



## India's Demographic Change: Opportunities and Challenges

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*Science* **333**, 576 (2011);

DOI: 10.1126/science.1207969

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10.1126/science.1207558

## REVIEW

# India's Demographic Change: Opportunities and Challenges

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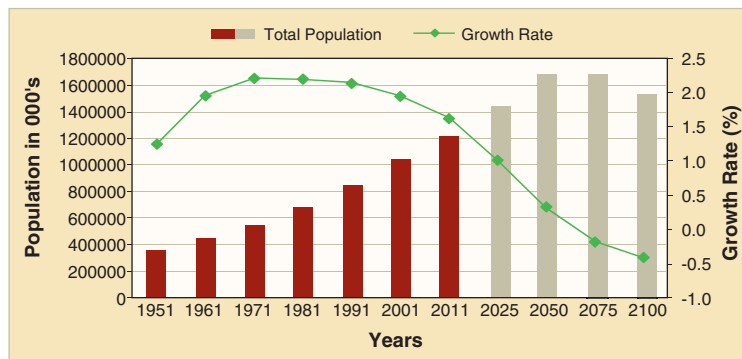
This paper discusses emerging demographic patterns and its opportunities and challenges for India. It investigates the specificities in the demographic transition in terms of various demographic parameters and the lack of homogeneity in the transition across states in the country. It presents some opportunities that can arise from having demographic changes, particularly the demographic dividend and interstate migration to overcome labor shortage in some parts. At the same time, there are serious challenges in the form of enhancing human capital development, addressing the issue of skewed sex ratio, and the possible rise in social and political unrest and conflict.

India accounts for nearly 17% of the world's population and is experiencing rapid demographic changes, with wide implications not only for the country but also across other regions of the world. The country exhibits one of the highest demographic heterogeneities ever experienced anywhere in the world at the regional and state levels. Demographic changes taking place across the country are often unaccompanied by substantial socio-economic changes. Hence, India stands to contradict the most often quoted theories of demographic change and poses a greater challenge to predicting the impact of demographic changes on the economy and society. There are also considerable benefits arising out of drastic demographic changes and demographic diversity. What follows is a brief critical discussion on the Indian demographic pattern and its likely impact on the economy and society.

## National Trends and Population Projections

According to the provisional results of the 2011 census, India's population as of 1 March 2011

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**Fig. 1.** Population size and its annual growth rate in India for 1951–2100. The 1951–2011 data are enumerated by decadal census (1), and 2025 and 2100 data are projections by the United Nations (5).

stands at 1210 million (1). In other words, currently one out of every six persons in the world lives in India. The difference in the total population between India and China has narrowed and now stands around 131 million. Despite the recent decline in the birth rate throughout the country, India has recorded a growth rate of 1.6% per year during 2001–2011 census periods, adding around 181 million people to the total during the decade (1). This addition is only marginally lower than the population of Brazil, the fifth most populous country in the world.

India experienced a rapid increase in population all through the second half of the past

century (Fig. 1). The growth rate remained at the peak of more than 2% per year between the 1961–1991 census periods. Such rapid growth in population was considered to reflect the dismal failure of the family planning program adopted by the country in the early 1950s (2–4). It appears that since 1991, the population growth in India has been slowing down. Although the growth rate has declined compared with the previous decade, the annual addition to the population remained nearly the same.

The ultimate size of India's population when the population stabilization is achieved will be about 1.72 billion around 2060, according to the latest population projection released by the United Nations Population Division (UNPD) (5). According to this projection, India will overtake China close to the year 2020, which is nearly a decade earlier than expected by the earlier projection (revision 2008) (6). By 2050, India is expected to have around 400 million more inhabitants than will China. After the peak in the total population in 2060, the size is projected to come down to 1.56 billion by 2100 (5). However, the projection by the Population Foundation of India and the Population Reference Bureau (PFI-PRB) expects stabilization only beyond 2080, with a population size of 1.86 billion (7).

Contrary to these, the probabilistic projection carried out by the International Institute for Applied Systems Analysis (IIASA) gives a median population projection of 1.4 billion and an 80% uncertainty range from 1.2 to 1.6 billion in 2050 (8). This projection explicitly considered the changing educational composition of the population and the strong existing educational fertility link for the future population.

