Proc. Natl. Acad. Sci. USA
Vol. 80, pp. 1757–1763, March 1983
Review

Population trends in China and India (A Review)

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Contributed by Ansley J. Coale, December 6, 1982

China and India constitute the sole members of the top category—very large populations—in any listing of national populations in order of size. The next two populations in such an ordering—the Soviet Union and the United States—are much smaller, neither being much more than a third as large as India's or more than about a quarter as large as China's. The 1×10^9 persons in China plus the nearly 700×10^6 in India represent about 40% of the world total, well over half the aggregate population of less-developed countries and more than the combined numbers in Africa, Latin America, and Europe with the Soviet Union added for good measure.

Although both countries are the heirs of cultures thousands of years old, both are in a sense young nations, having begun their current national life after World War II when India became independent of British rule and the Chinese Communist Party established the People's Republic.

The growth in numbers in China and India since the rebirth of the two nations, the changing rates of birth and death, and the factors accounting for the changes are obviously a significant chapter in recent demographic history. The future growth and future changes in the composition of the population of China and India and the future trends in fertility and mortality will help determine the well-being of a substantial portion of the people in the world.

Data on population in China and India in the past 30 years are characterized by different kinds of limitation and uncertainty. In regard to India, a large volume of detailed information has been published in continuation of statistics collected, tabulated, and published during the colonial period. The published data are frequently inaccurate in content (ages are grossly misreported in the 12 censuses conducted in India since 1872) or less than complete (births and deaths are incompletely registered even in the sample registration scheme initiated by the Registrar General in the 1960s). In regard to China, where government control of many aspects of daily life entails maintenance in each locality of a current record of every individual and where traditional beliefs in astrology mean that individuals know their date of birth with precision, the prerequisites for obtaining accurate data are tantalizingly present. Little emphasis has been given to the compilation of aggregate population statistics, however, and very few data have been published in sources accessible to foreigners, if at all, until the past 2 or 3 years. The possibility of achieving complete and precise statistics apparently has not been realized.

In other words, published demographic data for India are extensive but intrinsically less than fully accurate, and published data for China are sparse and potentially precise but, in fact, of an accuracy that cannot be fully verified. Nevertheless, because of the special interest of demographers in these two populations and because refined methods of analysis can exploit internal consistency in both sets of data to construct estimates, it is possible to depict with some confidence the general growth in numbers and the trends in fertility and mortality since 1950.

GROWTH IN POPULATION, 1951–1981

The increase in numbers of persons in China and India in the 30 years beginning in 1951 is shown in Table 1. Note the more rapid increase of India's population in the 1950s, and of China's in the 1960s, so that the total proportionate increase in the two populations from 1951 to 1971 was nearly the same. In China, there was a sharp reduction in rate of growth in the 1970s, but in India the rate of increase was the same in the 1970s as in the 1960s, so that the overall proportionate increase in India over the 30 years was somewhat greater. The birth rate in China was much lower in the 1970s than in the 1960s; in India the estimated decrease in birth rate from the earlier to the later decade was only moderate. The death rate in China has fallen extensively; the Indian death rate, generally at a higher level, has declined less.

The time pattern of changing birth rates in the two countries differs in year-to-year variability as well as in the extent of decline since the 1950s. There is no compelling evidence of large year-to-year fluctuations in the Indian birth rate; the modest downward course was at no point sharply reversed or suddenly accelerated.

On the other hand, numbers from various Chinese authorities who have published annual birth data indicate major fluctuations in birth rates around 1959–1963 and a subsequent substantial downward trend. Fig. 1 shows annual birth rates over the 30-year period from 1950 to 1980, as pieced together without correction from different Chinese authorities, and as adjusted for evident under-reporting.

During the "Great Leap Forward" and the subsequent economic and agricultural crisis (1959–1961), the recorded number of births was sharply reduced. As more nearly normal conditions were restored, the birth rate rose above the pre-crisis level and then declined to a rate less than half the rate in the 1950s or mid-1960s.

Fig. 2 shows annual death rates in China from 1950 to 1980. They are derived from data published by Chinese authorities, with no adjustment for understatement of the number of deaths. Because there is convincing evidence of under-reporting of births (especially during 1959–1961), one must suppose that the number of deaths was also understated, especially the deaths of infants and young children. To be consistent with the adjusted birth rates, the death rates in the 1950s and 1960s in Fig. 2 must be increased by 3.0–3.5 per 10^3. Because there is no obvious basis for appropriate adjustments for individual years, the rates as determined from Chinese sources are reproduced unaltered. The uncorrected values show a major reduction in mortality. Because under-registration presumably was more extensive in the earlier years and during the crisis of 1959–1961, the true decline was probably even greater than Fig. 2 indicates.

