



Demographic Transition of India: Trends and Future Population Projections

Dr. Asaram S. Jadhav,

Associate Professor, Department of Geography, Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati (Affiliated to Savitribai Phule Pune University M. No. 7058085930 E-mail: asaramsjadhav@gmail.com)

Abstract:

The demographic transition in India reflects a complex and multi-phased transformation influenced by historical, social, economic, and policy-driven factors. This paper applies the **Demographic Transition Model (DTM)** to analyze India's population dynamics from 1901 to 2101, highlighting shifts in birth and death rates, population growth, and fertility trends. India's demographic journey can be categorized into five stages—from the pre-modern regime characterized by high mortality and fertility rates to a projected phase of population stabilization and eventual decline. Using historical census data and projection models, the study examines national trends alongside state-level variations, demonstrating how regional socio-economic disparities shape differential demographic trajectories. Southern states like Kerala and Tamil Nadu have achieved advanced stages of transition, while northern states such as Bihar and Uttar Pradesh remain in earlier phases. The analysis also explores the socio-economic implications of India's demographic future, including aging populations, shrinking fertility, and the policy challenges of managing both population growth and decline. By integrating demographic data, projection methods, and regional analysis, this paper provides a comprehensive understanding of India's demographic transformation and its future population landscape.

Keywords: Demographic Transition Model (DTM), Population Dynamics, Fertility and Mortality Trends, Population Projection, Socio-Economic Development, Urbanization etc.

Introduction:

The Demographic Transition Model (DTM) is a conceptual framework used to understand the historical and projected population trends of countries or regions as they undergo economic and social development. It describes a series of stages through which societies progress in terms of birth rates, death rates, and population growth rates.

Literature Review:

The **Demographic Transition Model (DTM)** is a foundational framework that explains how societies evolve from high to low birth and death rates as they develop economically and socially. Initially formulated based on Western European experiences, it has been refined and critiqued over time. Early scholars such as **Kingsley Davis** (1945) and **Ansley Coale** (1973) emphasized modernization, urbanization, and fertility control as primary drivers of demographic transition. Later, **John Caldwell** (1976) proposed the *Wealth Flows Theory*, highlighting shifts in family structures and economic incentives as key to fertility decline.

Subsequent research expanded the model's scope by examining cultural, institutional, and ecological influences. For example, **Leete and Alam** (1993) underscored the role of state policies and family planning

initiatives, while **Wolfgang Lutz** and **Qiang Ren** (2002) drew attention to environmental constraints and sustainability.

Application of the DTM to non-Western countries reveals significant regional variations. In East Asia, fertility decline was accelerated by rapid industrialization and state policies, as seen in China's one-child policy. In South Asia, particularly India, demographic transition is uneven: southern states such as Kerala and Tamil Nadu have advanced due to high literacy, better healthcare, and family planning, whereas northern states like Bihar and Uttar Pradesh remain in early stages due to socio-economic disparities (**Dyson & Moore, 1983; Guilmoto & Rajan, 2001**). Similar deviations are found in Sub-Saharan Africa and Latin America, where cultural norms, inequality, and policy effectiveness shape fertility trends (**Bongaarts, 1997; Caldwell & Caldwell, 1990**).

Overall, the literature demonstrates both the universality and contextual limitations of the DTM, emphasizing the need for region-specific approaches to understanding demographic change.

Aims and Objectives:

- 1) To predict the future population size and composition of India using demographic data and trends.
- 2) To provide insights into how India's population has evolved and may change in the future.

Hypotheses of the Study

This study is guided by the following hypotheses, which aim to explain the observed and projected trends within the framework of India's demographic transition:

1. The death rate in India will remain stable at approximately 9 per thousand population in the future (Report of United Nations Department of Economic and Social Affairs (UN DESA)).

This is based on the assumption that while medical advancements and improved living conditions will continue to reduce mortality from infectious diseases, the growing share of elderly population will offset any further sharp declines in the overall death rate, leading to a long-term stabilization.

