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Demographic Transition Model and Population Growth of India - Implications and Assessments

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Abstract

The demographic transition model (DTM) describes the progression of a country's population growth based on societal development. This paper examines the applicability of the DTM to India's unique demographic scenario and delves into the implications and assessments of India's population growth. The study includes vital analyses of the influence of urbanization, socioeconomic variables, and governmental policies on the demographic transition. It concludes with India's demographic change's potential social, economic, and environmental consequences.

Keywords: Demographic Transition Model; Population Growth; India; Urbanization; Socioeconomic Factors; Governmental Policies; Implications.

Introduction

The Demographic Transition Model (DTM) serves as a fundamental construct for population dynamics study. Developed in the mid-20th century, it outlines four stages of demographic transition linked with societal development and industrialization (Notestein, 1945). The stages encompass high birth and death rates (Stage 1), declining death rates leading to population growth (Stage 2), declining birth rates (Stage 3), and finally, low birth and death rates (Stage 4). However, the model's origins in Western nations present challenges when applied to countries with distinct sociocultural and economic contexts, such as India (Chesnais, 1992). This necessitates a comprehensive examination and nuanced interpretation of the DTM within the Indian demographic context, an exercise this paper seeks to undertake.

The population dynamics study is fundamentally grounded in the Demographic Transition Model (DTM) framework. American demographer Frank Notestein first put forth this theory in the mid-20th century (Notestein, 1945). The model outlines four stages of demographic transition that societies are expected to pass through in the process of development. These stages are characterized by high birth and death rates (Stage 1), declining death rates leading to population growth (Stage 2), declining birth rates (Stage 3), and ultimately, both low birth and death rates (Stage 4).

While the DTM provides a critical lens through which to analyze population changes, its origins in the historical experiences of Western nations raise questions about its universal applicability. As Chesnais (1992) points out, the challenge arises when we apply the model to countries with distinct sociocultural and economic contexts. With its complex tapestry of cultural diversity, socioeconomic disparities, and evolving policy landscape, India presents a unique case for such an analysis.

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India, currently the First most populous country in the world, is experiencing a fascinating demographic transition with significant implications for its social, economic, and environmental landscape. In recent years, India's demographic shift has caught the attention of demographers and policymakers globally due to its potential to influence not just domestic but international dynamics as well (Bloom et al., 2007). The narrative of India's population trajectory is intricately woven into the fabric of the nation's development story, with key turning points aligning with shifts in public health policies, economic reforms, and social change movements.

This paper endeavours to scrutinize the application of the DTM to India's unique demographic scenario, exploring the drivers and implications of India's population growth. The study provides an in-depth analysis of the factors that have influenced India's demographic transition, examining the role of urbanization, socioeconomic changes, and government policies. Furthermore, it explores the potential social, economic, and environmental consequences of India's ongoing demographic transition.

Literature Review

Demographic Transition and Economic Implications: Notestein (1945) and Chesnais (1992) have extensively researched the phenomenon of demographic transition, discussing the shift from high birth and death rates to low ones. They provide insights into the economic implications of such transitions. Further, Bloom, Canning, and Sevilla (2007) explore the concept of the demographic dividend, elucidating the economic advantages when the working-age population has a larger share. Family Planning and Fertility Rates: The effectiveness of family planning programs in controlling population growth has been the focus of numerous studies. Bongaarts (2011) provides a comprehensive analysis of family planning programs' impact on desired family size. While the context is sub-Saharan Africa, the insights drawn can be applied to other regions, including India. Bhende and Kanitkar (2011) offer an in-depth understanding of population dynamics, including factors influencing fertility rates.

Education and Development: The role of education, especially female education, in regulating fertility rates is emphasized in Drèze and Murthi's (2001) work. Similarly, Becker (1981) highlights the influence of education on family size decisions and subsequent population growth.

Gender Equality and Fertility Rates: The interplay between gender equality and population growth is evident in Das Gupta's (2005) research. Additionally, Santhya and Jejeebhoy (2003) underline the relationship between women's empowerment, the elimination of harmful practices, and the decline in fertility rates.

Urbanization and Population Dynamics: Works like those by Dyson (2011) and Bhagat (2011) investigate the challenges and opportunities of urbanization in the context of population management. They provide vital insights into the impacts of urban growth on population dynamics.