Perhaps, all the above projections illustrate the extreme uncertainty inherent in the assumptions of future fertility, mortality, and migration in India. Although the UNPD projection assumes India will achieve replacement-level fertility [total fertility rate (TFR) of 2.1] around 2040, the

PFI-PRB projects that it will take place only a decade later (5, 7). The life expectancy achievement, on the contrary, is more rapid according to the PFI-PRB projection. The life expectancy of 70 years will be achieved by around 2025 according to the PFI-PRB projection and a decade later according to UNPD (5, 7). International migration has not figured to a substantial extent in any of these projections because the current incidence of international outmigration from India is too minor to alter the projected final population totals.

The ultimate population size in India will critically depend on all the anticipated changes to fertility, mortality, and migration. It is possible that the current fertility transition and its future trends may completely redefine the ultimate size of India's population. It may be remembered that there is a high level of uncertainty that is unavoidable in any long-run population projection. For instance, the mathematical projection by Kingsley Davis in 1951, which estimated a population of only 790 million for India and Pakistan in 2001, was obviously much off the mark (9). Similarly, the projection by Coale and Hoover estimated a population of about 120 million above the 2001 enumerated census population (10). Even with all the uncertainty, it may be safely argued that India will overtake China and become the most populous country in the world within the next two decades. The population will continue to grow at least until 2050, despite all the expected changes.

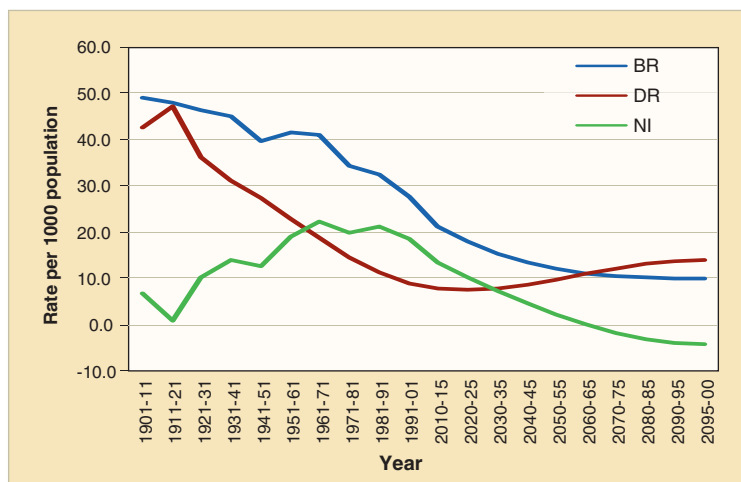
### India's Demographic Transition and Heterogeneity

It is now vividly evident that the demographic character of India's population is changing rapidly. India is now entering the final stages of demographic transition, with the country nearing replacement-level fertility. Of late, the demographic scenario in India has been viewed more optimistically as compared with the widespread anguish that was evident a few decades earlier, with successive census figures providing hardly any major change in the growth rate of population (2, 3). The classical demographic transition that is under way in India is reflected in Fig. 2, in which the mortality rate falls while the birth rate remains high, and later the birth rate falls as mortality remains low. The death rate has steadily declined in the country since the 1920s. The country experienced a negative population growth between 1911 and 1921 because of the recurrence of plague, cholera, and the influenza epidemic of 1918–1919 (9).

The influenza epidemic is estimated to have killed almost 5% of the total population of the subcontinent. However, thereafter except for some isolated attacks of cholera in the 1920s and the Bengal famine in the 1940s the country has been spared serious calamities (11). There has been acceleration in the rate of decline in mortality since independence in 1947. The crude death rate is as low as around 8 per 1000 population by 2010–2015 and is expected to go up in the future because of age structure changes. The life expectancy is expected to reach