BASIS OF SIMILARITIES AND DIFFERENCES IN POPULATION TRENDS IN CHINA AND INDIA

According to the estimates assembled here, these two very large populations have grown to a comparable extent (78% for China,

Table 1. Population growth in China and India, 1951–1981

Year	Population: Actual, millions		Population: % relative to 1951		Average rate of increase in previous decade, no./10^3		Average birth rate in previous decade, no./10^3		Average death rate in previous decade, no./10^3	
	China	India	China	India	China	India	China	India	China	India
1951	557	361	100	100						
1961	666	439	120	122	17.9	19.6	36	45	18	26
1971	837	548	150	152	22.9	22.2	36	41	13	19
1981	989	684	178	189	16.7	22.2	23	39	7	17

Birth and death rates for India are from refs. 1 and 2 for 1951–1961 and from a National Research Council study (Committee on Population and Demography, Panel on India, *Vital Rates in India 1961–1981*) (unpublished) for 1961–1981. Decade birth rates for China are averages of the adjusted values in Fig. 1. Decade death rates for China for 1951–1960 and 1961–1970 are the difference between the adjusted birth rate and the average rate of increase. Population for India is from decennial censuses; for China it is from Aird (3).

89% for India) since 1951; the cumulative growth in China has been less, despite lower mortality, because of a greater recent decline in the birth rate. In the early 1950s the fertility rates in China would have yielded a life-time average of about 5.5 children per woman; in India at about the same time the corresponding total fertility rate was about 6.0 or a little higher. By the late 1970s the total fertility rate had fallen to 2.5 children per woman in China and to about 4.9 in India. In China, according to the death rates in the early 1950s the average duration of life at birth was 40–45 years and it rose to about 65 years in the late 1970s. In India, expectation of life at birth increased from <35 years to nearly 50 years over the same interval. What accounts for the similarities and differences in these trends?

When their new national status was attained after World War II, India and China had the economic and demographic characteristics typical at that time of low-income, nonindustrialized countries. In both countries most of the labor force was in agriculture, most of the people lived in rural areas, per capita income was low, most production was by manual labor and other traditional means, the endowment of capital per worker was meager, and land holdings were small. Birth rates were at the high levels that had prevailed for many years and, although mortality was falling, death rates were very high in comparison with the rates in countries that had become industrialized in the 19th or early 20th century.

The aggregate performance of the two economies since 1950 is hard to compare because the two countries are so different in political and economic organization and because of the difficulty of assembling reliable data. Nevertheless, one may judge that the two countries have remained at roughly comparable overall economic levels. In both, the populations are still >80% rural, and in both about 70% of the labor force is in agriculture. In both, manufacturing output has risen more rapidly than aggregate national production; in both, estimated per capita incomes are still very low.

Causes of differences in mortality trends

There is no doubt that recent mortality rates are much lower in China than in India and that the trend in mortality since 1950 has overall been more favorable. (The exception is the sharp increase in mortality in China during the crisis following the Great Leap Forward.) Two general factors account for the greater reduction of mortality in China: the emphasis of the Chinese government on egalitarian distribution of income has meant that, with per capita resources and per capita availability of food only

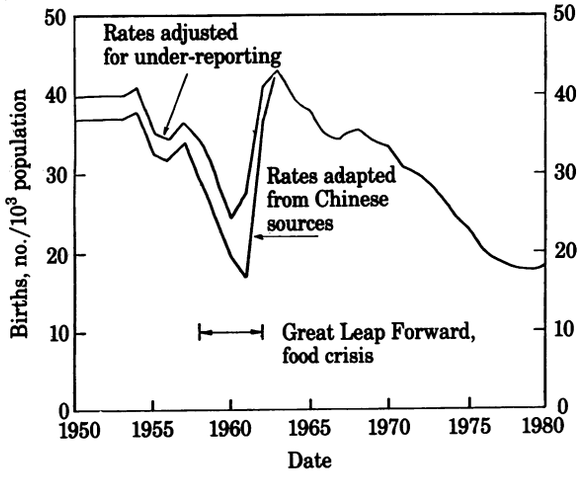

FIG. 1. Crude birth rate in China, 1950–1980. Unadjusted birth rates for 1958, 1960, and 1961 were calculated from the number of births for each year read by John Aird from a graph in Wang Naizong in 1980 (14). For other years, unadjusted birth rates are from ref. 3; Aird assembled these birth rates from several Chinese sources. Adjustments for birth rates up to 1962 were derived from the higher ratio of projected numbers arriving at age 22 (projected from an age distribution in the 1970s) to the recorded number of births 22 years earlier, for cohorts born in the years 1958–1963, especially in 1961 (4). The adjustment factors are: 1950–1957, 1.08; 1958, 1.17; 1959, 1.20; 1960, 1.25; 1961, 1.66; and 1962, 1.15.

