International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

Fertility Transition in India: An Inter State Analysis: For the Period 2011 to 2021

Dr. Swarita De[1], Aishmeen Kaur Sandhu[2], Khushhali Bajaj[3], Runuk Jaju[4]

[1]Assistant Professor, Economics ASMSOC, SVKM's NMIMS (Deemed-to-be-university)
[2,3,4]BBA Students, ASMSOC, SVKM's NMIMS (Deemed-to-be-university)

Abstract
This study examines the dynamics of fertility transition across five diverse Indian states - Bihar, Maharashtra, Rajasthan, Kerala and Tamil Nadu- from 2011 to 2021. Fertility transition is a critical demographic process with profound implications for social, economic, and public policy planning. These states were selected due to their varied socio-economic profiles, cultural practices, and regional disparities, offering a comprehensive view of fertility trends in India.
Through the analysis of data obtained from the decennial population censuses, the study identifies patterns, trends, and drivers of fertility change, taking into consideration factors such as education, urbanization, access to healthcare, and economic development. The aim is to unravel the specific pathways through which these states have embarked on their unique fertility transitions, moving towards lower fertility rates and a demographic dividend.

Keywords: Fertility rate, IMR, gender disparity, access to education, demographic change.

I. Introduction

Over the last two decades, a significant transformation in the approach toward understanding and addressing gender-related issues has unfolded, shifting from the conventional framework of Women in Development (WID) to the more comprehensive and inclusive lens of Gender and Development (GAD). This transformation has marked a pivotal moment in the landscape of gender studies, expanding the realm of research and inquiry into the multifaceted dynamics of gender disparities and their far-reaching implications for social and economic development, female agency, and population dynamics.
In essence, this scholarly endeavor endeavors to dissect this intricate web of connections by devising a sophisticated array of gender disparity indices, juxtaposed with an array of pertinent development metrics. Additionally, it delves into the realms of fertility transition and female autonomy, recognizing their crucial roles in shaping the gender landscape. The disparities, as unveiled by previous research, are by no means uniform; they exhibit striking regional disparities across the diverse states of India. Intriguingly, the research underscores the pivotal roles played by social development, female autonomy, and fertility transition in shaping gender disparities. These facets of societal progression are inextricably intertwined with the status of women, influencing their access to resources, decision-making power, and overall well-being. In contrast, the influence of economic development appears to be relatively subdued in addressing these gender disparities, suggesting that a more holistic approach encompassing social and demographic

factors is essential.

In this mosaic of gender inequities, the state of Rajasthan emerges as a disheartening epitome of discrimination against women, with disparities that reverberate most acutely. In stark contrast, Kerala stands out as a beacon of progress, boasting the lowest levels of gender bias. Beyond these statistics, a broader narrative emerges. Goa and Kerala shine as paragons of advanced social structures, exemplifying states where gender equality has gained considerable ground. However, in many other regions, the journey towards social development is still in its nascent stages, indicative of the formidable challenges that lie ahead.

As these findings come to light, it becomes increasingly evident that for genuine change to occur, it is imperative to integrate gender considerations into our developmental agendas. However, this endeavor necessitates a foundational step: the establishment of a robust, comprehensive, and high-quality database for conducting in-depth gender studies. Without this fundamental resource, the path towards addressing gender disparities and fostering a more equitable society remains obscure and uncertain. Thus, the call to action resonates loudly: it is time to invest in the infrastructure of knowledge and understanding, to pave the way for a future where gender equality is not just an aspiration but a tangible reality.

II. Literature Review

Dash & Nagdeve (2020) in their paper, explore change in fertility in India using Bongaarts' model. Data from 2005–2006 and 2015–2016 are analyzed, and the results show that the usage of contraceptives has grown while total fertility rates (TFR) have decreased. TFR has also been impacted by postpartum infertility and artificial insemination. Comparing rural and urban settings, married people and those using contraceptives are more prevalent in the former. Kerala has the highest postpartum infecundability, while Bihar has the highest proportion of married people and contraceptive use. Additionally, Kerala has the highest rate of abortions, much exceeding those of Punjab and Maharashtra. These results demonstrate considerable regional differences in fertility factors. Contraception has an impact on fertility decline, although other factors, such as marriage and abortion, can counteract this. The study's overall findings draw attention to the difficulties associated with India's fertility transition, particularly in light of socioeconomic inequities and rural-urban differences.

Irudaya Rajan and P. Mohanachandran's article(2019) critically examines the reliability of the Sample Registration System (SRS) in assessing infant mortality and related health indicators in Kerala, India. It highlights significant fluctuations in the Infant Mortality Rate (IMR) over the years, particularly emphasizing the contribution of post-neonatal mortality between 28 days and one year of age. Notably, a substantial proportion of infant deaths occur within the first week of life, making Kerala's infant mortality more of a one-week concern than an annual one. The article also raises concerns about the SRS estimating an exceptionally low IMR of 14, while other sources suggest higher figures. It touches on the gender disparities in India, mentioning issues like female infanticide, dowry, and Sati, and emphasizes the need for societal transformation, legal measures, and increased awareness to promote gender equality.

Shastri (2014) in the paper discuss the pervasive gender inequality that persists in India and is firmly ingrained in cultural traditions and conventions. It draws attention to the disparate roles that are expected of men and women, which restrict women's access to rights and education. The essay makes reference to both contemporary problems like female infanticide and social bias as well as historical practises like dowry and Sati. It emphasises the necessity of societal transformation, legislative initiatives, and increased awareness to advance gender equality. It is acknowledged that international initiatives like CEDAW and

the Beijing Declaration, as well as constitutional clauses like Articles 14, 15, 16, and 39, exist. In order to empower women and advance national development, it concludes that gender discrimination must be eradicated.

Mitra (2014) in his paper discusses the long going issue of son preference over daughter in India, revealing that it affects both well off and disadvantaged populations, surpassing economic boundaries. Ancient cultural traditions and patriarchal norms support this problem. Son preference leads to imbalanced gender ratios, higher girl child mortality, and adverse effects on women's health. Women face immense pressure to bear sons, not only from their families. Despite legislative efforts and awareness campaigns, the issue continues due to societal pressures. The paper emphasizes the importance of addressing the lack of female inheritance rights as a key factor in sustaining gender bias. It also highlights that economic development and education alone cannot eradicate this issue, recommending cultural awareness campaigns, legal actions, and economic incentives to promote gender equality as a solution.

Chatterjee and Mohanty (2021) present a comprehensive analysis of the relationship between socioeconomic development and fertility patterns across various districts in India over a 15-year period. Key findings include a converging pattern of fertility decline across Indian districts, with almost one in five districts achieving low fertility rates by 2016. Most high-fertility districts were concentrated in northern states like Rajasthan, Uttar Pradesh, and Bihar. The study also highlights the negative and convex association between socioeconomic development and total fertility rates (TFR), especially in districts with lower Developmental Diversity Index (DDI) values. It suggests that increased development, coupled with the diffusion of ideas favoring smaller families and contraceptive use, contributes to declining fertility. The document underscores the importance of regional variations and offers policy implications for prioritizing districts based on their fertility and development levels. However, it acknowledges data limitations and issues related to newly created districts.

Bocquet-Appel, et al (2002) explores the onset and patterns of fertility transition in India from 1961 to 1991. It uses statistical tests and geographical analysis to determine if fertility changes were influenced by spatial and temporal factors. The research suggests that India experienced a unique form of fertility transition characterized by a lack of geographical diffusion. Instead, it identifies a "top-down" diffusion process initiated by government organizations, resulting in quasi-simultaneous fertility changes across the country, particularly during the 1971-1981 period because of a compulsory birth control policy. The document emphasizes the importance of accurate data, discusses auxiliary variables for assessing transition districts, and provides references to related research in the field.

Galor & Weil (1993) examines the relationship between fertility and economic growth in this paper. It integrates growth theory and family economics to understand how changes in relative factor prices affect household decisions about fertility and women's labor supply. The model suggests a positive feedback loop, where increasing women's wages reduces fertility, leading to higher capital per worker and higher relative wages for women. Increasing women's wages raise the cost of children relative to household income, leading to a reduction in fertility. Lower fertility, in turn, increases the level of capital per worker, which raises women's relative wages. This positive feedback loop can result in multiple steady-state equilibria. The model provides insights into the inverse relationship between per-capita output and fertility and predicts the acceleration of fertility decline and output growth during a demographic transition.

A study by McDonald (2000) raises the possibility that the timing of the start of the fertility reduction is not as important as it seems. It makes the case that researching the reasons behind fertility's continued decrease to low levels after it has started to fall may be more valuable. This later stage may see a greater

impact from shifts in the degree of gender equity. As a result, compared to studies of the beginning of the fertility reduction, those studying the prolonged fall in fertility likely have more room for theoretical generalisation.

Manna (1998) provides valuable insights into the complexities of fertility trends and determinants in India. It highlights the multifaceted nature of fertility control, underlining the importance of considering both supply and demand factors, gender dynamics, and the impact of education and healthcare. Additionally, the passage suggests that policy approaches should be more inclusive and gender-sensitive. It is essential to explore the nuances of gender-specific fertility preferences and better understand the interplay of socioeconomic and cultural factors in shaping fertility behavior. Policymakers should also consider more holistic approaches to population control that address both female and male perspectives and prioritize investments in healthcare and education to achieve fertility reduction targets.

Tiwari & Mishra (2022) examines the declining fertility rates in India over the years, utilizing Period Parity Progression Ratios (PPPRs) to analyse parity transitions and transitions from birth to marriage. Using data from the National Family Health Survey (NFHS), the authors found a consistent decrease in India's fertility from 1982 to 2014. Notably, there was no significant change in the proportion of females with higher-order births, but there was a sharp decline in parity transitions between the second and third, and third and fourth births. Socioeconomic and educational status were identified as influential factors in fertility progression. Additionally, the study observed an increase in the age at first marriage for females between 1991 and 2014, highlighting the role of individual choices in shaping fertility rates in India.

According to Manna, The data from the 1992-93 NFHS sample and related sources underscores the strong link between wanted fertility and actual fertility, along with the influence of female education and maternal and child health. While it's unclear how statewise indicators of education, health, and expenditure relate, family planning achievements vary among states. The data reveals a female-specific focus in India's population control policies, notably relying on female sterilization. It highlights the need for more gender-sensitive data collection and variations in fertility ranks and family planning achievements among states, with Kerala and Goa excelling in fertility reduction. This data informs discussions on India's demographic transition and population policies.

Chaurasia A. (2016) provides a comprehensive analysis of fertility transition in India and 15 major states during the period from 1985 to 2003. The study utilizes decomposition methodology and data from the Sample Registration System to investigate the dynamics of population fertility and individual fertility. It reveals that, while the overall population fertility, represented by the crude birth rate, consistently declined over this period, individual fertility, measured by the annual average marital fertility rate, experienced a plateau in the late 1990s, coinciding with the introduction of the target free approach in the National Family Welfare Programme. The paper highlights the importance of contraception as a key factor influencing fertility trends, with an emphasis on the need to further understand the impact of policy interventions on fertility behaviors in India.