clined by roughly 1.5% per year from 6.0 in 1966 to 3.6 in 1992 (13). The rate of decline quickened further to 1.7% per year during 1992–2008, with TFR reaching 2.6 births per woman by 2008 (15). It appears that with this rate of decline, India will reach replacement-level fertility of 2.1 children per woman within a decade, which is far ahead of the assumed year by the UNPD and PFI-PRB projections (5, 7). TFR and net reproduction rate (NRR) and the corresponding IMRs for major states in India for the year 2008 are shown in Fig. 3. It brings up several important dimensions of India's fertility transition. Of the 20 states considered in the analysis constituting nearly 98% of the population in the country, 11 states with 46% of the total population achieved a NRR of 1.0, implying replacement-level fertility. Three states with a population proportion of around 10% are also close to replacement level. India's fertility transition has several specificities and is distinctly different from the experience of classical fertility transition observed in many countries (16, 17). The decline in fertility was achieved primarily through contraceptive use almost solely through female sterilization. The average age at marriage, particularly of females, remains low at 18 years, and more than 50% of women marry before the legal age of 18 years in the country. Marriage is universal, and births take place primarily within marriage. The very low use of temporary methods of contraception and early age at marriage result in women bearing children at very young ages and undergoing sterilization soon after. A study based on Andhra Pradesh, one of the states in India with the most rapid decline in fertility, showed that a sizable proportion of women in the state undergo sterilization before reaching 25 years of age (18).

Another striking demographic pattern emerging in India is its huge heterogeneity across regions and states. The TFR in 2008 varied from as low as 1.7 in Andhra Pradesh to 3.9 in Bihar, and infant mortality varied from 12 per 1000 live births in Kerala to 70 in Uttar Pradesh (15). The four states in Fig. 3 to the far right, constituting 41% of India's total population, are from the north central region. These states continue to record ~2% annual growth rate of population, even during the 2001–2011 census years. In contrast, the three states in Fig. 3 to the far left show a TFR of 1.8 or less. What is perhaps unclear is how far the fertility level will fall in the country. The various projections assume that the TFR may ultimately remain within a safe range of 1.8 to 2.1 (5, 7). At one level, it is observed that even in states with early fertility transition there is no sign of drastic changes



**Fig. 2.** Birth rate (BR), death rate (DR), and natural increase (NI) (NI = BR – DR) in India for 1901–2100. The 1901–1971 data are census-based estimates published by the Office of the Registrar General of India for various years. Data for 1971–2001 are from Sample Registration System (SRS) Bulletins published by the Office of the Registrar General of India. The latest data is available at (12), and 2010–2100 data are projections according to United Nations Revision 2010 (5). The NI provides information on the growth of a population in the absence of migration.

64.4 years among males and 67.6 years among females by 2010–2015, up from 38.7 years for males and 37.1 years for females in 1950–1955 (5).

At the same time, the infant mortality rate (IMR) remains high in India at around 50 per 1000 live births as of 2009 (12). The rate far exceeds the IMR in China, which now stands around 22 per 1000 live births according to the United Nations estimate (5). From an estimated level of around 200 to 225 infant deaths per 1000 live births at the time of India's independence in 1947, IMR has declined to about 80 during 1990–1992, which is a decline of around 1.4% per year (13). The rate of decline had been faster during 1992–2009 at around 3% per year. Perhaps owing to relatively high levels of infant mortality, the birth rate failed to respond to mortality decline until about 1971. With the overall mortality level at relatively low rates and infant mortality remaining high, India's disease profile shows a double burden, with one third of the burden accounted by communicable disease and the rest by noncommunicable diseases (14).

The pace of decline in fertility has quickened in the country in recent years. The TFR has de-

clined by roughly 1.5% per year from 6.0 in 1966 to 3.6 in 1992 (13). The rate of decline quickened further to 1.7% per year during 1992–2008, with TFR reaching 2.6 births per woman by 2008 (15). It appears that with this rate of decline, India will reach replacement-level fertility of 2.1 children per woman within a decade, which is far ahead of the assumed year by the UNPD and PFI-PRB projections (5, 7). TFR and net reproduction rate (NRR) and the corresponding IMRs for major states in India for the year 2008 are shown in Fig. 3. It brings up several important dimensions of India's fertility transition. Of the 20 states considered in the analysis constituting nearly 98% of the population in the country, 11 states with 46% of the total population achieved a NRR of 1.0, implying replacement-level fertility. Three states with a population proportion of around 10% are also close to replacement level. India's fertility transition has several specificities and is distinctly different from the experience of classical fertility transition observed in many countries (16, 17). The decline in fertility was achieved primarily through contraceptive use almost solely through female sterilization. The average age at marriage, particularly of females, remains low at 18 years, and more than 50% of women marry before the legal age of 18 years in the country. Marriage is universal, and births take place primarily within marriage. The very low use of temporary methods of contraception and early age at marriage result in women bearing children at very young ages and undergoing sterilization soon after. A study based on Andhra Pradesh, one of the states in India with the most rapid decline in fertility, showed that a sizable proportion of women in the state undergo sterilization before reaching 25 years of age (18).

