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Research Article

Forecasting Fertility, Family Planning, And Maternal Health Indicators in India: Evidence from Five Rounds of the National Family Health Survey

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Abstract

India has experienced substantial improvements in fertility, family planning, and maternal healthcare over the past three decades. This study analyses trends in key reproductive and maternal health indicators using data from the five completed rounds of the National Family Health Survey (NFHS-1 to NFHS-5) and projects their likely status in NFHS-6. Multiple regression models, including linear, polynomial, exponential, logarithmic, and power models, were evaluated, and the best-fitting model for each indicator was selected based on the coefficient of determination (R^2).

The findings project a continued decline in the Total Fertility Rate, accompanied by increasing contraceptive prevalence and greater adoption of modern contraceptive methods. The unmet need for family planning is expected to decline further, while institutional births and skilled birth attendance are projected to approach universal coverage. However, female sterilization is likely to remain the predominant contraceptive method, whereas male sterilization is projected to remain extremely low, highlighting persistent gender disparities in family planning.

The study demonstrates the usefulness of statistical forecasting for anticipating future reproductive health trends and supporting evidence-based policymaking. The findings have important implications for strengthening family planning services, promoting balanced contraceptive choices, increasing male participation in reproductive health, and improving maternal healthcare. By integrating fertility, family planning, and maternal health indicators within a single analytical framework, the study contributes to the achievement of Sustainable Development Goals 3 (Good Health and Well-being) and 5 (Gender Equality) and provides valuable evidence for future public health planning in India.

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KEYWORDS: National Family Health Survey (NFHS); fertility; family planning; maternal health; contraceptive prevalence; forecasting; Sustainable Development Goals; India.

1. INTRODUCTION

Reproductive health and maternal well-being are fundamental components of sustainable development and public health planning. They influence demographic transitions, population dynamics, economic productivity, gender equality, and the overall quality of life. Over the past three decades, India has undergone a significant demographic transformation characterized by declining fertility rates, increased contraceptive acceptance, improved maternal healthcare utilization, and enhanced institutional support for reproductive health. These improvements have been facilitated by rapid socio-economic development, rising educational attainment, urbanization, expansion of healthcare infrastructure, and sustained governmental efforts to strengthen maternal and child healthcare services.

The Government of India has consistently prioritized reproductive and maternal health through several flagship programmes, including the National Health Mission (NHM), Janani Suraksha Yojana (JSY), Janani Shishu Suraksha Karyakram (JSSK), Mission Parivar Vikas, and various family planning initiatives. These interventions have contributed substantially to reducing fertility rates, promoting institutional deliveries, expanding contraceptive accessibility, and improving maternal and neonatal health outcomes. Despite these achievements, important challenges remain. Regional disparities in healthcare access, unmet need for family planning, low male participation in contraceptive practices, adolescent reproductive health concerns, and socio-economic inequalities continue to influence reproductive health outcomes across different states and population groups. Continuous monitoring of these indicators is therefore essential for evidence-based policy formulation and effective healthcare planning.

The importance of reproductive health extends beyond national priorities to the global development agenda. The 2030 Agenda for Sustainable Development recognizes reproductive, maternal, newborn, and child health as critical components of inclusive and sustainable development. In particular, Sustainable Development Goal (SDG) 3: Good Health and Well-being aims to ensure healthy lives and promote well-being for all at all ages. Target 3.1 focuses on reducing maternal mortality, while Target 3.7 emphasizes universal access to sexual and reproductive healthcare services, including family planning, information, and education. Similarly, SDG 5: Gender Equality, particularly Target 5.6, advocates universal access to sexual and reproductive health and reproductive rights. Progress towards these global commitments depends on reliable data, continuous monitoring, and robust evidence capable of guiding public health interventions. Since several SDG indicators related to fertility, family planning, maternal healthcare, and institutional deliveries are measured through the National Family Health Survey (NFHS), forecasting these indicators provides valuable insights into India's preparedness for achieving the SDG targets by 2030.

The National Family Health Survey (NFHS) is India's largest and most comprehensive source of nationally representative

data on fertility, family planning, maternal and child health, nutrition, mortality, and healthcare utilization. Conducted under the stewardship of the Ministry of Health and Family Welfare (MoHFW) with the International Institute for Population Sciences (IIPS) serving as the nodal agency, the NFHS has generated high-quality demographic and health data since 1992. Five rounds of the survey have been completed to date—NFHS-1 (1992–93), NFHS-2 (1998–99), NFHS-3 (2005–06), NFHS-4 (2015–16), and NFHS-5 (2019–21). These surveys have become indispensable resources for researchers, policymakers, and public health professionals by providing consistent and comparable information on India's evolving reproductive and maternal health landscape.

Evidence from successive NFHS rounds demonstrates remarkable improvements in reproductive and maternal health indicators. The Total Fertility Rate (TFR) has declined from above replacement level to approximately replacement level, reflecting the country's ongoing demographic transition. Contraceptive prevalence has increased steadily, institutional deliveries have expanded significantly, and births attended by skilled health personnel have become increasingly common due to improvements in healthcare infrastructure and targeted government interventions. At the same time, persistent dependence on female sterilization, extremely low adoption of male sterilization, regional inequalities, and varying levels of healthcare accessibility indicate that several dimensions of reproductive health still require focused policy attention. Understanding the future trajectory of these indicators is therefore essential for strengthening reproductive health programmes and ensuring equitable healthcare delivery.

Forecasting future reproductive health indicators has become increasingly important for strategic health planning and policy formulation. Predictive analysis enables governments and healthcare administrators to anticipate future healthcare requirements, allocate resources efficiently, evaluate the long-term effectiveness of ongoing programmes, and identify emerging challenges before they become critical. As India prepares for the forthcoming National Family Health Survey (NFHS-6), reliable projections of fertility, family planning, and maternal healthcare indicators can provide valuable evidence for designing proactive interventions and supporting data-driven decision-making.

Although numerous studies have examined fertility trends, contraceptive prevalence, and maternal healthcare using NFHS datasets, most investigations have primarily focused on descriptive analyses or comparisons between individual survey rounds. Limited attention has been given to developing comprehensive predictive models that simultaneously forecast multiple reproductive and maternal health indicators using longitudinal NFHS data. Moreover, existing studies generally analyse fertility, family planning, and maternal healthcare independently despite their strong interrelationship within the broader demographic transition process. This lack of integrated forecasting limits the availability of evidence required for long-term reproductive health planning and policy evaluation.

The present study addresses this research gap by analysing longitudinal data from all five completed rounds of the National Family Health Survey and developing projections for key reproductive and maternal health indicators expected in NFHS-6. The study examines trends in Total Fertility Rate, contraceptive prevalence, modern contraceptive use, female and male sterilization, intrauterine device (IUD) usage, oral contraceptive pill use, condom use, unmet need for family planning, institutional births, and births attended by skilled health personnel. Using statistical curve-fitting techniques and predictive modelling, the study estimates future trends based on historical evidence and identifies the most appropriate models for forecasting each indicator.

The findings of this study are expected to contribute to the existing body of literature by providing an integrated predictive assessment of India's reproductive and maternal health transition. The projections offer valuable insights for policymakers, healthcare administrators, researchers, and public health practitioners in strengthening reproductive health programmes, improving maternal healthcare services, promoting informed family planning practices, and monitoring India's progress towards achieving the Sustainable Development Goals. By combining historical trend analysis with predictive modelling, the study provides an evidence-based framework to support strategic planning and future public health interventions in India.

2. LITERATURE REVIEW

Reproductive health, fertility, family planning, and maternal healthcare have remained central themes in public health research due to their direct influence on demographic transition and sustainable development. In India, the National Family Health Survey (NFHS) has emerged as the most reliable source of nationally representative data for assessing reproductive and maternal health indicators. Successive rounds of the NFHS have enabled researchers to examine long-term changes in fertility behaviour, contraceptive practices, maternal healthcare utilization, and population dynamics (International Institute for Population Sciences [IIPS] & ICF, 2017; IIPS & ICF, 2021).

India has experienced a substantial decline in fertility over the past three decades. The reduction in the Total Fertility Rate (TFR) has been attributed to increasing female literacy, delayed marriage, urbanization, improved healthcare access, and wider acceptance of family planning methods. Recent evidence indicates that India has reached replacement-level fertility at the national level, although considerable regional disparities continue to exist (Tripathi et al., 2023). Researchers have observed that the demographic transition has created new opportunities for economic development while simultaneously requiring governments to strengthen reproductive health services and population policies.

Family planning remains one of the most effective strategies for improving reproductive health outcomes. Several studies have reported a steady increase in contraceptive prevalence across successive NFHS rounds, reflecting improved awareness, better availability of contraceptive services, and

supportive government interventions (IIPS & ICF, 2021). However, the contraceptive method mix continues to be dominated by female sterilization, whereas male sterilization remains negligible. This imbalance highlights persistent gender inequalities in reproductive responsibility and indicates the need for greater male participation in family planning programmes (Tripathi et al., 2023). Expanding access to reversible modern contraceptive methods and promoting informed reproductive choices remain important priorities for public health policymakers.

Maternal healthcare indicators have also shown remarkable improvements in India. Government initiatives such as the National Health Mission, Janani Suraksha Yojana, and Janani Shishu Suraksha Karyakram have significantly increased institutional deliveries and births attended by skilled health personnel. These interventions have contributed to reductions in maternal and neonatal mortality while improving healthcare accessibility across the country (Ali et al., 2021). Despite these achievements, disparities based on socio-economic status, educational attainment, and geographical location continue to influence maternal healthcare utilization, particularly in rural and underserved regions.

Recent studies have increasingly explored the application of statistical techniques for analysing demographic and reproductive health trends. Regression analysis, time-series methods, and curve-fitting techniques have been employed to understand historical changes in fertility, contraceptive prevalence, and maternal healthcare indicators. Predictive modelling has gained growing importance because it enables policymakers to anticipate future healthcare requirements and evaluate the potential impact of ongoing public health interventions. Nevertheless, forecasting studies using NFHS data remain relatively limited, particularly those integrating multiple reproductive and maternal health indicators within a single analytical framework.