R. Savitri (1994) explores the decline in fertility rates in the Indian state of Tamil Nadu, a phenomenon that has occurred without the expected preconditions such as a decrease in infant mortality rates, improved literacy rates, and enhanced status of women. This decline in fertility rates is particularly surprising because, unlike the state of Kerala, Tamil Nadu has not shown significant progress in these areas. The article analyzes various factors influencing fertility variations among districts in Tamil Nadu, including population density, urbanization, female literacy, marriage patterns, sex ratio, workforce, and healthcare facilities. It also examines inter-temporal changes in fertility rates and their relationship with economic

factors like foodgrain prices. The findings suggest that rural-urban connectivity and better road facilities have played a significant role in reducing fertility by influencing attitudes towards family size and employment opportunities, challenging the conventional wisdom that poverty leads to higher fertility rates.

According to Murthi, Guio & Drèze (1995) the study underscores the critical role of women's agency, particularly female literacy and labor force participation, in reducing mortality, fertility, and gender inequality in India. It suggests that these factors have a significant impact on diminishing gender bias in child mortality, while broader socioeconomic indicators like poverty, urbanization, male literacy, and healthcare facilities do not exhibit the same influence. Female literacy is also a major determinant of fertility reduction, outweighing the effects of general development indicators. This challenges the notion that gender bias automatically decreases with economic development and suggests a more complex relationship. Additionally, the study focuses on gender bias in child mortality, and other aspects of gender inequality may evolve differently.

Krishnan (2001) explores the impact of cultural factors and social interactions on fertility levels in India. The author investigates how culturally determined rules and obligations influence preferences and constraints, and how they interact with economic incentives to shape fertility outcomes. The study reveals that variations in cultural norms across Indian communities significantly contribute to differences in fertility outcomes across regions and influence the trajectory of fertility decline over time. While the paper acknowledges evidence of social interaction effects, it offers little support for the existence of multiple equilibria in fertility behavior. This research contributes to our understanding of the complex factors driving the fertility transition in India and underscores the importance of cultural and social dimensions in shaping demographic trends.

III. Objective of the study

The study's objectives are to assess fertility trends in Kerala, Tamil Nadu, Bihar, Rajasthan, and Maharashtra from 2011-2021. It aims to identify regional disparities, drivers of fertility change, and the role of education, economic development, and socio-cultural factors. The study also seeks to provide policy recommendations and insights for managing fertility transitions in these diverse states.

The selection of Bihar, Kerala, Maharashtra, Rajasthan, and Tamil Nadu for analyzing fertility levels across regions within India represents a strategic choice aimed at comprehensively understanding the nuanced dynamics of fertility transition within the country. Each of these states not only presents distinct cultural, socio-economic, and geographical landscapes but also encapsulates varying perspectives on women, education, resource allocation, and developmental challenges.

Bihar, for reflects a predominantly agrarian society with traditional views on gender roles and limited access to education and healthcare. Its high fertility rates are often intertwined with socio-economic disparities and infrastructural deficiencies.

In stark contrast, Kerala stands out with its remarkable progress in education and healthcare, leading to a significant decline in fertility rates. Its emphasis on female empowerment, literacy, and healthcare accessibility has resulted in a demographic transition characterized by lower birth rates and improved maternal health outcomes.

Maharashtra, being one of India's most industrialized states, presents a diverse landscape where urbanization coexists with rural areas. Its fertility trends reflect a complex interplay of urbanization, education, and socio-economic disparities, offering valuable insights into the impact of rapid development

on demographic patterns.

Rajasthan's fertility dynamics are influenced by its arid climate, traditional societal norms, and uneven distribution of resources. Efforts to address issues such as child marriage, female education, and healthcare accessibility play a crucial role in shaping its demographic trajectory.

Tamil Nadu, renowned for its focus on education and social welfare programs, has witnessed significant declines in fertility rates over the years. Its proactive approach towards family planning, women's empowerment, and healthcare infrastructure serves as a model for other states grappling with similar challenges.

By analyzing the fertility transitions across these diverse states, we gain a holistic understanding of the multi-dimensional factors driving demographic changes in India. This comparative study not only sheds light on the effectiveness of various policies and interventions but also provides valuable lessons for formulating targeted strategies aimed at promoting sustainable development and improving the well-being of women and families across the nation.

IV. Data and Method

For the entire research, secondary research has been conducted. Extensive secondary research has been conducted to evaluate the objectives at state levels with the focus being on 5 states naming Bihar, Kerala, Maharashtra, Rajasthan and Tamil Nadu. Different research papers, journals, websites, and databases were analyzed. The National Family Health Survey 4 and 5 covering years 2011-2021 were used in-depth. Due credit has been given wherever necessary. We analyzed data on the basis of 5 indicators through the use of statistical tools, Median, Correlation and Maxima Minima. The five indicators chosen were as follows:

- Fertility Trends
- Trends in Infant Mortality
- Effect of Schooling on Fertility
- Percentage of Women using Family Planning
- Percentage of safe deliveries

With NFHS 4 covering data from 2011-2016 and NFHS 5 covering data from 2017–21, the measure of correlation is utilised to show any improvement witnessed in India during the previous ten years.

Further, to show the interconnection among the states, Median and Maxima Minima were used.

The formulae used for the research are as follows:

- **CORRELATION**

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{[n\sum x^2 - (\sum x)^2][n\sum y^2 - (\sum y)^2]}$$

where,

n = Number of values or elements

∑x = Sum of 1st values list

∑y = Sum of 2nd values list

∑xy = Sum of the product of 1st and 2nd values

∑x2 = Sum of squares of 1st values

∑y2 = Sum of squares of 2nd values

- **MEDIAN**

Odd Observations

$$\text{Median} = \left(\frac{n+1}{2}\right)^{th} \text{observation}$$

Even Observations

$$\text{Median} = \frac{\frac{n^{th}}{2}\text{obs.} + \left(\frac{n}{2}+1\right)^{th}\text{obs.}}{2}$$

V. Analysis and Discussion

WITH RESPECT TO MEDIAN

Median was chosen as one of the measures to establish a benchmark for understanding how individual states performed relative to the national average. The national median for each indicator was calculated by organizing data from all states and identifying the middle value, representing the central tendency for the country.

A. TAMIL NADU

Indicators	**NFHS 4**	**NFHS 5**
Total fertility rate	1.7 children per woman	1.8 children per women
Infant mortality rate	● Rural- 23 ● Urban- 18	● Rural - 22 ● Urban -15
How many women do family planning	53 per 100 women	66 per 100 women
Schooling affecting fertility	● 5-9 YRS-2.2, ● 12 yrs or more-2	● 5-9 yrs-1.9 ● 12 yr or more - 1.7
Babies being delivered safely	● IN HEALTH FACILITY -99 ● ASSISTED BY A HEALTH PROFESSIONAL- 100	● IN HEALTH FACILTIY -99 ● ASSISTED BY A HEALTH PROFESSIONAL-100

1) The Total Fertility Rate (TFR):

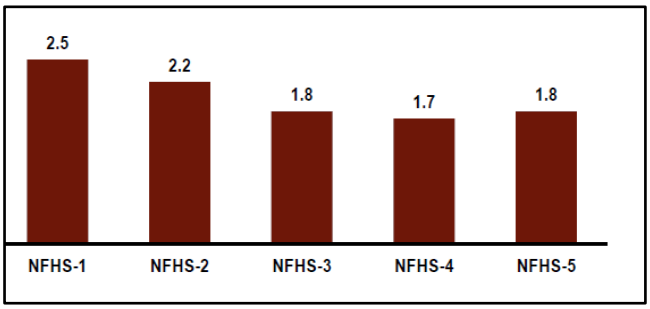
In Tamil Nadu stands at 1.7 children per woman, as per the NFHS report 4, indicating that the state's fertility rate is below the replacement level. According to R. Savitri. (1994). Several factors may contribute to this trend:

Female Literacy and Education: In Tamil Nadu, while literacy rates were relatively high compared to other Indian states, they were not as exceptionally high as in Kerala. Nevertheless, female literacy plays a

crucial role in influencing fertility rates. Educated women tend to have fewer children, often because they delay marriage, understand the importance of family planning, and have improved access to information regarding reproductive health**.**

Urbanization: Tamil Nadu had a significant level of urbanization, with a considerable portion of its population residing in urban areas. This urbanization is linked to lower fertility rates since urban dwellers typically have smaller families due to factors such as improved access to healthcare, education, and family planning services.

There has been an slight increase in the fertility rates (1.8 children per yr) as compared to the last five years and it is in line with the median of fertility rate prevailing in India.



Graph 1: Fertility Trends- Total fertility rate (children per woman)

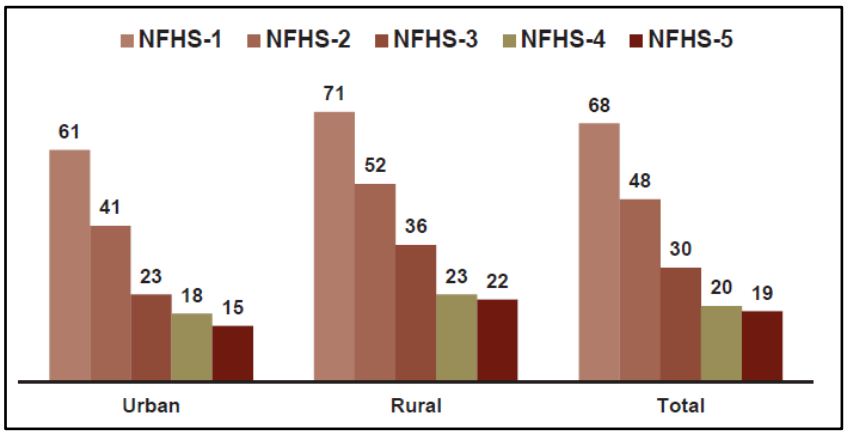
2) Infant Mortality Rate:

According to NFHS 4 report -All the infant and child mortality rates decline sharply with mother's education and are higher for scheduled castes than for other backward classes.

All infant and child mortality rates are also higher in rural areas than in urban areas with the exception of the post neonatal mortality rate. One significant reason is -

- **Age at Marriage**: Tamil Nadu had a relatively higher mean age at marriage compared to some other Indian states. Delayed marriage can influence fertility, as couples who marry later in life tend to have fewer children.

There is no change in the overall median according to the NFHS 5 report. However there is a slight decline in the infant mortality of tamil nadu which is a good sign as health care facilites increased by 0.9% acc to health ministry report of Tamil Nadu.



Graph 2: Trends in infant mortality (deaths per 1000 live births)

3) How does Fertility vary with Schooling:

- **NFHS 4**

5-9 YRS (2.2):

The rate is equal to the median of the country . This means that the states resources, educational opportunities are at par with that of the nation.

12 or more (1.8):

In comparison to the national average, the impact of the state's fertility rate on schooling is relatively minimal. According to the NFHS Report 4, a reduced fertility rate can encourage greater investment in education. With fewer children in a family, there may be more available resources in terms of time, finances, and parental attention to dedicate to the education and overall welfare of each child. This, in turn, can result in improved access to high-quality education, better educational achievements, and an increased probability of completing one's schooling.

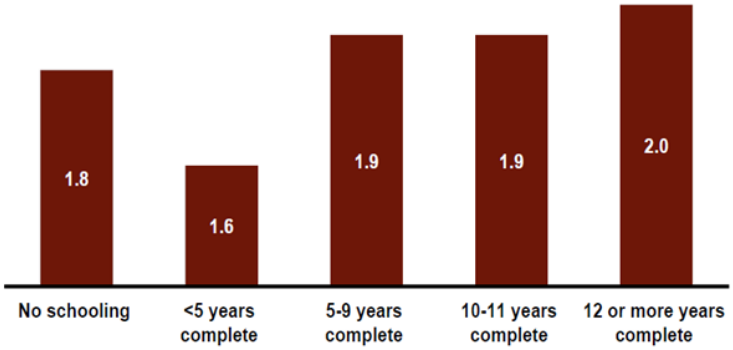
- **NFHS 5**

5-9 YRS (2.1):

The rate is slightly less as compared to the country's median signifying the state is not bias in terms of gender disparity with reference to edcuational opportunities.

