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ORIGINAL ARTICLE

Health Improvements Have Been More Rapid and Widespread in China than in India: A Comparative Analysis of Health and Socioeconomic Trends from 1960 to 2011

Gopal K. Singh, PhD[1] ✉; **Jihong Liu**, ScD[2]

[1] US Department of Health and Human Services and Center for Global Health and Health Policy, Global Health and Education Projects, Washington, DC 20018, USA

[2] University of South Carolina, Arnold School of Public Health, Department of Epidemiology and Biostatistics, Columbia, SC 29208, USA

✉ Corresponding author e-mail: gsingh@mchandaids.org

ABSTRACT

Objectives

We examined differences between China and India in key health and socioeconomic indicators, including life expectancy, infant and child mortality, non-communicable disease mortality from cancer, cardiovascular diseases (CVD), and diabetes, Human Development Index, Gender Inequality Index, material living conditions, and health expenditure.

Methods

Data on health and social indicators came from various World Health Organization and United Nations databases on global health and development statistics, including the GLOBOCAN cancer database. Mortality trends were modeled by log-linear regression, and differences in rates and relative risks were tested for statistical significance.

Results

Although both countries have made marked improvements, India lags behind China on several key health indicators. Differential rates of mortality decline during 1960-2009 have led to a widening health gap between China and India. In 2009 the infant mortality rate in India was 50 deaths per 1,000 live births, 3 times greater than the rate for China. Sixty-six out of 1,000 Indian children died before reaching their 5th birthday, compared with 19 children in China. China's life expectancy is 9 years longer than India's. Life expectancy at birth in India increased from 42 years in 1960 to 65 years in 2009, while life expectancy in China increased from 47 years in 1960 to 74 years in 2009. Major health concerns for China include high rates of stomach, liver, and lung cancer, CVD, and smoking prevalence. Globally, India ranked 90th and China 102nd in life satisfaction.

Conclusions and Public Health Implications

India's less favorable health profile compared to China is largely attributable to its higher rates of mortality from communicable diseases and maternal and perinatal conditions. Further health gains can be achieved by reducing social inequality, greater investments in human development and health services, and by prevention and control of chronic-disease risks such as hypertension, smoking, obesity, and physical inactivity.

Key Words

China • India • Health status • Life expectancy • Infant and child mortality • Non-communicable diseases • Cancer • Health risks • Human development • Social inequality.

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Introduction

China and India are the two most populous nations in the world. With the populations of 1.35 and 1.21 billion respectively, they jointly account for 37% of the world population [1]. China and India gained their independence in the modern era, in 1949 and 1947, respectively. Around the time of their independence, both countries had roughly similar levels of health and socioeconomic development[2]. However, according to our analysis that follows, both countries differ greatly in their health and socioeconomic achievements, six decades on.

Because of the remarkable and rapid economic growth of the past two decades, there have been numerous comparisons of economic performance of India and China[3-7]. However, to date, few comparisons have been made that provide a comprehensive assessment of how key health, disease, socioeconomic, and human development indicators for these two countries have changed over time[5-8]. With the availability of high-quality data from the World Health Organization (WHO) and the United Nations (UN), it is possible to provide a more complete and systematic comparison of China and India on various health and development issues[1, 9-11].

In this study, we analyze the extent of disparities between the two nations in key health indicators such as life expectancy, infant mortality, under-five mortality, maternal mortality, cancer, and other chronic diseases, health behaviors, health expenditure, and social and economic factors such as human development, gender inequality, life satisfaction, urbanization, literacy, and income per capita. Additionally, we examine the magnitude of health inequalities within India and China across socioeconomic groups, provinces, and rural and urban areas. Special emphasis is given to the analysis of disparities in cancer rates, detailed data on which are available for both countries. Cancer is also a disease that is expected to account for a greater share of the total disease burden in the future in both China and India as lifestyle factors and consumption patterns begin to mimic those seen in the developed world and aging of the population becomes an important issue in China[10, 12].

Simultaneous examination of health and socioeconomic conditions is important because social conditions, including human development, have been shown as fundamental, underlying determinants of health inequalities both within and between nations[13-15]. Analysis of existing health and social conditions and changes in these indicators is vital for social planning and public health decision making[1, 6, 9]. Comparisons between China and India can highlight the extent of disease burden due to specific health conditions, similarities as well as differences in socioeconomic conditions, urbanization patterns, prevalence of health-risk factors, and availability and use of preventive health services[9, 12]. Analysis of various health and socioeconomic indicators is presented side by side for China and India in the hopes that such information would be readily used by policymakers and researchers in both countries for policy and program formulation, and for facilitating more in-depth examination of specific health and/or development issues.