2. The birth rate in India will continue to decline due to delayed pregnancy and postponed childbearing.

An increasing number of individuals, especially women, are prioritizing higher education and career stability, resulting in later marriages and delayed decisions about starting families. This delay contributes significantly to the ongoing fertility decline.

3. There is a decreasing economic dependency on children in old age.

Traditional motivations for having more children—as a means of financial and social support in old age—are weakening due to improved access to pensions, health insurance, and institutional elder care, particularly in urban areas. This shift reduces the perceived need for larger families.

4. The rising cost of raising children is contributing to lower fertility preferences.

As families invest more in each child's education, healthcare, and quality of life, the financial burden increases. This compels many parents to opt for smaller families to maintain economic stability and provide better opportunities for fewer children.

These hypotheses reflect the socio-economic and cultural factors driving India's transition from high to low fertility and mortality, and help contextualize its future demographic trajectory.

Study Area:

India, located in South Asia, has a vast geographical extent covering 32,87,263 square kilo meters. It extends from latitudes 8°4'N to 37°6'N and longitudes 68°7'E to 97°25'E.

India's diverse geographical features include the towering Himalayan Mountain range in the north, fertile plains along the Ganges and other river systems, the Thar Desert in the northwest, the Western and Eastern Ghats along the coasts, and the lush forests of the Western Ghats, among others. These geographical features contribute to India's rich biodiversity and varied climate zones, supporting diverse ecosystems and human habitats.

Methodology:

To apply the Demographic Transition Model (DTM) and predict the future population of India, we can follow a methodology that involves several steps:

- **Data Collection:** Demographic data from various sources such as national censuses, surveys, and reports. This data should include information on birth rates, death rates, population size, age structure, fertility rates, migration patterns, and other relevant demographic indicators.
- **Demographic Transition Analysis:** Analyse the collected data to assess India's current stage in the demographic transition. Determine the trends in birth rates, death rates, and population growth over time to understand how India's demographic landscape has evolved.
- **Projection Model Selection:** Select an appropriate population projection model to forecast future population trends. Commonly used models include the correlation regression method, the exponential growth model, and more sophisticated models like the United Nations' World Population Prospects (WPP) model. We use correlation regression method to predict the birthrate, death rate and population.
- **Parameter Estimation:** Estimate key parameters such as fertility rates, mortality rates, and migration rates based on historical data and expert analysis. These parameters will serve as inputs to the population projection model.
- **Population Projection:** Use the selected population projection model to forecast future population trends for India. This involves applying the estimated parameters to the model and generating population projections for different time horizons (e.g., 5-year, 10-year, or 20-year projections). I have projected census year (10 years interval) data related to population.
- **Sensitivity Analysis:** Conduct sensitivity analysis to assess the impact of variations in key parameters on population projections. This helps identify uncertainties and potential scenarios that may influence future population trends.
- **Interpretation and Policy Implications:** Interpret the projected population trends in the context of India's socio-economic development, urbanization, healthcare infrastructure, and other relevant factors. Identify potential policy implications and interventions to address challenges or leverage opportunities arising from future demographic changes.
- **Validation and Refinement:** Validate the population projections against historical data and refine the model as needed to improve accuracy and reliability.

By following this methodology, apply the Demographic Transition Model to India and generate informed predictions about its future population dynamics.