12 or more (1.8):

The state's performance in terms of offering educational opportunities, including enhancements in education quality, teacher-to-student ratios, and related factors, is now nearly on par with the national average (as per NFHS 5 report of the state).This suggests significant progress within the state regarding its ability to provide access to education and enhance the overall quality of the educational experience. These improvements reflect not only an increased availability of educational resources but also a concerted effort to enhance the learning environment, which includes improving the quality of teaching and maintaining an appropriate teacher-to-student ratio. This achievement is indicative of the state's commitment to ensuring that its educational system aligns closely with national standards, resulting in more equitable and effectiveeducational opportunities for its residents.



Graph 3: How does fertility vary with schooling? (total fertility rate)

4) How many women use Family Planning:

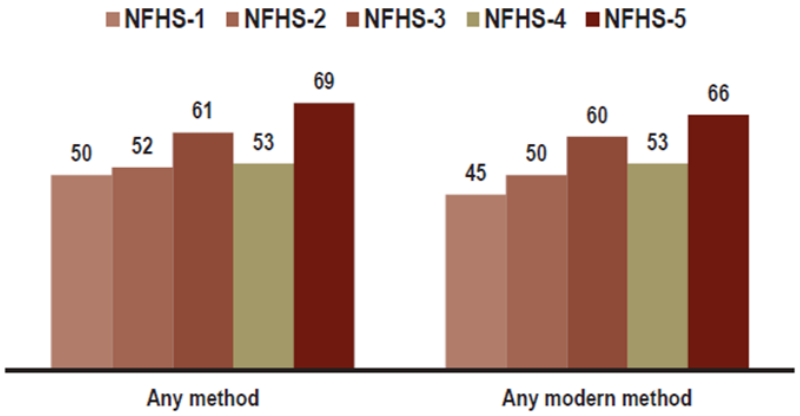
- **NFHS 4**

Tamil Nadu has achieved near-universal knowledge of contraception, with some methods less well-known. Compared to other Indian states, Tamil Nadu stands out for its strong performance in family planning. The state's excellence in this area is exemplified by a national award from the Union government, as reported by The Times of India, recognizing its best practices in family planning.

Source: Times of India – Tamil Nadu Receives National Award for Best Practices in Family Planning.

- **NFHS 5**

In comparison to the national average, the state has achieved a superior level of awareness regarding family planning. According to Ministry of Health and Family Welfare in India ,this suggests that the state has placed a significant emphasis on investing in awareness campaigns related to family planning and enhancing the utilization of contraceptives.



Graph 4: How many women use family planning (% of currently married women)

5) Are babies being delivered safely:

HEALTH FACILITY & ASSISTED BY HEALTH PROFESSIONAL

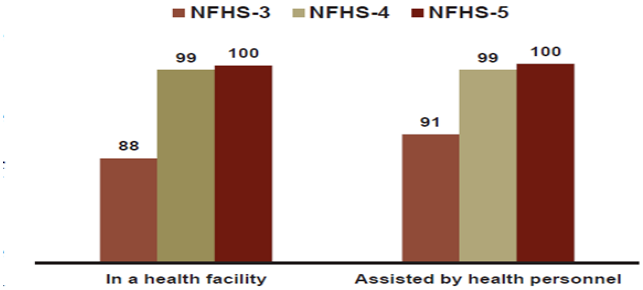
NFHS 4 & NFHS 5

The state has demonstrated an exceptionally high birth rate, signifying that childbirth is occurring under healthy and controlled conditions, as indicated by the National Health Mission's Tamil Nadu state report:

Consistency and Quality of Care: The data reveals that Tamil Nadu consistently achieves a remarkably high percentage (99-100%) of births taking place in healthcare facilities and attended to by skilled health professionals. This consistency reflects a strong commitment to ensuring that childbirth happens in a safe and controlled environment.

Enhanced Maternal and Neonatal Health: The high rates of births occurring in healthcare facilities with professional assistance underscore the state's dedication to improving maternal and neonatal health. By providing skilled attendants in healthcare settings, the state is effectively reducing maternal and infant mortality rates.

Access to Healthcare Services: The elevated percentages suggest that a significant number of women in Tamil Nadu have access to healthcare facilities and skilled healthcare providers for childbirth. This access is facilitated by the state's robust healthcare infrastructure and the availability of well-trained healthcare professionals.



Graph 5: Are babies being delivered safely (% of births in the past 5 years)

B. BIHAR

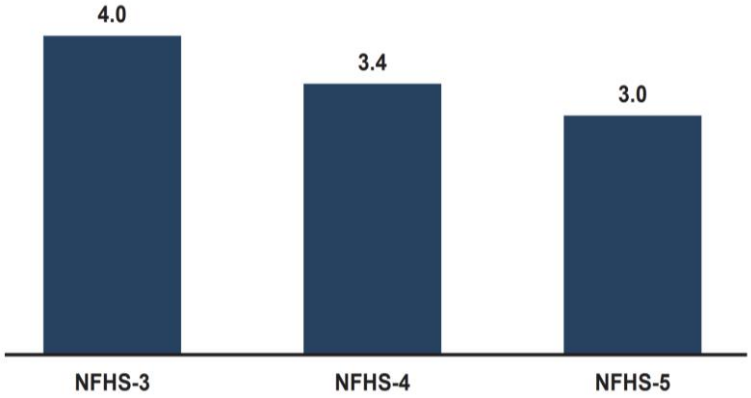
Indicators	NFHS 4	NFHS 5
Total fertility rate	3.4 children per woman	3.0 children per women
Infant mortality rate	● Rural- 50 ● Urban- 34	● Rural - 47 ● Urban -43
How many women do family planning	23 per 100 women	44 per 100 women
Schooling affecting fertility	● 5-9 YRS-3 ● 12 yrs or more-2.2	● 5-9 yrs-3 ● 12 yr or more-2.2
Babies being delivered safely	● IN HEALTH FACILITY - 64 ● ASSISTED BY A HEALTH PROFESSIONAL - 76	● IN HEALTH FACILTIY - 70 ● ASSISTED BY A HEALTH PROFESSIONAL - 79

1) Total Fertility Rate:

In Bihar, the total fertility rate (TFR) is 3.4 children per woman, which is higher above the replacement level. The reasons behind bihar having the maximum fertility rate in both NFHS 4 and NFHS 5 are-

- As stated by Mukesh Sharma, executive director of Population Service International, India, 2023, there is a lack of awareness of modern contraceptive methods, as well as access to them, as a result, women in Bihar (both rural and urban) have a large number of children.
- According to a paper by (Louis & Louis, 2018), if unwanted reproduction were eliminated through methods such as expanding access to contraception, average fertility rates would reduce by more than half a kid per woman. According to the UNFPA, Uttar Pradesh, Bihar, and Madhya Pradesh have high fertility rates.
- In the report by (S, 2020), according to Poonam Muttreja, executive director of the Population Foundation of India, In Bihar, there has been a lack of focus on family planning as well as any other related issues that have an impact on family size, such as women's health, girls' education, and access to contraception.

The total fertility rate (TFR) of Bihar is 3.0 children a woman, which is greater above the replacement level. Because of the same reasons described previously, the fertility rate remains the highest among the other states.



Graph 6: Fertility Trends- Total fertility rate (children per woman)

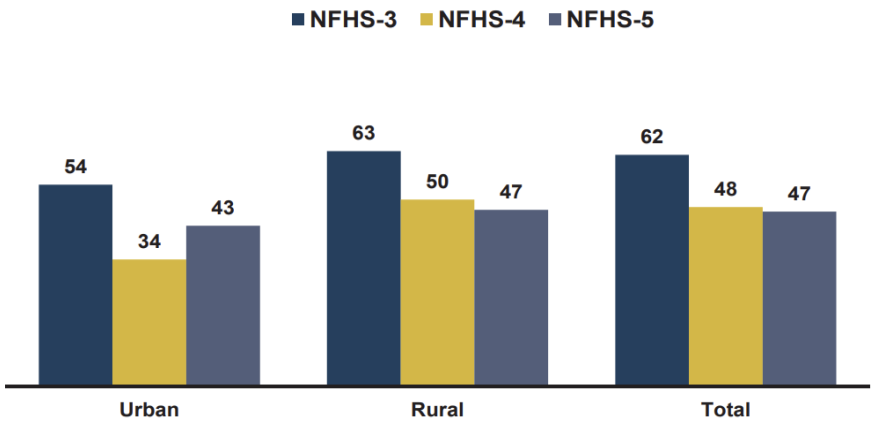
2) Infant Mortality Rate:

The infant mortality rate in Bihar in NFHS-4 is estimated at 50 deaths in rural areas and 34 deaths in urban areas before the age of one year per 1,000 live births which is again, the highest among other states.

Some of the reasons why Bihar has the highest infant mortality rate are-

- In the five years preceding the study, 93% of final pregnancies ended in a live birth, whereas the remaining 7% ended in foetal wastage (abortion, miscarriage, or stillbirth).
- Moreover, in rural areas, 2/5th of the deliveries are done at home, and due to lack of proper equipment, sanitation and education, the mortality rates (including neonatal) are higher in rural areas.
- Teenage pregnancy is quite prevalent.
  In Bihar, 11 percent of young women aged 15-19 have already began childbearing, that is, they have already had a live birth or are pregnant with their first child, which is nearly unchanged (12%) since NFHS-4, pointing to a dearth of education among young females in rural areas.
- Children born to the teenage mothers are more likely to die during infancy than to mothers age 20-29
- Besides the known reasons such as poverty, mother's and child's nutrition, transportation barrier and lack of healthcare access,
- The report by (Legare et al., 2020), states that in rural areas of bihar, traditional medical practices that are proven to be less effective are still widely used along with certain taboos that are inconsistent with science for e.g Mothers report continuing to apply mustard oil to the infant's umbilical cord stump after birth, which contradicts the biological prescription for umbilical cord care and protection. Several mothers also stated that pregnant women should not eat or sleep during an eclipse to avoid physical defects in their children. Such practises endanger the mother's and baby's health, resulting to greater infant death rates.

In NFHS 5, Bihar's infant mortality rate remains the highest among all other states, standing at 47 in rural areas and 43 in urban areas, up from 34 in NFHS 4 and indicating that conditions in Bihar have deteriorated. This is due to a shortage of resources/income, job possibilities, healthcare services (shifted to Covid), and a lack of other recreational activities in Bihar during Covid 19, therefore their priority shifted to growing their family. Furthermore, in the five years preceding the study, 91% of final pregnancies resulted in a live birth, while 10% resulted in foetal wastage (abortion, miscarriage, or stillbirth). The most common type of foetal wastage is miscarriage, which accounts for 6% of all pregnancies, whereas abortions account for 2%. According to NFHS 4, the trend of undesired pregnancies, pregnancy taboos, and a shortage of healthcare will continue in the next five years



Graph 7: Trends in infant mortality (deaths per 1000 live births)

3) How does fertility vary with schooling?

