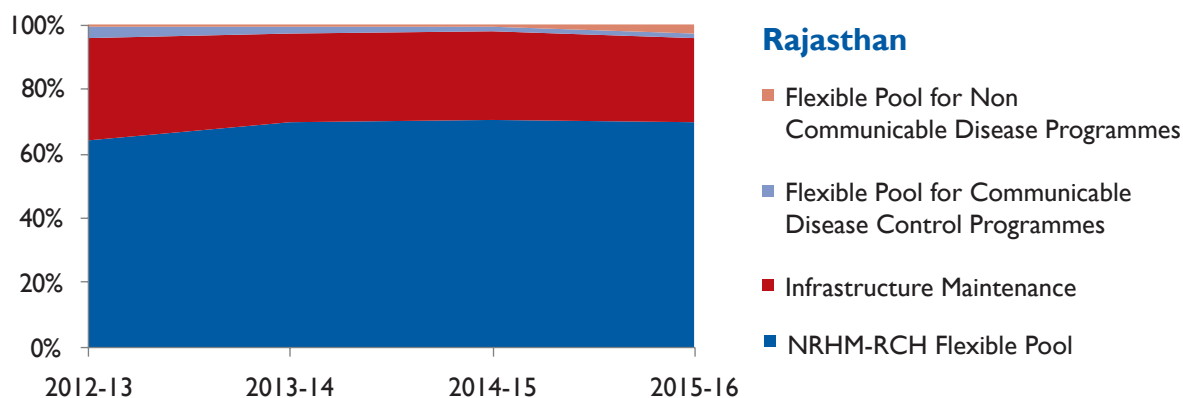
Note: RCH - RCH Flexible Pool, MF - Mission Flexible Pool, RI - Routine Immunization, PPI - Pulse Polio Immunization and NIDD - National I.D.D Control Programme

**Figure S7:** Details of Budget Expenditure, NHM Rajasthan 2012-13 to 2015-16



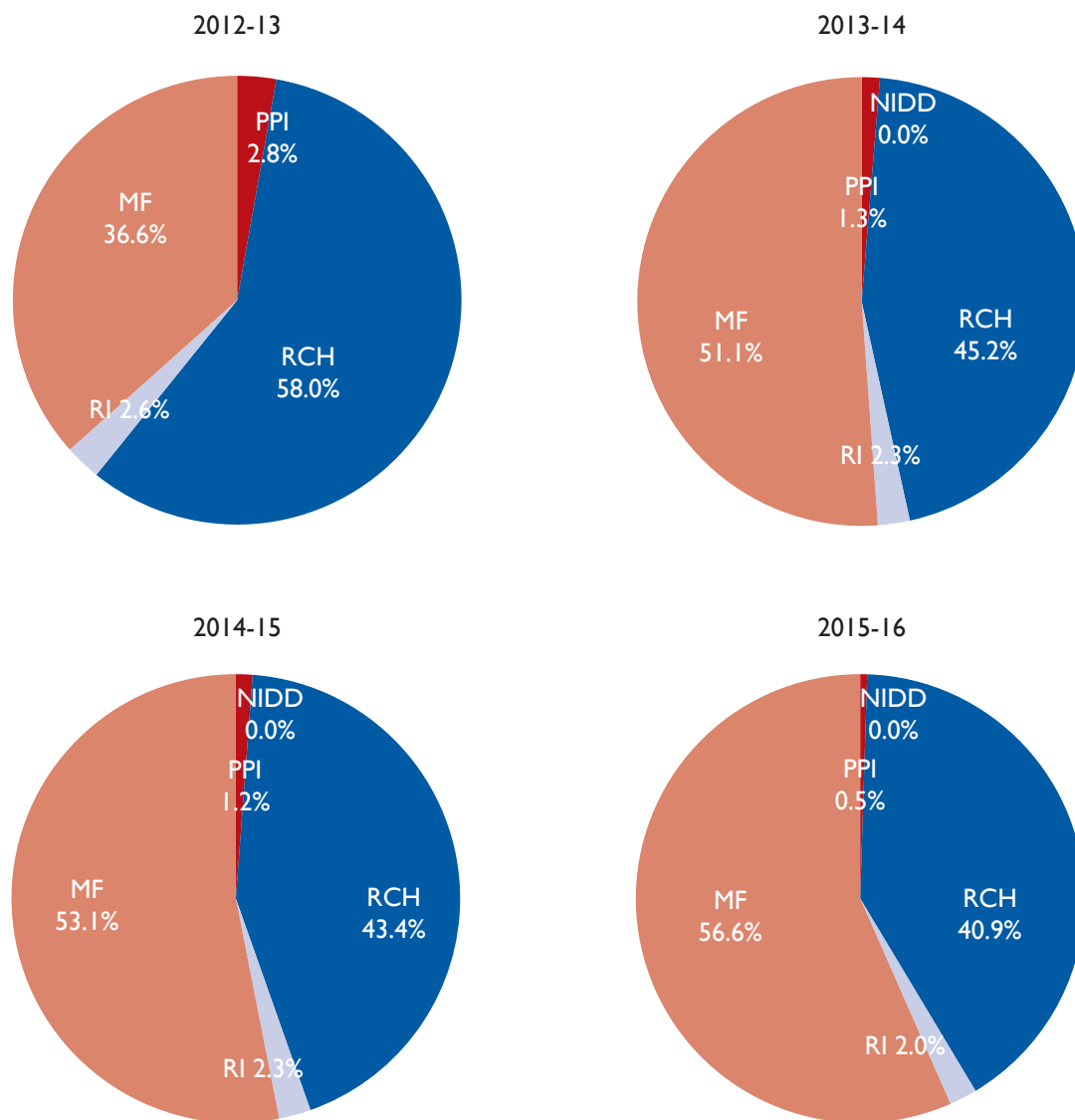
Note: RCH - Reproductive Child Health, IF - Infrastructure, CD - Communicable Disease, NCD - Non - Communicable Disease