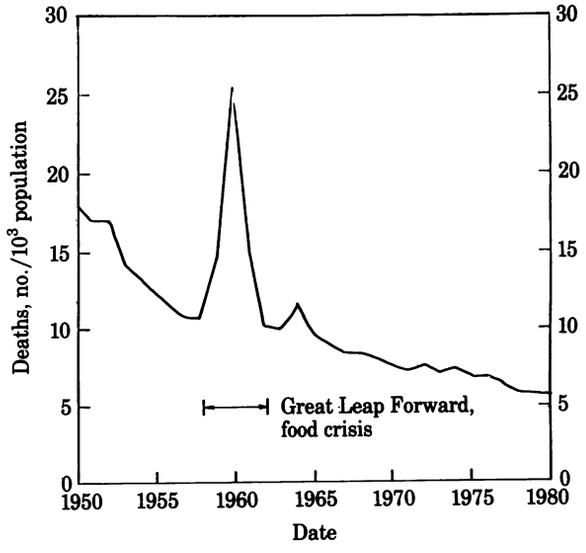

FIG. 2. Crude death rate in China, 1950–1980. Death rates for all years but 1958 and 1961 are from Aird (3). The death rate in 1958 is assumed to be equal to the rate in 1957. The total number of deaths for the 4 years 1958–1961 was reported in ref. 5; the number occurring in 1961 was estimated by subtracting the number implied by the rates for 1958, 1959, and 1960 from this total.

moderately more favorable, those at the bottom of the scale are less deprived in China than in India. Second, China has put more emphasis on and devoted proportionately more resources to improvement in health and reduction of mortality. According to the compilations of the World Bank, in 1977 in China there was 1 doctor for every 1,160 persons and in India, 1 for every 3,620 persons (6). More detailed data released by the State Statistical Bureau indicate that the listed Chinese ratio of population per doctor is based on doctors of Western medicine; in addition there were 1 doctor of traditional medicine for every 3,800 persons and 1 "barefoot doctor" for every 617 persons. The use of barefoot doctors—persons with secondary school education and brief, intensive training in medical care—is part of an emphasis in China on bringing health services to the entire population. About 90% of the rural production brigades (with an average population of about 1,400) have cooperative medical stations with paramedical personnel, and a similar proportion of communes (average population, about 18,000) have health centers with staff physicians as well as nurses and barefoot doctors (7). The central direction of activities of all sorts that is such a prominent part of China's political and economic organization has probably contributed to the effectiveness of preventive medicine—with 2,000 anti-epidemic stations, and strong emphasis on clean water supplies and other aspects of environmental sanitation, including the celebrated campaign against flies implemented by equipping hundreds of millions of Chinese with fly swatters and effectively urging their constant use.

In India there has been a similar aim (but with less intensive planned coverage and less effective implementation) to bring medical services to the rural population. The number of doctors per 10,000 population is in India about one-third the equivalent ratio in China, and within India the ratio of doctors to population is about 8 times as high in the cities as in the countryside (8).

Less-effective preventive medicine is probably more important than fewer doctors in explaining the slower progress in reducing mortality in India than in China. The antimalaria campaign has been very successful (and the campaign to eradicate smallpox completely so) in India; however, the principal remaining causes of death are associated with fecally contaminated soil and water, with airborne infections, and with tetanus and other contagious or infectious factors, compounded by inadequate nutrition. The most essential changes required to reduce mortality further are changes in environment and day-to-day behavior in addition to access to better curative medicine. Transformations of rural life of the required sort have evidently been more prevalent in China than in India.

Causes of differences in fertility trends

The difference in fertility to be explained has two aspects; the first is the ups and downs in the Chinese birth rate from 1950 to 1965 (with no counterpart in India), and the second is the very large decline in China since 1965, in contrast to the more modest reduction in the Indian birth rate. The first difference—the big reduction in fertility in 1959–1961 followed by a peak in 1963—resulted from drastic changes in economic policy (the Great Leap) that, in coincidence with unfavorable weather, led to economic breakdown and acute shortages of food. The fragmentary demographic data from Chinese sources for this period evidently exaggerate the extent of the birth deficit and, because of the possibility of registration after the emergency of some of the births not recorded earlier, may overstate the peak in 1963.