In NFHS 4, the rate, 3, is greater than the median and highest among other states, indicating that the number of children born by a woman with 5-9 years of schooling is three.

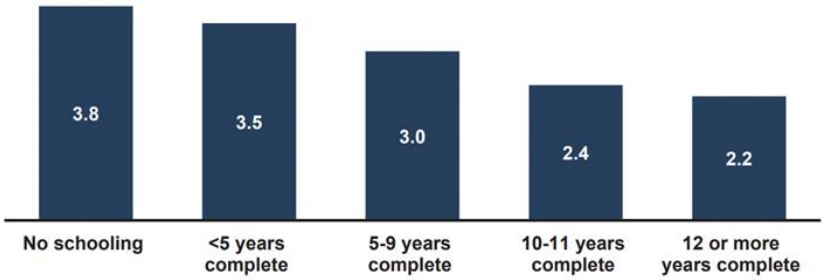
- Girls with only primary and secondary schooling are more likely to come from lower socioeconomic backgrounds. These households may lack the resources or information to seek family planning or contraception services, resulting in increased fertility rates.
- Bihar's cultural and traditional standards urge females of reproductive age to marry early and establish a family.
- Furthermore, girls with only a secondary education have less autonomy in choosing marriage and family planning decisions.

In NFHS 4, the rate, 2.2, is greater than the median and highest among other states, indicating that the number of children born to a woman with 12 or more years of schooling is 2.2. As previously stated, the reasons for the highest rate among other states are a lack of education and awareness among young girls and in society, a lack of income or resources as stated in NFHS 4, Only 13% of Bihar's households are in cities, and only 4% have water piped into their home, garden, or plot.

However, because of government initiatives, the fertility rate for girls with 12 or more years of schooling is lower than for those with only 5-9 years of schooling. As reported by (P., & P. 2017), Nitish Kumar, the chief minister of Bihar, stated The state government has introduced many programmes to improve girls' education, including a bicycle initiative, free uniforms, and school bags and shoes. He stated that senior secondary schools were established in over 5,000 village panchayats in 2007 and that more would be established in the coming years.

The rate recorded in NFHS 5 is the same as the rate reported in NFHS 4, i.e. 3, indicating little to no improvement in fertility trends among females obtaining only primary and secondary schooling.

The rate of fertility trends of girls getting schooling for more than 12 years recorded in NFHS 5 is the same as that reported in NFHS 4, indicating that Bihar is still performing poorly in terms of GDP, education provision, and resources (infrastructure). As reported by by Times of India (2021),per capita income of Bihar was Rs 54,383 in 2021, lowest among all Indian States.



Graph 8: How does fertility vary with schooling? (total fertility rate)

4) How many women use family planning?

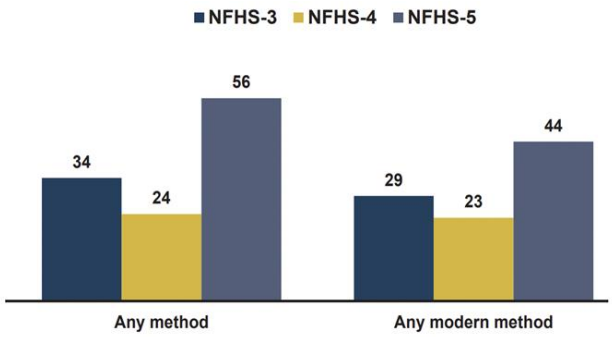
According to the NFHS 4 survey, 23% of women are aware of and utilise contraception, which is lower than the median and the national average.

Women in Bihar are also considerably more likely to utilise contraception if they already have a son, according to reports. As a result, in most households, the fertility preference of a son determines the use of contraceptives with little to no respect for family planning. Contraception use increases with age in NFHS-4, rising from 2% for women aged 15 to 19 to 35% for those aged 30 to 39. This raises problems because many households include teenage females who marry and have children.

We noticed that while more than 90% of women discussed family planning with their husbands, just 18% had a say in the ultimate decision, according to (Das et al., 2019). And, in most cases, women would not have had as many children if they had more control over family planning. In addition, 48.5% of women who used contraception travelled more than 30 minutes to get them.

The rate has nearly doubled in NFHS 5 to 44 from 23 in NFHS 4, although it remains the lowest among all other states.

According to (*Unmet Need for Family Planning and Its Determinants in Bihar: Policy and Programme Implications*, n.d.), Following the implementation of Mission Parivar Vikas, there has been a significant improvement in practically all family planning indicators, including current use of any or modern contraception, reduction in unmet need, and large increase in condom update. Moreover, only one in three married women had access to family planning services. The state's health department failed to provide contraception to nearly 4 million couples in Bihar, according to a 2018 report by the Times of India.



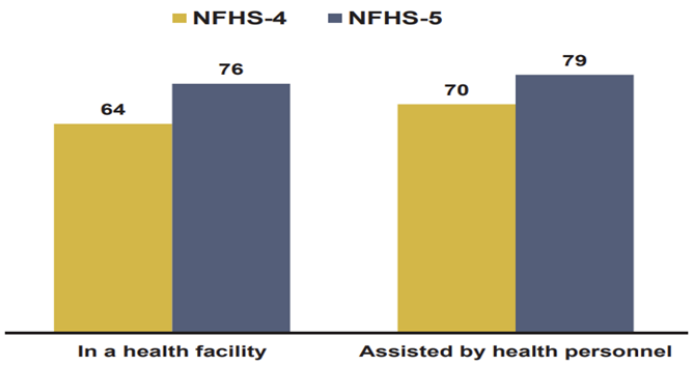
Graph 9: How many women use family planning (% of currently married women)

5) Are babies being delivered safely?

According to the NFHS 4 Report, the number of babies born safely at a health facility is 64, and 76 when

supported by a Health Professional. As described by, (A. 2022), the majority of the state of Bihar is home to subsistence, agriculture-based populations, and all too often, moms from these often marginalised rural communities endure early deliveries due to stress.

Despite a decline in home delivery, (Darmstadt et al., 2020) reports the delivery of health services in public institutions in Bihar has been hampered by a weak and inadequate infrastructure, a significant scarcity of competent health professionals, low health provider motivation, and a lack of key supplies and equipment. The number of babies delivered successfully at a health institution is 70, and 79 when helped by a health professional, according to NFHS 5.



Graph 10: Are babies being delivered safely (% of births in the past 5 years)

C. KERALA

Indicators	NFHS 4	NFHS 5
Total fertility rate	1.6 children per woman	1.8 children per women
Infant mortality rate	● Rural- 5.4 ● Urban- 5.8	● Rural - 5.2 ● Urban - 3.5
How many women do family planning	50 per 100 women	53 per 100 women
Schooling affecting fertility	● 5-9 YRS-1.8 ● 12 yrs or more- 1.6	● 5-9 yrs- 1.8 ● 12 yr or more- 1.9
Babies being delivered safely	● IN HEALTH FACILITY- 100 ● ASSISTED BY A HEALTH PROFESSIONAL- 100	● IN HEALTH FACILTIY- 100 ● ASSISTED BY A HEALTH PROFESSIONAL- 100

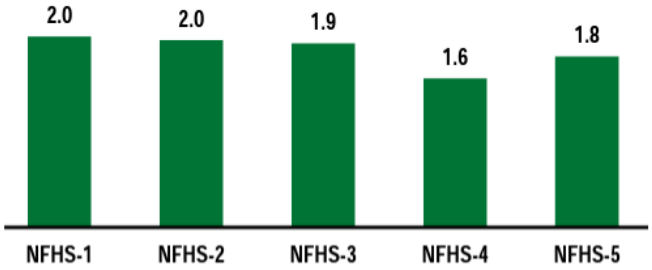
1) Total Fertility Rate:

Kerala's total fertility rate stands at 1.6 which is the minimum out of all states. According to the NFHS 4 report, this implies that the state has achieved below replacement level fertility. This is a situation when average number of children born to women in a population is not sufficient enough to replace the populat-

ion.

According to a report by national library of medicine, the growth potential that is implied by population momentum is the phenomenon's direct demographic consequence. Adding to this, there is a lag time before the rate of natural rise decreases to zero, which is also known as the growth potential that remains after reaching replacement-level fertility, even when the overall fertility rate drops to that level. This is due to the fact that individuals who were born during periods of high fertility provide "momentum," also known as population momentum, to the population. Putting it another way, in a population that is expanding, children outweigh parents. The reason Kerala's population is still increasing at a natural rate of 8.6 per 1,000 people even after reaching replacement-level fertility is because of this seemingly odd demographic phenomenon. It will take several years for population growth to stop. Massive unemployment and a loss of opportunity would result from this population rise if capital investment and job creation are not increased in proportion. (Nair, 2010)

Kerala's TFR grew 20% in the past 5 years, falling in line with the inter state median. Further it can be re-traced to the reasons stated in the report given by National Library of Medicine. (Nair, 2010)



Graph 11: Fertility Trends- Total fertility rate (children per woman)

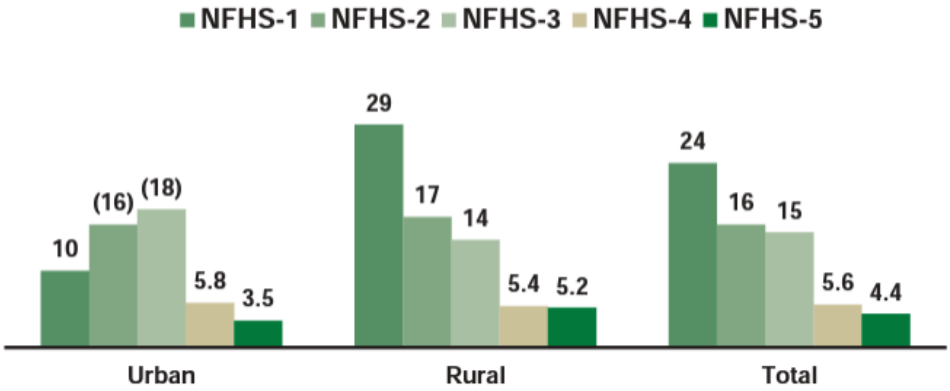
2) Infant Mortality Rate:

According to the NFHS 4 report, infant mortality rate of Kerala in rural area stands at 5.4 and stands at 5.8 in urban areas being minimum among all states in both cases. In accordance with a World Bank study, the following factors may contribute to child mortality in a household:

- Mother's well-being and dietary habits
- Nourishment a baby received at birth
- The mother and infant got medical care prior to, during, and following delivery.
- Conditions of the house's sanitation and the surrounding area

The paper also discusses how, in terms of sanitation, homes that have constructed toilet facilities—such as flush toilets and ESP slabs—had mortality rates that are noticeably lower than those of households that use "compounds" for their toilet requirements. The household's source of water supply, however, does not significantly discriminate. Using the IMR data from 1975 to 1980, it can be seen that homes with pipes accounted for 50, those with wells for 56, and those using other sources of water supply was 44. (Zachariah & Patel, 1982)

In NFHS 5, Infant Mortality rate of Kerala in rural area decreases even further to 5.2, implying a good sign for Kerala in terms of sanitation and nutritional levels and significant decrease in urban areas to 3.5, again being the minimum among all states. This can be directly traced back to the availability of better sanitation facilities in urban areas when compared to that of rural areas. 97% of the homes in urban areas have a toilet within their residential premises.



