



## Demography India

A Journal of Indian Association of Study of Population

Journal Homepage: <https://demographyindia.iasp.ac.in/>



### Fertility Decline in India: A Decomposition Analysis

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#### Abstract

India's fertility declined over the last five decades and many factors influenced this decline. This study examines the decline in TFR between 2011 and 2020 in India and across six Indian states which exhibited a similar rate of decline using the Sample Registration System (SRS) Statistical Reports of 2011 and 2020. The analysis decomposes the overall fertility decline into two key components: changes in the marital fertility rate (MFR) and shifts in the proportion of married women (PMW). By distinguishing between these two factors, this study aims to provide a clearer understanding of the role that marital patterns and fertility within marriage have played in shaping India's fertility transition. The results of the decomposition analysis show that the decline in TFR from 2.4 in 2011 to 2.0 in 2020 was largely driven by a reduction in the proportion of married women (PMW). Although marital fertility exhibited a potential to increase overall fertility, the predominant effect of declining marriage rates resulted in an overall fertility decline. In states such as Maharashtra and West Bengal, marital fertility placed upward pressure on fertility levels; however, the significant reduction in PMW offset this effect. In contrast, Kerala saw minimal influence from changes in marital fertility, with the decline in marriage proportions emerging as the primary factor behind its fertility decline. This study highlights the crucial role of changing marriage patterns in India's fertility decline, with a decreasing proportion of married women, especially among younger cohorts, being the primary driver. While a slight rise in marital fertility in some states reflects evolving reproductive behaviours, addressing factors like education, economic opportunities, and cultural shifts will be essential in shaping India's future fertility trends.

#### Keywords

Births, CRS, Deaths,  
Delhi, and Local  
Bodies

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## Introduction

India, the most populous country in the world, has followed the demographic transition and fertility transition that occurred earlier in developed countries. Over the last three decades, India has experienced a significant decline in its Total Fertility Rate (TFR), reflecting profound demographic and socio-economic transformations. In the early 1990s, the TFR stood at approximately 3.8 children per woman, largely driven by early marriages, limited access to family planning services, and high fertility in rural areas. By the early 2000s, the TFR had declined to 3.2, continuing its downward trajectory to 2.4 by 2011 and further dropping to 2.0 by 2020, falling below the replacement level. As in many countries that have completed the demographic transition, India's fertility continued to decline after nearing replacement level, contributing to concerns about future population ageing. Understanding the underlying factors contributing to these changes is crucial for effective population policies and planning. India's fertility decline has been shaped by two primary drivers: changes in age-specific marital fertility rates (ASMFRs) and shifts in the proportion of married females (PMW) across reproductive age groups. Given that most births in India occur within marriage, the trends in these two factors provide a window into how societal and behavioural changes have influenced fertility patterns. One major reason for the TFR decline is the increasing proportion of females in the prime child-bearing age groups choosing to remain single. The reduction in PMW signifies a delay in marriage, driven by factors such as improved access to education, expanded economic opportunities and shifting societal norms. Postponing marriage reduces exposure to childbearing during peak reproductive years and encourages smaller family sizes by delaying first births.

Simultaneously, the decline in ASMFRs reflects transformations in reproductive behaviour within marriage, including the adoption of contraception, delayed childbearing, and smaller family norms. These changes have been facilitated by family planning initiatives, rising female education levels, and greater autonomy in reproductive decision-making. The consistent fall in marital fertility rates highlights a transformation in reproductive norms, driven by better access to contraception, enhanced educational opportunities, and changing aspirations of families. Despite the extensive literature on India's fertility transition, gaps remain in understanding the relative roles of marital behaviours and fertility changes within marriage in driving the overall decline. Existing studies often emphasize either structural shifts, such as delayed marriage, or behavioural transformations, like contraceptive use, but fail to integrate these perspectives comprehensively. This research bridges this gap by decomposing the decline in TFR into its two principal components—marital fertility rate (MFR) and proportion of married women (PMW)—to assess their respective contributions. The relevance of this study lies in its potential to inform policies aimed at sustaining fertility decline while addressing regional variations. As India approaches population stabilization, understanding the drivers of this demographic shift is critical for ensuring equitable access to reproductive health services, promoting gender equity, and supporting socio-economic development. This study's objective is to provide a nuanced analysis of how shifts in marital patterns and reproductive behaviours have interacted to shape India's fertility trajectory, contributing to broader discussions on sustainable development and population policy design.