Methods

Annual trends in life expectancy, infant, child, and maternal mortality rates were analyzed using the 2011 WHO, UN, and the World Bank databases that include current and time-trend data on health and human development variables for all nations, including China and India[1, 9-11]. Information on these databases can be found elsewhere and is briefly described below[1, 9-11]. Cancer incidence and mortality data were derived from the 2008 GLOBOCAN database.[16-18] The GLOBOCAN database, developed by the International Agency for Research on Cancer, provides contemporary estimates of the incidence of, mortality and prevalence from major type of cancers, at national level, for 184 countries of the world. Details of the GLOBOCAN database are provided elsewhere[16-18].

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The data on the Human Development Index (HDI), Gender Inequality Index (GII) and life satisfaction were taken from the 2011 Human Development Report[1], while those on Gross National Income (GNI) per capita, international poverty rate (the proportion of population living in extreme poverty), literacy rate, urbanization, cause-specific morbidity and morbidity, health behaviors, health expenditure, and health services came from the 2011 World Health Statistics Report, Non-Communicable-Disease country profiles, and the World Bank's health, nutrition, and population database[9-11]. HDI, developed by the UN, is a composite index of social and economic development which combines indicators of life expectancy, educational attainment, and GNI per capita. HDI varies between 0 and 1, with 0 indicating the lowest level and 1 representing the highest level of development[1, 19]. GII is also a composite index that reflects women's relative social disadvantage in three dimensions – reproductive health, empowerment, and the labor market[1, 19]. GII combines 5 indicators, maternal mortality ratios, adolescent fertility rate, educational attainment, parliamentary representation by each sex, and female labor force participation[1, 19].

Log-linear regression models were used to estimate annual rates of change in life expectancy, infant mortality, and child mortality trends from 1960 to 2009[15, 19]. Specifically, during the 1960-2009 period, the logarithm of the mortality rates or life expectancy were modeled as a linear function of time (calendar year), which yielded annual exponential rates of change in mortality rates or life expectancy[15, 19]. Differences between China and India in cancer incidence and mortality rates and relative risks were tested for statistical significance at the 0.05 level.