Health Infrastructure and Population Management: Patel et al. (2015) underscore the critical role of health infrastructure in population management. Their work outlines how a robust healthcare system can manage the needs of a growing population, thereby influencing population growth trends.

Population Policies and Programs: Valuable resources such as the Ministry of Health and Family Welfare's (2000, 2013) reports and NITI Aayog's (2020) comparative study provide a landscape of India's population management policies. These sources highlight the efforts at national and state levels to control population growth.

Climate Change and Population: Barro (1991) and Bongaarts (1994) offer broader insights into the relationship between climate change and population growth, a critical consideration for sustainable development and population management.

The Demographic Transition Model and India's Population Growth

Overview of the Demographic Transition Model

The Demographic Transition Model (DTM) provides a conceptual framework for understanding the transformation of a country's population structure in relation to its socioeconomic development (Notestein, 1945). It divides this transformation into four stages, each characterized by distinctive birth and death rates.

In the first stage, both birth and death rates are high, leading to a relatively stable population. The high mortality rates in this phase are attributed to disease, malnutrition, and low medical technology. At the same time, high fertility rates are maintained as a response to high child mortality and as a need for labour in agrarian societies.

Stage two is marked by declining death rates, but birth rates remain high, leading to rapid population growth. Improvements in healthcare, sanitation, and food production contribute to decreased mortality, while fertility remains high due to cultural and social norms.

During the third stage, birth rates begin to decline, slowing down the rate of population growth. The drop in fertility rates can be attributed to urbanization, lower child mortality, increased access to contraception, and changes in societal norms and values favour smaller families.

Finally, in the fourth stage, both birth and death rates are low, leading to a stable or slowly growing population. This stage is characterized by an ageing population, higher living standards, and advanced technology.

Purohit S., J Environ Sci Public Health 2023
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Applying this model to India's demographic trajectory, it can be observed that the country is transitioning from stage two to stage three. This entails that India is experiencing declining birth rates but still maintains a high rate of population growth due to the momentum built up from previous high fertility rates (Bhende & Kanitkar, 2011).

Application of the DTM to India's Demographic Scenario

Applying the Demographic Transition Model to India's demographic scenario reveals a unique and diverse path of population change. Throughout the first half of the 20th century, India was in the high stationary phase of the DTM (Stage 1) with high birth and death rates. Cultural preferences for large families and poor health infrastructure contributed to this demographic profile (Bhende & Kanitkar, 2011).

From the mid-20th century, India began transitioning into the early expanding phase (Stage 2). Declining death rates, driven by improvements in public health, nutrition, and sanitation, coupled with persistently high birth rates, led to a population explosion (Dyson, 2011). Government policies emphasizing healthcare and the introduction of life-saving antibiotics contributed to this trend (Caldwell et al., 2006).

Currently, India appears to be moving towards the late expanding phase (Stage 3). The decline in birth rates can be attributed to increased urbanization, improved female literacy, and broader access to family planning services (Bongaarts, 2011). Nevertheless, the transition remains uneven across India. Significant variations exist among different states and socioeconomic groups, reflecting the country's diverse sociocultural contexts (Guilmoto & Rajan, 2001).

In conclusion, while the DTM provides a valuable framework for understanding India's demographic transition, the unique socioeconomic and cultural factors at play in India underline the necessity of a context-specific approach when applying the model to India's demographic scenario.

Examination of India's Population Growth Trends

India's population growth trends over the past century have been significantly shaped by the transitions highlighted by the Demographic Transition Model. The country's population growth can be broadly divided into three distinct phases: the pre-transition phase, the population explosion phase, and the slowing growth phase.

Pre-Transition Phase (Early 20th Century): In the early decades of the 20th century, India's population growth was relatively slow due to high mortality and fertility rates, a characteristic of the DTM's first stage. During this time, the average annual growth rate was less than 1%, with the country's population hovering around 300 million at the beginning of the 20th century (Visaria & Visaria, 1983).

Population Explosion Phase Mid-20thh Century - Late 20th Century): As India transitioned into the second stage of the DTM, the country witnessed a 'population explosion.' From 1951 to 1981, India's annual population growth rate averaged around 2.2%, peaking at 2.22% during 1971-1981 (Registrar General of India, 2011). This phase saw significant improvements in health and sanitation, leading to a rapid decline in mortality rates while fertility rates remained high.