Bhojak and Jani (2024) compared NFHS-4 and NFHS-5 and reported considerable improvements in women's health indicators, institutional deliveries, and reproductive healthcare utilization in India. Their study emphasized the importance of evidence-based policy interventions to address persistent inequalities in healthcare accessibility and reproductive health outcomes. While the study provided valuable comparative insights into changes between two NFHS rounds, it did not extend its analysis to predictive modelling or future projections of reproductive and maternal health indicators.

Collectively, the existing literature demonstrates that India has achieved significant progress in fertility reduction, contraceptive adoption, institutional deliveries, and maternal healthcare utilization. However, most previous investigations have concentrated on descriptive analyses or comparative assessments of individual NFHS rounds. Comprehensive studies integrating multiple family planning, fertility, and maternal health indicators using predictive statistical models remain limited. Furthermore, limited research has attempted to generate evidence-based projections for upcoming NFHS rounds using longitudinal data spanning all five completed

surveys. Addressing this gap is important for supporting evidence-based policymaking, resource allocation, and monitoring India's progress towards Sustainable Development Goals related to reproductive and maternal health.

3. RESEARCH GAP

Although the existing literature has extensively examined fertility trends, family planning practices, and maternal healthcare utilization using data from successive rounds of the National Family Health Survey (NFHS), several important research gaps remain. Most studies have primarily focused on descriptive analyses or comparative assessments of individual NFHS rounds, with emphasis on evaluating historical changes in reproductive health indicators (Ali et al., 2021; Tripathi et al., 2023). While these studies have significantly enhanced the understanding of India's demographic and reproductive health transition, they provide limited insights into future trends. Furthermore, previous research has generally analysed fertility, contraceptive prevalence, maternal healthcare, and institutional deliveries as independent variables rather than examining them within an integrated analytical framework. Since these indicators are closely interrelated and collectively influence reproductive health outcomes, a comprehensive assessment is essential for effective policy planning and programme implementation.

Another important limitation is the limited application of predictive statistical techniques using longitudinal NFHS data. Although regression analysis and trend analysis have been employed in several studies, comparatively few researchers have attempted to forecast future reproductive and maternal health indicators by utilizing multiple statistical curve-fitting models. Such predictive analyses are valuable for anticipating future healthcare requirements, optimizing resource allocation, and supporting evidence-based decision-making.

Additionally, limited research has explored the potential implications of projected reproductive health indicators in relation to India's progress towards the Sustainable Development Goals (SDGs), particularly SDG 3 (Good Health and Well-being) and SDG 5 (Gender Equality). Forecasting future reproductive and maternal health indicators can provide policymakers with early evidence regarding the country's preparedness to achieve these global targets.

The present study addresses these research gaps by employing longitudinal data from all five completed rounds of the National Family Health Survey (NFHS-I to NFHS-V) to analyse historical trends and generate projections for key reproductive and maternal health indicators expected in NFHS-6. Unlike previous studies, the research integrates fertility, family planning, and maternal healthcare indicators within a single analytical framework using multiple curve-fitting techniques. The study also contributes to the existing literature by providing evidence-based projections that may assist policymakers, researchers, and healthcare administrators in strengthening reproductive health strategies and monitoring India's progress towards the Sustainable Development Goals.

4. RESEARCH OBJECTIVES

The present study aims to analyse the long-term trends in reproductive health, family planning, fertility, and maternal healthcare indicators in India using data from the five completed rounds of the National Family Health Survey (NFHS). The specific objectives of the study are:

1. To examine the historical trends in selected reproductive health and maternal healthcare indicators across NFHS-I (1992–93) to NFHS-V (2019–21).
2. To identify the most appropriate statistical curve-fitting models for forecasting key reproductive health indicators based on historical NFHS data.
3. To project the likely values of selected fertility, family planning, and maternal healthcare indicators for the forthcoming NFHS-6.
4. To compare the projected trends across various reproductive health indicators and assess their implications for population stabilization and maternal healthcare.
5. To provide evidence-based recommendations for policymakers and public health practitioners to strengthen family planning programmes and maternal healthcare services while supporting India's progress towards the Sustainable Development Goals (SDGs).

5. Research Questions

The study seeks to address the following research questions:

RQ1: What trends have been observed in fertility, family planning, and maternal healthcare indicators across the five completed rounds of the National Family Health Survey?

RQ2: Which statistical curve-fitting model provides the best fit for forecasting each reproductive and maternal health indicator?

RQ3: What are the projected values of the selected reproductive health and maternal healthcare indicators for NFHS-6?

RQ4: What are the policy implications of these projected trends for improving reproductive health outcomes and achieving the Sustainable Development Goals in India?

6. Data Source and Methodology

6.1 Data Source

The present study is based exclusively on secondary data obtained from the five completed rounds of the National Family Health Survey (NFHS), India's largest nationally representative household survey on population, health, and nutrition. The survey is conducted under the stewardship of the Ministry of Health and Family Welfare (MoHFW), Government of India, with the International Institute for Population Sciences (IIPS), Mumbai, serving as the nodal agency. The survey follows standardized sampling procedures and internationally accepted data collection protocols, ensuring comparability across survey rounds.

Data from NFHS-1 (1992–93), NFHS-2 (1998–99), NFHS-3 (2005–06), NFHS-4 (2015–16), and NFHS-5 (2019–21) were utilized for the present analysis. These surveys provide nationally representative estimates of fertility, family planning,

maternal and child health, reproductive health, and healthcare utilization. The longitudinal nature of the NFHS dataset enables the examination of long-term demographic transitions and supports the development of predictive models for future reproductive health indicators.

6.2 Selection of Indicators

The study focuses on ten key indicators representing fertility, family planning, and maternal healthcare. These indicators were selected because of their relevance to reproductive health policy, demographic transition, and Sustainable Development Goal (SDG) monitoring.

Fertility Indicator

- Total Fertility Rate (TFR)

Family Planning Indicators

- Contraceptive Prevalence Rate (CPR)
- Modern Contraceptive Prevalence Rate (mCPR)
- Female Sterilization
- Male Sterilization
- Intrauterine Device (IUD/PPIUD) Use
- Oral Contraceptive Pill Use
- Condom Use
- Unmet Need for Family Planning

Maternal Healthcare Indicators

- Institutional Births
- Births Attended by Skilled Health Personnel

These indicators collectively represent the major dimensions of reproductive health and provide a comprehensive assessment of India's demographic and maternal healthcare transition.

6.3 Statistical Analysis

The study adopts a quantitative research design using trend analysis and predictive modelling. Historical values of each indicator were extracted from the five completed NFHS rounds and analysed to identify long-term patterns. Multiple curve-fitting techniques were employed to model the relationship between survey period and each reproductive health indicator.

The following statistical models were evaluated:

- Linear Model
- Polynomial Model
- Exponential Model
- Logarithmic Model
- Power Model

For each indicator, the goodness-of-fit of the competing models was assessed using the coefficient of determination (R^2). The model demonstrating the highest explanatory power and best representation of the historical trend was selected for

forecasting. The selected model was then used to estimate the expected value of each indicator for the forthcoming NFHS-6.

6.4 Forecasting Procedure

Forecasts were generated by extending the mathematical equation of the best-fitting regression model beyond the observed NFHS data. Separate predictive models were developed for each reproductive health indicator to account for their individual growth patterns. This approach enables the estimation of future trends while preserving the historical trajectory observed across successive survey rounds.

The projected estimates should be interpreted as evidence-based statistical forecasts derived from historical trends rather than exact future observations. Actual values reported in future surveys may vary due to policy changes, socio-economic developments, technological advancements, healthcare interventions, or unforeseen demographic events.

6.5 Analytical Framework

The analytical framework of the study consists of four sequential stages:

1. Collection of secondary data from NFHS-I to NFHS-V.
2. Compilation and trend analysis of selected reproductive health indicators.
3. Development and evaluation of multiple regression-based curve-fitting models.
4. Selection of the best-fitting model based on R^2 and generation of projections for NFHS-6, followed by interpretation of policy implications.

6.6 Ethical Considerations

The study is based entirely on publicly available secondary data obtained from published National Family Health Survey reports. Since no primary data were collected and no human participants were directly involved, ethical approval and informed consent were not required for the present research. The analysis adheres to accepted principles of academic integrity and responsible use of publicly accessible datasets.

7. RESULTS AND DISCUSSION

The results of the study are presented through a comprehensive analysis of fertility, family planning, and maternal healthcare indicators using data from the five completed rounds of the National Family Health Survey (NFHS). Historical trends were examined to understand changes in reproductive health outcomes over time, and appropriate statistical curve-fitting models were employed to generate projections. The findings are presented indicator-wise, supported by tables and graphical representations, followed by their interpretation, comparison with previous studies, and implications for reproductive health policy and the Sustainable Development Goals (SDGs).