Results

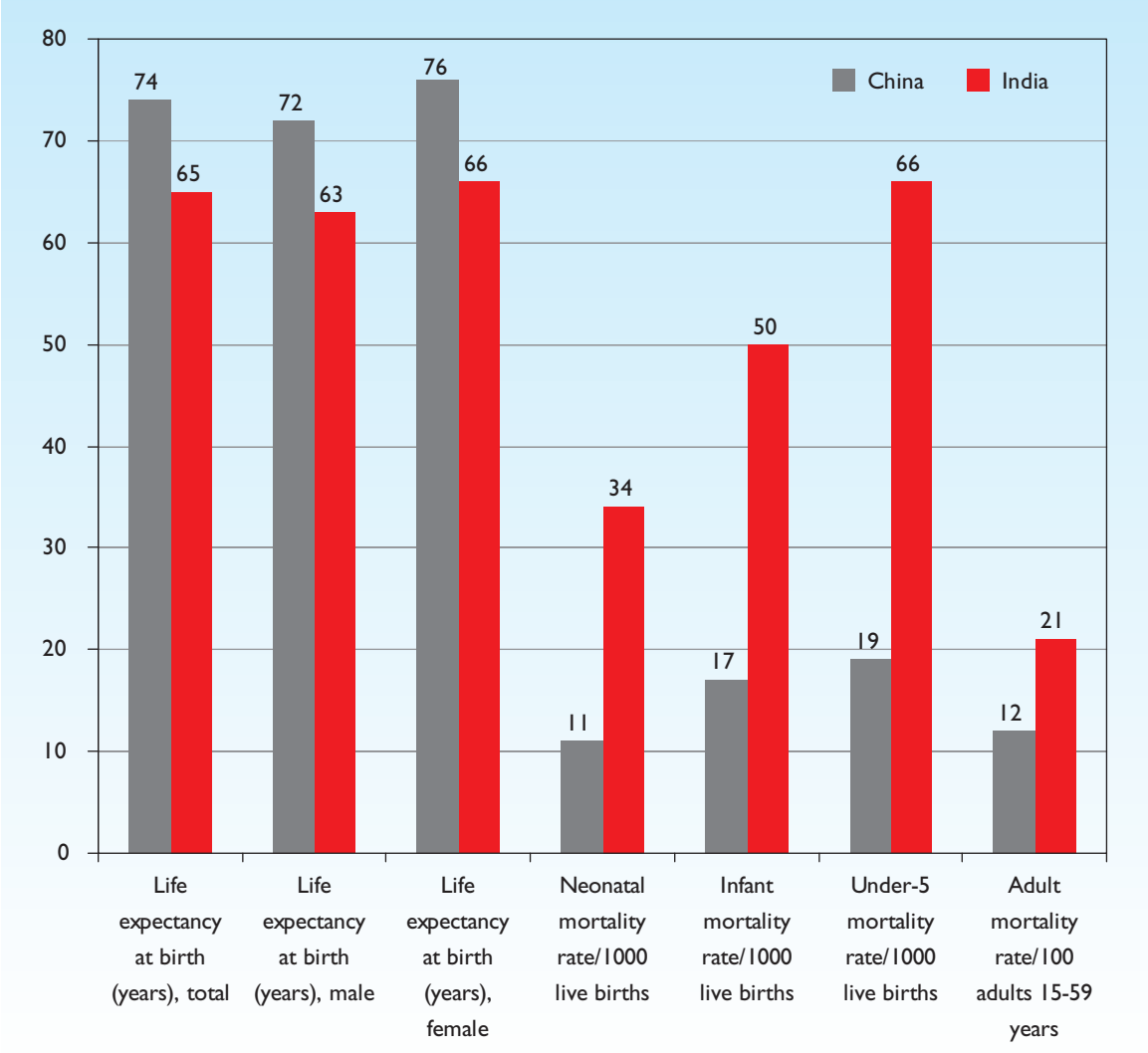
Inequalities in Key Health Measures

In 2009, life expectancy was nine years longer in China than in India (74 versus 65 years) (Figure 1). For both India and China, life expectancy increased substantially during the past 5 decades. Life expectancy at birth in India increased from 42 years in 1960 to 65 years in 2009, while life expectancy in China increased from 47 years in 1960 to 74 years in 2009. Although the rate of increase in life expectancy was similar for the two countries, the absolute increases in life expectancy were larger for China (Figure 2). During 1960-2009, life expectancy increased annually by 0.55 years in China and by 0.47 years in India.

Infant and child mortality rates declined impressively in both India and China between 1960 and 2009. However, disparities between the two nations have widened (Figure 3). In 2009 the infant mortality rate (IMR) of 50 deaths per 1,000 live births in India was three times greater than the rate of 17 in China (Figures 1 and 3). In 1960 the IMR was only 1.3 times higher in India than in China. The average annual rate of decline in infant mortality was faster in China than in India (3.5% versus 2.2%). It is important to note that the IMR in mainland China is still much greater than the rate for Hong Kong and for many developed nations. The 2009 IMR for the US, for example, was 6.4, and, for Hong Kong, Japan, and Singapore, the rate was below 3.[9] The disparities in under-5 mortality were also marked, with 66 out of 1,000 Indian children in 2009 dying before reaching their 5th birthday, as compared with 19 children in China (Figure 1). The relative risk of child mortality in India compared to China increased from 1.1 in 1960 to 3.5 in 2009. Child mortality declined at a rate of 4.4% per year in China, compared with an annual rate of 2.5% in India (Figure 3). The rate of low birth weight among newborns in India was 28% [only Mauritania (34%) and Pakistan (32%) have higher rates], compared with only 3% in China (Table 1). China's low-birth-weight rate was even lower than the overall US rate of 8.2% and 4.2% for Chinese Americans[20].