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in the marriage pattern. However, the latest available data on fertility in India reveals the possibility of some states achieving in the future a fertility level far below replacement. The recorded TFR in the urban areas has been below 1.8 in nine out of 20 larger states in India. The state of West Bengal recorded the lowest urban fertility rate of 1.3 children per woman (15).

The conventional theories of fertility transition and the factors underlying its decline appear to be inadequate to explain the fertility decline under way in many states in India. The first indication of decline in fertility in India was in the state of Kerala—located in the southwest

declining in India primarily because of the decline of fertility among illiterate women, and this is due to the diffusion of a new reproductive idea of having only a few children but investing more on their future (23). The decline in the desired number of children from 3.2 in 1992–1993 to 2.2 in 2005–2006 among illiterate women is an example of such a change (24). Alternatively, decline in fertility is also portrayed as the successful implementation of the family planning program in these states (3). Indian states also have the dubious distinction of achieving a NRR of 1, with relatively higher levels of TFR as a result of higher incidence of infant mortal-

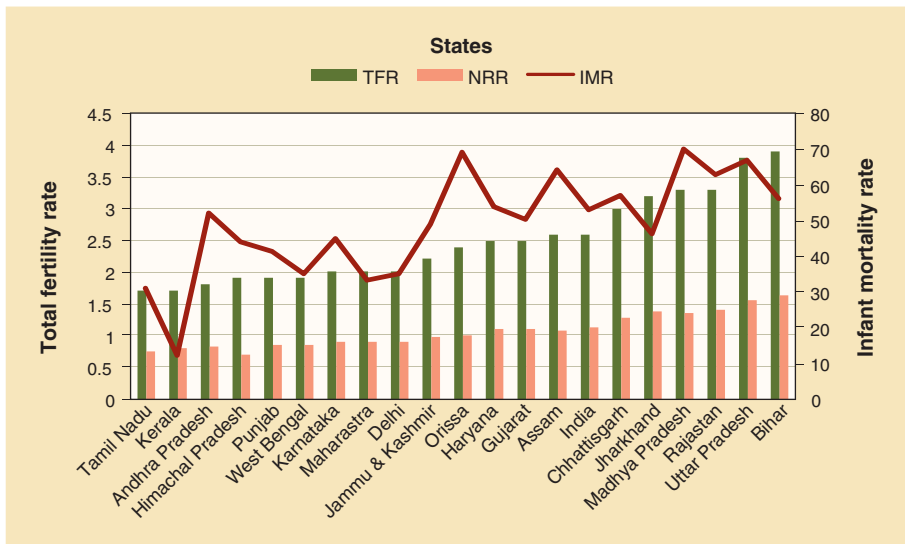
ity (1). It is argued that there is a 7.1 million deficit of females in the 0-to-6-years age group in 2011 (26). This points to sex-selective abortions to the magnitude of 3.1 to 6 million female fetuses during the 2001–2011 decade (26). Interestingly, the decline in female-male ratio in the 0-to-6-years age group was much greater among mothers with 10 or more years of education than among mothers with no education. Thus, there is every reason to suspect that fertility transition and modernization are, in fact, enhancing the phenomenon of son preference in the country.

### Demographic Dividend and Opportunities

There is a general consensus that the demographic change in India is opening up new economic opportunities. The rapid fall in birth rates in the past few decades resulted in adding fewer children to the population and a relatively rapid growth of the working age group population. In 2010, the dependency ratio (the ratio of the population aged 0 to 14 years and those aged >65 years to the population aged 15 to 64 years) in India at 55% is marginally lower as compared with that of Japan (56%) but higher than China's (38%) (5). The recorded growth rate of the 0-to-6-years age group population is negative (–0.3% per year) according to the 2011 census results (1). Thus, a larger group will be now moving into the working ages, leading to a potentially higher number of workers as compared with dependents. The adult population (aged 15 to 64 years) is estimated to reach ~68% of the total population by 2035, and the dependency ratio is estimated to reach ~47% (5). Demographic heterogeneity also results in a rather slow and longer duration of age structure changes across the country. Contrasting age structures of Kerala (low TFR) and Uttar Pradesh (high TFR) are shown in Fig. 4, A to D.