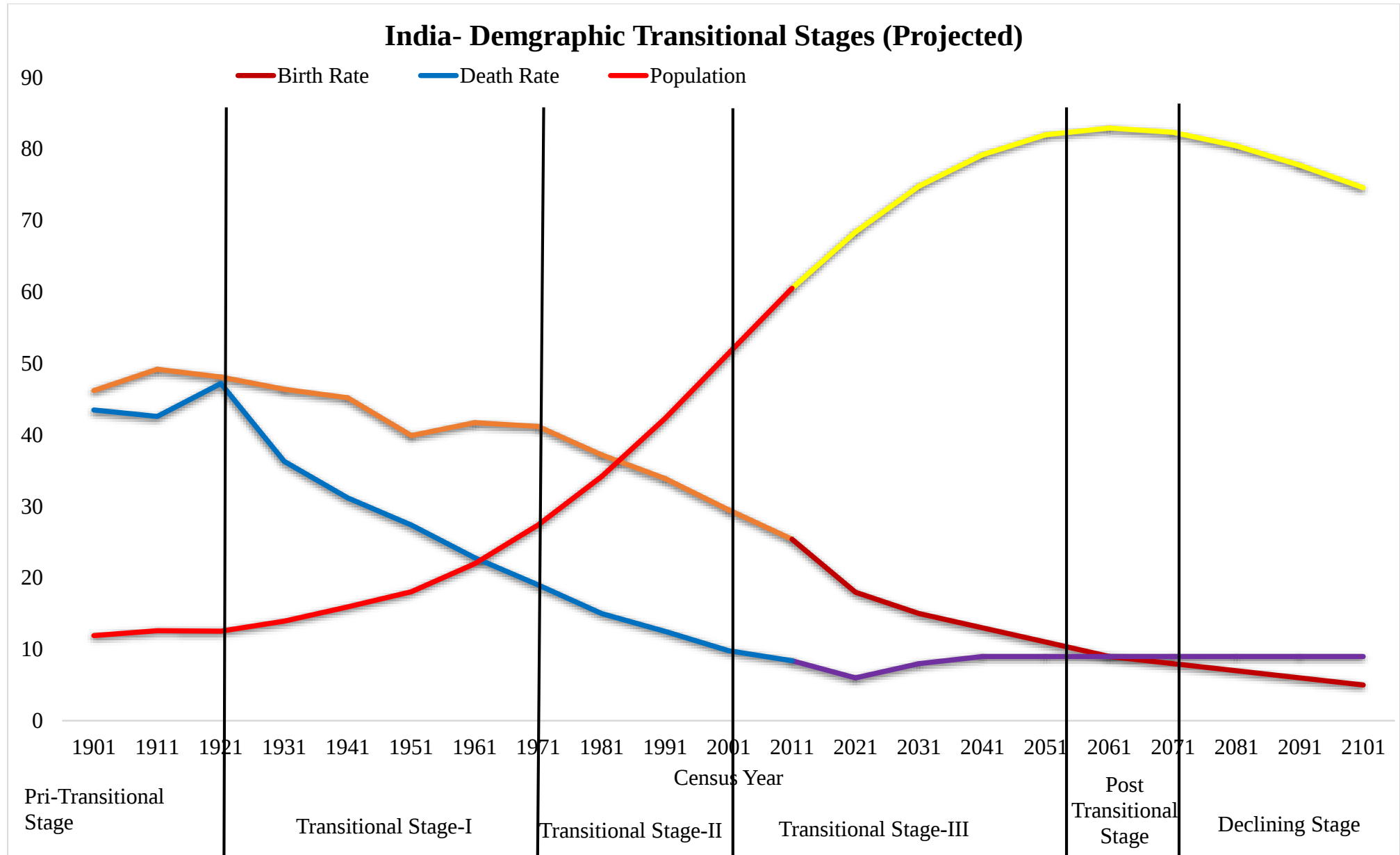
Analysis

Birth rate Death rate and Population (actual and projected) of India (Source: Census of India)

Census Year	Birth Rate	Death Rate	Population (in Million)
1901	46.2	43.5	238
1911	49.2	42.6	252
1921	48.1	47.2	251
1931	46.4	36.3	278
1941	45.2	31.2	318.6
1951	39.9	27.4	361

1961	41.7	22.8	439.2
1971	41.2	19	548.1
1981	37.2	15	683.3
1991	33.9	12.5	846.4
2001	29.5	9.8	1028.7
2011	25.4	8.4	1210.6
2021	18	6	1368
2031	15	8	1496
2041	13	9	1584
2051	11	9	1640
2061	9	9	1659
2071	8	9	1647
2081	7	9	1609
2091	6	9	1555
2101	5	9	1492





India's journey through the various stages of demographic transition has been influenced by a complex interplay of historical, social, economic, and technological factors. From high birth and death rates in the early 20th century to the gradual decline in fertility and mortality in the latter half, the demographic changes have had a profound impact on the country's population growth and structure.