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Figure 1. Selected Key Health Indicators for China and India, 2009

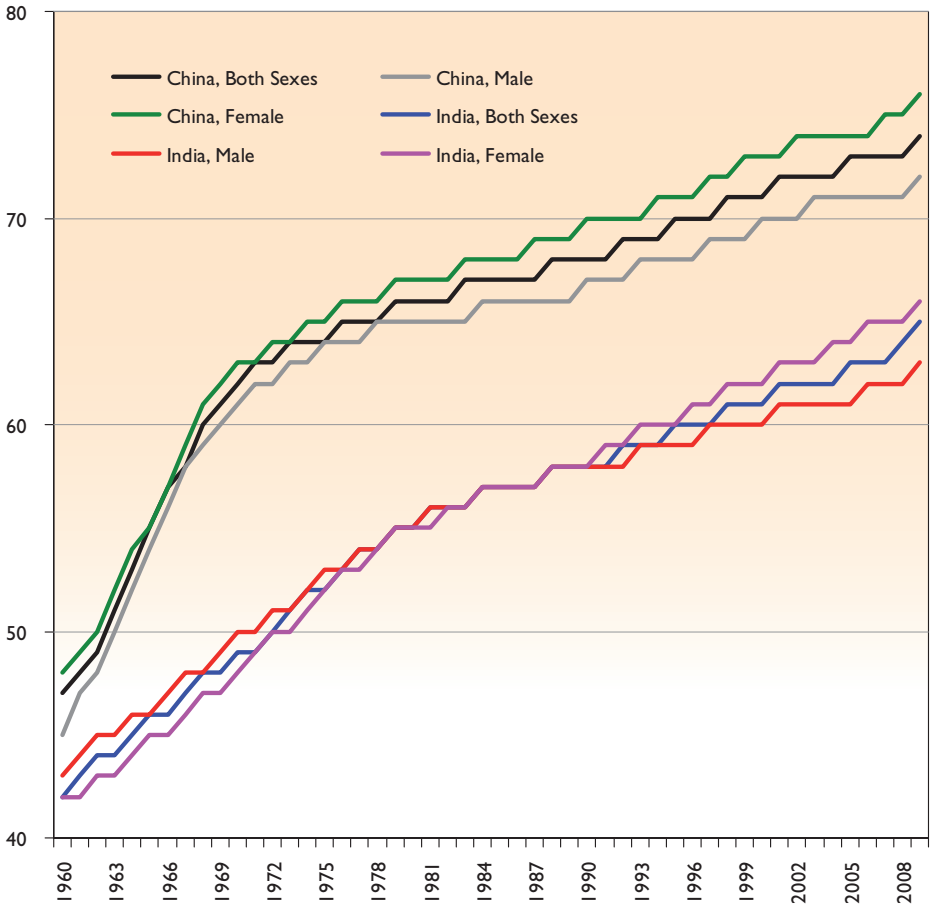


Source: World Health Organization, World Health Statistics Report 2011.

Marked differences can also be seen in maternal mortality and cause-specific mortality rates. India's maternal mortality rate of 230 maternal deaths per 100,000 live births was 6.1 times greater than the rate of 38 in China. Between 1980 and 2008, both China and India were able to reduce maternal mortality rates by 60-65%. Prevalence of tuberculosis was 1.8 times higher and the adult HIV prevalence was 3 times higher in India than in China (Figure 4). There are 2.4 million people living with HIV in India and the annual number of AIDS deaths is 172,000[21]. China, on the other hand, has a lower HIV/AIDS burden, with 740,000 people living with HIV and 26,000 AIDS deaths annually[21].

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Figure 2. Trends in Life Expectancy at Birth (Years) in China and India, 1960-2009