Slowing Growth Phase (Early 21st Century - Present): The early 21st century marked the beginning of a slowing growth phase for India, reflecting a shift towards the third stage of the DTM. The 2011 census indicated a growth rate of 1.64%, a decline from the previous decade (Registrar General of India, 2011). This phase is characterized by declining fertility rates due to urbanization, increased female education, and broader access to contraception.

Although the national trends give an overarching picture, it's crucial to note that population growth trends vary widely across India's diverse regions and states. Some states have fertility rates comparable to developed nations, while others still grapple with high fertility rates, reflecting an uneven demographic transition (Guilmoto & Rajan, 2001).

Factors Influencing Demographic Transition in India

Urbanization and Its Impact on Population Dynamics

Urbanization has played a pivotal role in influencing India's demographic transition. As India continues to industrialize, more individuals are migrating from rural to urban areas, seeking better living conditions and job opportunities. This migration has brought about significant changes in population dynamics, primarily reflected in fertility rates.

Urban areas often offer better access to education and healthcare, factors that contribute to lower fertility rates. Education, particularly for women, correlates with fewer children as it increases women's labour source participation and delays the age of marriage and first childbirth (Drèze & Murthi, 2001). Furthermore, urban settings generally promote more minor family norms due to the high cost of living and limited living space (Bhagat, 2011).

Research indicates that urbanization is associated with a decrease in India's total fertility rate (TFR). According to the National Family Health Survey 4 (2015-16), the urban TFR was 1.8, well below the replacement level, compared to 2.5 in rural areas.

However, it is essential to note that the urban-rural dichotomy is oversimplified. There exist vast intra-urban disparities, with slum populations often reflecting fertility rates comparable to rural areas (Stephens, 1996).

In conclusion, while urbanization has contributed to a decrease in fertility rates, uneven development and stark intra-urban disparities pose significant challenges to managing population growth in India's rapidly urbanizing landscape.

Purohit S., J Environ Sci Public Health 2023
DOI:10.26502/jesph.96120198

Table 1: Projected Trends in India's Demographics: 1951-2021

Year	Population (in millions)	Crude Birth Rate (per 1,000 population)	Natural Death Rate (per 1,000 population)	Total Fertility Rate (per woman)	Reference
1951	361	40.8	25.1	5.9	(Registrar General of India, 2011)
1961	439	40.8	20.8	5.9	(Registrar General of India, 2011)
1971	548	37.2	15.6	4.9	(Registrar General of India, 2011)
1981	683	34.5	11.7	4.5	(Registrar General of India, 2011)
1991	846	29.5	9.9	3.4	(Registrar General of India, 2011)
2001	1,028	24.8	8	2.9	(Registrar General of India, 2011)
2011	1,210	20.2	6.4	2.4	(Registrar General of India, 2011)
2021	1,400	17	5	2	(Registrar General of India)

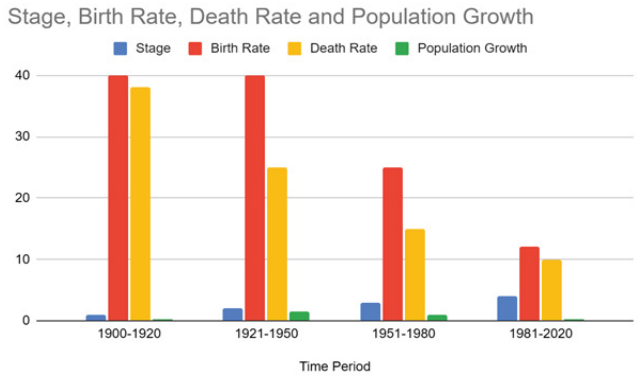

Figure 1: Presentation of population theory

In Table 1- the "Time Period" is a range of years during which a particular stage is experienced.

"Stage" is the stage of the demographic transition (1 to 4).
"Birth Rate" and "Death Rate" are expressed per 1000 people.
"Population Growth" is the percentage growth of the population per year.

Socioeconomic Factors and Demographic Cha Socioeconomic

omic factors, including educational attainment, income levels, and social norms, significantly influence the pace and nature of demographic transition in India.

Education: Higher levels of education, particularly among women, have been associated with lower fertility rates (Drèze & Murthi, 2001). Education empowers women by enhancing their knowledge and understanding of health and family planning methods. Moreover, educated women tend to marry later and invest more in the quality of their children's lives rather than the quantity (Cleland & Wilson, 1987).