**Figure S8:** Distribution of Expenditure, NHM Rajasthan 2012-13 to 2015-16



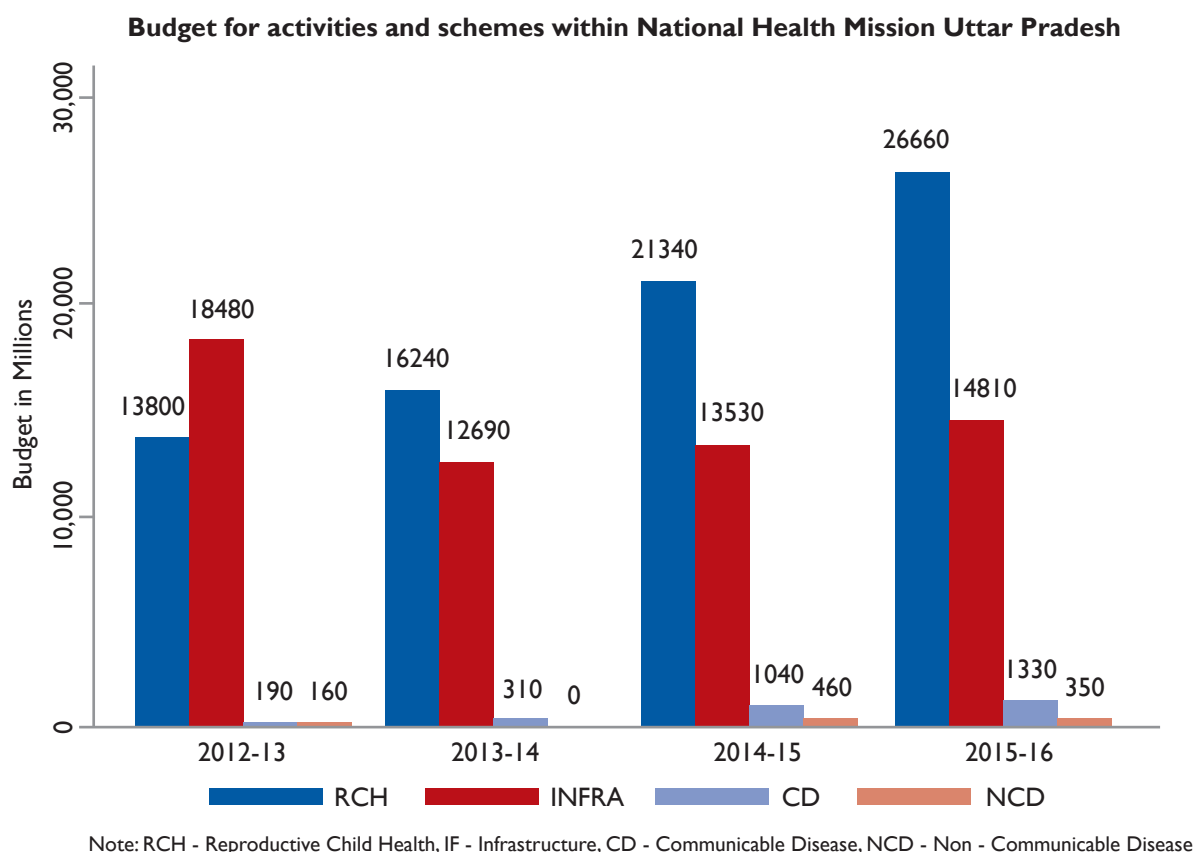
**Figure S9: Breakup of RCH Flexi-Pool Expenditure, NHM Rajasthan 2012-13 to 2015-16**