7.1 Total Fertility Rate (TFR)

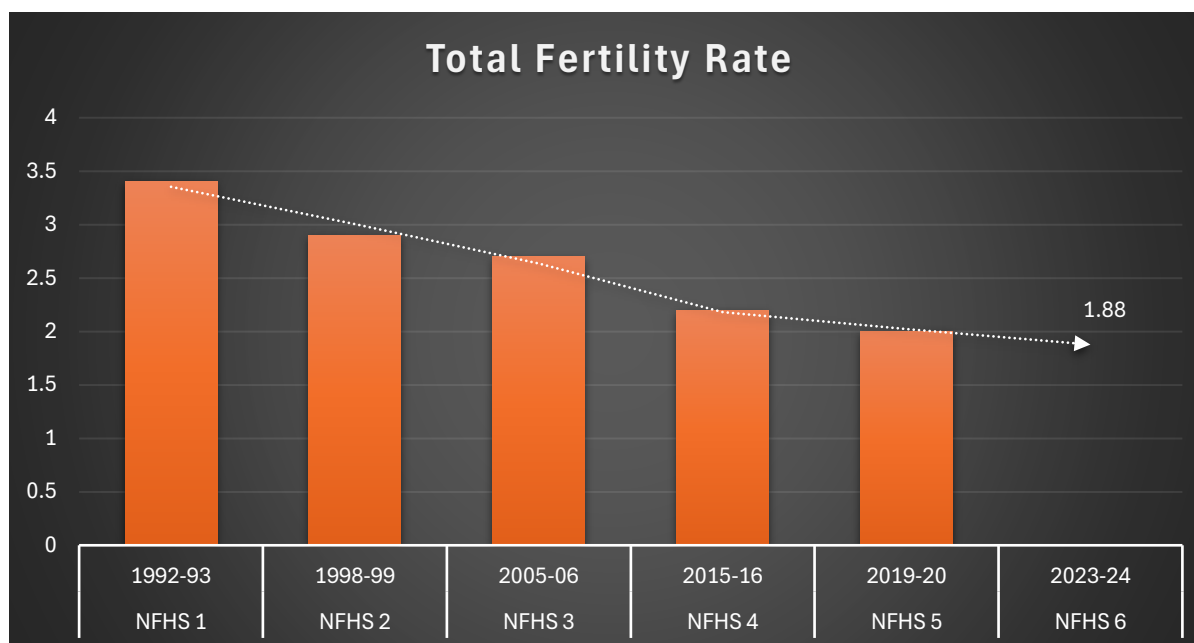


Figure 1

Figure 1 present the historical trend and projected value of the Total Fertility Rate (TFR) in India based on data from the five completed rounds of the National Family Health Survey (NFHS). The findings reveal a consistent decline in fertility over the past three decades, with TFR decreasing from 3.39 children per woman in NFHS-1 (1992–93) to 2.90 in NFHS-2 (1998–99), 2.70 in NFHS-3 (2005–06), 2.20 in NFHS-4 (2015–16), and 2.00 in NFHS-5 (2019–21). Based on the selected forecasting model, the TFR is projected to further decline to 1.88 in NFHS-6, indicating the continuation of India's demographic transition towards below-replacement fertility.

The sustained decline in fertility reflects the cumulative impact of socio-economic development, increasing female literacy, delayed marriage, improved access to reproductive healthcare, greater awareness and acceptance of family planning methods, and the expansion of maternal and child health services. Government initiatives such as the National Health Mission (NHM), Mission Parivar Vikas, Janani Suraksha Yojana (JSY), and other family planning programmes have played a significant role in improving reproductive health outcomes and promoting informed contraceptive choices (IIPS & ICF, 2021).

The projected TFR of 1.88 suggests that India is likely to maintain fertility below the replacement level if the current demographic trends continue. Although declining fertility contributes to population stabilization and creates opportunities for socio-economic development, it also necessitates long-term planning to address challenges associated with population ageing, regional demographic imbalances, and future workforce

dynamics. Furthermore, fertility patterns continue to vary considerably across states, indicating that reproductive health policies should be tailored to regional needs rather than relying solely on national averages.

The findings of the present study are consistent with previous research that reported a steady decline in fertility as a consequence of improved educational attainment, urbanization, women's empowerment, and wider access to reproductive healthcare services (IIPS & ICF, 2021; UNFPA, 2023). Similarly, Bhojak and Jani (2024) reported substantial improvements in reproductive and maternal health indicators between NFHS-4 and NFHS-5, emphasizing that strengthened healthcare infrastructure and evidence-based policy interventions have contributed significantly to India's demographic transition. The projected decline in fertility also supports India's progress towards Sustainable Development Goal (SDG) 3, particularly Target 3.7, which promotes universal access to sexual and reproductive healthcare services, and SDG 5, which advocates gender equality and reproductive rights.

Overall, the observed and projected decline in the Total Fertility Rate demonstrates the effectiveness of India's reproductive health policies and family planning initiatives. Continuous monitoring of fertility trends through successive NFHS rounds and evidence-based forecasting can support policymakers in designing targeted interventions, optimizing healthcare resources and sustaining progress towards national health priorities and the Sustainable Development Go

7.2 Contraceptive Prevalence Rate (Any Method)

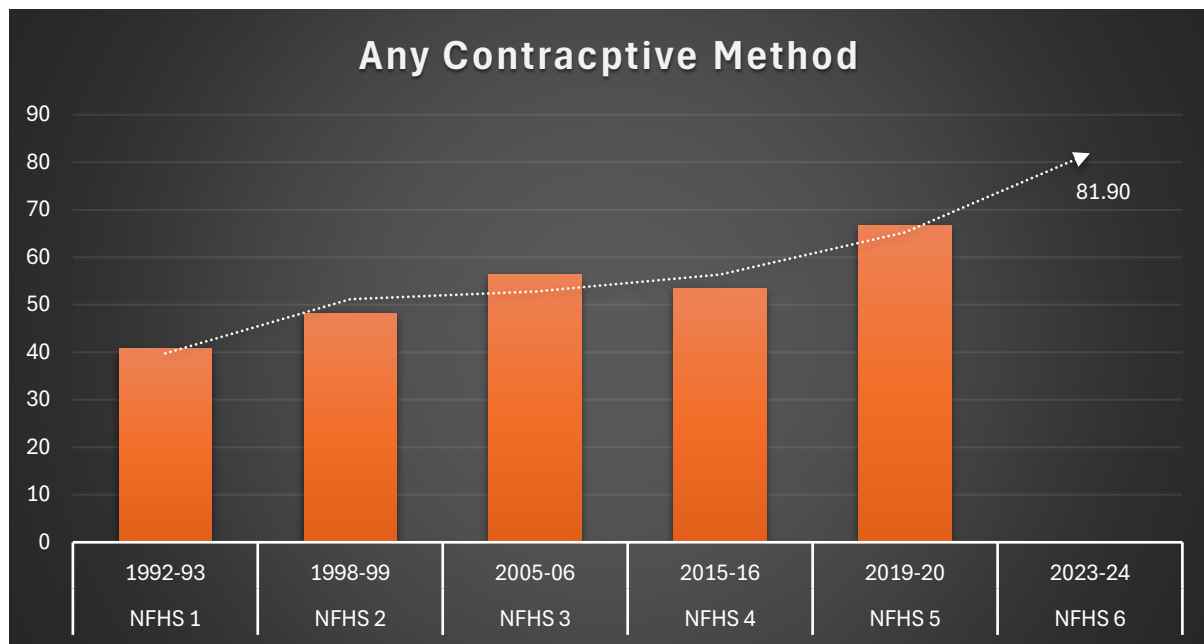


Figure 2

Figure 2 present the historical trend and projected value of the Contraceptive Prevalence Rate (CPR) for any contraceptive method in India. The findings indicate an overall increase in contraceptive use from 40.7% in NFHS-1 (1992–93) to 66.7% in NFHS-5 (2019–21). Although a slight decline was observed during NFHS-4 (53.5%) compared to NFHS-3 (56.3%), the subsequent increase in NFHS-5 reflects renewed progress in family planning acceptance. Based on the selected forecasting model, the CPR is projected to increase further to 81.90% in NFHS-6, indicating a continued positive trend in contraceptive adoption.

The overall increase in contraceptive prevalence reflects improvements in reproductive health awareness, wider availability of family planning services, increased female literacy, and the expansion of government health programmes promoting informed reproductive choices. Initiatives such as the National Health Mission (NHM), Mission Parivar Vikas, and strengthened community-based healthcare services have contributed significantly to improving access to contraceptive methods across the country (IIPS & ICF, 2021).

The projected increase to 81.90% suggests continued progress towards universal access to family planning services. Higher contraceptive prevalence is expected to contribute to improved birth spacing, reduced unintended pregnancies, lower maternal and infant mortality, and enhanced reproductive health outcomes.

However, increasing contraceptive use should also be accompanied by greater availability of a diverse range of modern contraceptive methods and increased participation of men in family planning to ensure balanced reproductive responsibility.

The findings are consistent with previous studies that reported a gradual improvement in contraceptive prevalence due to expanding healthcare infrastructure and growing public awareness regarding reproductive health (IIPS & ICF, 2021). Similarly, Bhojak and Jani (2024) observed improvements in reproductive health indicators between NFHS-4 and NFHS-5 and highlighted the importance of strengthening family planning programmes to reduce regional disparities. The increasing trend in contraceptive prevalence supports SDG 3 (Good Health and Well-being) by promoting universal access to reproductive healthcare services and SDG 5 (Gender Equality) through informed reproductive decision-making and improved access to family planning.

Overall, the observed and projected trends demonstrate that India has made considerable progress in expanding contraceptive use. Continued policy efforts focusing on awareness, accessibility, quality counselling, and equitable availability of contraceptive methods will be essential for sustaining these gains and strengthening reproductive health outcomes.