Explanations of the different extent of the fall in fertility in the past 15 years in China and India are complex. I shall classify the possible sources of this difference in three categories: (*a*) differences in policy aims with respect to reduction in the birth rate; (*b*) differences in government measures used to affect fertility; and (*c*) structural and cultural differences in the two societies that either in themselves affect the course of fertility or affect the responsiveness of the population to programs intended to reduce the birth rate.

Differences in Policy Aims. The government of India has maintained a lower birth rate as a goal of policy since 1951, with variations only in the degree of emphasis on this goal, the specificity of targets, and the resources devoted to implementation. The First Five-Year Plan in 1951 included provisions for family planning clinics. With the Second Plan of 1956–1961, a Central Family Planning Board was established. With the Third Plan, an objective of stabilization of growth was stated. The Fifth Plan in 1971 stipulated a target birth rate of 25 per thousand by 1984. Then, during the operation of the Emergency Act of 1975, when normal government machinery was suspended, the reduction of fertility suddenly was given high priority, with the initiation of a set of much stronger measures than any previously used. With the end of the emergency, and the defeat in the 1977 elections of Indira Ghandi who had invoked it, there was a reaction against family planning and especially against the elements of compulsion that had been used. At present, priority is again being given to the goal of fertility reduction (8, 9).

Official statements in the People's Republic of China concerning the desirability and legitimacy of lowered fertility as a goal have varied, sometimes abruptly, between extremes of strong affirmation and uncompromising opposition. To some extent these changes in position have been related to major changes in the political and economic strategies of the governing Communist Party. Policy goals have also been influenced by the need to reconcile official positions with Marxist dogma, a strong strand of which is passionate opposition to Malthus' views on population.

In 1949 Mao Zedong said:

"A large population in China is a good thing. With a population increase of several fold we still have an adequate solution. The solution lies in production. The fallacy of the Western capitalist economists like Malthus that the increase of food lags behind the increase of population was long ago refuted in theoretical reasoning by the Marxists; it has also been disproved by the facts existing after the revolution of the Soviet Union and in the liberated region of China." (Quoted in ref. 7.)

In the mid-1950s, government sponsorship of birth control was begun with statements that stressed the health hazards of a high birth rate and the difficulties of adeqate provision of child care in an economy still impoverished rather than arguments about adverse effects of aggregate population size or rate of increase. Zhou Enlai said, at the Eighth National Congress of the Communist Party in 1956: "To protect women and children and bring up and educate our younger generation in a way conducive to the health and prosperity of the nation, we agree that a due measure of birth control is desirable." (quoted in ref. 10). During a brief period in the 1950s in which freedom of expression was encouraged, many Chinese spoke of the advantages of a lower birth rate for economic development as well as for reasons of health. With the Great Leap Forward in 1958, a belief in the benefits of population growth in a socialist state reemerged, and advocacy of a lower birth rate was condemned in strongest terms as reactionary, capitalist, neo-Malthusian thinking. As normalcy was restored after the post-Great-Leap economic crisis, the State Council in 1962 called on local communities to promote birth control measures and, in 1964, established a Family Planning Office. After the Cultural Revolution began in 1966, the work of the state family planning agencies came to a standstill (7).

In 1971, as order was restored after the disruption of the

economy by the Cultural Revolution, reduction in the birth rate again became an explicit goal of state policy. During the 1970s, increasing emphasis on lower fertility was signaled by increasingly explicit and stringent targets as well as in programs of information, services, and incentives to reduce the number of births. Such emphasis was sharpened after Mao's death and the arrest and trial of the "Gang of Four."

The greater fall in the birth rate did not occur, then, in the country with the more consistent government position favoring lower fertility. The greater reduction that occurred in China is the result, rather, of a mixture of more effective government measures once a belated commitment was made to reduce fertility and a social context more favorable to a fall in the birth rate.

More Effective Family Planning Programs in China. Government influence on such an intimate aspect of behavior as the rate of childbearing is feasible in China because the People's Republic is an authoritarian state with well-established machinery for directing economic activity down to the smallest unit and for securing compliance with government policies that affect many aspects of daily life. A hierarchy of authority extends from the center in Beijing to provincial and county governments and then to the committees that administer communes, brigades, and production teams. When it was decided in the early 1970s to move toward a lower birth rate, the Planned Birth Program was built into this hierarchical structure. Administrative bodies were established at every level, from the State Birth Planning Commission and the Birth Planning Staff Office at the center to the brigade birth planning leadership group. Even the production team has a team-level health aide who delivers contraceptives to individual households.