Graph 12: Trends in infant mortality (deaths per 1000 live births)

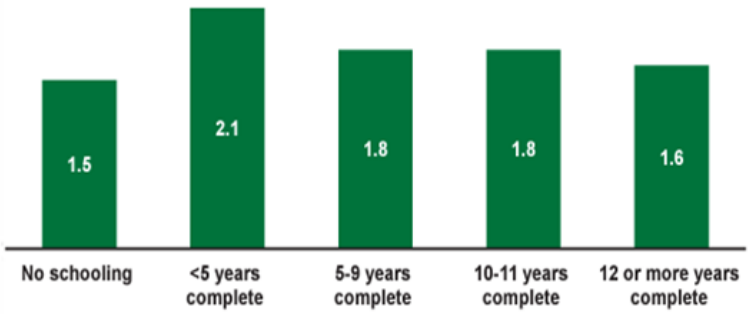
3) How does fertility vary with schooling?

In Kerala the rate of women attending school upto 5-9 years is 1.8 being the minimum value among all states thus implying good education resources and opportunities.

When it is in the state of attending school for 12 years or longer, the rate drops to 1.6, which is once more the minimum number. According to a World Bank report, a mother's level of education has an impact on infant and child mortality. According to research, a woman's lack of education increases the risk of a child dying in the first year of life by double the amount compared to a mother with some education. They give an example of how mortality has decreased across all educational categories, with the greatest fall seen in children born to mothers who had completed one to four years of school. Furthermore, it details how this particular group of women has had the greatest loss in fertility. (Zachariah & Patel, 1982)

In NFHS 5 report the rate in Kerala is similar at 1.8 for school attended for 5-9 years again being the minimum value among all states thus implying good education resources and opportunities.

For 12 or more school years attended, rate is 1.9 which is higher than the median, which shows how compared to other states Kerala is actually doing better in terms of gender disparity and providing education to women.

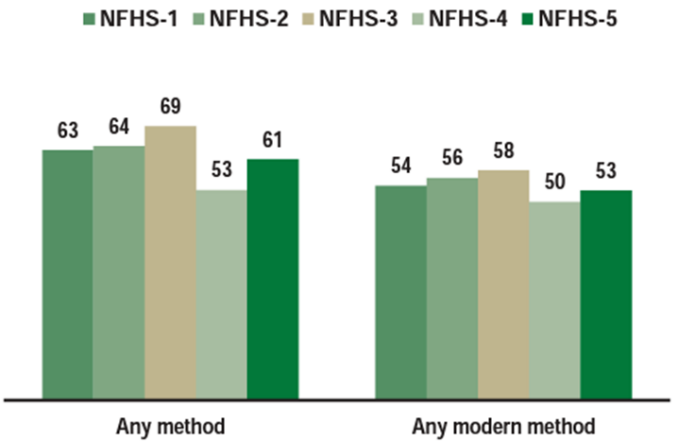


Graph 13: How does fertility vary with schooling? (total fertility rate)

4) How many women use family planning?

In Kerala, 50% of women utilise contraception, with a median of 53%, according to the NFHS 4 study. The number of children who are still alive was used to assess the use of contraceptives in a research published by Scholars Journal of Applied Medical Sciences (SJAMS). Compared to 46.5% of women with one kid, it was discovered that 85.8% of women with three or more children accepted contraception. It

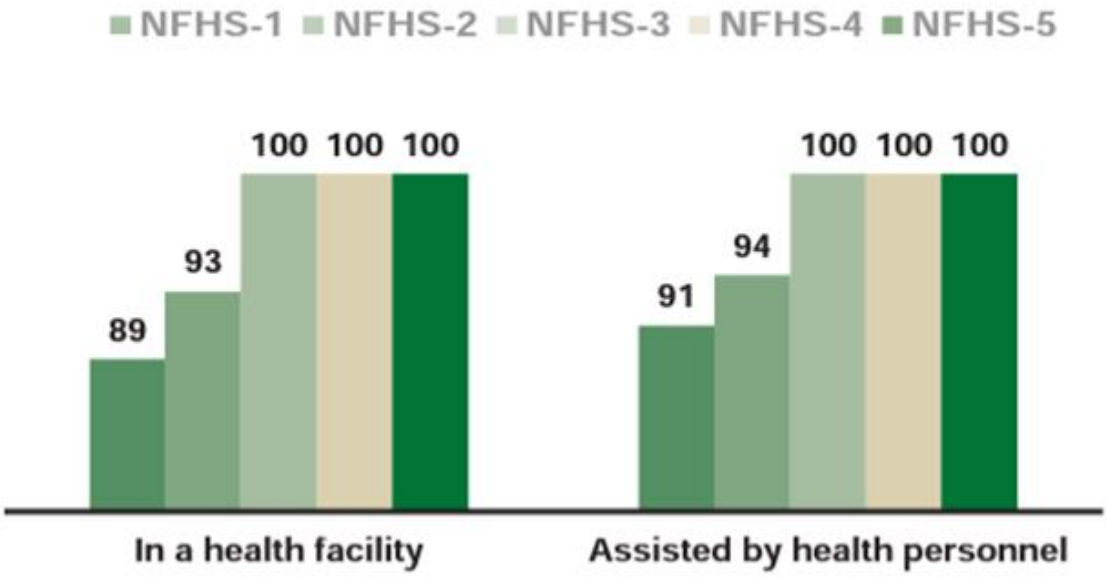
was also connected to Kerala's high literacy rate, which raised women's awareness. (Anant et al., 2014) This rate increases to 53% in NFHS 5 implying possible growth in literacy among women and awareness in the community. However the median also increases to 62% thus implying that while kerala is doing well individually, it has not increased ad much when compared with other states.



Graph 14: How many women use family planning (% of currently married women)

5) Are babies being delivered safely?

Both NFHS 4 and NFHS 5 state that Kerala has a maximum delivery rate of 100% safe deliveries. This may be a sign of reduced morbidity and mortality among mothers. According to a research paper published in the Public Library of Science, the main causes of maternal morbidity and mortality are socioeconomic/cultural factors (women's status in the home and society, their level of education, their economic status, etc.), accessibility factors (distance, transportation, etc.), and availability of high-quality care (skills and equipment in a health facility). Maternal healthcare utilisation is also influenced by a few other characteristics, including healthcare programmes, education, economic status, and the high cost of healthcare services. (Singh et al., 2012).



Graph 15: Are babies being delivered safely (% of births in the past 5 years)

D. RAJASTHAN:

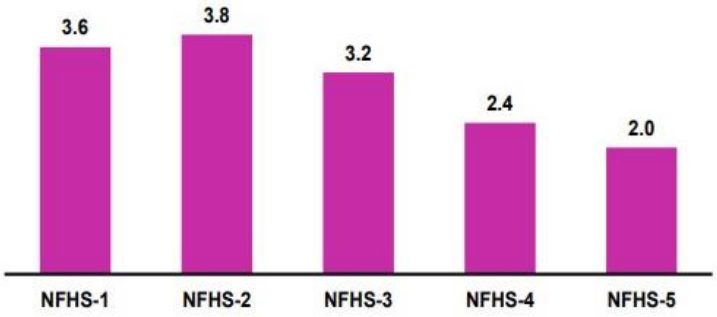
Indicators	NFHS 4	NFHS 5
Total fertility rate	2.4children per woman	2 children per women
Infant mortality rate	● Rural- 44 ● Urban- 31	● Rural - 32 ● Urban -22
How many women do family planning	54 per 100 women	62 per 100 women
Schooling affecting fertility	● 5-9 YRS-2.4 ● 12 yrs or more-1.8	● 5-9 yrs-2.1 ● 12 yr or more-1.9
Babies being delivered safely	● IN HEALTH FACILITY -84 ● ASSISTED BY A HEALTH PROFESSIONAL- 95	● IN HEALTH FACILTIY -87 ● ASSISTED BY A HEALTH PROFESSIONAL-96

1) Total Fertility Rate:

Rajasthan, in NFHS 4, exhibited a total fertility rate of 2.4, which was higher than the national median of 2.2 among the five states in the dataset. Rajasthan's initial fertility rate of 2.4 in NFHS 4 was influenced by a combination of socioeconomic factors, cultural norms favoring larger families, limited access to contraception and family planning resources, lower female education levels, and traditional gender roles. The decrease in fertility to 2.0 in NFHS 5 suggests positive changes in healthcare services, education, and awareness about family planning, signifying progress in reproductive health and maternal outcomes in the state. These improvements indicate a shift toward smaller family sizes and better overall well-being in Rajasthan

- Fertility and Family Planning in Rajasthan: A Study Based on NFHS-3 and NFHS-4 Data, International Institute for Population Sciences (IIPS), 2016.

This decline in fertility rates in Rajasthan is indicative of a remarkable demographic transition. Several factors contribute to this shift. Increased awareness and accessibility to family planning methods, coupled with better healthcare infrastructure, have played pivotal roles in enabling women and families to make informed decisions about the timing and number of children they wish to have. Moreover, there has been an uptick in female education, which tends to correlate with lower fertility rates. Women, with greater educational attainment, often choose to have fewer children as they prioritize careers, personal development, and family well-being.



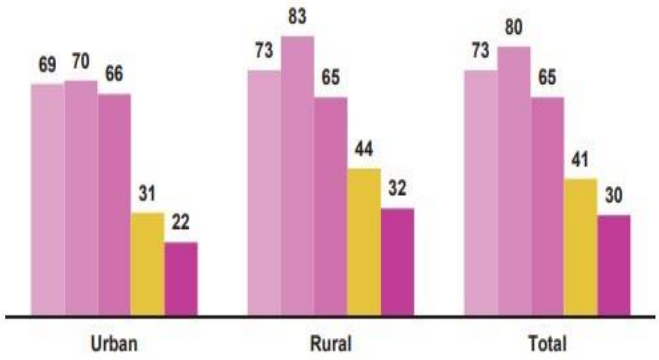
Graph 16: Fertility Trends- Total fertility rate (children per woman)

2) Infant Mortality Rate:

In NFHS 4, the data reveals important insights regarding trends in infant mortality rates in Rajasthan. The state reported an infant mortality rate of 44 deaths per 1,000 live births. However, when compared to other states in the dataset, this was significantly higher. Kerala, in contrast, had one of the lowest rates at 5.4, highlighting a substantial disparity. Various factors contribute to this disparity, including differences in healthcare infrastructure, socioeconomic conditions, and access to quality healthcare services. Rajasthan's relatively higher infant mortality rate in NFHS 4 emphasized the need for interventions to improve maternal and child healthcare services and reduce the risks faced by newborns.

The data from NFHS 5 presents a remarkable improvement in infant mortality rates in Rajasthan. The infant mortality rate in the state has reduced to 32 per 1,000 live births, which represents a significant decline. This positive trend suggests improvements in healthcare services, greater access to prenatal and postnatal care, and overall enhanced child healthcare in the state. The state's ongoing efforts to address these issues, raise awareness, and provide better healthcare access to infants and their mothers have contributed to this notable reduction in infant mortality.

In summary, the data from NFHS 4 and NFHS 5 for Rajasthan demonstrates a considerable reduction in infant mortality rates. This decline reflects positive changes in healthcare services and accessibility, which have contributed to improved child health outcomes in the state. The reduction in infant mortality rates is a promising sign for the overall well-being of Rajasthan's population, especially its youngest members.