7.3 Modern Contraceptive Prevalence Rate (mCPR)

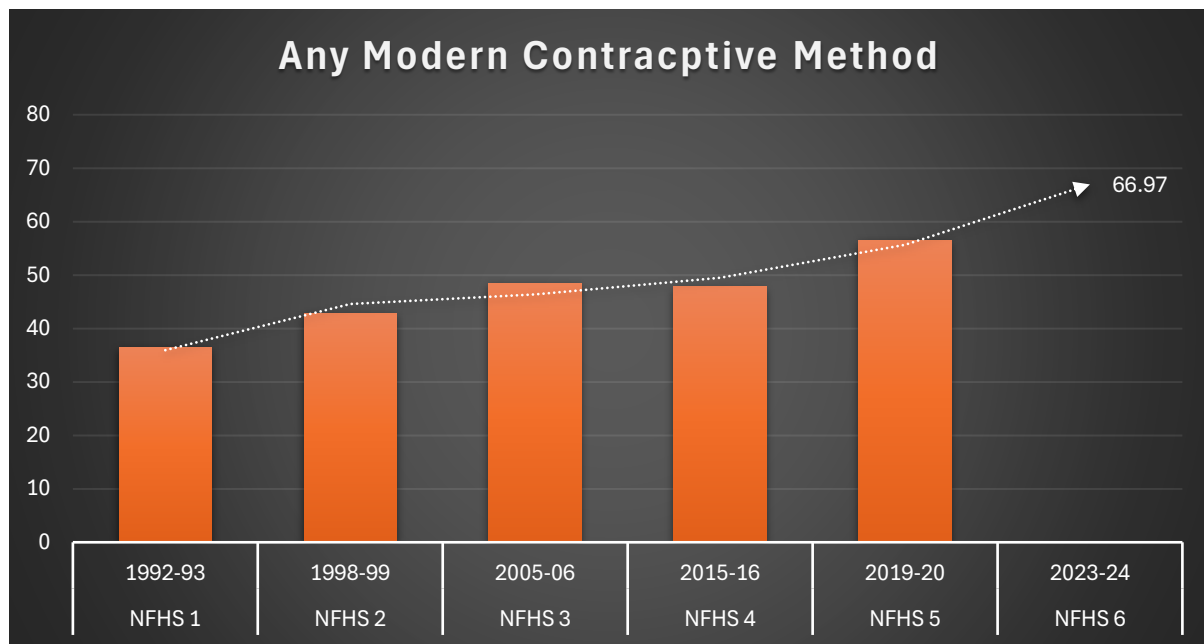


Figure 3

Figure 3 present the historical trend and projected value of the Modern Contraceptive Prevalence Rate (mCPR) in India across the five completed rounds of the National Family Health Survey (NFHS). The findings indicate a steady increase in the use of modern contraceptive methods from 36.5% in NFHS-1 (1992–93) to 56.5% in NFHS-5 (2019–21). Although a marginal decline was observed between NFHS-3 (48.5%) and NFHS-4 (47.8%), the subsequent rise in NFHS-5 reflects renewed progress in the adoption of modern family planning methods. The forecasting model projects that the mCPR will further increase to 66.97% in NFHS-6, indicating continued improvement in the acceptance and utilization of modern contraceptive methods.

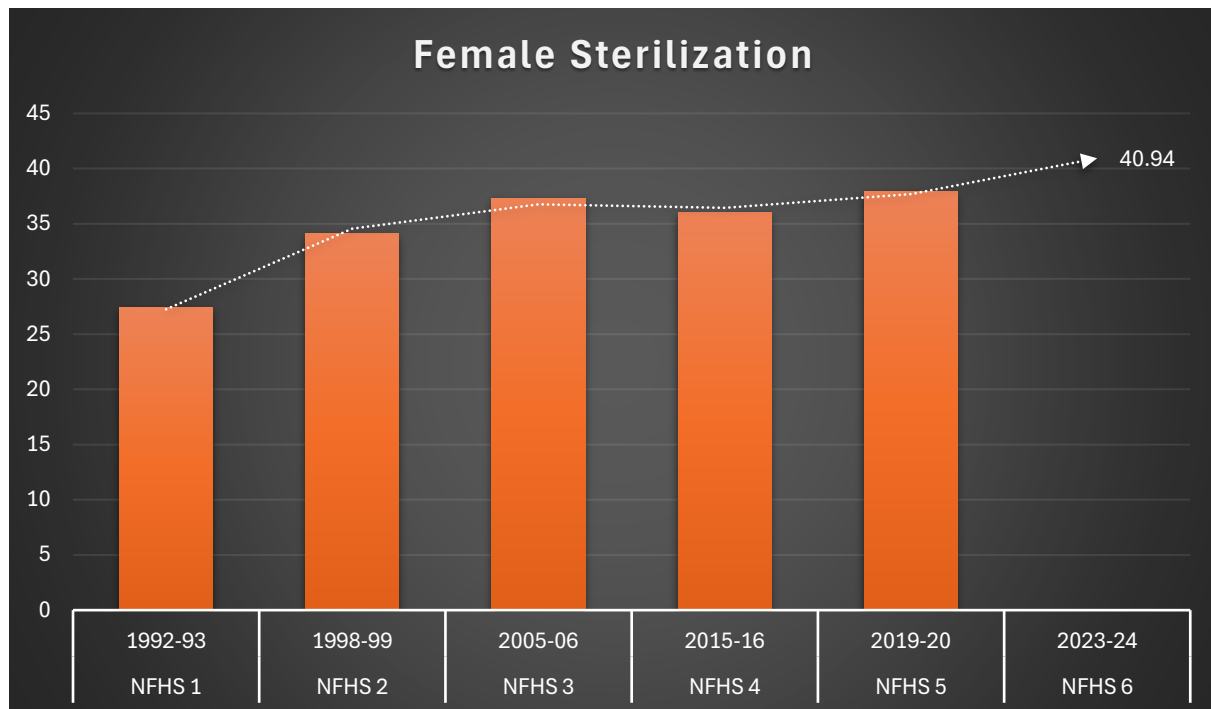
The increasing use of modern contraceptives reflects the positive impact of government family planning programmes, improved healthcare infrastructure, wider availability of contraceptive services, and growing awareness regarding reproductive health. The expansion of initiatives under the National Health Mission (NHM), Mission Parivar Vikas, and community-based health services has strengthened access to modern contraceptive methods and promoted informed reproductive choices among eligible couples (IIPS & ICF, 2021).

The projected increase in mCPR to 66.97% suggests that India is likely to continue strengthening the adoption of modern contraceptive methods. Increased utilization of modern contraception is expected to contribute to improved birth spacing, reduction in unintended pregnancies, enhanced

maternal and child health outcomes, and better reproductive health planning. Nevertheless, sustained progress will depend upon ensuring equitable access to a diverse range of reversible contraceptive methods, improving the quality of family planning counselling, and encouraging greater participation of men in reproductive decision-making.

The present findings are consistent with earlier studies reporting a gradual increase in the use of modern contraceptive methods due to improved healthcare accessibility, educational attainment, and awareness of reproductive health services (IIPS & ICF, 2021). Similarly, Bhojak and Jani (2024) reported improvements in reproductive health indicators between NFHS-4 and NFHS-5 and emphasized the importance of strengthening evidence-based family planning strategies to reduce regional disparities and improve healthcare accessibility. The increasing trend in modern contraceptive use also contributes to achieving SDG 3 (Good Health and Well-being) by ensuring universal access to reproductive healthcare services and SDG 5 (Gender Equality) by promoting informed reproductive choices and reproductive rights.

Overall, the historical and projected trends demonstrate encouraging progress in the adoption of modern contraceptive methods in India. Continued investments in healthcare infrastructure, awareness programmes, quality counselling services, and equitable access to modern contraceptive options will be essential for sustaining these gains and achieving long-term reproductive health objectives.



7.4 Female Sterilization

Figure 4 presents the historical trend and projected value of female sterilization in India across the five completed rounds of the National Family Health Survey (NFHS). The findings indicate that female sterilization has remained the predominant contraceptive method throughout the study period, increasing from 27.4% in NFHS-1 (1992–93) to 38.0% in NFHS-5 (2019–21). A slight decline was observed during NFHS-4 (36.0%) compared to NFHS-3 (37.3%); however, the overall trend remained positive. Based on the selected forecasting model, female sterilization is projected to increase further to 40.94% in NFHS-6.

The continued dominance of female sterilization reflects the long-standing emphasis of India's family planning programme on permanent contraceptive methods for women. Factors such as completed family size, easy availability of sterilization services through public healthcare facilities, financial incentives under government programmes, and greater acceptance among eligible couples have contributed to the widespread adoption of this method. Although female sterilization has played an important role in reducing fertility, its predominance also highlights the unequal distribution of reproductive responsibility between women and men.

The projected increase in female sterilization indicates that permanent methods are likely to remain an important component of India's family planning strategy.

However, excessive dependence on a single contraceptive method may limit reproductive choice and reduce the adoption of reversible contraceptive options.

Future family planning policies should therefore promote a balanced contraceptive method mix by improving access to intrauterine devices, oral contraceptive pills, injectable contraceptives, condoms, and other modern reversible methods while encouraging informed reproductive decision-making.

The present findings are consistent with previous studies reporting that female sterilization continues to account for the largest share of contraceptive use in India despite gradual improvements in the availability of modern reversible contraceptive methods (IIPS & ICF, 2021). The findings also emphasize the need to strengthen SDG 5 (Gender Equality) by promoting shared reproductive responsibility and ensuring that women are provided with informed choices rather than relying predominantly on permanent sterilization. Furthermore, improving access to diverse contraceptive methods contributes to SDG 3 (Good Health and Well-being) through enhanced reproductive healthcare services.

Overall, while female sterilization has contributed significantly to fertility reduction and population stabilization, future reproductive health policies should focus on expanding contraceptive choice, strengthening counselling services, and promoting gender-equitable participation in family planning to achieve sustainable reproductive health outcomes.