The transition in India can be categorized into five key stages, each representing a different phase in population dynamics—starting from the pre-modern demographic regime characterized by high mortality and fertility, to the current and projected phases marked by declining growth, fertility stabilization, and eventual population decline.

Using key indicators such as **birth rate, death rate, and total population** over time, the demographic evolution of India provides valuable insights into the country's development path, healthcare progress, and socio-economic transformation.

Pre-Primary Stage (Before 1921)

In the early 20th century, India remained entrenched in the pre-primary stage of demographic transition, a period marked by extremely high birth and death rates. In 1901, the birth rate was 46.2 per thousand, while the death rate was nearly as high at 43.5 per thousand. This resulted in negligible population growth, with the population only reaching 238 million. Life was harsh and survival uncertain due to frequent famines, epidemics such as plague and influenza, lack of modern medicine, and poor sanitation. The healthcare infrastructure was nearly non-existent, and mortality among infants and children was alarmingly high. Even though the birth rate saw a marginal increase in the following decade, reaching 49.2 in 1911, the death rate also remained high at 42.6. By 1921, India faced the devastating influenza pandemic, leading to the highest recorded death rate of 47.2 per thousand and causing a rare population decline. The total population stagnated at around 251 million. This period is historically known as the "Period of Stagnant Population" or the "Year of Great Divide," marking a crucial demographic turning point in India's history.

Early Transitional Stage (1921–1971)

The early transitional stage began after 1921, marking the onset of significant demographic change. Mortality rates began to decline steadily due to the introduction of rudimentary healthcare systems, control of major epidemics, improved public sanitation, and the gradual spread of vaccinations. In 1931, the death rate dropped to 36.3, and by 1971, it had fallen further to 19 per thousand. During this time, the birth rate, although beginning to decline slowly, remained high—reducing from 46.4 in 1931 to 41.2 in 1971. The persistent gap between the high birth rate and the declining death rate led to rapid population growth. India's population increased from 278 million in 1931 to over 548 million in 1971. The government began to take note of this explosive growth and initiated family planning programs, but social norms, illiteracy, and limited access to contraception slowed their adoption. Nonetheless, the fall in death rates was a significant demographic achievement, signalling improvements in living conditions, though the country was still far from stabilizing its population.

Late Transitional Stage (1971–2031)

From the 1970s onward, India entered the late transitional stage, marked by a sharper and more sustained decline in both birth and death rates. The success of family planning campaigns, increased urbanization, greater literacy (especially among women), and changing societal attitudes toward family size contributed to a consistent fall in fertility rates. The birth rate fell from 41.2 in 1971 to 15 per thousand in 2031 (projected). Meanwhile, the death rate also declined, reaching as low as 6 per thousand by 2021 before slightly increasing to 8 in 2031. During this period, population growth remained positive but started to decelerate, moving from 548 million in 1971 to a projected 1.496 billion by 2031. Improved healthcare services, expanded access to education, delayed marriages, and rising economic aspirations all played a crucial role in reducing fertility. India also witnessed a demographic dividend during this stage, as a large segment of the population entered the working-age group, offering potential economic advantages. However, regional disparities in fertility and mortality persisted, reflecting uneven development across states.