Although there is a general appreciation of the existence of demographic opportunity, whether the country will be able to harness the dividend is open to debate and is of considerable interest. The concerns arise mainly from three important factors. Many authors argue that there is nothing automatic about the links between demographic change and economic growth. Rather, fruits of demographic dividend are crucially determined by the policy environment and in particular good governance, carefully constructed trade policy for capturing the economic benefits, and sound macroeconomic management (27). Contrary to this, a study carried out at the state level found that the prime reason for India's accelerated economic growth is demographic changes as compared with the economic reform policies. The authors argued that on the basis of their estimation, the demographic dividend will boost India's economic growth substantially in the coming two decades (28).

Second, India still has considerable educational deficits, particularly among the adult population.

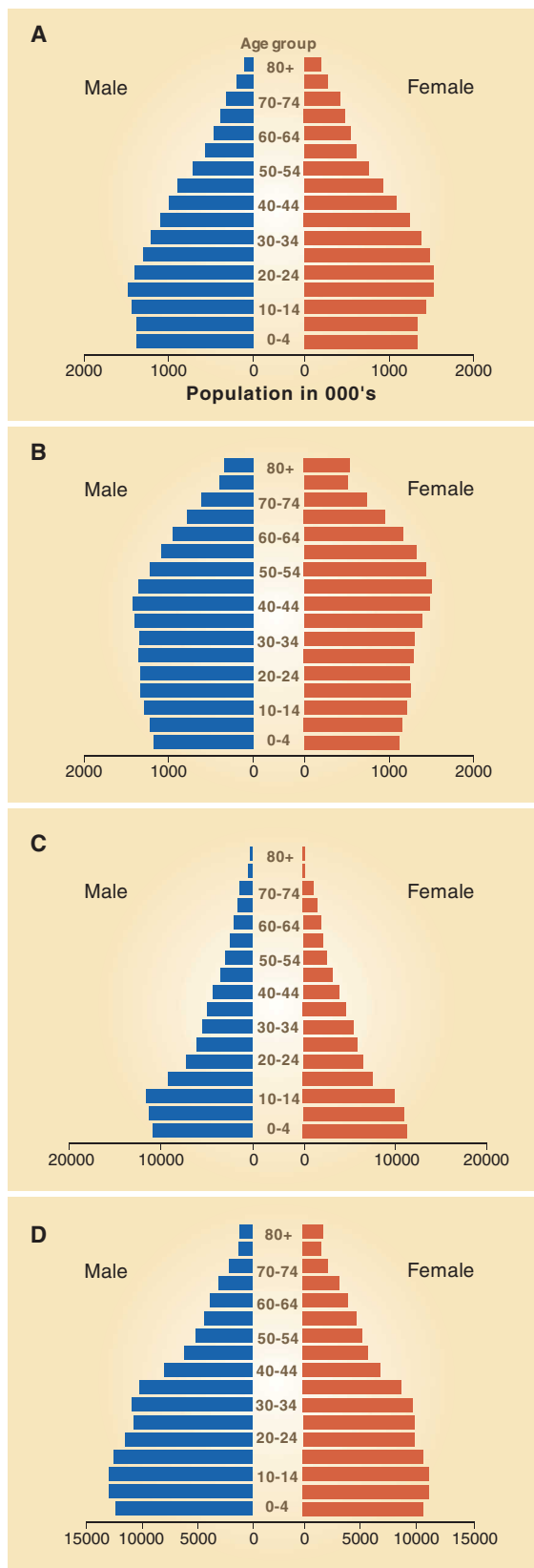


**Fig. 3.** TFR, NRR, and IMR among major Indian states, 2008. The data for TFR and IMR were obtained from the Sample Registration System (15). The NRR is estimated by using life tables for the period 2004–2008 derived from the age-specific death rate from Sample Registration System for the respective years.