7.5 Male Sterilization

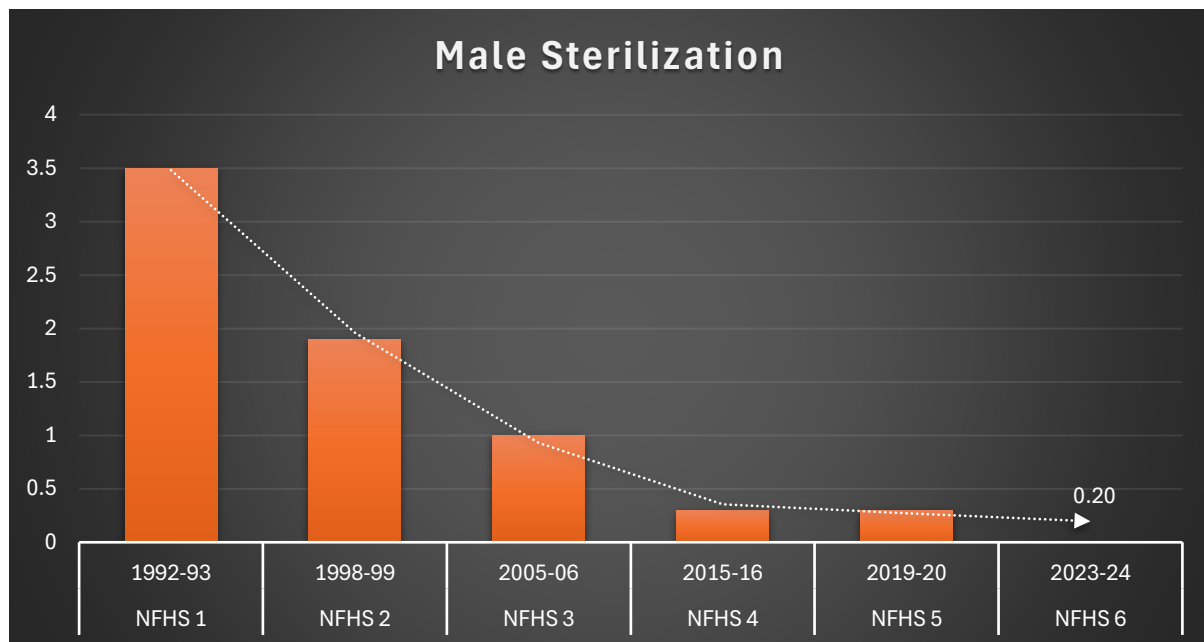


Figure 5 presents the historical trend and projected prevalence of male sterilization in India across the five completed rounds of the National Family Health Survey (NFHS). The findings reveal a continuous decline in the adoption of male sterilization, decreasing from **3.5% in NFHS-1 (1992–93)** to 1.9% in NFHS-2 (1998–99), 1.0% in NFHS-3 (2005–06), and further declining to 0.3% in both NFHS-4 (2015–16) and NFHS-5 (2019–21). The forecasting model projects a further marginal decline to 0.20% in NFHS-6, indicating that male sterilization is likely to remain one of the least adopted contraceptive methods in India.

The declining trend reflects persistent socio-cultural barriers, misconceptions regarding vasectomy, limited awareness, gender stereotypes, and the continued perception that family planning is primarily the responsibility of women. Although vasectomy is a safe, simple, and effective permanent contraceptive method, its acceptance has remained extremely low due to social stigma and inadequate male engagement in reproductive health programmes. Consequently, the burden of permanent contraception continues to fall disproportionately on women.

The projected decline to 0.20% highlights the urgent need for policy interventions that actively promote male participation in family planning. Public awareness campaigns should focus on dispelling myths surrounding vasectomy, encouraging shared reproductive responsibility, and providing accurate information regarding the safety and effectiveness of male sterilization.

Strengthening counselling services, community outreach programmes, and behaviour change communication can help improve male involvement in reproductive health decisions and promote a more balanced contraceptive method mix.

The present findings are consistent with previous studies reporting extremely low acceptance of male sterilization despite improvements in overall contraceptive prevalence in India (IIPS & ICF, 2021). Bhojak and Jani (2024) also emphasized that while reproductive health indicators have improved substantially, male participation in family planning remains limited, highlighting the need for gender-sensitive policy interventions. The continued decline in male sterilization underscores the importance of SDG 5 (Gender Equality) by promoting shared reproductive responsibility and equitable participation in family planning. It also contributes to SDG 3 (Good Health and Well-being) through the promotion of comprehensive reproductive healthcare services that involve both women and men.

Overall, the findings indicate that although India has achieved considerable progress in reproductive health, male sterilization continues to remain a neglected component of the national family planning programme. Future policies should prioritize male engagement, expand awareness initiatives, and encourage informed reproductive decision-making to achieve a more equitable and sustainable family planning system.

7.6 Intrauterine Device (IUD)

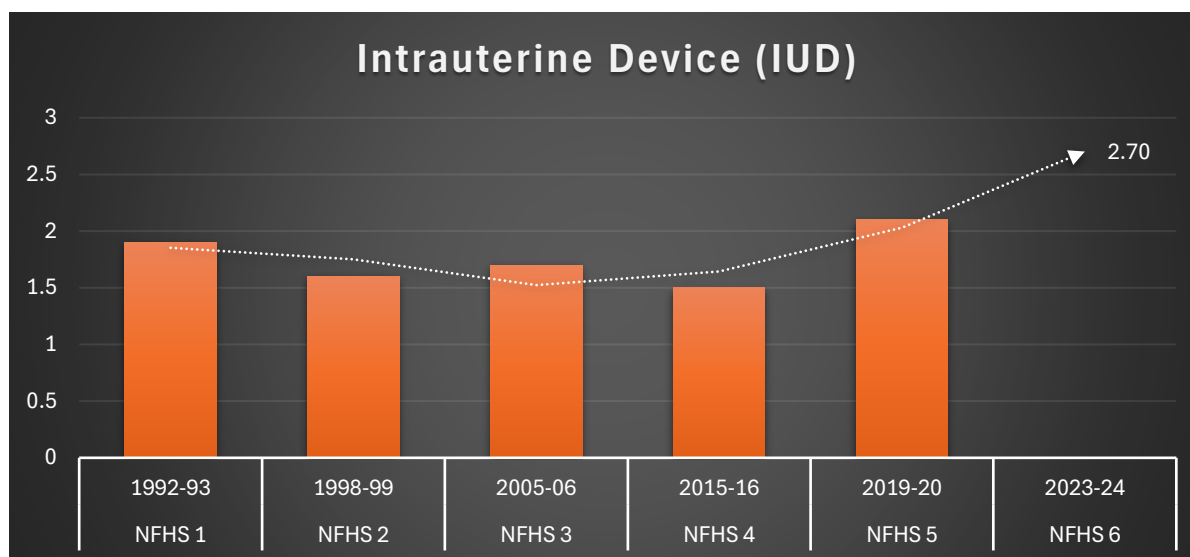


Figure 6

Figure 6 presents the historical trend and projected prevalence of Intrauterine Device (IUD) use in India across the five completed rounds of the National Family Health Survey (NFHS). The findings indicate that IUD use remained relatively stable over the first four survey rounds, changing from 1.9% in NFHS-1 (1992–93) to 1.6% in NFHS-2 (1998–99), 1.7% in NFHS-3 (2005–06), and 1.5% in NFHS-4 (2015–16). A noticeable increase was observed in NFHS-5 (2.1%), and the forecasting model projects a further rise to 2.70% in NFHS-6, indicating growing acceptance of long-acting reversible contraceptive methods.

The relatively low but gradually increasing prevalence of IUD use reflects improved awareness regarding reversible contraception, expansion of family planning counselling services, and strengthened maternal healthcare programmes. Government initiatives promoting postpartum intrauterine contraceptive devices (PPIUCDs), improved training of healthcare providers, and increased availability of IUD services at public health facilities have contributed to the recent increase in utilization (IIPS & ICF, 2021).

The projected increase to 2.70% suggests continued improvement in the acceptance of long-acting reversible contraceptive methods. Unlike permanent sterilization, IUDs provide effective, reversible, and long-term protection against unintended pregnancies, making them an important option for

women wishing to delay or space pregnancies. Nevertheless, their utilization remains comparatively low, highlighting the need for enhanced awareness, improved counselling, and greater confidence among women regarding the safety and effectiveness of IUDs.

The present findings are consistent with earlier studies that reported modest but gradual improvements in the utilization of reversible contraceptive methods in India following strengthened family planning initiatives (IIPS & ICF, 2021). Bhojak and Jani (2024) also emphasized the importance of expanding contraceptive choices beyond permanent methods to ensure informed reproductive decision-making and equitable access to reproductive healthcare services. Increasing IUD utilization contributes directly to SDG 3 (Good Health and Well-being) by improving access to quality reproductive healthcare and supports SDG 5 (Gender Equality) by expanding women's contraceptive choices and reproductive autonomy.

Overall, although IUD use continues to account for a relatively small proportion of contraceptive adoption in India, the observed and projected increase reflects encouraging progress towards a more diversified contraceptive method mix. Continued investments in awareness campaigns, provider training, and high-quality counselling services will be essential for further increasing the acceptance and utilization of long-acting reversible contraceptive methods.

7.7 Oral Contraceptive Pills (OCPs)

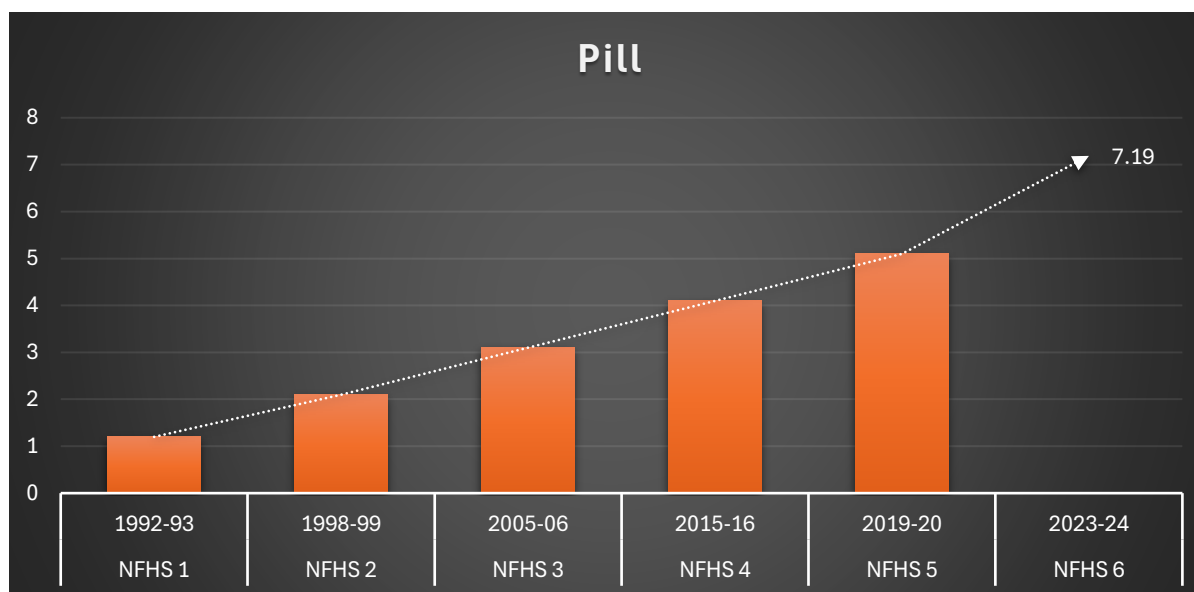


Figure 7

Figure 7 present the historical trend and projected prevalence of oral contraceptive pill (OCP) use in India across the five completed rounds of the National Family Health Survey (NFHS). The findings indicate a steady and consistent increase in pill usage, rising from 1.2% in NFHS-1 (1992–93) to 2.1% in NFHS-2 (1998–99), 3.1% in NFHS-3 (2005–06), 4.1% in NFHS-4 (2015–16), and 5.1% in NFHS-5 (2019–21). Based on the selected forecasting model, the prevalence of oral contraceptive pill use is projected to further increase to 7.19% in NFHS-6, indicating growing acceptance of short-term reversible contraceptive methods.