## Data

The data for this study were obtained from the Sample Registration System (SRS) Statistical Reports for the years 2011 and 2020, which serve as a vital source of reliable demographic statistics in India. The SRS, initiated in 1965, is a large-scale demographic survey that functions as the principal source of fertility and mortality estimates in the country. Operated by the Office of the Registrar General and Census Commissioner, India, the SRS includes a dual-record system consisting of continuous enumeration by local enumerators and biannual retrospective surveys for cross-verification. This methodology ensures high accuracy and reliability in the estimates produced.

The analysis focused on six states – Andhra Pradesh, Kerala, Maharashtra, Punjab, Tamil Nadu, and West Bengal – chosen for their consistent and comparable rates of Total Fertility Rate (TFR) decline during the study period. These states exhibit diverse socio-economic and cultural contexts, making them ideal for capturing variations within the overall fertility transition.

## Methodology

This study does not consider non-marital childbirths due to their negligible occurrence in India. The overwhelming majority of births in the country take place within the confines of marriage, as societal norms and cultural values strongly emphasise marriage as the appropriate setting for childbearing. According to the National Family Health Survey (NFHS-5) 2019-21, less than 1% of births occur outside marriage, reinforcing that fertility patterns in India are primarily shaped by marital status (IIPS & MoHFW, 2021). In India marriage continues to be nearly universal, and childbearing outside marriage is rare due to strong societal

disapproval. Given the marginal contribution of non-marital births to overall fertility trends, their exclusion does not significantly affect the findings of this study.

Several studies have decomposed changes in the Total Fertility Rate (TFR) into variations in the proportion of married women and changes in the marital fertility rate (Retherford & Ogawa, 1978; Khawaja, 2000; Retherford et al., 2005; Yip et al., 2015). This decomposition approach closely aligns with Kitagawa's (1955) method for analyzing shifts in crude rates between two time points, which has been extensively applied in demographic research (Das Gupta, 1993; Jiang et al., 2017). In this study, changes in the PMW by age serve as an indicator of marriage and subsequent childbearing postponement. A decline in PMW within a particular age group signifies that individuals in that cohort are delaying both marriage and childbirth.

## Decomposition of TFR

TFR refers to the average number of live births per female and is derived based on Equation (1).

It can theoretically be decomposed into two components\*:

- i. Marital Fertility Rate (ASMFR) and
- ii. Proportion of Married Females (PMW).

The term  $ASMFR_a(t)$  represents the age-specific marital fertility rate (ASMFR) for married women aged  $a$  (age-specific MFR) at time  $t$ , and  $PMW_a(t)$  represents the proportion of married women (PMW) aged  $a$ . Thus, the age-specific fertility rate for women aged  $a$  is  $ASFR_a(t) = ASMFR_a(t) \times PMW_a(t)$ .

$$TFR = 5 \times \sum_a \left( \frac{\text{Live births}}{\text{Female Population}} \right) \text{----- Equation (1)}$$

$$= 5 \times \sum_a \left( \frac{\text{Live births}}{\text{Married Female Population}} \times \frac{\text{Married Female Population}}{\text{Female Population}} \right)$$

$$= 5 \times \sum_a (\text{Marital Fertility Rate} \times \text{Proportion of Married Females})$$

$$= 5 \times \sum_a (\text{ASMFRa} \times \text{PMWa})$$

The difference between TFRs at times t and t + h can be decomposed into:

$$TFR(t+h) - TFR(t)$$

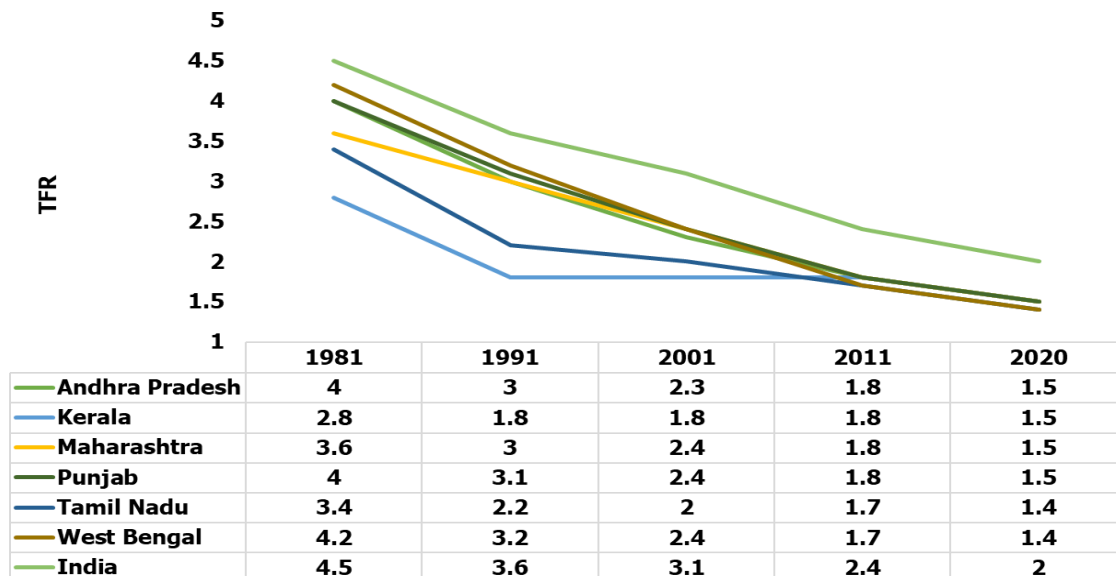
$$= 5 \times \left\{ \sum_a [\text{ASMFRa}(t+h) \times \text{PMWa}(t+h)] - \sum_a [\text{ASMFRa}(t) \times \text{PMWa}(t)] \right\}$$

$$= 5 \times \left\{ \sum_a \frac{\text{PMWa}(t+h) + \text{PMWa}(t)}{2} \times [\text{ASMFRa}(t+h) - \text{ASMFRa}(t)] \right.$$

$$\left. + \sum_a \frac{\text{ASMFRa}(t+h) + \text{ASMFRa}(t)}{2} \times [\text{PMWa}(t+h) - \text{PMWa}(t)] \right\}$$

\*The method of decomposition into components is an established method used by researchers to allocate changes in population indicators over time into its components (Cho & Retherford, 1973; Kitagawa, 1955; Takahashi, 2004).

### Results



Source: Author's calculation based on data obtained from SRS

Figure 1 Total Fertility Rate of India and Six States in the Last Five Decades

## Total Fertility Rate

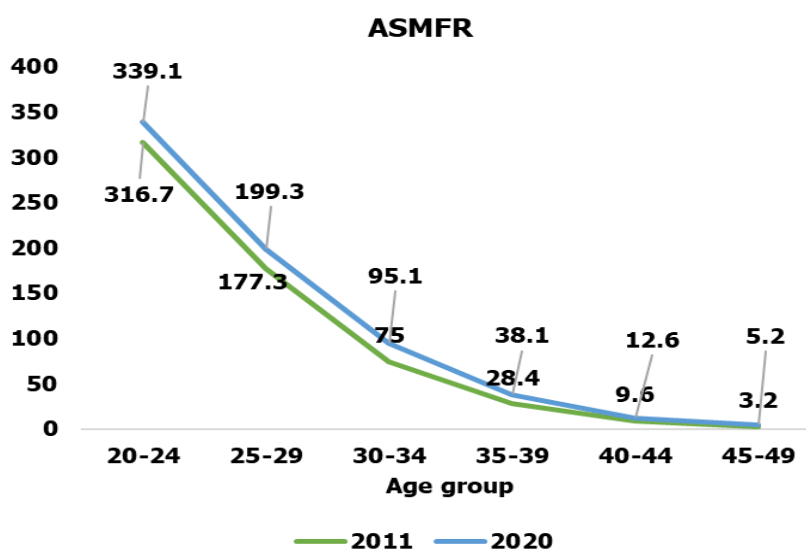
The total Fertility Rate from 1981 to 2020 across the six selected states in India and for the country overall is shown in Figure 1. India's TFR declined from 4.5 in 1981 to 2.0 in 2020. By 2020, the selected states converged to a TFR of around 1.4–1.5. Kerala consistently maintained a low TFR, starting at 2.8 in 1981 and stabilizing at 1.5 by 2020,

West Bengal had the highest TFR among these states in 1981 and 2020 which declined into lowest. Punjab and Maharashtra exhibited similar patterns, starting with TFRs of 4 and 3.6 in 1981, respectively, and reaching 1.5 by 2020.