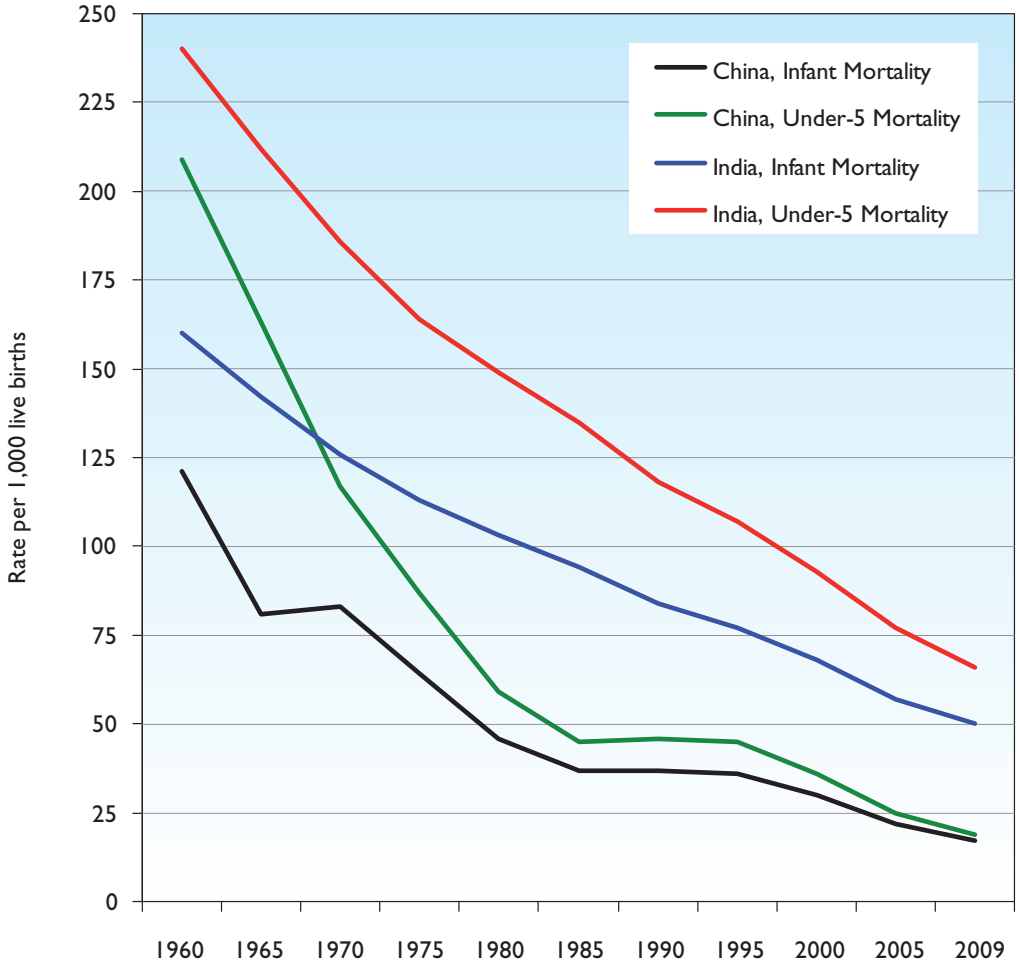
Log-Linear Regression Trend Models of Life Expectancy, 1960-2009

	China	China	China	India	India	India
1960-2009	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**
Regression slope (b)	0.0069	0.0068	0.0072	0.0079	0.007	0.0089
SE (slope)	0.0005	0.0005	0.0005	0.0003	0.0003	0.0003
R-Square	0.7978	0.7615	0.8229	0.9379	0.9221	0.9527
Annual rate of change (%), (exp(b)-1)*100	0.70	0.68	0.72	0.80	0.70	0.90
95% lower confidence limit	0.60	0.57	0.63	0.74	0.64	0.84
95% upper confidence limit	0.80	0.79	0.82	0.85	0.76	0.95

Source: World Health Organization and World Bank.

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Figure 3. Trends in Infant and Child (Under 5) Mortality Rates in India and China, 1960-2009