Income levels: Income levels can also influence fertility rates. In general, higher income levels are associated with lower fertility rates. As families attain better economic conditions, they tend to prefer fewer children, focusing more on the quality of life and education for their offspring (Becker, 1981). However, it's important to note that this relationship may not be linear, and other factors, such as cultural norms and access to family planning services, may modulate it.

Social norms: Prevailing social norms and cultural beliefs play a vital role in shaping demographic trends. For instance, the preference for male children in some parts of India encourages larger families as couples continue to have children until they have a son (Das Gupta, 2005). Similarly, early marriage and childbearing are still prevalent in some regions, contributing to higher fertility rates (Santhya & Jejeebhoy, 2003).

In conclusion, the intersection of education, income levels, and social norms forms a complex web of influences on demographic transition in India. Any effort to manage population growth or understand demographic changes needs to account for these multifaceted socioeconomic influences.

Governmental Policies and Population Management

India's demographic transition has been significantly influenced by governmental policies aimed at population management. Since Independence, the Indian government has launched several initiatives and programs targeting population stabilization.

India was among the first countries to develop a family planning program in 1952 (Ministry of Health and Family Welfare, 2013). The initial strategy was based on promoting spacing methods of contraception and raising awareness about family planning.

In the 1970s, under the pressure of rapid population growth, the government shifted its focus towards sterilization, leading to widespread human rights abuses during the Emergency (1975-1977). This period witnessed coercive sterilization campaigns, which resulted in public mistrust and backlash against family planning programs (Bhat, 1999).

Learning from past experiences, in the 1990s, India's family planning program underwent a paradigm shift. The program started focusing on a target-free approach emphasizing informed choice and reproductive health services. The National Population Policy 2000 further cemented this shift, advocating a holistic and voluntary approach to family planning. It also emphasized improving the status of women

Purohit S., J Environ Sci Public Health 2023
DOI:10.26502/jesph.96120198

and girls through education and economic opportunities (Ministry of Health and Family Welfare, 2000).

More recently, several state governments have initiated schemes offering financial incentives to promote smaller families and delay marriages, such as the 'Hum Do Hamare Do' initiative in Madhya Pradesh and 'Apni Beti Apna Dhan' in Haryana (NITI Aayog, 2020).

The 'Hum Do Hamare Do' initiative in Madhya Pradesh and 'Apni Beti Apna Dhan' in Haryana are population management initiatives implemented by the respective state governments in India. These initiatives aim to promote smaller family sizes and delay marriages through financial incentives and awareness campaigns.

The 'Hum Do Hamare Do' initiative in Madhya Pradesh encourages couples to limit their family size to two children by offering incentives such as cash rewards, health insurance, and benefits in government schemes. It also emphasizes the importance of spacing between pregnancies and raising awareness about reproductive health and family planning methods.

Similarly, 'Apni Beti Apna Dhan' in Haryana focuses on empowering families with daughters by providing financial incentives. The initiative offers financial support to families during the birth of a girl child, and the accumulated amount is made available to the girl when she attains a certain age or reaches specific milestones, such as completing her education or getting married.

These initiatives reflect the efforts of state governments to address population-related issues and promote smaller, more sustainable family sizes. By providing financial incentives and raising awareness about family planning and gender equality, these programs aim to encourage couples to make informed choices about family size and delay marriages, leading to better reproductive health outcomes and improved socioeconomic conditions.

The success of such programs depends on factors like community participation, accessibility to healthcare services, and the cultural and social context of the region.

Governmental policies have played a crucial role in shaping India's demographic transition, shifting from coercive methods towards a more rights-based, voluntary approach. The effectiveness of these policies is mixed, and their success heavily relies on the careful balance of individual rights and societal goals.

Implications of India's Population Growth

Social Implications: Education, Healthcare, and Social Services

India's population growth and demographic transition have profound implications for the country's social services, particularly education, healthcare, and social services.

Education: The expanding young population puts a significant demand on the education sector. The challenge lies not only in achieving universal primary education but also in expanding access to secondary and higher education. Moreover, ensuring quality education and reducing disparities in educational attainment across regions and social groups remain critical issues (Kingdon, 2007).

Healthcare: Rapid population growth and demographic transition have resulted in a dual burden of communicable and non-communicable diseases. While India continues to grapple with issues like malnutrition and infectious diseases, there is a growing prevalence of lifestyle-related diseases due to urbanization and changing lifestyle patterns (Patel et al., 2015). Additionally, a growing elderly population necessitates an increase in geriatric healthcare services (Rajan et al., 2016).