The continuous increase in oral contraceptive pill use reflects improved awareness of reproductive health, greater accessibility of contraceptive services through public and private healthcare facilities, and enhanced counselling provided under national family planning programmes. The expansion of healthcare infrastructure, increased educational attainment among women, and wider dissemination of information regarding modern contraceptive methods have contributed to the gradual shift towards reversible contraceptive options (IIPS & ICF, 2021).

The projected increase to 7.19% suggests that oral contraceptive pills are likely to play an increasingly important role in India's contraceptive method mix. As an effective and reversible method, oral contraceptive pills provide women with greater flexibility in planning pregnancies and maintaining

appropriate birth spacing. However, continued progress will depend on ensuring uninterrupted availability, improving counselling regarding correct and consistent use, addressing misconceptions about side effects, and expanding access among underserved populations.

The findings are consistent with earlier studies reporting increasing utilization of modern reversible contraceptive methods as a result of strengthened reproductive healthcare

services and improved family planning awareness (IIPS & ICF, 2021). Bojack and Jani (2024) also emphasized the importance of expanding contraceptive choices to improve reproductive autonomy and reduce dependence on permanent contraceptive methods. The increasing adoption of oral contraceptive pills contributes to SDG 3 (Good Health and Well-being) by improving access to quality reproductive healthcare services and supports SDG 5 (Gender Equality) by empowering women to make informed reproductive choices.

Overall, the historical and projected trends demonstrate encouraging progress in the acceptance of oral contraceptive pills in India. Sustained policy support, continuous awareness programmes, quality counselling, and equitable access to affordable contraceptive services will be essential for maintaining this positive trend and strengthening reproductive health outcomes.

7.8 Condom Use

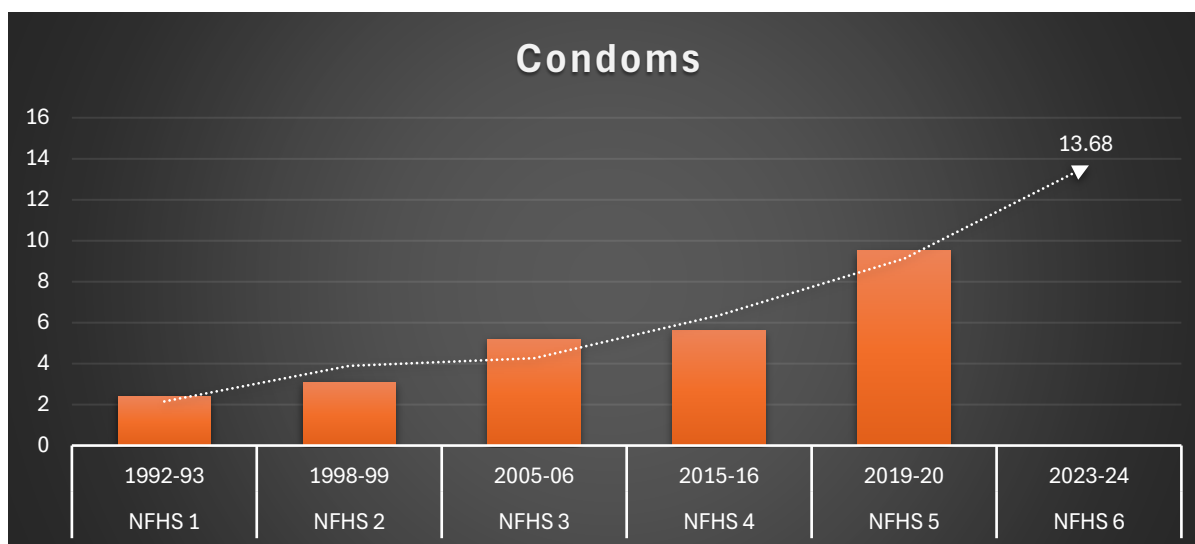


Figure 8 illustrates the historical trend and projected prevalence of condom use in India across the five completed rounds of the National Family Health Survey (NFHS). The findings reveal a consistent increase in condom use from 2.4% in NFHS-1 (1992–93) to 3.1% in NFHS-2 (1998–99), 5.2% in NFHS-3 (2005–06), 5.6% in NFHS-4 (2015–16), and 9.5% in NFHS-5 (2019–21). Based on the selected forecasting model, condom use is projected to increase further to 13.68% in NFHS-6, indicating growing acceptance of male-controlled reversible contraceptive methods.

The increasing trend reflects improved public awareness regarding reproductive health, greater accessibility of condoms through government health programmes and social marketing initiatives, and increased recognition of condoms as an effective method for both pregnancy prevention and protection against sexually transmitted infections (STIs), including HIV. National awareness campaigns, improved distribution networks, and behaviour change communication strategies have contributed to the growing acceptance of condom use among reproductive-age couples (WHO, 2023; UNAIDS, 2023).

The projected increase to 13.68% suggests continued progress towards a more diversified contraceptive method mix. Unlike permanent methods, condoms provide dual protection by preventing unintended pregnancies while simultaneously reducing the transmission of sexually transmitted infections.

Increased condom use also reflects greater male involvement in reproductive health, which contributes to a more equitable distribution of family planning responsibilities. Nevertheless, continued efforts are required to overcome social stigma, improve consistent and correct usage, and enhance accessibility, particularly among adolescents, young adults, and underserved populations.

The observed trend is consistent with global evidence indicating that sustained awareness programmes and improved accessibility have contributed to increased condom utilization in many low- and middle-income countries (WHO, 2023; UNAIDS, 2023). The continued rise in condom use supports SDG 3 (Good Health and Well-being) by promoting sexual and reproductive health and reducing the risk of sexually transmitted infections. It also advances SDG 5 (Gender Equality) by encouraging shared responsibility in family planning and informed reproductive decision-making.

Overall, the historical and projected trends demonstrate encouraging progress in condom adoption in India. Strengthening awareness campaigns, ensuring uninterrupted availability through public healthcare systems, and promoting comprehensive sexuality education will be essential to sustain this positive trend and improve reproductive health outcomes.

7.9 Total Unmet Need for Family Planning

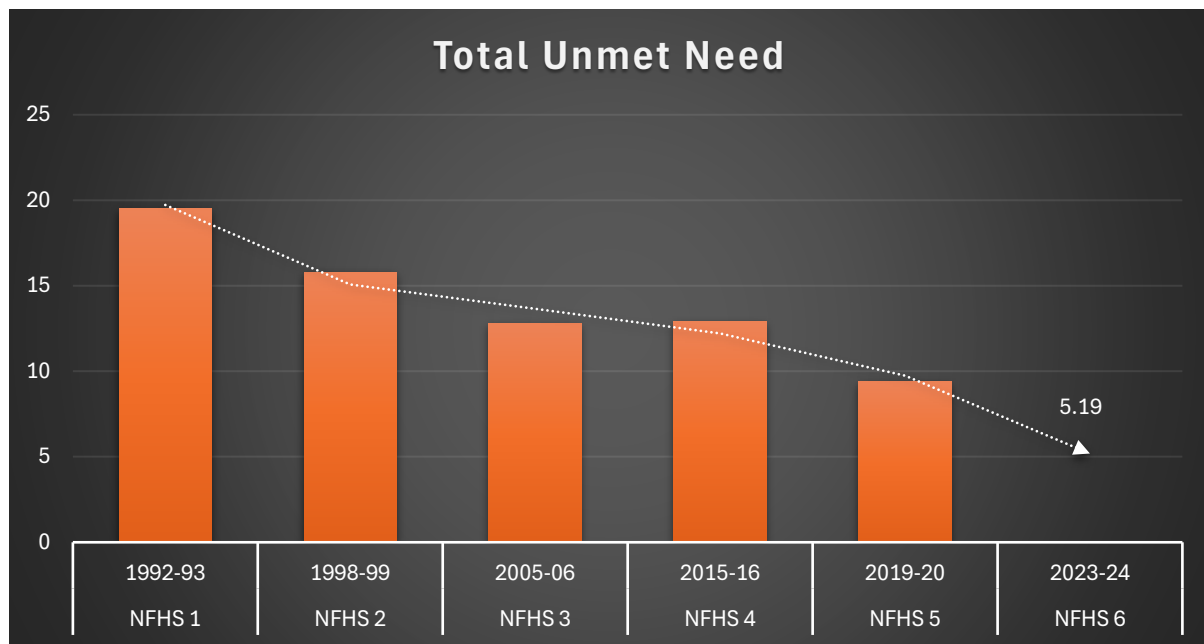


Figure 9 presents the historical trend and projected total unmet need for family planning among currently married women in India across the five completed rounds of the National Family Health Survey (NFHS). The findings indicate a substantial decline in unmet need, decreasing from 19.5% in NFHS-1 (1992–93) to 15.8% in NFHS-2 (1998–99) and 12.8% in NFHS-3 (2005–06). A marginal increase was observed in NFHS-4 (13.0%), followed by a considerable decline to 9.4% in NFHS-5 (2019–21). The forecasting model further projects the unmet need for family planning to decrease to 5.19% in NFHS-6, reflecting continued improvements in access to reproductive healthcare services and contraceptive availability. The declining trend indicates that an increasing proportion of women who wish to delay or avoid pregnancy are successfully accessing appropriate family planning services. This improvement may be attributed to expanded contraceptive availability, strengthened public health infrastructure, improved counselling services, enhanced community outreach through Accredited Social Health Activists (ASHAs), and greater awareness of reproductive health rights. National initiatives under the National Health Mission and Mission Parivar Vikas have contributed significantly to reducing barriers to family planning services, particularly in high-fertility districts (Bradley et al., 2012).