Graph 17: Trends in infant mortality (deaths per 1000 live births)

3) How does fertility affect with schooling:

- **NFHS 4**

5-9 YRS (2.2)

The data from NFHS 4 reveals a significant correlation between the educational attainment of women and fertility rates in Rajasthan. Notably, women with 5-9 years of schooling exhibited a higher fertility rate of 2.4. This finding underscores the influence of education on fertility trends. Women with intermediate levels of education may have somewhat limited awareness of family planning methods and might be less likely to make informed choices about family size. Additionally, these women might encounter challenges in pursuing career aspirations and personal growth, impacting their decisions about family size. The data from NFHS 4 emphasizes the need for targeted education and awareness campaigns to reach women in this educational bracket to further contribute to fertility reduction in Rajasthan.

12 or more (1.8)

In the same survey, women with 12 years or more of schooling demonstrated a notably lower fertility rate of 1.8. This statistic highlights the pivotal role of education in shaping fertility trends. Women with higher educational levels exhibit a stronger awareness of family planning methods and are more likely to make informed choices about family size. This can be attributed to the fact that educated women often have the opportunity to pursue careers and personal growth, actively contributing to their family's overall well-being. The findings from NFHS 4 underscore the significant impact of education as a driving force behind fertility reduction in Rajasthan. To promote continued demographic transition, investing in education, particularly for women, remains a vital strategy for the state.

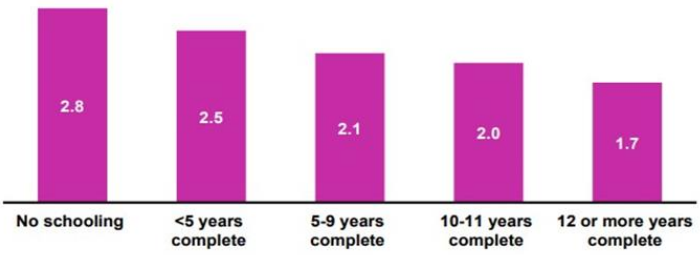
- **NFHS 5**

5-9 YRS (2.1)

The data from NFHS 5 demonstrates a similar significant correlation between women's educational attainment and fertility rates in Rajasthan. In this survey, women with 5-9 years of schooling maintained the same fertility rate as in NFHS 4, standing at 2.4.

12 or more (1.8)

In the same survey, women with 12 years or more of schooling also maintained a lower fertility rate, with it remaining steady at 1.9. This statistic reaffirms the enduring role of education in shaping fertility trends. Highly educated women consistently exhibit a better awareness of family planning methods and tend to make informed choices about family size.



Graph 18: How does fertility vary with schooling? (total fertility rate)

4) How many women use family planning?

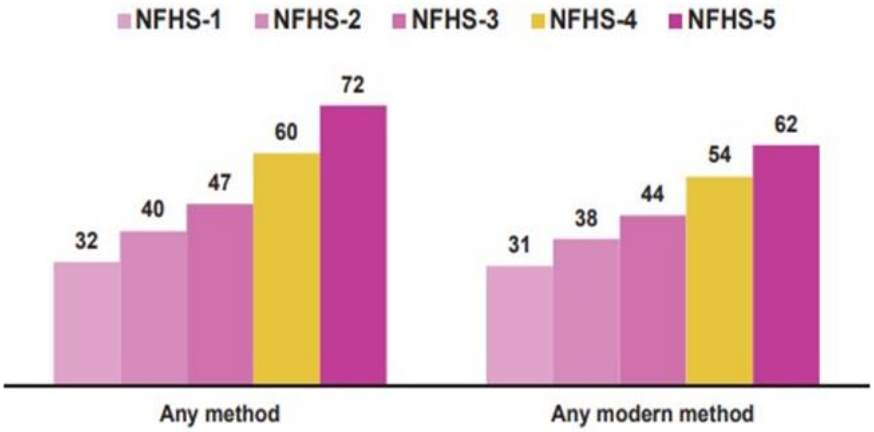
- **NFHS 4**

In Rajasthan, the usage of family planning methods has increased significantly between NFHS 4 and NFHS 5. In NFHS 4, 54% of women used family planning

- **NFHS 5**

The percentage increased to 62% in NFHS 5.

This increase indicates that more women in Rajasthan are choosing to control the timing and number of their pregnancies. The government and healthcare organizations in the state may have implemented successful family planning programs, increasing awareness and access to contraception.



Graph 19: How many women use family planning (% of currently married women)

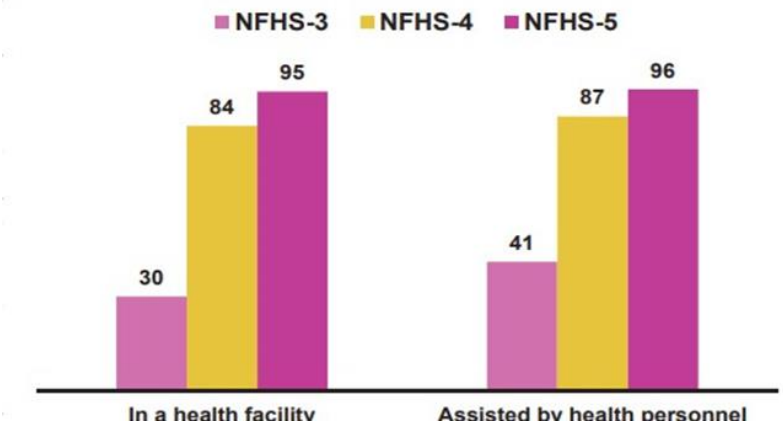
5) Are babies being delivered safely?

HEALTH FACILITY & ASSISTED BY HEALTH PROFESSIONAL

- **NFHS 4 & NFHS 5**

In both NFHS 4 and NFHS 5, Rajasthan made notable progress in the percentage of safe deliveries in health facilities and assistance by health professionals. In NFHS 4, 84% of deliveries took place in a health facility, which increased to 87% in NFHS 5. Assistance by health professionals increased from 95% to 96%.

This indicates that Rajasthan has improved maternal healthcare services and encouraged more women to give birth in health facilities, reducing the risks associated with home births. This can be attributed to various healthcare initiatives, awareness campaigns, and infrastructure development.



Graph 20: Are babies being delivered safely (% of births in the past 5 years)

E. MAHARASHTRA

Indicators	**NFHS 4**	**NFHS 5**
Total fertility rate	1.9 children per woman	1.7 children per women
Infant mortality rate	● Rural- 24 ● Urban- 24	● Rural - 24 ● Urban -23
How many women do family planning	63 per 100 women	64 per 100 women
Schooling affecting fertility	● 5-9 YRS-2.2 ● 12 yrs or more-1.6	● 5-9 yrs-2.1 ● 12 yr or more-1.6
Babies being delivered safely	● IN HEALTH FACILITY - 90 ● ASSISTED BY A HEALTH PROFESSIONAL- 91	● IN HEALTH FACILTIY -95 ● ASSISTED BY A HEALTH PROFESSIONAL-94

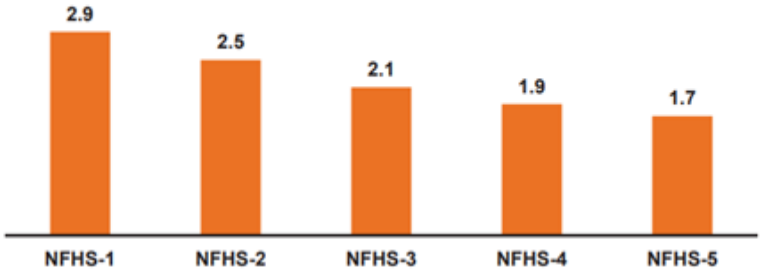
1) Total fertility rate:

- **NFHS 4**

Maharashtra's TFR of 1.9 in NFHS 4 reflects a declining fertility trend. This is primarily due to heightened awareness of family planning methods, enabling couples to make informed choices about their family size. Improved access to healthcare services has played a significant role in educating and supporting family planning. Additionally, higher education levels among women have empowered them to pursue careers and delay childbearing, resulting in smaller family sizes. These factors collectively contribute to Maharashtra's relatively low fertility rate, aligning with global demographic shifts toward smaller, more manageable

- **NFHS 5**

The decrease in Maharashtra's Total Fertility Rate (TFR) from 1.9 to 1.7 in NFHS 5 indicates a continued trend towards smaller families. This trend can be ascribed to a number of things, including increased knowledge of family planning options, easier access to healthcare, and higher educational levels among women. Women prefer to delay childbirth and have fewer children as they have more control over their reproductive options. Family size preferences are also influenced by urbanisation and shifting societal standards. Maharashtra's declining TFR reflects the state's dedication to family planning and women's emancipation, which has led to a demographic environment characterised by smaller, more sustainable families



Graph 21: Fertility Trends- Total fertility rate (children per woman)

2) Infant Mortality Rate:

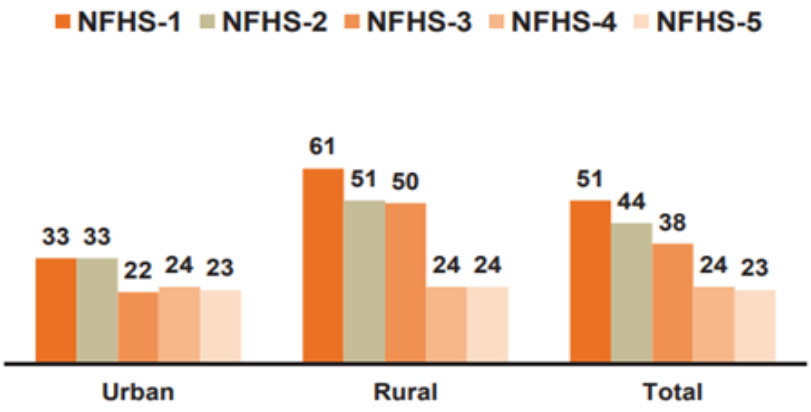
- **NFHS 4**

Maharashtra's continuously low newborn mortality rates (24 and 23, respectively) in both rural and urban areas show a notable dedication to children's health. This accomplishment demonstrates how well-resourced the state's healthcare system is, how easy it is to receive high-quality treatment, and how effective its public health initiatives have been. The availability of medical facilities has increased in rural areas, allowing for timely deliveries and the treatment of newborns. Hospitals and medical professionals in urban areas benefit from improved facilities. To a large extent, these low mortality rates can be attributed to the state's emphasis on maternity and child health education, immunisation, and disease prevention. The actions taken by Maharashtra show that the state is taking preventative measures to guarantee the welfare of its most vulnerable inhabitants.

- **NFHS 5**

In NFHS 5, Maharashtra continued to demonstrate unwavering dedication to child health with sustained low infant mortality rates. The consistency of these rates, with rural areas at 24 and urban areas at 23, suggests that the state's healthcare and public health systems are effectively preserving the well-being of its youngest citizens. Maharashtra's commitment to reducing infant mortality is reflected in its comprehensive approach to maternal and child healthcare, ensuring access to medical services, quality prenatal and neonatal care, and immunization.

The unaltered rates between NFHS 4 and 5 indicate that the state has successfully maintained its standards in child health, a testament to its persistent focus on the welfare of its future generations.



Graph 22: Trends in infant mortality (deaths per 1000 live births)

3) How Does Fertility affect with Schooling?

- **NFHS 4**

5-9 YRS (2.2)

The rate is equal to the median of the country . This means that the states resources, educational opportunities are at par with that of the nation.

12 or more (1.6)

According to the NFHS 4 report, the level of fertility among people with 12 and 12+ years (1.6) is quite below the median level (1.9). This is because, level of education plays an important role in family planning trends of a particular place.