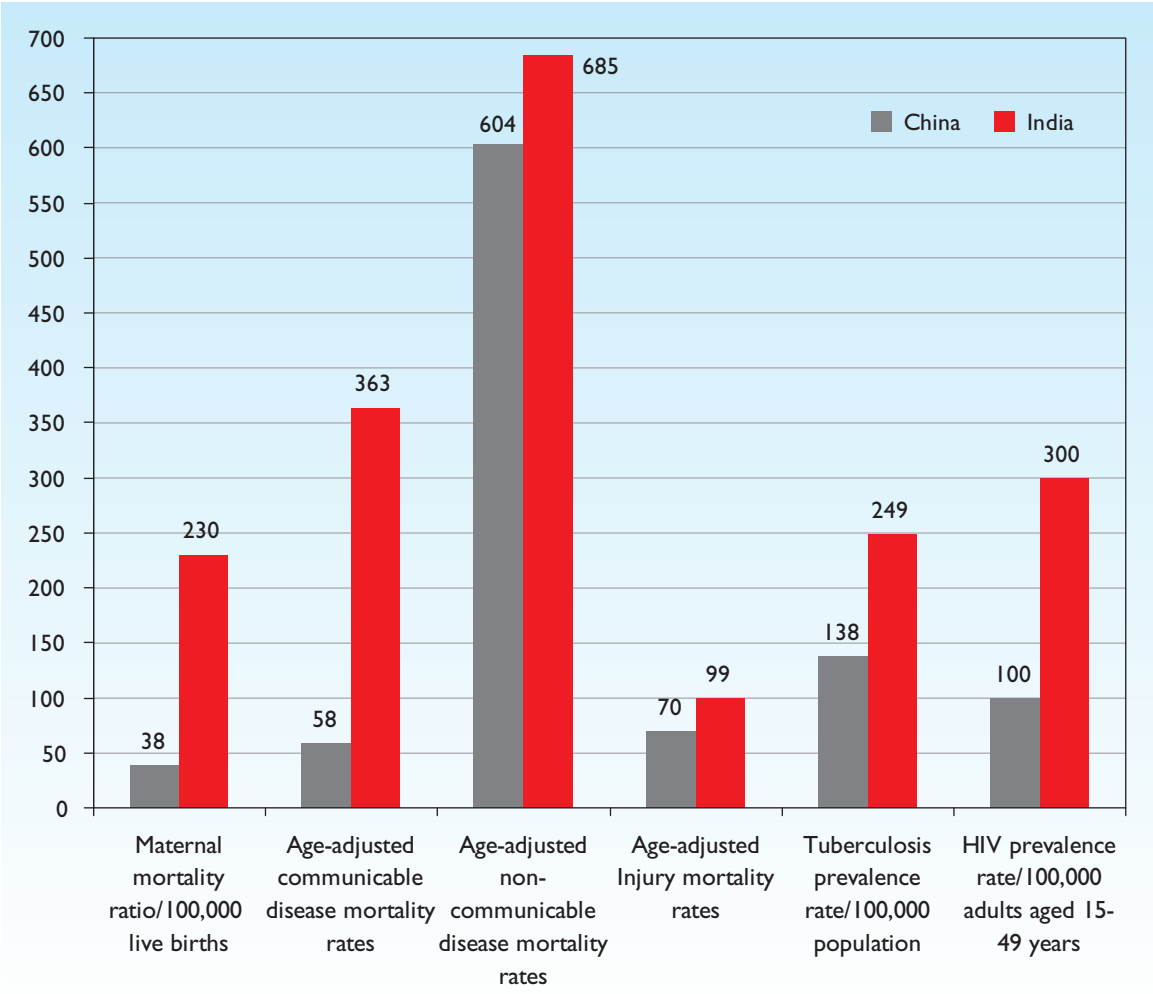
Log-Linear Regression Trend Models of Infant and Child Mortality Rates, 1960-2009

	China	China	India	India
1960-2009	**IMR**	**CMR**	**IMR**	**CMR**
Regression slope (b)	-0.0356	-0.0451	-0.0225	-0.0251
SE (slope)	0.0024	0.0031	0.0007	0.0008
R-Square	0.9609	0.9597	0.9919	0.9915
Annual rate of change (%), (exp(b)-1)*100	-3.50	-4.41	-2.23	-2.47
95% lower confidence limit	-3.95	-4.99	-2.36	-2.62
95% upper confidence limit	-3.05	-3.83	-2.10	-2.33

Source: World Health Organization and World Bank.

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Figure 4. Selected Cause-Specific Mortality and Morbidity Indicators for China and India, 2008