The projected decline to 5.19% suggests that India is moving closer to achieving universal access to voluntary family planning services. Nevertheless, completely eliminating unmet need remains challenging due to persistent regional disparities,

socio-economic inequalities, cultural barriers, limited male participation, and unequal access to quality reproductive healthcare in remote and marginalized communities. Continued efforts are therefore required to ensure equitable availability of contraceptive information, counselling, and services across all population groups.

The observed decline is consistent with international evidence demonstrating that investments in reproductive healthcare, women's education, and community-based family planning programmes substantially reduce unmet need for contraception (United Nations Population Division, 2022; FP2030, 2023). Lower unmet need contributes directly to reducing unintended pregnancies, improving maternal and child health outcomes, and enhancing women's reproductive autonomy. These improvements strongly support SDG 3 (Good Health and Well-being), particularly Target 3.7, which emphasizes universal access to sexual and reproductive healthcare services, while simultaneously advancing SDG 5 (Gender Equality) through strengthened reproductive rights and informed family planning choices.

Overall, the historical and projected trends indicate significant progress in reducing the unmet need for family planning in India. Sustaining this achievement will require continued policy support, targeted interventions in underserved regions, improved quality of reproductive healthcare services, and greater emphasis on equitable access to modern contraceptive methods.

7.10 Institutional Births

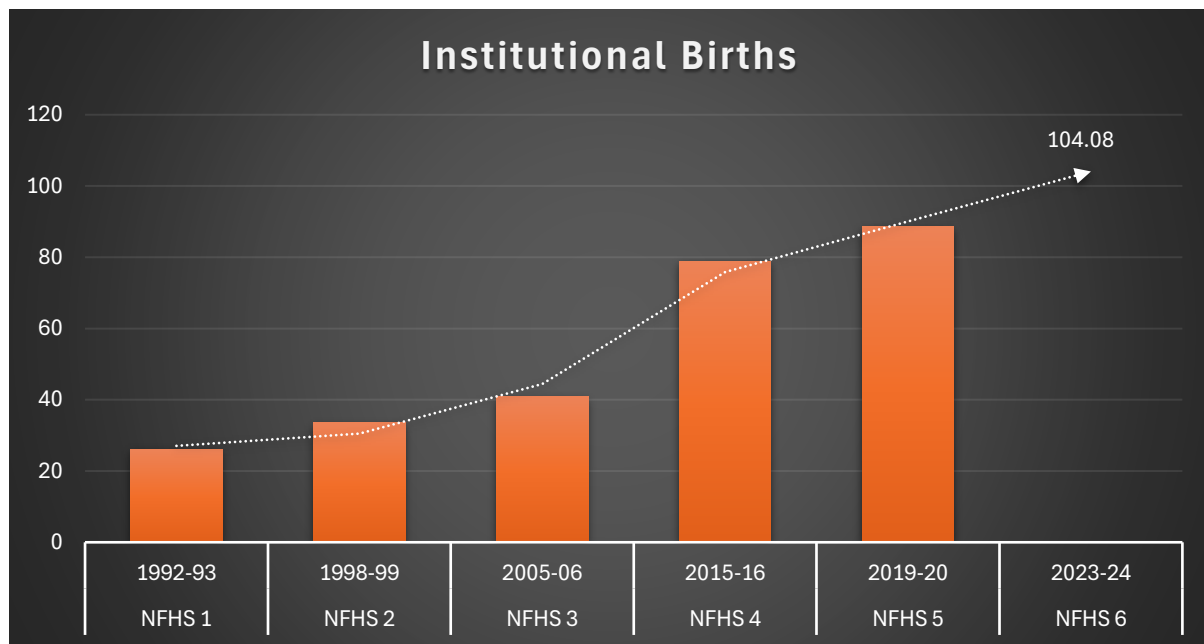


Figure 10 presents the historical trend and projected proportion of institutional births in India across the five completed rounds of the National Family Health Survey (NFHS). The findings reveal remarkable progress in institutional deliveries over the past three decades. The proportion of births occurring in healthcare institutions increased from 26.0% in NFHS-1 (1992–93) to 34.0% in NFHS-2 (1998–99) and 41.0% in NFHS-3 (2005–06). A substantial improvement was observed in NFHS-4 (79.0%), followed by a further increase to 89.0% in NFHS-5 (2019–21). The forecasting model indicates that institutional births are likely to approach universal coverage in the forthcoming survey, reflecting continued strengthening of maternal healthcare services in India.

The remarkable increase in institutional deliveries demonstrates the effectiveness of national maternal health programmes and expanded healthcare infrastructure. Government initiatives such as the Janani Suraksha Yojana (JSY), Janani Shishu Suraksha Karyakram (JSSK), Pradhan Mantri Surakshit Matritva Abhiyan (PMSMA), and the National Health Mission (NHM) have significantly improved access to safe delivery services by reducing financial barriers, expanding skilled obstetric care, and promoting institutional childbirth. Improvements in transportation, referral systems, antenatal care coverage, and community health worker support have further contributed to this positive trend (WHO, 2023; UNICEF, 2023).

The projected continuation of this upward trend suggests that India is moving towards universal institutional delivery, an important milestone for reducing maternal and neonatal

mortality. However, increasing institutional delivery rates alone does not guarantee improved maternal health outcomes. The quality of obstetric care, availability of emergency services, respectful maternity care, timely referral mechanisms, and equitable access across rural and remote regions remain equally important. Future health policies should therefore emphasize both universal coverage and quality improvement within maternal healthcare services.

The observed findings are consistent with global evidence demonstrating that institutional births substantially reduce maternal and neonatal mortality when supported by skilled healthcare professionals and functional referral systems (Campbell & Graham, 2006; WHO, 2023). The increasing trend strongly supports Sustainable Development Goal 3, particularly Target 3.1, which aims to reduce the global maternal mortality ratio, and Target 3.2, which focuses on ending preventable deaths of newborns and children under five years of age. Improved institutional delivery coverage also contributes to strengthening universal health coverage by ensuring equitable access to essential maternal healthcare services.

Overall, the historical and projected trends demonstrate significant achievements in expanding institutional childbirth in India. Continued investments in healthcare infrastructure, quality maternal services, skilled human resources, and equitable access will be essential to sustain these gains and further improve maternal and neonatal health outcomes.

7.11 Births Assisted by Skilled Health Personnel

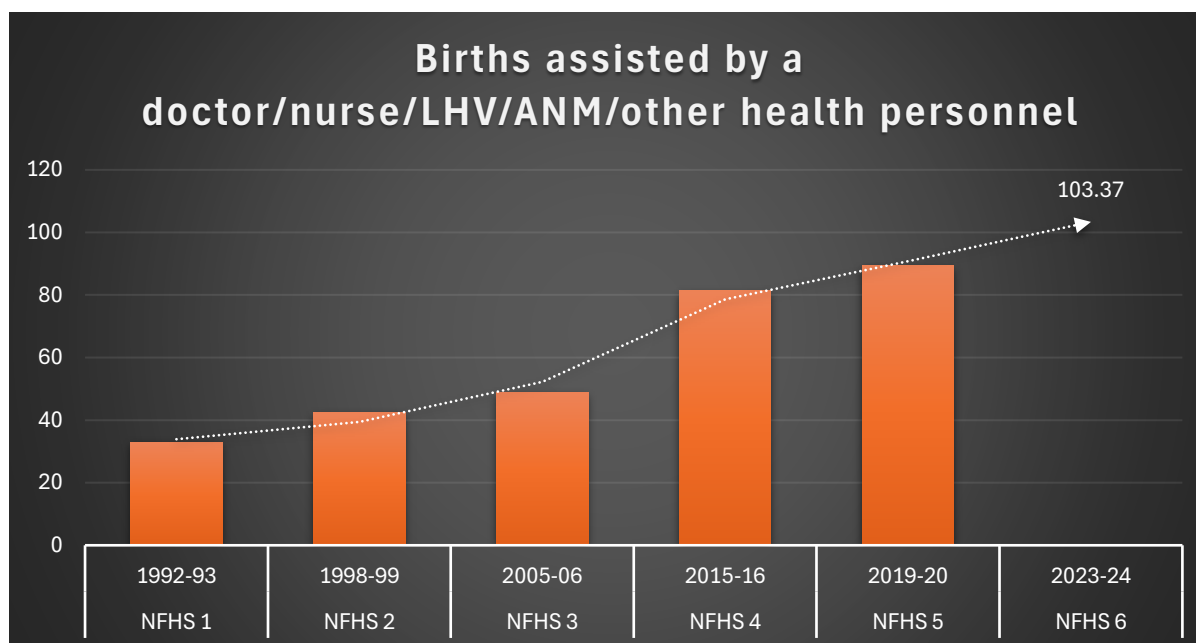


Figure 11 presents the historical trend and projected proportion of births assisted by skilled health personnel in India across the five completed rounds of the National Family Health Survey (NFHS). The findings demonstrate substantial progress in the availability of skilled birth attendance over the study period. The proportion of births assisted by trained health professionals increased from 33.0% in NFHS-1 (1992–93) to 43.0% in NFHS-2 (1998–99) and 49.0% in NFHS-3 (2005–06). A marked improvement was observed during NFHS-4 (82.0%), followed by a further increase to 90.0% in NFHS-5 (2019–21). The forecasting model indicates that skilled birth attendance is likely to approach universal coverage in NFHS-6, reflecting sustained improvements in maternal healthcare services.