## Age-Specific Marital Fertility Rate

Figure 2 shows an increase in India's Age-Specific Marital Fertility Rate (ASMFR) between 2011 (green line) and 2020 (blue line) across most age groups, indicating shifts in fertility patterns. For the 20–24 age group, ASMFR increased from 316.7 in 2011 to 339.1 in 2020, suggesting a rise in early marital fertility. Similarly, the 25–29 age group experienced an increase from 177.3 to 199.3, reflecting a concentration of childbearing in this peak reproductive age. In the 30–34 age group, ASMFR rose from 75 to 95.1, while in

the 35–39 age group, it increased from 28.4 to 38.1, indicating a trend of continued childbearing into older reproductive years. Although fertility rates remain low in the 40–44 and 45–49 age groups, slight increases from 9.6 to 12.6 and 3.2 to 5.2, respectively, suggest a marginal rise in late childbearing. These changes point to evolving reproductive behaviours, possibly driven by delayed marriages, increased contraceptive access, and changing societal norms around family size and timing.



Source: Author's calculation based on data obtained from SRS

**Figure 2** Age-Specific Marital Fertility Rate of India in 2011 and 2020\*\*

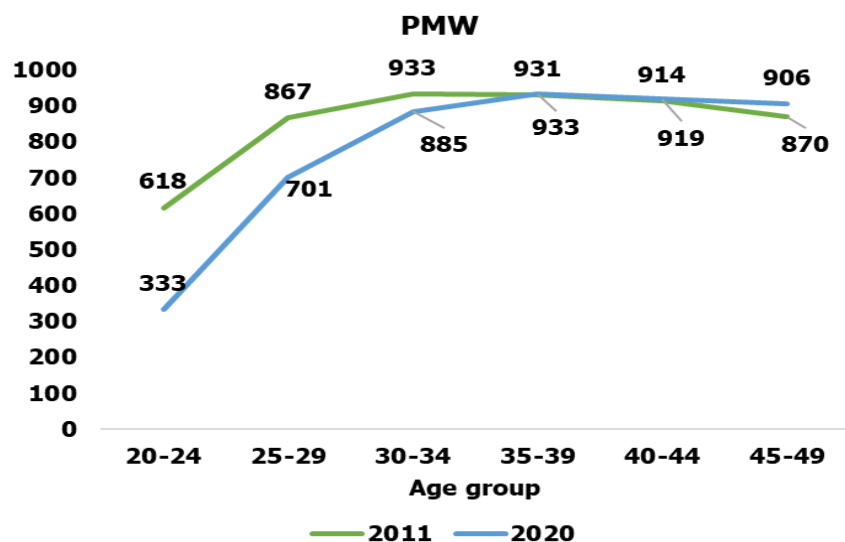
## Proportion of Married Women

Figure 3 illustrates the change in the proportion of married women (PMW) in

India across different age groups between 2011 and 2020. The data reveals a general

decline in PMW across all age groups, with the most significant drop observed among younger women aged 20-24, where the proportion decreased from 618 in 2011 to 333 in 2020. While the PMW increases with age, peaking around 30-34 years in both years, it remains slightly lower in 2020 compared to 2011. The older age groups (40-44 and 45-49)

show relatively smaller declines, indicating that while marriage remains nearly universal for older women, younger cohorts are delaying marriage. This shift likely reflects changing social norms, higher educational attainment, and economic factors influencing marriage patterns in India.



Source: Author's calculation based on data obtained from SRS

**Figure 3** Proportion of Married Women in India in 2011 and 2020\*\*

\*\* Breakdowns in graphs are not analyzed for the 15-19 years age group as the married female population is small within this age group.