**Budget share for activities and schemes within National Health Mission Rajasthan**

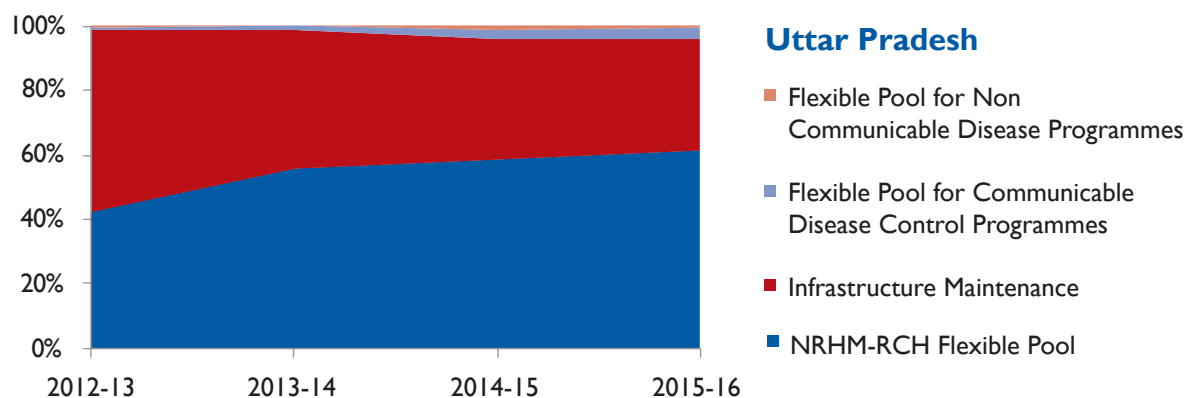


Note: RCH - RCH Flexible Pool, MF - Mission Flexible Pool, RI - Routine Immunization, PPI - Pulse Polio Immunization and NIDD - National I.D.D Control Programme