part of the country—as early as in the 1960s (19, 20). At the time of the onset of the fertility transition, Kerala had relatively high levels of poverty, undernourishment, and low per-capita income compared with the national average. However, it had higher social development indicators, in particular high rates of female literacy. This has led to an alternate hypothesis that social development in itself can trigger fertility transition (19, 20). Nevertheless, subsequently in the late 1980s and 1990s two other states (Tamil Nadu and Andhra Pradesh) in the country also recorded rapid declines in fertility that were not accompanied by any major economic or social changes (21, 22). At the time of fertility transition, both of these states had relatively high incidences of infant mortality and low rates of female literacy. Even according to the 2011 Census, Andhra Pradesh recorded a female literacy level of only 59.7% in contrast to the all-India average of 65.5% (1). Later, many states except those in the north-central region experienced rapid decline in fertility with similar conditions. It has been argued that fertility is

ity. For instance, Orissa has achieved a NRR of 1 with a TFR of 2.4 and IMR of 69, one of the highest in the country (Fig. 3). In contrast, states such as Maharashtra, West Bengal, and Delhi achieved NRRs of 1 with a moderate IMR of around 30, and Kerala had the lowest IMR at ~12. Perhaps, this illustrates the fact that India's fertility decline took place not only within poor social and economic conditions but also with relatively higher levels of IMR. Thus, many Indian states remain a paradox as to how the norm of small family spread.

It should be mentioned that the acceptance of the small family norm—even by poor families—is not an unmitigated blessing. It has gone hand in hand with strong son preference, leading to an adverse sex ratio (25). The masculinity in childhood years is increasing. The census data show a consistent decline in the ratio of females to males in the childhood years (0-to-6-years age group), from 945 to 914 females per 1000 males during 1991 and 2011 (1). This is despite a marked improvement in female literacy rates of over 12% in the past decade, as revealed by the 2011 cen-



**Fig. 4.** (A) Age-sex pyramid, Kerala, 2001. (B) Age-sex pyramid, Kerala, 2026. (C) Age-sex pyramid, Uttar Pradesh, 2001. (D) Age-sex pyramid, Uttar Pradesh, 2026 (33).

The adult literacy rate is still quite low. According to Census 2011 results, only 74% of the population 7 years and older are literate, with a female literacy rate as low as 65%. Because of the high illiteracy rate and poor quality of education in the past, a large majority of the adult working age population are inadequately prepared for the modern economy. Scholars have argued that the demographic changes are insufficient to provide an upward thrust to the rate of economic growth because of the deficits in the area of education and health, ultimately resulting in a waste of demographic advantage (29, 30). The employability of the vast majority of the people with zero or negligible level of education has been a matter of concern, and therefore India's demographic dividend would turn out to be a liability (30). At the same time, studies also point out that the fertility transition and the consequent decline in dependency ratio have an independent effect on economic growth irrespective of the level of education (28, 31). This is partly because fertility transition augments household savings and enhances the household's investment in quality education for children. The evidence in India has been highly positive with regard to savings (31), particularly in states with faster declines in fertility, and to some extent with the enhanced investment in education (23).

Third, there also exists considerable unemployment and underemployment in different parts of the country. It is generally accepted that if India is able to employ productively the booming adult population, India's economic growth would accelerate (27). Female unemployment in the state of Kerala with its higher educational progress and demographic changes has been startling and has raised serious questions on

the ability of the nation to provide employment opportunities to the huge adult population (32). According to the Census 2001 results, only 15% of the women in Kerala are engaged in productive work, which is one of the lowest among Indian states. The concern has been whether India possesses the capacity to productively employ the increasing adult population in order to take full advantage of the demographic dividend.

However, available statistical estimates on the impact of demographic changes on the economic growth in India has clearly brought out that those states achieving fertility transition are also able to enhance their per-capita income growth substantially (28, 31, 34). Thus, there seems to be lack of concordance between statistical estimates and general economic writings as far as India's demographic dividend is concerned. Perhaps, the dividend that accelerates per-capita income growth emanates primarily from the faster decline in fertility in the country, even with moderate educational achievements. But once India is able to enhance its educational potential, improve its policy environment, and provide female employment, the demographic dividend opportunity can be improved further. At the same time, it appears that the state-level heterogeneity in demographic dividend has large implications for the economic inequality in the country. The available evidences suggest an increasing trend in spatial inequality since the 1990s (35).