This structure provides community-based contraceptive delivery services and information, education, and motivation activities. Reportedly, the most frequent form of contraception is the intrauterine device (IUD) followed by sterilization (female and male), oral contraceptives, and condoms. Abortion is also available free of charge, and some barefoot doctors serving isolated brigades have been trained in vacuum aspiration.

This administrative apparatus has been used to promote the increasingly stringent targets of fertility reduction. In the early 1970s, three fertility-reducing norms were introduced—late marriage, long spacing between births, and few children. "Late marriage" meant (for women) an age of at least 23 years in rural areas and 24 years in the cities. "Long spacing" meant at least 4 years between the first and second births. Until 1977, "few" meant no more than two children in the city and no more than three for rural couples. Beginning in 1979, the official goal was reduced to one child (7).

The Birth Planning Program in China is not limited to the provision of supplies and services plus information and education. There are also an array of incentives, positive and negative. These include promotion of a pledge to have only one child and the concession of many privileges to those who take such a pledge and hold a one-child certificate—privileges including more income (or work points) for the same work, preferences in housing, better health and education opportunities for the child, and the promise of preferential old age support for the parents. Those who have a second child not only forfeit these benefits but also must pay back the extra financial rewards they have received. The allocation of planned birth certificates for authorized births only after production team discussion of priorities provides further pressure for conformity. Finally, there is evidence reported in the Chinese press that the allocation of low individual community targets for numbers of births and the encouragement of local leaders (cadres) to hold to the targets has led to coercive measures, probably including abortions performed with or without the woman's willing consent (3).

Despite official support (for 30 years) of family planning, the government of India has not been able to organize a birth control program that regularly provides adequately staffed services to most of the population. At different times the responsible central agency (the Planning Commission, the Ministry of Health, and later the Ministry of Health and Family Planning) has promoted different methods of contraception and tried different organizational approaches. At first, when modern contraceptives were not widely used anywhere in the world, there was a hope, soon disappointed, that periodic continence (the rhythm method) would reduce the birth rate in India, where it seemed to conform so well with Ghandian principles. Later, there was primary reliance on the intrauterine device, but the health and family planning network never developed the capacity for skillful insertion, proper monitoring, and adequate counseling to counter exaggerated reports about the dangers of the device, to reassure patients about side effects, or overall to obtain sustained high rates of insertion and retention. For various reasons, oral contraceptives have never been authorized for use in India (8, 9).

The most successful family planning efforts in India have been the sterilization program and the distribution of conventional contraceptives, mostly condoms. From mid-1966 through mid-1981, according to government figures, approximately 32×10^6 Indians were sterilized. Allowing for attrition (mortality of the sterilized, the wife's passing beyond childbearing age), perhaps 15% of married women 15–49 years old in 1981 were themselves sterilized or had a sterilized husband. Also, in the middle to late 1970s, conventional contraceptives were distributed to more than 3×10^6 users per year, about as many through subsidized commercial sales as supplied free by the government (8, 9).

During the Emergency declared by Prime Minister Indira Ghandi when a lawsuit judgement denied her parliamentary rights, a New National Population Policy was announced. The policy established a national commitment to a direct assault on rapid population growth, reiterated a target in the Fifth Plan of 25 per thousand for the birth rate by 1984, and called for a number of direct measures, from an increase in the minimum age at marriage and increased monetary incentives for sterilization to group incentives for village councils. The policy also gave permission for state legislatures to pass bills authorizing compulsory sterilization. Only one state legislature (Maharashtra) passed such a bill, and it was never signed into law. Government workers were deprived of benefits for refusing or given inducements in return for agreeing to sterilization after three children were born. The result of the New National Policy was a large increase in sterilizations—more than 8×10^6 in 1976–1977, compared to an average of 2×10^6 per year in the preceding 5 years (8).

A second effect was strong resistance to what was perceived as widespread coerced sterilization. Coercion was denied by the government but was almost inevitable, whether or not intended, because, for example, local officials set quotas for villages and for the number of motivated couples a school teacher was to round up. The Congress Party (and, with it, Prime Minister Ghandi) was defeated in the 1977 elections. Reaction against various features of the National Population Policy was widely believed to have contributed to the party's defeat.

In later elections, the Congress Party was returned to power, and Mrs. Ghandi again became Prime Minister. The end of the Emergency and of the "direct assault" on the birth rate saw a large cutback in the government family planning program, although it is again receiving high priority.