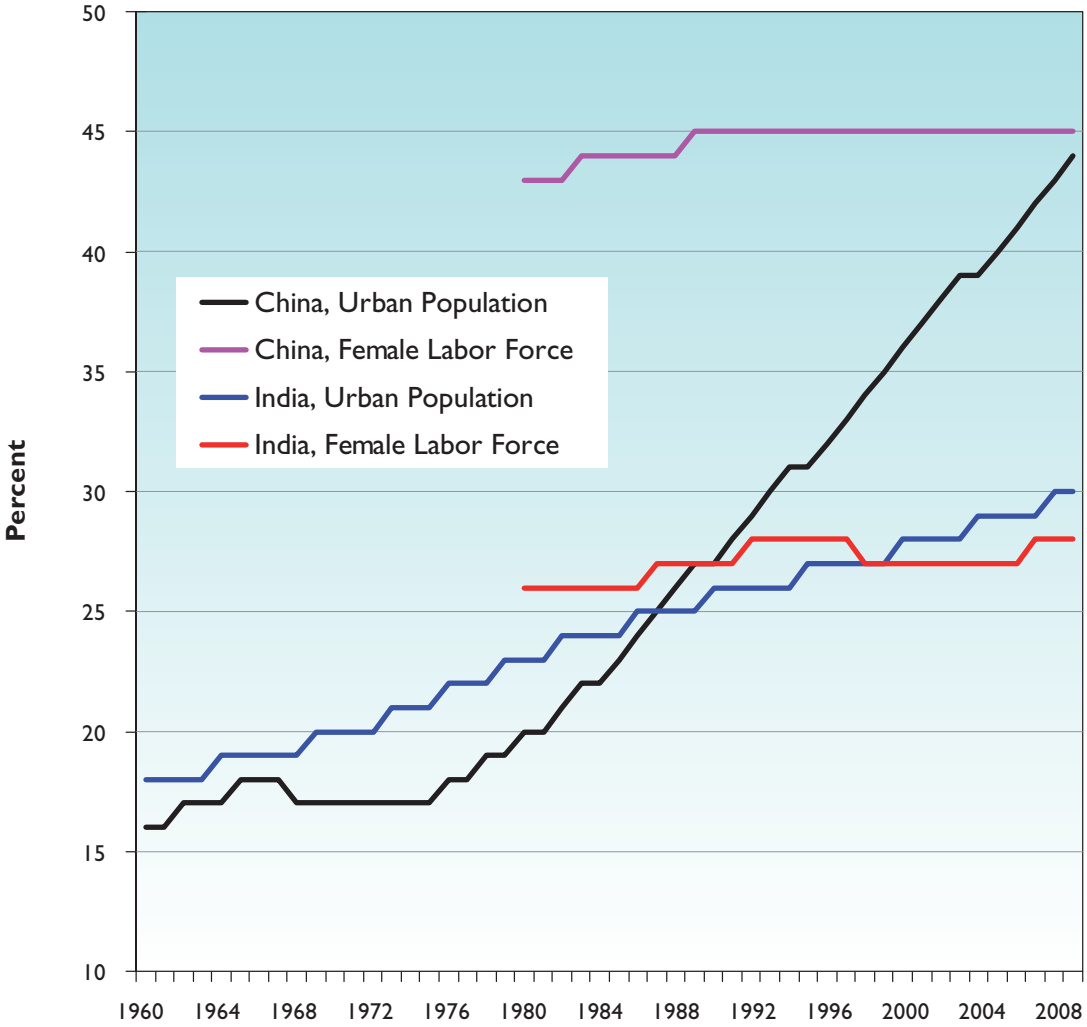
Note: Cause-specific mortality rates are per 100,000 population and are age-adjusted to the world standard population.
Source: World Health Organization, World Health Statistics Report 2011.

Infectious diseases account for 52% of the total years-of-life lost in India compared with 15% in China. The rate of infectious-disease mortality in India was 6.3 times higher than that in China (Figure 4). Even though non-communicable diseases accounted for 65% of the total years-of-life lost in China compared to 35% in India, the absolute rate of mortality from non-communicable diseases was still 13% higher in India than in China (Table 1 and Figure 4).

Overall, cancer incidence and mortality rates were 83-84% higher in China than in India (Table 2). Incidence rates for liver and stomach cancers were 8-12 times higher and those for uterine, lung, colorectal, esophageal, pancreatic, kidney, bladder, and brain cancers were 2-6 times higher in China

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Figure 5. Trends in Urbanization and Female Labor Force Participation (Percentage of Total Labor Force) in India and China, 1960-2009