### Future Challenges

Not only does India's fertility transition appear to be unconventional, it is also the result of an effective public delivery of a family planning program. However, the sterilization-focused family planning approach may not result in sudden reversals or fluctuations in fertility because the method itself is nonreversible. However, there may be several sociopsychological implications given the fact that the age at sterilization is relatively low and that most women remain unemployed. With the average age at marriage not changing to any great extent, promotion of reversible methods of contraception will be the key to ensure spacing between births and healthy babies in India. Any further decline in infant mortality depends heavily on improvements in birth spacing. In addition, low levels of maternal nutrition and public health infrastructure limitations are other major reasons for higher levels of infant mortality in the country (24, 36). Data from the recent survey show that across India, ~43% of children under age 5 years are underweight, and 36% of women in the age group 15 to 49 years had body mass index below normal in 2005–2006 (24). Improvements in the rate of immunization and acceptance of maternal health services are also found to be slow in the last decade (24). At the same time, India is also experiencing an epidemiological transition alongside a demographic transition. Noncommunicable



Explore pyramids for additional states at [www.scim.ag/o9g5xu](http://www.scim.ag/o9g5xu)

diseases require long-term costly intervention in an already overburdened health system (36). The mortality transition presents an immense challenge to the Indian health system, both in terms of financing the burden and providing good quality care.

The changing demographic dynamics also pose an increasing challenge to the educational sector in the country. Although the older cohorts in India largely remained illiterate (with an illiteracy level of nearly 40% for those aged 15 years and above in 2001), considerable changes are taking place among younger cohorts. Many Indian states have already achieved universal primary enrollment, and some are currently approaching it. At the same time, there are larger concerns about the quality of school education in India. A study based on rural India found that on any given day, the average attendance rate in rural India is around 75% (37). According to the learning test administered among children, half of the children in rural India are at least three grade levels behind where they need to be (37). Another serious concern is the lack of sufficient infrastructure in higher education. At present, only ~10% of the students pursue higher education, which is significantly below the developing country average of 20%. Inevitably, demographic changes are likely to create considerable pressure on the Indian educational system, for which the country needs to prepare at the earliest.

India's huge demographic disparity across states has serious implications at different levels. Demographic disparity may cause considerable social turbulence and may even pose a threat to the political stability of the country. It is expected that representation in Indian parliament will undergo rapid changes, with the northern states gaining a substantially higher number of seats once the freeze on the number of seats is withdrawn (38). Since 1976, the number of seats in Parliament and in the state legislatures have been frozen and will continue to be through 2026 on the basis of the population enumerated in the 1971 Census. This move was to prevent states being punished in terms of the number of parliamentary seats because they were successful in implementing family-planning initiatives (38). Once the freeze is lifted, it is likely to create more political imbalances and conflicts. The demographic heterogeneity, nevertheless, is also providing a unique opportunity to fill the labor deficit within the country through interstate migration. Of late, there has been a relatively large inflow of migrants from the northern belt, which has had a high fertility rate, to the southern region, which has been below the replacement level of fertility; this is known as replacement migration (32). These migrants are generally drawn from less privileged sections both in terms of caste and class hierarchy in India and as such may have to circumvent various hardships. Although migration as such may be development driven, there is the possibility of increased conflict and

unrest in the destination regions. A study using cross-regional, time-series data on violence in Indian states (1989–2009) revealed the possibility of escalating violence because of demographic heterogeneity in the country (39).

India's demographic dividend is likely to continue for the next few decades as more and more states, particularly the northern belt, experience rapid fertility transition. The age structure changes have great potential for rapid economic growth. The demographic dividend can be enhanced further if policy-makers take note of the areas of concern, particularly educational improvement and providing jobs for women (40). Undoubtedly, beyond the 2030s, India's demographic structure is likely to alter from a young to an aging population. The 60-years-and-older population is expected to triple in the next four decades from 92 million to 316 million, constituting ~20% of the population by the middle of the century (29). Nevertheless, for the time being, as the proportion of the aged remains relatively low, the country's economic advantage from the demographic bonus is likely to continue.

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**Acknowledgments:** The author is indebted to D. E. Bloom, W. Lutz, V. Skirbekk, K. Srinivasan, P. M. Kulkarni, N. Krishnaji, S. Padmadas, K. M. Sathyanarayana, S. RoyChowdhury, L. Subaiya, and D. Bansod for helpful discussion and comments. However, the content is solely the responsibility of the author.