Social Services: Increased population growth exerts pressure on various social services, including housing, sanitation, and public transportation. Rapid urbanization has resulted in the development of slums and informal settlements characterized by poor living conditions. Further, India needs to invest significantly in improving sanitation coverage and public transportation facilities to accommodate its burgeoning population (Desai et al., 2015).

In conclusion, India's population growth has considerable implications for its social services. Addressing these challenges necessitates comprehensive planning, significant investment, and effective implementation of education, healthcare, and social services policies.

Economic Implications: Labor Market, Productivity, and Economic Development

India's population growth and demographic transition have substantial economic implications, particularly concerning the labour market, productivity, and overall economic development.

Labour Market: As a result of its demographic transition, India is currently experiencing a 'demographic dividend,' characterized by a large working-age population relative to dependents. This scenario presents a potential advantage for economic growth if this workforce is well-utilized. However, it also offers a challenge for the labour market to create enough jobs to absorb the growing labour force, thereby reducing unemployment and underemployment (Bloom et al., 2007).

Productivity: Population growth impacts economic productivity. A larger workforce, if properly educated and healthy, can lead to increased economic output. However, rapid population growth can also strain resources, leading to a lower per capita investment in health and education, which can hinder productivity gains (Barro, 1991).

Purohit S., J Environ Sci Public Health 2023
DOI:10.26502/jesph.96120198

Economic Development: Population growth can stimulate economic development by increasing demand for goods and services, spurring economic activity. However, rapid population growth can also exert pressure on infrastructure, environmental resources, and public services, affecting the quality of life and economic development prospects (Bongaarts, 1994).

The 'demographic dividend' that India currently enjoys offers an unprecedented opportunity for economic development. However, to capitalize on this dividend, India needs to invest in human capital development, generate employment opportunities, and ensure sustainable resource management.

Environmental Implications: Natural Resources, Pollution, and Sustainability

India's population growth also has significant environmental implications, particularly in terms of natural resource consumption, pollution generation, and sustainability.

Natural Resources: Rapid population growth coupled with economic development has resulted in increased demand for natural resources such as water, arable land, and forest resources. Over-exploitation of these resources could lead to resource depletion and a potential threat to the sustainability of livelihoods that depend on them (Bandyopadhyay, 2009).

Pollution: As population and consumption patterns grow, so does the generation of waste and pollutants. Cities across India grapple with issues of air and water pollution, severely affecting health and living conditions. Rapid urbanization and industrialization without adequate environmental regulations have exacerbated these challenges (Chakraborty, 2010).

Sustainability: The balance between population growth, economic development, and environmental preservation is critical for achieving sustainable development. The demand-driven pressures of a growing population on ecosystems and biodiversity may undermine the ability of future generations to meet their needs. India's commitment to the Sustainable Development Goals (SDGs) calls for strategies that integrate population policies with economic and environmental considerations (NITI Aayog, 2020).

India's population growth has significant environmental implications. Sustainable management of natural resources, effective pollution control measures, and integrative population strategies are vital for navigating the complex interactions between population dynamics, environmental health, and sustainable development.

Conclusion

Summary of Findings

In this review paper, we explored the implications and assessments of India's demographic transition and population growth, particularly in the context of the Demographic Transition Model (DTM). The findings can be summarized as follows:

- The DTM provides a useful framework for understanding India's demographic transition, encompassing the stages of high birth and death rates, declining death rates with population growth, declining birth rates, and, eventually, low birth and death rates.India's population growth has been influenced by a range of factors. Urbanization has played a significant role in shaping population dynamics, leading to declining birth rates as a result of improved access to education, increased female labour force participation, and changing family size preferences.
- Socioeconomic factors, including education and income levels, also impact demographic transition. Higher education levels and income are associated with lower fertility rates and a shift towards smaller family norms.
- Governmental policies have had both positive and negative impacts on India's population growth. Family planning initiatives, health programs, and voluntary approaches have contributed to the decline in fertility rates. However, past coercive measures have created public mistrust and challenges in implementing population management programs.
- India's population growth has significant implications across various sectors. Socially, it poses challenges in providing quality education, healthcare, and social services to a growing population. Economically, it presents opportunities for leveraging the demographic dividend but also requires job creation and productivity enhancements. Environmentally, it calls for sustainable resource management and pollution control measures.
- India's demographic transition and population growth are complex phenomena with multifaceted implications. Addressing these implications effectively requires a comprehensive approach encompassing education, healthcare, social services, labour market policies, and environmental sustainability. A careful balance of socioeconomic development and population management is essential for India's sustainable future.