Possible Influence of the General Social Context in Causing a Greater Decline in Chinese Fertility. In recent debates over population policy in the less-developed countries the extreme

positions are (*a*) a family planning program that combines the efficient provision of services with suitable campaigns of persuasion is usually sufficient for a large reduction in the birth rate; and (*b*) fertility falls because social and economic change makes lower fertility advantageous and breaks down traditional beliefs and behavior sustaining the former high birth rate, so that direct support of family planning is of little use. There probably is some merit in both positions. Birth control facilities have little effect if the population has no interest in limitation of births; but a desire for fewer births can be better implemented (and possibly stimulated) by the provision of services, information, and incentives.

The abrupt restructuring of the Chinese economy and society by the Chinese Communist Party may have been the principal cause (or a major contributing cause) of the decline in the birth rate. The replacement by collective production of production mostly by family enterprises, the increased role of the community in child rearing, the extension of education, the reduction in mortality, the redefinition of women's roles, and the incessant programs of indoctrination are much like the assault on preindustrial customs and values that are ascribed to modern economic development in the so called "demographic transition." (The demographic transition is a set of generalizations concerning the source of the population changes that occurred during the industrialization of Europe, the United States, and other early entrants into the more developed category.)

A more speculative factor in the greater reduction in the Chinese birth rate is the possibly different malleability or receptivity of the traditional Chinese culture to the changes in behavior that bring about lower fertility. This speculation is derived from the similarity of the fertility reduction that has occurred in Japan since 1920 (but especially after World War II) and since the 1950s in Taiwan, Hong Kong, Singapore, and South Korea. In all these populations, which have cultures that in varying degrees originated in China, fertility has been very substantially reduced, and in all the reduction has entailed a major increase in age at marriage and a big increase in contraception and abortion. The social and economic changes in these other populations are not at all the same as in the People's Republic; also, with the possible exception of Singapore, government-supported family planning programs have been less intensive.

IMPLICATIONS OF POPULATION TRENDS IN INDIA AND CHINA

About 25 years ago Edgar M. Hoover and I completed our research on the relation between population growth and economic development in India (11). Our time perspective was the 30 years from 1956 to 1986, and our analytical framework was a pair of alternative population projections. These projections combined a single attempt to make a realistic assessment of prospects for the reduction in mortality over the 30 years to come and two arbitrarily chosen contrasting assumptions about the course of fertility over the same 30 years. One assumption was that the rates of childbearing would remain unaltered for 30 years, and the other was that fertility would decline continuously for 25 years to a level 50% lower and then remained fixed.

These alternative future populations were then incorporated in an analysis designed to determine how the economy and the society would evolve with different demographic trends. In the two economic projections (one for each assumed future evolution of the population), the same assumptions were made about marginal rates of savings and the productivity of capital, and about policies governing the allocation of resources to increased industrial and agricultural production and to education, housing, and other welfare measures. Our emphasis was on how much difference it would make to the future well-being of India if fertility were reduced or not. This emphasis was a deliberate escape from the debate then current, and still continuing, between pessimists who saw inevitable disaster from high population growth in poor countries and optimists who saw the sources of poverty elsewhere and denied any important adverse effects of population growth. Our intention was to avoid black-or-white assumptions about disaster on the one hand or the absence of any difficulties on the other, and to ask how much difference would lower fertility make.

In estimating the growth in total national product under the two projected populations, we concluded that the increase in the effective labor force would be about the same for 25 or 30 years. Lower fertility would not reduce the population over age 15 years until 15 years had passed, and then by a small initial margin. Moreover, the greater availability for participation of women in the labor force with much lower fertility would make up the difference in the potential labor force, at least for 25 or 30 years. Most of the difference in the projected populations in this time period is in the number of children. According to our analysis, the greater number of children with sustained than with reduced fertility would tend to increase the fraction of national income devoted to consumption at the expense of investment and to increase the part of investment devoted to uses with a lesser or more delayed contribution to later increases in output. We concluded that the growth of national income in 30 years would be somewhat larger if fertility were to be reduced rather than maintained (to be sure, only 4% larger after 20 years and 8% after 25 years but as much as an estimated 14% after 30 years). This somewhat larger product would of course be divided by a smaller population if fertility were reduced. After 30 years, the population with lower fertility would be only 76% as large as the sustained-fertility population; the per capita income with reduced fertility would be nearly 50% greater. Because the greater number of consumers would be mostly children, who normally consume less than adults, we counted each child as equivalent to half an adult consumer, reducing the advantage from reduced fertility from 50% per capita to 40% per equivalent adult consumer after 30 years.