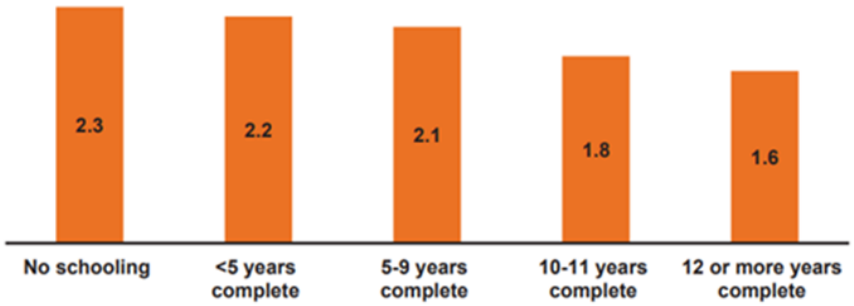
- **NFHS 5**

5-9 YRS (2.1)

The rate is equal to the median of the country . This means that the states resources, educational opportunities are at par with that of the nation.

12 or more (1.6)

According to the NFHS 5 report, women with 12 years or more of schooling maintained a steady fertility rate at 1.6. This statistic reaffirms the enduring role of education in shaping fertility trends. Highly educated women consistently exhibit a better awareness of family planning methods and tend to make informed choices about family size.



Graph 23: How does fertility vary with schooling? (total fertility rate)

4) How many women use family planning?

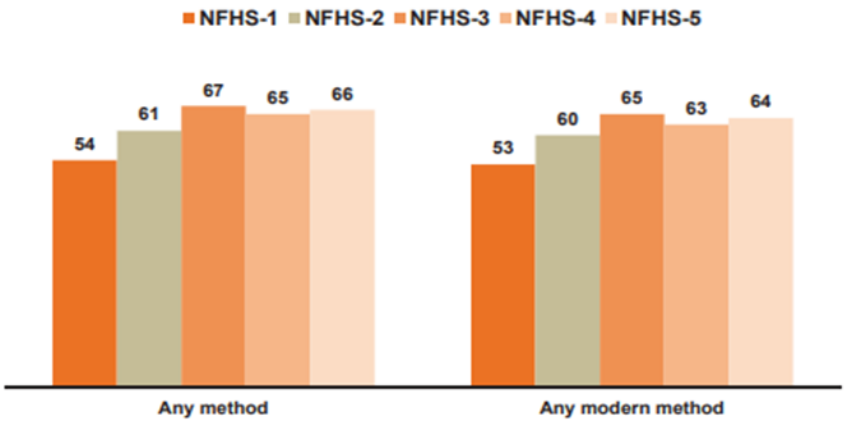
NFHS 4

63% of Maharashtrian women used family planning methods, according to NFHS 4 data, demonstrating widespread access to and use of these services. Several causes may be responsible for this excessive utilisation. In the first place, Maharashtra has a well-established healthcare infrastructure that makes family planning services available. Additionally, family planning has been supported by government programmes and awareness campaigns. Women may also be more aware of the advantages of family planning now that they are empowered and educated, giving them the ability to make wise decisions. This pattern reflects a positive shift in the state's favouring of planned parenthood and is influenced by the desire for fewer families, career aspirations, and financial considerations.

NFHS 5

The increase in family planning technique use in Maharashtra from 63% in NFHS 4 to 64% in NFHS 5 demonstrates consistent availability to and use of family planning services. This growth demonstrates the state's dedication to offering complete reproductive health services. Current government initiatives and

public awareness campaigns to support family planning are among the factors fueling this trend. Making educated decisions is further aided by improved healthcare accessibility and infrastructure as well as a focus on women's empowerment and education. The increased trend in family planning usage continues to be driven by economic factors, together with the desire for fewer families and improved professional opportunities, indicating a persistent commitment to planned parenthood in the state.



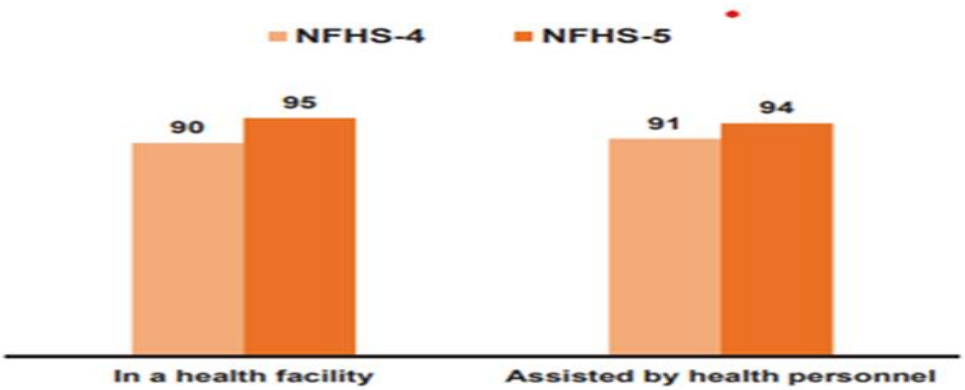
Graph 4: How many women use family planning (% of currently married women)

5) Are babies being delivered safely?

HEALTH FACILITY & ASSISTED BY HEALTH PROFESSIONAL

NFHS 4 & NFHS 5

The data underscores a notable improvement in safe childbirth practices within Maharashtra. When comparing NFHS 4 to NFHS 5, there is a significant increase in the proportion of births taking place in medical facilities (from 90% to 95%) and a parallel rise in the proportion of births receiving medical professional support (91% to 94%). Maharashtra's deliberate emphasis on maternal health services might be credited with these favourable changes. The state has made major investments in healthcare infrastructure, making it simpler to access facilities and qualified healthcare workers. In parallel, widespread community awareness campaigns have helped people appreciate the value of institutional deliveries and expert support throughout labour. In addition to promoting safer deliveries, these coordinated measures also support the overarching objective of lowering maternal and newborn mortality rates, demonstrating Maharashtra's dedication to improving maternal and child healthcare outcomes.



Graph 255: Are babies being delivered safely (% of births in the past 5 years)

II. With respect to correlation

By examining data from the National Family Health Survey (NFHS) rounds 4 and 5, the study analyzes trends in fertility, the influence of education on fertility, and the prevalence of safe deliveries, among other indicators. Correlation analysis is utilized to identify the strength and direction of the relationships between these factors across different time periods, aiming to reveal any interconnected patterns among the states. The process involved calculating correlation coefficients to determine if changes in one state are likely mirrored by shifts in others, underscoring the broader demographic and health patterns captured by NFHS data.

HIGH CORRELATION INDICATORS

According to NFHS 4 and NFHS 5, there is a very significant positive link between the fertility trends in these five states, as indicated by the correlation value of 0.952845442. The effect of education on fertility for students enrolled in 5–9 years of schooling also showed a very strong association (0.9484220607), and safe deliveries in both medical facilities with professional assistance also demonstrated a high correlation (0.99885536454 and 0.9956600182, respectively).

It is possible that the trends in fertility, the impact of education on fertility, and the proportion of safe deliveries in these states are tightly correlated and trend in the same direction across the two survey periods, based on the high connection between them.

When two states have a positive correlation, it means that when one state increases or decreases, the other states typically follow suit.

High correlation suggests that low improvement has occurred in between NFHS 4 and NFHS 5.

The following government policies have been since introduced and implemented to reduce fertility rates in all states by creating awareness around the importance of family planning-

1. The goal of Mission Parivar Vikas, which was created by the government in 2016, is to significantly increase access to family planning services and contraceptives.
2. Therapeutic Outreach Team (COT) Programme: A major contributing factor to the high fertility rates in the MPV areas is the lack of family planning practitioners in public health institutions and the absence of private sector family planning facilities.
3. When the Ministry of Health & Family Welfare (MoHFW), Government of India, introduced the Pradhan Mantri Surakshit Matritva Abhiyan in 2016, the government's goal was to guarantee that all pregnant women would receive comprehensive, high-quality prenatal care on the ninth of every month, free of charge. In the second and third trimesters of pregnancy, PMSMA provided women with a basic set of antenatal care services.
4. The government initiative known as Janani Suraksha Yojana (JSY) encourages women to give birth in medical facilities. This programme supports hospital deliveries, which not only encourage safe childbirth but also give healthcare providers a chance to counsel women on contraception and family planning.

- Although these policies have a positive effect on the fertility trends, they take time (more than 10 years) in bringing change in society's mindset as it often involves altering deeply ingrained beliefs and behaviors.
- Secondly, Fertility transition is a generational change, it is only possible to observe the impact of awareness and education when the next generation chooses to consider family planning.
- Moreover, these metrics are intimately related to economic development and growth. Therefore, for there to be meaningful changes in fertility rates, there has to be Income growth and distribution, access

to healthcare, adequate infrastructure, and a considerable increase in education levels in both rural and urban areas.

- With most states already performing well in terms of safe deliveries, not a lot of improvement is needed. However a state like Bihar which still has a long way to go, improvement was seen which can be directly related to the introduction of PMSMA and JSY which helped improve the care that women receive during pregnancy and delivery.
- We observe little improvement in fertility trends among girls who have received primary and secondary education since these young girls are not sufficiently educated to understand the significance of family planning, contraception, and fertility trends Moreover, girls receiving only primary and secondary education have less autonomy in making decisions about marriage and family planning. Government efforts are concentrated on raising awareness among girls in grades 10–12 because they are the ones who are ready to start families and can understand the seriousness of the situation.

2. LOW CORRELATION INDICATORS

The correlation coefficient of 0.8923223154 for percentage of women using family planning, indicates a comparatively lower positive correlation in the five states as measured in NFHS 4 and NFHS 5. Lower Correlation suggests that higher improvement has been experienced between NFHS 4 and NFHS 5. Similarly, for effect of schooling on fertility for 12 or more years of schooling coefficient stands very low at 0.6163243593 indicating that between NFHS 4 and NFHS 5 significant improvement has occurred. Furthermore, trends in infant mortality for both rural and urban areas have also seen improvement with coefficients standing at 0.911418482 and 0.90030853 respectively.

The following reasons can be stated to analyze the improvement:

- Governments in all the states (especially of Bihar and Rajasthan) examined in this study have consistently allocated funds and personnel to teaching senior secondary school girls and boys who have reached the necessary age to comprehend such ideas about family planning. In a similar vein, the business sector has taken efforts in setting up campaigns in these schools to instruct young people on the subject. Media campaigns have a big impact on how young men and women decide to get married and start families. As a result, the youthful generation is changing significantly in terms of fertility trends.
- The majority of states have seen significant gains in family planning, with Bihar seeing an almost twofold increase in the rate. The introduction of specific government initiatives, such the Family Planning Logistics Information System (FP-LMIS), may be connected to this improvement. It was introduced to improve the supply-chain management system and control the distribution of contraceptives. It is used as a decision-making tool by policy makers, programme managers, and logistics staff to keep an eye on and control the flow of contraceptive supplies, thereby lowering stock-outs and overstocks and enhancing the security and efficacy of the programme.
- Many states have experienced major changes as a result of government initiatives like the Janani Suraksha Yojana (JSY), JananiShishuSurakshaKaryakaram (JSSK), and others. All pregnant women giving birth in public health facilities are entitled to completely free deliveries, including cesarean sections, under the JananiShishuSurakshaKaryakaram (JSSK) programme. The effort includes free transportation from house to institution, between facilities in the event of a referral, and back home. It also includes free prescription medications, diagnostics, blood work, and nutrition. All sick newborns who seek treatment in public health facilities up until the age of one have access to the same benefits.