Assessment of the Demographic Transition in India

Assessing the demographic transition in India involves evaluating its progress, challenges, and future prospects. While India has made significant strides in its demographic transition, there are essential considerations to be made:

1. **Progress:** India has transitioned from a phase of high birth and death rates to a stage of declining birth rates, indicating progress in its demographic transition. The decline in fertility rates, improvements in healthcare, and increased access to education are positive indicators of this transition.

Purohit S., J Environ Sci Public Health 2023
DOI:10.26502/jesph.96120198

2. **Regional Variations:** It is crucial to acknowledge the substantial regional variations within India's demographic transition. Different states and socioeconomic groups exhibit diverse demographic profiles, with some regions still lagging behind in terms of fertility decline and healthcare access. Targeted interventions and policies are necessary to address these regional disparities.
3. **Challenges:** India faces several challenges in managing its population growth. The sheer scale of the population poses a strain on social services, including education and healthcare. Ensuring quality education, reducing disparities, and providing adequate healthcare services to a growing population remain significant challenges.
4. **Urbanization:** The rapid pace of urbanization in India has both positive and negative implications for the demographic transition. While urban areas have witnessed a decline in birth rates, urbanization has also led to issues such as slum growth, inadequate infrastructure, and environmental degradation. Effective urban planning and infrastructure development are essential for sustainable urban growth.
5. **Future Prospects:** The future trajectory of India's demographic transition will depend on various factors, including continued access to education, empowerment of women, provision of healthcare services, and effective population management policies. Sustainability, equitable development, and social inclusion should be at the forefront of future planning.

While India has made progress in its demographic transition, there are still challenges to address and regional disparities to overcome. Sustained efforts and comprehensive policies that encompass education, healthcare, urban development, and environmental sustainability are crucial for India to navigate its demographic transition successfully and ensure a prosperous and equitable future for its population.

Recommendations for Population Management and Future Research

To effectively manage India's population growth and ensure sustainable development, the following recommendations can be considered:

1. **Strengthen Family Planning Programs:** Emphasize the importance of family planning and ensure the availability of a wide range of contraceptive methods. Promote reproductive health services, educate communities about family planning options, and secure access to affordable and quality contraceptives.
2. **Invest in Education:** Focus on improving educational opportunities, particularly for girls and women. Education empowers individuals, promotes informed decision-making, and contributes to lower fertility rates. Address regional disparities in educational access and quality to ensure equitable development.
3. **Enhance Healthcare Infrastructure:** Invest in healthcare infrastructure, particularly in rural and underserved areas. Improve access to quality healthcare, including maternal and child health services, reproductive health services, and family planning counselling. Strengthen healthcare systems to address both communicable and non-communicable diseases.
4. **Promote Gender Equality:** Continue efforts to promote gender equality and empower women. Enhance women's access to education, employment opportunities, and decision-making power. Gender equality is closely linked to lower fertility rates and improved overall development.
5. **Sustainable Urban Development:** Focus on sustainable urban planning and development to address the challenges associated with rapid urbanization. Ensure access to essential services, including housing, sanitation, and public transportation. Implement measures to mitigate environmental impacts and promote sustainable lifestyles.
6. **Strengthen Research and Data Collection:** Conduct research on regional variations in demographic transition within India, understanding the socioeconomic, cultural, and environmental factors that influence population dynamics. Collect and analyze data to inform evidence-based policymaking and evaluate the effectiveness of population management strategies.
7. **Climate Change and Population:** Explore the intersection between climate change and population dynamics in India. Assess the impact of climate change on population growth, migration patterns, and resource availability. Develop strategies that integrate population policies with climate change adaptation and mitigation efforts.
8. **Stakeholder Collaboration:** Foster collaboration between government agencies, NGOs, academic institutions, and international organizations to address population-related challenges. Engage stakeholders at various levels to ensure the effective implementation of population management policies and programs.

In conclusion, a comprehensive approach encompassing family planning, education, healthcare, gender equality, urban development, and research is necessary for effective population management in India. These recommendations can guide policymakers and researchers in addressing the implications of India's population growth and working towards sustainable development.

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Purohit S., J Environ Sci Public Health 2023
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