How do the results of this analysis compare with the changes in population and the growth in income that have actually occurred in India in the 25 years since the analysis was made? A short answer is that the population projected on the assumption of no change in fertility is close to the population recorded in the censuses of 1961, 1971, and 1981, in age composition as well as in total number; the birth and death rates by decade projected on the same assumption are close to the estimates made after the fact, and the growth in national product calculated in conjunction with sustained fertility also agrees with after-the-fact estimates by the World Bank (Table 2).

The assumption of no change in fertility was not intended as a forecast but was used as a device to estimate the effect of contrasting alternatives. The population projections on this assumption were close to reality because fertility actually declined only slightly and because the estimates of fertility at the start of the population projection (around 1951) were probably a little too low. The estimates of mortality seem to have correctly foreseen a steep decline in the 1950s and a slackening decrease thereafter, and the calculated growth of the Indian economy proved quite close to its actual development during the 2 decades after 1956.

The surprisingly good fit of the projected population and the projected national product to the recorded or estimated real counterparts does not (unfortunately) prove that we correctly determined the extra gain in output per consumer that would have resulted if fertility had been reduced by 50% between 1956 and 1981. We estimated that income per consumer would rise

Table 2. Changes in Indian population and national product as projected in 1956 (under assumption of no change in fertility) compared to census figures and estimates after the fact

Variable	Period	Projected numbers	Later records or estimates
Birth rate, no./10^3	1951–1960	43.6	45
	1961–1970	41.0	41
	1971–1980	40.0	39
Death rate, no./10^3	1951–1960	25.8	26
	1961–1970	18.6	19
	1971–1980	15.3	17
Total population,	1951	100	100
% relative to 1951	1961	119	122
	1971	149	152
	1981	191	189
Age distribution	0–14 yr	41.0	42.0
in 1971, %	15–64 yr	55.5	54.6
	≥65 yr	3.4	3.4
National income,	1956	100	100
% relative to 1956	1961	118	120
	1966	139	136
	1971	164	177
	1976	195	203

The projected numbers are from ref. 11. Later recorded numbers for population data are from sources listed in Table 1; national income data are from ref. 6.

by about 30% in 20 years if fertility were unchanged, and that the gain with reduced fertility (at the postulated pace) would be about 14% greater—4% greater because gross national product would rise more, and 10% greater because the number of equivalent adult consumers would increase less. The projected relative advantage of reduced fertility increases from 14% in 20 years to 26% in 25 years and 40% in 30 years.

In retrospect, the extent of any extra increase in gross national product that a reduction in the birth rate would have produced is the most uncertain feature of our analysis. Less pressure for consumption because of fewer children would not inevitably lead to much additional investment, partly because household savings are not a major source of the potential volume of investment. But at least some advantage in growth of gross national product seems to be plausible, and the principal part of the advantage from reduced fertility—the greater individual income from dividing the product among fewer consumers—is undeniable.

The most readily visualized advantages of lower fertility are those that would have accrued to the children born since 1956 had there been fewer of them. In families of three or four children instead of five or six, there could have been better parental care, less-crowded housing, better nourishment, and better schooling. Most certainly the future prospects of today's young would be more favorable if fewer had been born.

Provision of adequate opportunity for productive employment of a large and growing labor force is an almost universal and often intractable problem in less-developed economies. The introduction of modern methods of production in agriculture and manufacturing has been more successful in increasing output than in expanding the number of jobs. The lack of opportunity for productive employment is sometimes manifest in large numbers unemployed, in the sense of actively seeking work, and, in poorer economies, more often is manifest in large numbers engaged in activities of very low productivity—for example, more porters, more barbers, more small shopkeepers, and more farm workers than are needed to provide the actual level of service or of agricultural output. The failure of fertility to decrease in the past 25 years means that the labor force will continue to grow rapidly in the next 20–40 years, making the problem of providing adequate employment opportunities more acute.

The potential members of the labor force 20 years in the future are mostly already born, and their number will be much larger than if fertility had been reduced in the past 25 years rather than remaining almost constant. Specifically, the projected population in India at ages 15–64 20 years from now is about 60% greater than the current population at those ages; if fertility had been reduced by 50% in the past 25 years, the population of labor force age would increase by only about 30%. It would be difficult enough to generate productive employment for 30% more potential workers 20 years from now; one of the greatest costs of the failure to reduce fertility is that the additional number will be about twice that large.