The remarkable increase in births attended by skilled health personnel reflects India's continued investment in maternal and child healthcare through expanded healthcare infrastructure, improved training of healthcare professionals, strengthened referral systems, and increased institutional deliveries. National programmes such as the National Health Mission (NHM), Janani Suraksha Yojana (JSY), and Pradhan Mantri Surakshit Matritva Abhiyan (PMSMA) have significantly improved access to skilled obstetric care, particularly among vulnerable populations. The growing presence of trained doctors, nurses, auxiliary nurse midwives (ANMs), and other healthcare personnel has contributed to safer childbirth and improved maternal and neonatal health outcomes (WHO, 2023; UNICEF, 2023).

The projected movement towards universal skilled birth attendance represents a significant achievement for India's public health system. Skilled attendance during childbirth plays a critical role in preventing maternal and neonatal complications by ensuring timely identification and

management of obstetric emergencies. However, expanding coverage should be accompanied by continuous improvements in the quality of maternal healthcare, emergency obstetric services, respectful maternity care, and equitable access across geographically and socio-economically disadvantaged populations.

The observed findings are consistent with previous research demonstrating that increased skilled birth attendance is strongly associated with reductions in maternal mortality, neonatal mortality, and preventable childbirth-related complications (Campbell & Graham, 2006; WHO, 2023). The continued improvement directly contributes to Sustainable Development Goal 3, particularly Target 3.1, which aims to reduce maternal mortality, and Target 3.2, which focuses on ending preventable newborn deaths. Furthermore, improved access to skilled healthcare professionals during childbirth strengthens universal health coverage and promotes equitable maternal healthcare services.

Overall, the historical and projected trends indicate that India has made substantial progress in expanding skilled birth attendance over the past three decades. Continued policy efforts should focus on maintaining high-quality maternal healthcare services, strengthening the health workforce, reducing regional disparities, and ensuring that every woman has access to safe and skilled care during childbirth.

8. Policy Implications

The projected trends presented in this study provide valuable evidence for strengthening India's reproductive and maternal health policies. Although the country has made remarkable progress in reducing fertility and improving access to family planning and maternal healthcare services, the findings suggest

that future policy efforts should move beyond increasing service coverage towards improving equity, quality, and informed reproductive choice.

The projected decline in the Total Fertility Rate indicates that India is likely to sustain below-replacement fertility in the coming years. While this reflects the success of national population and family planning programmes, policymakers should also anticipate emerging demographic challenges, including population ageing, changing dependency ratios, and regional differences in fertility patterns. Future reproductive health policies should therefore adopt a region-specific approach rather than relying solely on national averages.

The steady increase in contraceptive prevalence demonstrates the effectiveness of family planning initiatives. However, the continued dominance of female sterilization alongside the negligible uptake of male sterilization highlights an imbalance in reproductive responsibility. Public health programmes should encourage greater male participation through targeted awareness campaigns, community engagement, and counselling services that promote shared responsibility in family planning decisions.

The increasing use of reversible contraceptive methods such as oral contraceptive pills, IUDs, and condoms reflects a gradual diversification of contraceptive choices. Continued expansion of the contraceptive method mix, uninterrupted availability of supplies, quality counselling, and informed decision-making should remain central to future family planning programmes. Ensuring equitable access to a broad range of contraceptive options will strengthen reproductive rights while reducing dependence on permanent methods.

The substantial decline in unmet need for family planning demonstrates improved access to reproductive healthcare services. Nevertheless, geographical disparities, socio-economic inequalities, and variations in healthcare accessibility continue to influence contraceptive utilization. Priority should therefore be given to underserved rural, tribal, and economically disadvantaged populations through targeted interventions and strengthened primary healthcare services.

The remarkable increase in institutional births and skilled birth attendance reflects the success of national maternal health initiatives. Future policy efforts should focus not only on achieving universal coverage but also on improving the quality of maternal healthcare through strengthened emergency obstetric care, respectful maternity services, adequate healthcare infrastructure, and continuous capacity building of healthcare professionals.

Collectively, these policy priorities contribute directly to the achievement of Sustainable Development Goal 3 (Good Health and Well-being) by strengthening maternal and reproductive healthcare services and Sustainable Development Goal 5 (Gender Equality) by promoting informed reproductive choices, equitable access to healthcare, and shared responsibility in family planning. Continued monitoring of reproductive health indicators through successive NFHS rounds will remain essential for evidence-based policymaking and sustainable health system planning.

9. Strengths of the Study

This study offers a comprehensive assessment of long-term trends in fertility, family planning, and maternal healthcare by analysing nationally representative data from all five completed rounds of the National Family Health Survey. Unlike studies that focus on a single reproductive health indicator, the present research integrates multiple dimensions of reproductive health within a unified analytical framework, providing a broader understanding of India's demographic transition.

A key strength of the study lies in the application of multiple forecasting models to estimate future trends in reproductive health indicators. Comparing different regression models and selecting the most appropriate model for each indicator improves the robustness of the projections and provides useful evidence for long-term health planning. The integration of statistical forecasting with public health interpretation further enhances the practical relevance of the study.

Another important contribution is the alignment of the findings with the Sustainable Development Goals, particularly SDG 3 and SDG 5. By linking demographic trends with global development priorities, the study extends its significance beyond descriptive analysis and provides evidence that can inform future reproductive health policies and programme planning.

10. Limitations of the Study

The findings of this study should be interpreted in light of certain limitations. First, the projections are based exclusively on historical NFHS data and assume that past demographic and healthcare trends will continue into the future. Unexpected policy changes, economic fluctuations, public health emergencies, or behavioural shifts may influence future reproductive health outcomes and lead to deviations from the projected estimates.

Second, the analysis was conducted at the national level and does not capture state-level or district-level variations in fertility, contraceptive use, and maternal healthcare indicators. Given India's considerable demographic and socio-economic diversity, future research should explore regional forecasting models to provide more localized evidence for policy formulation.

Third, some projected values for proportion-based indicators, such as institutional births and skilled birth attendance, approach or slightly exceed the theoretical upper limit of 100 percent. These values should be interpreted as indicating near-universal coverage rather than literal percentages beyond 100 percent. Future studies may consider bounded forecasting techniques or logistic growth models to generate projections that remain within realistic limits.

Finally, the study focuses on quantitative trends and does not examine behavioural, cultural, or socio-economic factors that influence reproductive health decisions. Incorporating qualitative evidence alongside statistical forecasting would provide a more comprehensive understanding of the determinants of family planning and maternal healthcare utilization.

11. Future Research Directions

Although the present study provides valuable insights into long-term trends and future projections of fertility, family planning, and maternal healthcare indicators in India, several opportunities remain for further investigation. Future studies should extend the analysis to the state and district levels to identify regional variations that may not be apparent from national estimates. Such analyses would help policymakers design location-specific interventions based on local demographic and healthcare needs.

Further research could incorporate socio-economic, educational, and environmental variables to examine their influence on reproductive health outcomes. Factors such as women's education, household income, urbanization, healthcare accessibility, and digital health interventions may provide a more comprehensive understanding of the determinants of fertility behaviour and contraceptive use.

The forecasting approach may also be strengthened by applying advanced statistical and machine learning techniques, including ARIMA, Prophet, Random Forest, or Long Short-Term Memory (LSTM) models, and comparing their predictive performance with traditional regression models. Such comparative analyses could improve the precision of future demographic projections.

In addition, qualitative studies exploring attitudes, beliefs, and behavioural factors influencing contraceptive choices, male participation in family planning, and maternal healthcare utilization would complement the quantitative findings. Integrating statistical projections with behavioural research can support the development of more effective and culturally appropriate reproductive health policies.

Finally, future NFHS rounds will provide an opportunity to validate the projections presented in this study. Comparing projected estimates with observed NFHS-6 data will help assess the reliability of forecasting models and refine future demographic forecasting methodologies.

12. CONCLUSION

India has made substantial progress in improving reproductive and maternal health over the past three decades. The analysis of NFHS data demonstrates a consistent decline in fertility alongside significant improvements in contraceptive use, institutional deliveries, and skilled birth attendance. These changes reflect the combined impact of sustained public health investments, expanded healthcare infrastructure, and national family planning initiatives.

The projections suggest that these positive trends are likely to continue in the coming years. Total fertility is expected to remain below the replacement level, while the adoption of modern contraceptive methods is projected to increase further. The decline in unmet need for family planning indicates continued improvements in access to reproductive healthcare services. At the same time, the projected expansion of institutional births and skilled birth attendance highlights India's continued progress towards universal maternal healthcare coverage.

Despite these encouraging trends, several challenges remain. Female sterilization continues to dominate the contraceptive method mix, whereas male sterilization remains extremely low, reflecting persistent gender disparities in reproductive responsibility. Although the use of reversible contraceptive methods has increased, greater efforts are required to expand contraceptive choice, improve counselling services, and ensure equitable access across socio-economically disadvantaged and geographically remote populations.

The findings underscore the importance of strengthening policies that emphasize informed reproductive choice, quality maternal healthcare, and gender-equitable participation in family planning. Continued monitoring through successive NFHS rounds, supported by evidence-based forecasting, can help policymakers anticipate future healthcare needs and allocate resources more effectively.

Overall, this study demonstrates that statistical forecasting using nationally representative NFHS data can provide valuable evidence for reproductive health planning in India. By integrating historical trends with future projections and aligning the findings with Sustainable Development Goals 3 and 5, the study offers practical insights that can support policy formulation, programme implementation, and long-term improvements in reproductive and maternal health.

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