**Figure S10:** Details of Budget Expenditure, NHM Uttar Pradesh 2012-13 to 2015-16

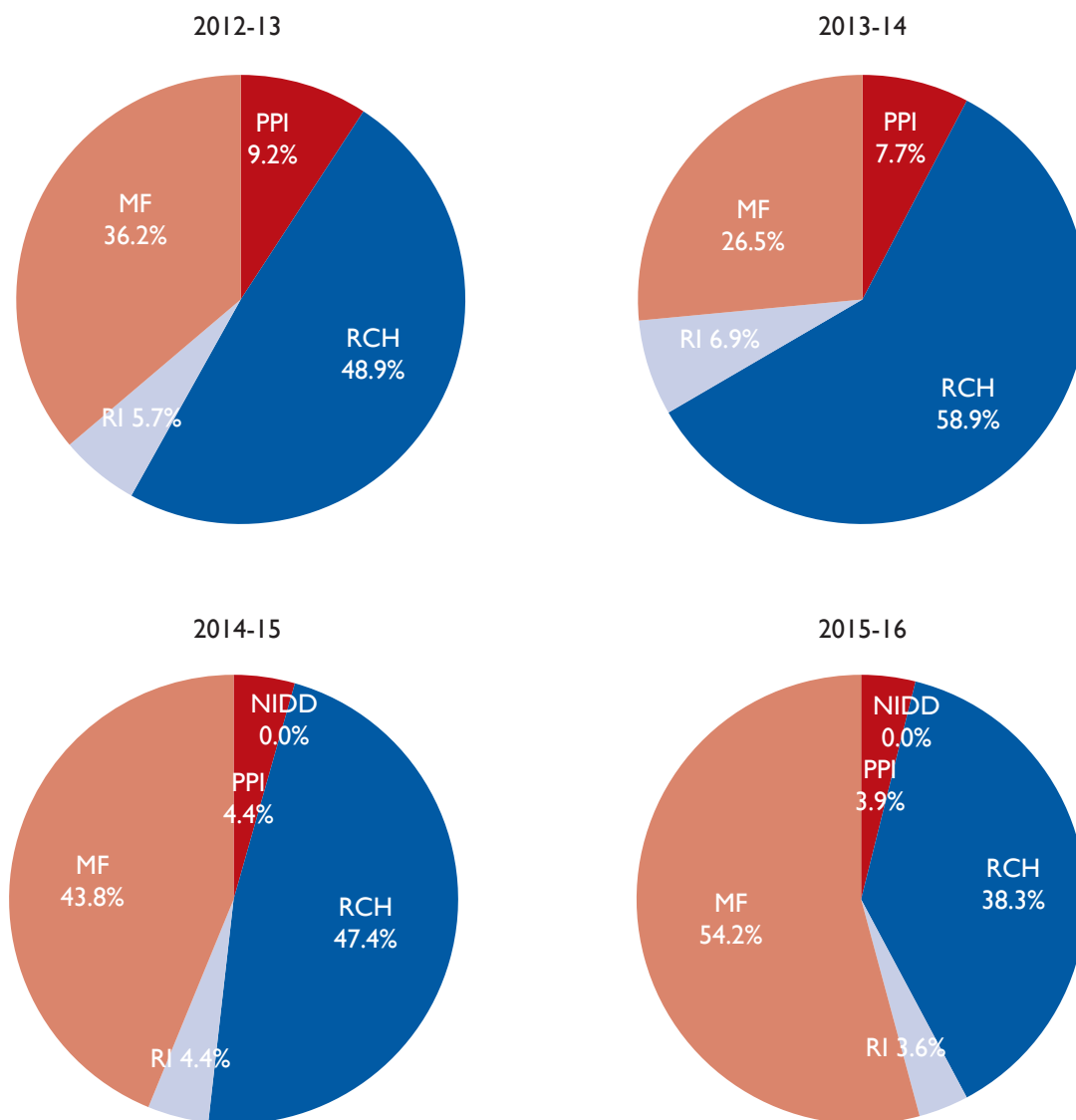


**Figure S11:** Distribution of Expenditure, NHM Uttar Pradesh 2012-13 to 2015-16



**Figure S12: Breakup of RCH Flexi-Pool Expenditure, NHM Uttar Pradesh 2012-13 to 2015-16**

**Budget share for activities and schemes within National Health Mission Uttar Pradesh**



Note: RCH - RCH Flexible Pool, MF - Mission Flexible Pool, RI - Routine Immunization, PPI - Pulse Polio Immunization and NIDD - National I.D.D Control Programme

# Notes

# About PFI

Population Foundation of India is a national NGO which promotes and advocates for the effective formulation and implementation of gender sensitive population, health and development strategies & policies. The organisation was founded in 1970 by a group of socially committed industrialists under the leadership of the late JRD Tata and Dr Bharat Ram. PFI addresses population issues within the larger discourse of empowering women and men, so that they are able to take informed decisions related to their fertility, health and well-being. It works with the government, both at the national and state levels and with NGOs in the areas of community action for health, urban health, scaling up of successful pilots and social & behaviour change communication. PFI is guided by an eminent governing board and advisory council comprising distinguished persons from civil society, the government and the private sector.



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