The provision of needed jobs is made more difficult by the current structure of employment in India, where 70% of the labor force is in agriculture. Because there are no more than 2 acres of cultivated land per person in the agricultural labor force and there is little additional cultivable acreage, no one would contend that additions to the agricultural labor force are needed. Indeed, with 20th century technical possibilities, a much smaller labor force could produce a much larger total agricultural output. A conservative assumption, then, is that the additional labor force 20 years from now should all be provided nonagricultural employment. With a 60% increase in the population 15–64 years old, the needed nonagricultural employment after 20 years is 3 times the total current employment outside of agriculture; even if fertility had fallen by 50% since 1956, the required nonagriculture jobs in 20 years would be about twice the current number. The actual increase in employment outside agriculture will very likely be less than the doubling that would be required had fertility been reduced. What unfortunately will be necessary is the absorption of many additional workers in an agricultural sector already overfull. This unfavorable prospect is much worse because the birth rate declined so little.

STATEMENTS BY AUTHORITIES IN CHINA ABOUT THE REDUCTION OF FERTILITY

In support of a stringent birth planning program, Chinese authorities have made statements very similar to the above descriptions of the gains forgone in India by India's inability to reduce its birth rate 25 years ago. In a speech in 1979 on the day the Planned Birth Law was promulgated, Chen Muhua, then Vice Premier and head of the Planned Birth Leadership Group in the State Council, made the following points (12):

(*i*) Rapid population growth does not foster accelerated capital accumulation. It is estimated that the cost of raising the 600×10^6 children born since the founding of the People's Republic has been about 30% of the aggregate national income over the period. It would have been better if only about 400×10^6 had been born, a reduction that would still have yielded a labor force adequate for development but that would have greatly enhanced national capital accumulation.

(*ii*) Rapid population growth impedes improvements in the population's scientific and cultural level by putting too great a numerical burden on the system of education; it also creates "labor force and employment difficulties."

(*iii*) Rapid population growth is not beneficial to the improvement in living standards. About 58% of the added "consumption fund" each year must be spent on increased population; only 42% can be used to raise expenditure levels. In spite of a near doubling of food output, the per capita increase in food has been only 17%.

THE FUTURE POPULATIONS OF CHINA AND INDIA

In the absence of catastrophic events such as nuclear war, the populations of India and China are destined to become even larger, and by a large margin. If the Chinese were to achieve a total fertility rate of as low as 1.7 children born per woman by 1990 and maintain fertility that low for 30 years, the population would increase to a maximum of 1.22×10^9 in 2020—about 75% greater than the 700×10^6 it was when the birth rate began its big decline in the mid-1960s. To limit the increase to this amount will require an extraordinary success of the birth planning program. For many years, 30% of parents would need to have only one child, and 70% only two. If a significant fraction had three or more, the proportion of one-child couples would need to be higher still. The social cost would be substantial. Many children would grow up with no siblings; many in the next generation would have no aunts, uncles, or cousins; very many parents would have no sons, and there would be an age structure with a marked relative shortage of younger workers, males of military age, etc. These features are very foreign to Chinese customs and values; the stringent and allegedly coercive means needed to achieve such low fertility might have adverse political effects as did less draconian measures in India.

In India, the failure to have started a large decline in fertility as early as in China implies a prospective growth on the order of 75% or more of the current population—to a maximum of at least 1.2×10^9, because the current population is nearly the size the Chinese population was when the birth rate in China began its dramatic fall.

The death rate in India is higher than that in China, but the prospective decline in fertility in India is surely more gradual; the attainment of a replacement level (total fertility rate of about 2.2 or 2.3 children) is long in the future, to say nothing of attainment of lower rates.

The reason for the large continuing increases in population in each country even after fertility is reduced is that population growth has its own momentum. High birth rates in the recent past mean that there will be many more potential parents for another generation than there are now. Even if every couple merely replaces itself, the population continues to increase by 50% or more.

Thus, the world's two largest populations are destined to become much larger. I believe today, as I did when working with Hoover, that if sensible economic policies are followed it will be possible to provide a somewhat better life for these larger populations than is enjoyed in the two countries today. Reducing fertility soon to no higher than needed for long-run replacement would improve the prospects significantly and would especially improve the social and economic future as seen from the perspective of early in the next century. Yet, the mistakes of the past cannot be cancelled; the birth rate cannot be lowered retrospectively. A lower birth rate now is desirable, but the ideal rate is not zero. There are social and political costs of excessive emphasis on the immediate achievement of very small families; the rights and sensibilities of the current population, and the disequilibrating effects of drastic changes in age composition must enter the calculation of desirable population policies.

This material was presented as the David Glass Lecture at the London School of Economics in October 1982. It was prepared at the Center for Advanced Studies in the Behavioral Sciences, Stanford, CA. I am grateful for financial support provided by National Science Foundation Grant BNS8206304 and by the Exxon Education Foundation.

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