## Decomposition of TFR

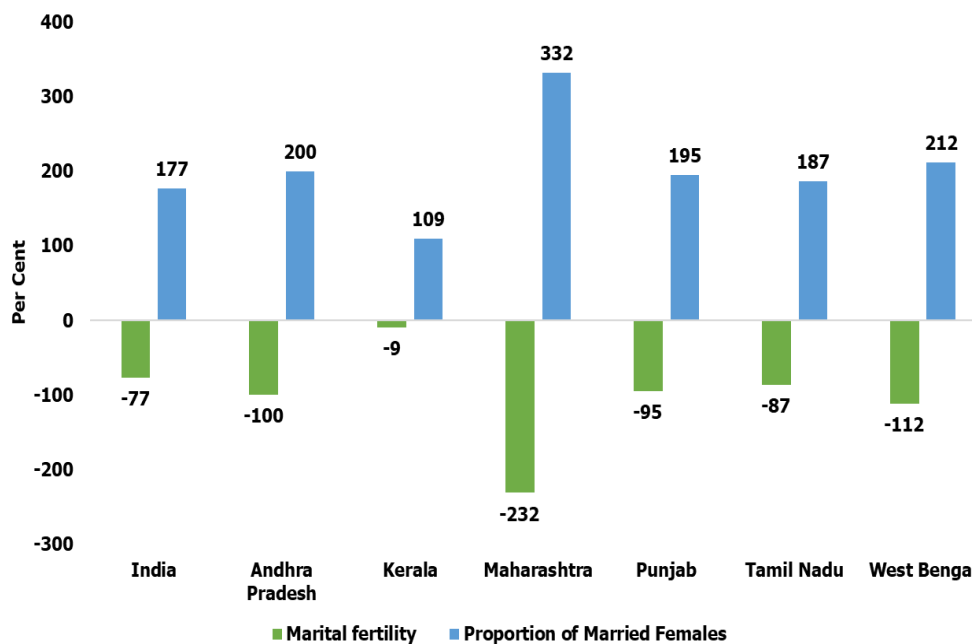
**Table 1** Decomposition of TFR decline in India and Six States, 2011 and 2020

States	TFR		Change (2011-2020)		
	2011	2020	TFR	ASMFR	PMW
Kerala	1.8	1.5	-0.3	0.03	-0.36
Maharashtra	1.8	1.5	-0.3	0.61	-0.88
West Bengal	1.7	1.4	-0.3	0.36	-0.68
Andhra Pradesh	1.8	1.5	-0.3	0.35	-0.71
Punjab	1.8	1.5	-0.3	0.30	-0.61
Tamil Nadu	1.7	1.4	-0.3	0.23	-0.49
India	2.4	2	-0.4	0.34	-0.79

Source: Author's calculation based on data obtained from SRS

The result of the decomposition of TFR decline in India and six states from 2011 to 2020 is shown in Table 1. TFR declined across India and its states, driven primarily by reductions in the Proportion of Married Women (PMW). At the national level, TFR dropped from 2.4 to 2.0, with PMW contributing significantly to the decline, while the Age-Specific Marital Fertility Rate (ASMFR) increased slightly. States like Maharashtra and West Bengal saw substantial drops in PMW, despite notable increases in ASMFR. In Kerala, Andhra Pradesh, Punjab, and Tamil Nadu, the TFR decline was similarly dominated by reductions in PMW, reflecting societal trends such as delayed marriages and lower marriage rates. The modest increases in ASMFR across most states were insufficient to offset the fertility-reducing effects of declining marriage proportions, underscoring the importance of changing marital patterns in shaping fertility trends.

The percentage decline in India's Total Fertility Rate (TFR) and that of various states from 2011 to 2020 is shown in Figure 4, highlighting how much of this decline is due to a decrease in the proportion of married women versus changes in marital fertility rates. Negative values for marital fertility indicate upward pressure on fertility, while positive values for the proportion of married females show their role in reducing fertility. At the national level, marital fertility attempted to increase fertility, but the declining proportion of married females had a stronger fertility-reducing impact. Maharashtra and West Bengal experienced significant upward pressure from marital fertility, but the effect of reduced marriage proportions dominated. In Kerala, the impact of marital fertility was minimal, while the decline in marriage proportions was the primary driver of fertility reduction.