Such government initiatives, along with those made by state governments, have greatly enhanced prenatal and infant care in a variety of settings, including rural ones.

VI. Conclusions and Recommendations

The document delves into a comprehensive analysis of fertility trends and maternal healthcare practices in five Indian states: Tamil Nadu, Kerala, Bihar, Rajasthan, and Maharashtra, comparing data from two National Family Health Surveys (NFHS 4 and NFHS 5). These surveys spanned a period of time marked by significant socioeconomic changes, healthcare initiatives, and evolving cultural dynamics.

In terms of fertility trends, a striking pattern emerges. These states exhibit a high positive correlation, signifying that their fertility trends are tightly interwoven, evolving in the same direction over time. This is indicative of shared underlying factors shaping fertility outcomes. While this correlation tells us how closely these states' trends align, it doesn't elucidate the causes, which may be multifaceted.

Socioeconomic factors, governmental policies, cultural values, and rural-urban dynamics are identified as key influences on fertility trends. Economic development and enhanced educational opportunities can delay family planning and slightly elevate fertility rates. Government initiatives aimed at family planning, maternal health, and public awareness campaigns play a pivotal role in mitigating fertility. Evolving cultural norms also contribute to fluctuations in fertility preferences. The rural-urban population shift, driven by economic prospects, improved infrastructure, and changes in the agricultural sector, alters demographic dynamics.

Childbirth safety is another noteworthy facet. All five states demonstrate a substantial rise in births occurring in healthcare facilities and assisted by health professionals, suggesting improved maternal and neonatal health. The impressive consistency, particularly in Tamil Nadu, Kerala, and Maharashtra, reflects these states' strong commitment to creating safe and controlled environments for childbirth. It's also a testament to their robust healthcare infrastructure, extensive awareness campaigns, and efforts to empower women and provide quality education.

In conclusion, the document unveils an intricate interplay of socioeconomic, cultural, and policy factors driving fertility trends across these states. Despite shared upward trends in fertility, the significant improvements in maternal healthcare practices, facility-based childbirths, and skilled professional assistance represent a positive shift. These outcomes result from a concerted effort by state governments to enhance maternal and child healthcare. Nevertheless, further research is warranted to uncover the intricate causes underlying these trends, acknowledging that regional intricacies and localized factors may play a crucial role.

Issues such as elevated rates of childbirth, high infant mortality, inadequate healthcare facilities, and so forth are interconnected and stem from elements such as inadequate education, inadequate sanitation, low living standards, and inadequate revenue creation. While there has been progress with the introduction of government initiatives such as Mission Parivar Vikas, Janani Suraksha Yojana, and Janani Shishu Suraksha Karayakarm, the problem has been with implementation in

states that perform poorly, such as Bihar and Rajasthan, where the core problem is rural areas with high rates of poverty and low nutrition. The success of policies has also been hampered by resistance to family planning from particular communities, religious organisations, or individuals.

In these isolated places, finding healthcare facilities and personnel is another difficulty. Campaigns to raise awareness about these concerns must be strictly intensified and directed at these rural places that lack media exposure and public knowledge of them. Educating men and boys about the seriousness of topics

like family planning and the usage of contraception is also crucial. In addition, women must be empowered appropriately, given job possibilities, and allowed to work from home in order for them to make these decisions independently and avoid being overpowered or influenced by local society and cultural norms.

VII. References

1. R. Savitri. (1994). Fertility Rate Decline in Tamil Nadu: Some Issues. *Economic and Political Weekly*, *29*(29), 1850–1852. http://www.jstor.org/stable/4401485
2. According to Murthi, M., Guio, A.-C., & Drèze, J. (1995). Mortality, Fertility, and Gender Bias in India: A District-Level Analysis. *Population and Development Review*, *21*(4), 745–782. https://doi.org/10.2307/2137773
3. Kulkarni, P. M., & Manoj Alagarajan. (2005). Population Growth, Fertility, and Religion in India. *Economic and Political Weekly*, *40*(5), 403–410. http://www.jstor.org/stable/4416131
4. Krishnan, P. (2001). Cultural norms, social interactions and the fertility transition in India. *University of Cambridge, Faculty of Economics, Cambridge, UK Processed*.
5. Munshi, K., & Myaux, J. (2006). Social norms and the fertility transition. *Journal of development Economics*, *80*(1), 1-38.
6. Louis, A., & Louis, A. (2018, November 12). *Why UP, Bihar and Madhya Pradesh Have High Fertility Rates*. TheQuint. https://www.thequint.com/neon/uttar-pradesh-bihar-and-madhya-pradesh-have-high-fertility-rates-according-to-unfpa#read-more
7. S, R. (2020, July 7). As India moves to slow population growth, Bihar gets left behind | Mint. Mint. https://www.livemint.com/news/india/as-india-moves-to-slow-population-growth-bihar-gets-left-behind-11594110050215.html
8. Legare, C. H., Akhauri, S., Chaudhuri, I., Hashmi, F. A., Johnson, T., Little, E. E., Lunkenheimer, H. G., Mandelbaum, A., Mandlik, H., Mondal, S., Mor, N., Saldanha, N., Schooley, J., Sharda, P., Subbiah, S., Swarup, S., Tikkanen, M., & Bürger, O. (2020, June 29). *Perinatal risk and the cultural ecology of health in Bihar, India*. Philosophical Transactions of the Royal Society B; Royal Society. https://doi.org/10.1098/rstb.2019.0433
9. P., & P. (2017, September 5). *Bihar fertility rate reduced by boosting education among girls, says Nitish Kumar*. Firstpost. https://www.firstpost.com/india/bihar-fertility-rate-reduced-by-boosting-education-among-girls-says-nitish-kumar-4011863.html
10. Das, K., Das, K., & I. (2019, July 24). *Indiaspend*. Indiaspend. https://www.indiaspend.com/if-women-could-decide-bihar-wouldnt-have-a-population-crisis/#:~:text=And%20only%20one%20in%20three,%2C%20as%20per%20NFHS%2D4
11. Unmet need for family planning and its determinants in Bihar: Policy and programme implications. (n.d.). http://adriindia.org/centre/working_paper_details/unmet-need-for-family-planning-and-its-determinants-in-bihar-policy-and-programme-implications
12. T. (2018, March 11). *Government fails to meet contraceptive demand of 41% couples in Bihar*. The Times of India. https://timesofindia.indiatimes.com/city/patna/government-fails-to-meet-contraceptive-demand-of-41-couples-in-state/articleshow/63249300.cms
13. Darmstadt, G. L., Pepper, K. T., Ward, V., Srikantiah, S., Mahapatra, T., Tarigopula, U. K., Bhattacharya, D., Irani, L., Schooley, J., Chaudhuri, I., Dutt, P., Sastry, P., Mitra, R., Chamberlain, S., Monaghan, S., Nanda, P., Atmavilas, Y., Saggurti, N., Borkum, E., . . . Shah, H. (2020, December 1). *Improving primary health care delivery in Bihar, India: Learning from piloting and statewide scale-*

up of Ananya. Journal of Global Health; Edinburgh University Global Health Society. https://doi.org/10.7189/jogh.10.021001
14. Galor, O., & Weil, D. N. (1993). The gender gap, fertility, and growth. https://www.nber.org/system/files/working_papers/w4550/w4550.pdf
15. McDonald, P. (2000). Gender equity in theories of fertility transition. *Population and development review*, *26*(3), 427-439. https://www.jstor.org/stable/172314
16. Manna, M. (1998). Factors affecting fertility decline and fertility variation in 1990s: An inter-state analysis. *Economic and Political Weekly*, 3280-3284. https://www.jstor.org/stable/4407497
17. Nair, P. (2010, September 6). Understanding Below-replacement Fertility in Kerala, India. Journal of Health, Population and Nutrition; BioMed Central. https://doi.org/10.3329/jhpn.v28i4.6048
18. Zachariah, K. C. Z., & Patel, S. P. (1982, January). Trends and Determinants of Infant and Child Mortality in Kerala. Retrieved October 20, 2023, from https://documents1.worldbank.org/curated/en/478441468915052958/pdf/Trends-and-determinants-of-infant-and-child-mortality-in-Kerala.pdf
19. Anant, P. A., John, A. J., & Kumar, D. K. (2014). Family Planning Practices in Rural Kerala. SAS Publishers. Retrieved October 20, 2019, from https://saspublishers.com/media/articles/SJAMS_21A19-21.pdf
20. Singh, P. K., Kumar, R., Alagarajan, M., & Singh, L. (2012, February 15). Determinants of Maternity Care Services Utilization among Married Adolescents in Rural India. PLOS ONE; Public Library of Science. https://doi.org/10.1371/journal.pone.0031666
21. National Family Health Survey. (n.d.). http://rchiips.org/nfhs/NFHS-5Report_KL.shtml
22. National Family Health Survey. (n.d.). https://rchiips.org/nfhs/NFHS-4Report.shtml
23. National Family Health Survey. (n.d.). https://rchiips.org/nfhs/NFHS-4Reports/Maharashtra.pdf
24. National Family Health Survey. (n.d.). https://rchiips.org/nfhs/NFHS-5Reports/Maharashtra.pdf
25. Mitra, A. (2014). Son preference in India: implications for gender development. Journal of Economic Issues, 48(4), 1021-1037
26. Bocquet-Appel, J. P., Rajan, I. S., Bacro, J. N., & Lajaunie, C. (2002). The onset of India's fertility transition. European Journal of Population/Revue europeenne de demographie, 18, 211-232. Link: https://www.jstor.org/stable/pdf/20164189.pdf?casa_token=BAgajMnww7UAAAAA:GZA2bcR07zkbQI-Vd9bEiEDmjnJFiqaMAxe93qisuvu77l5Q_utlEaOHc6fvokecv6ebBhIYMeo_XNW8Xeho9OLb_hYsVhYUkqOvKC6ZX5yeJ4IvEmZ
27. Desai, S., Pramanik, S., & Chouhan, B. (2022, September 1). *The paradox of declining fertility and declining contraceptive use in India: An artefact of survey design?* SSM-Population Health; Elsevier BV. https://doi.org/10.1016/j.ssmph.2022.101256
28. *In Rajasthan, family planning is a one-way street*. (2022, August 6). ETHealthworld.com. https://health.economictimes.indiatimes.com/news/industry/in-rajasthan-family-planning-is-a-one-way-street/93388492
29. Narayan, R. (2019, June 19). *Rajasthan's Safe Child Birth Checklist, And Tackling Low Birth Weight Are Making Waves: CIFF's Hisham Mundol*. https://www.outlookindia.com/.

https://www.outlookindia.com/website/story/rajasthans-safe-child-birth-checklist-tackling-low-birth-weight-and-malnutrition-is-making-waves-ciffs-hisham-mundol/332404

30. T. (2016, December 16). *Total fertility rate falls in Rajasthan*. The Times of India. https://timesofindia.indiatimes.com/city/jaipur/total-fertility-rate-falls-in-raj/articleshow/56007945.cms
31. Ali, S. I. (2022, May 27). *Rajasthan tops improving infant mortality rate among six big worst performing states*. The Times of India. https://timesofindia.indiatimes.com/city/jaipur/rajasthan-tops-improving-infant-mortality-rate-among-six-big-worst-performing-states/articleshow/91823436.cms