Post-Transitional Stage (2031–2061)

After 2031, India is projected to enter the post-transitional stage of demographic evolution, where birth and death rates converge and remain low. By 2041, the birth rate is expected to fall to 13 per thousand, with the death rate slightly higher at 9 per thousand. These rates remain constant through 2061, stabilizing population growth. The country's population is projected to peak at around 1.64 billion in 2051 and remain relatively steady afterward. This phase signals a maturing demographic profile characterized by lower fertility, longer life expectancy, and an increasing proportion of the elderly. The effects of urban lifestyle, career-oriented choices, and economic pressures are expected to keep fertility rates below replacement level. With continued access to education and healthcare, small family norms become almost universal. The challenge during this stage will shift from controlling growth to managing aging, healthcare infrastructure, and ensuring social security for an expanding elderly population.

Declining Stage (2061–2101)

By 2061, India is anticipated to enter the declining stage of the demographic transition. Here, the birth rate will fall below the death rate for the first time, resulting in a natural decrease in population. The birth rate is expected to reduce from 9 per thousand in 2061 to just 5 per thousand by 2101, while the death rate stabilizes at around 9 per thousand throughout. Consequently, the population is projected to decrease from 1.659 billion in 2061 to approximately 1.492 billion in 2101. This demographic shift will introduce new socio-economic challenges. The working-age population will shrink, dependency ratios will rise, and there will be increasing pressure on pensions, healthcare, and aged care systems. Policymakers may need to implement measures such as promoting higher fertility, encouraging immigration, or restructuring the workforce to adapt to an aging society. While India's earlier stages were defined by how to manage growth, this stage will require thoughtful planning to maintain social and economic balance amid demographic decline.

Conclusion

The demographic transition model (DTM) serves as a powerful analytical framework to understand the shifting population patterns across India and its diverse states. This research, using historical and projected birth and death rate data, reveals a broad yet nuanced picture of how demographic transitions unfold in the Indian context.

India as a whole has clearly traversed from the **Pre-Primary Stage**, characterized by extremely high birth and death rates with stagnant population growth, into the **Late Transitional Stage**, marked by steadily declining fertility, improved health outcomes, and a gradual movement toward population stabilization. The research reveals that by 2021, the birth rate had dropped from over 46 in 1901 to 18, while the death rate fell from 43.5 to 6, indicating major improvements in public health, food security, and social development. The population swelled from 238 million in 1901 to over 1.36 billion in 2021, reflecting the explosive growth during the early and late transitional phases.

The study also forecasts that **India is likely to enter the declining stage of population growth after 2061**, when the birth rate is projected to fall below the death rate. The national birth rate is expected to reach as low as 5 by 2101, while the death rate may remain around 9. This demographic inversion may lead to **natural population decline**, posing significant socio-economic challenges such as labour shortages, elder care demands, rising dependency ratios, and the need for sustainable economic strategies.

Reference:

- Bongaarts, J. (1997). *Trends in fertility and mortality in developing countries*.
- Caldwell, J. C. (1976). Toward a restatement of demographic transition theory. *Population and Development Review*, 2(3–4), 321–366.
- Caldwell, J. C., & Caldwell, P. (1990). High fertility in Sub-Saharan Africa. *Scientific American*, 262(5), 118–125.

- Coale, A. J. (1973). The demographic transition reconsidered. *International Population Conference*.
- Davis, K. (1945). The world demographic transition. *Annals of the American Academy of Political and Social Science*, 237, 1–11.
- Dyson, T., & Moore, M. (1983). On kinship structure, female autonomy, and demographic behavior in India. *Population and Development Review*, 9(1), 35–60.
- Guilmoto, C. Z., & Rajan, S. I. (2001). Spatial patterns of fertility transition in Indian districts. *Population and Development Review*, 27(4), 713–738.
- Leete, R., & Alam, I. (1993). *The revolution in Asian fertility: Dimensions, causes, and implications*. Clarendon Press.
- Lutz, W., & Qiang, R. (2002). Determinants of human population growth. *Philosophical Transactions of the Royal Society B*, 357(1425), 1197–1210.