Source: Author's calculation based on data obtained from SRS

**Figure 4** Percentage of Decline in TFR of India and States Over 2011-2020 Attributable to Changes in the Proportion of Married Females and Marital Fertility

## Discussion

The findings of this study underscore the critical role of declining marriage proportions in shaping fertility trends in India. The most significant decline in the proportion of married women (PMW) was observed among women aged 20–24, where PMW fell from 618 per 1,000 in 2011 to 333 per 1,000 in 2020. This decline aligns with broader socio-economic and cultural transformations, including increasing educational attainment, higher female labour force participation, and evolving societal attitudes toward marriage and family formation.

While the Age-Specific Marital Fertility Rate (ASMFR) increased across most age groups, it was insufficient to counteract the fertility-reducing effect of declining marriage rates. The ASMFR for women aged 20–24 rose from 316.7 in 2011 to 339.1 in 2020, and for women aged 25–29, it increased from 177.3 to 199.3. Additionally, fertility in the 30–34 and 35–39 age groups increased, suggesting a shift toward later childbearing. Although fertility rates in the 40–44 and 45–49 age groups remain low, slight increases indicate a marginal rise in late childbearing.

The observed fertility decline is consistent with global demographic transitions, where reductions in marriage rates often precede declines in overall fertility. The variations across states highlight the differential impact of social and economic factors on fertility patterns. Kerala's early and sustained fertility decline exemplifies how improvements in education and healthcare contribute to lower fertility rates. In contrast, Maharashtra and West Bengal's substantial drops in PMW, despite rising marital fertility, suggest that delayed marriages play a more dominant role in fertility reduction than changes in marital fertility behaviour.

The decomposition analysis revealed that at the national level, TFR declined from 2.4 in 2011 to 2.0 in 2020, primarily due to reductions in PMW. Although marital fertility contributed to a potential increase in fertility, the dominant effect of reduced marriage proportions led to an overall fertility decline. In states like Maharashtra and West Bengal, marital fertility exerted upward pressure on fertility, but the decline in PMW outweighed this effect. Kerala experienced minimal impact from marital fertility, with reductions in marriage proportions being the primary driver of fertility decline.

These findings suggest that the fertility transition in India is being shaped by structural and behavioural shifts. Delayed marriages, driven by higher educational aspirations and economic security concerns, are emerging as key determinants of fertility decline. Future research should examine the long-term implications of these changes, particularly on workforce composition, population ageing, and policy responses aimed at addressing demographic shifts.

## Conclusion

The findings of this study underscore the central role of marriage patterns in shaping fertility trends in India. The decreasing proportion of married women, particularly among younger cohorts, is the most significant factor driving the decline in fertility rates, while the modest rise in marital fertility in some states reflects evolving reproductive behaviours in the context of delayed marriages and changing social norms. These results highlight the importance of addressing factors influencing marriage patterns, such as education, economic opportunity, and changing cultural norms, as they play a crucial role in the future trajectory of fertility in India.

### Strengths and Limitations

This study represents the first attempt to decompose India's Total Fertility Rate (TFR) and analyze the relative contributions of changes in marriage proportions and marital fertility rates. A key strength of this study is its use of decomposition analysis, which allows for a clearer understanding of the underlying demographic processes driving fertility decline. Additionally, the study leverages nationally representative data, ensuring the broad applicability of findings to policy discussions and demographic projections.

However, some limitations must be acknowledged. First, while the study identifies key demographic shifts, it does not account for the potential role of unobserved factors such as contraceptive use, urbanization, and policy interventions that may influence fertility patterns. Second, the decomposition method captures only aggregate trends and does not fully disentangle the interactions between socioeconomic variables and fertility behaviour. Finally, while the study highlights variations across six Indian states, it does not cover all states in the country. A more comprehensive analysis including all states would provide a fuller understanding of the diverse fertility trends and the specific policy needs across India.

### Declaration of Competing Interests

None of the writers disclosed any conflicts of interest.

### Funding

This research did not receive any particular grant from a public, private, or nonprofit organization.

### Acknowledgement

Not applicable.

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