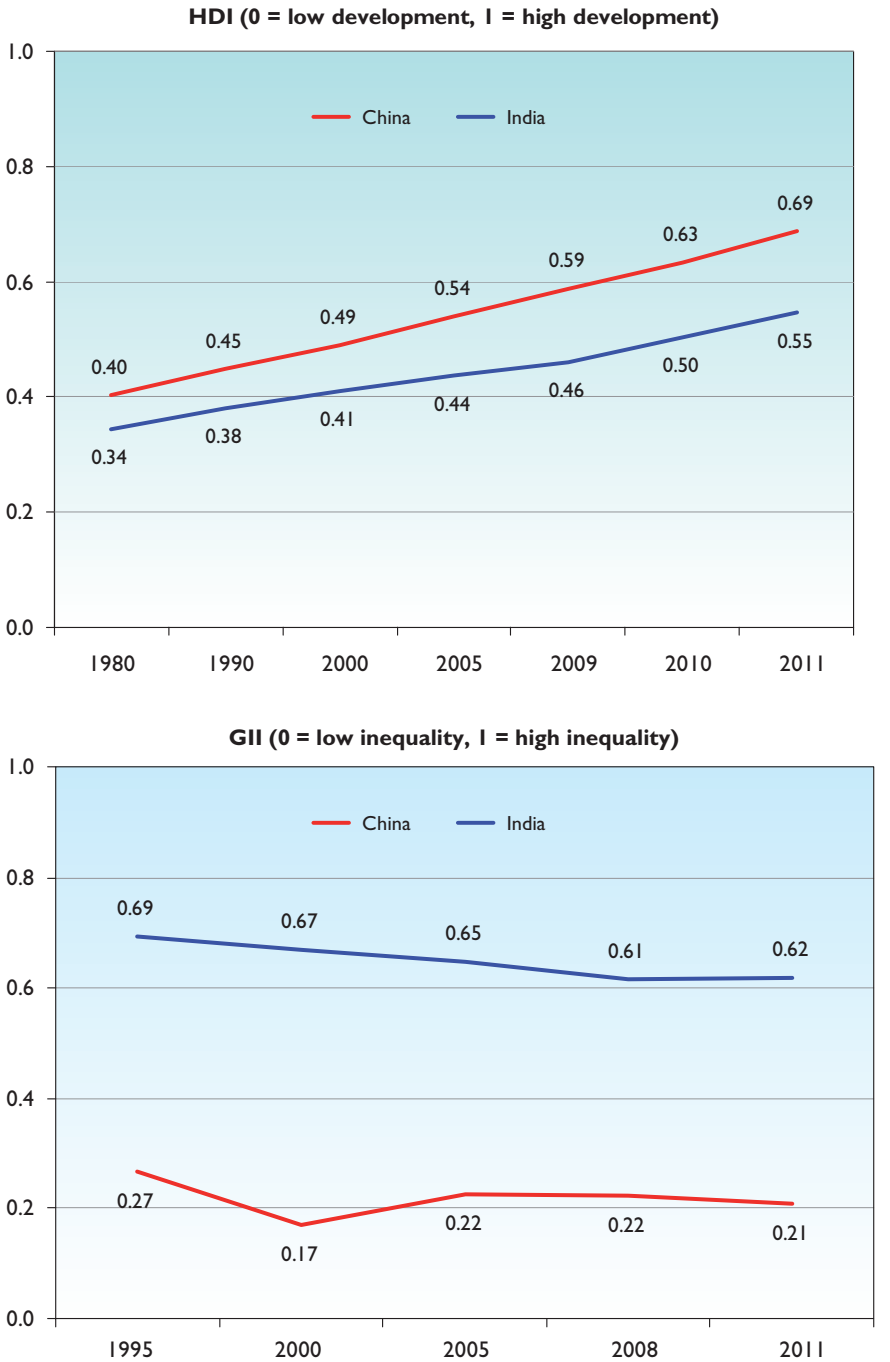
Source: World Health Organization and World Bank.

than in India. Mortality rates from most reproductive cancers were higher in India than in China. Women in India had 2.0, 2.7, and 3.6 times higher rates of breast, ovarian and cervical cancer mortality, respectively, than their Chinese counterparts. Mortality from prostate, lymphoma, and multiple myeloma was also substantially higher in India than in China. Rates of incidence and mortality from oral cancers (lip, oral cavity and pharynx) were 9-14 times higher in India than in China. This is primarily because of high prevalence of bidi smoking, chewing tobacco, and betel quid (paan) in India[18].

In terms of childhood cancers, although the overall incidence rate was 10% lower in China than in India, Chinese children had 24% higher overall cancer mortality and approximately two-fold higher

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Figure 6. Trends in Human Development Index (HDI) and Gender Inequality Index (GII) for India and China, 1980-2011



Source: United Nations, Human Development Report 2011.

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brain and leukemia mortality than Indian children (Table 2).

In terms of chronic-disease risk factors, smoking prevalence among Chinese men was 49.3%, two times higher than the prevalence of 25.1% among Indian men (Table 1). Prevalence of physical inactivity, hypertension, obesity/overweight, and raised cholesterol were higher in China, but Indians had a two times higher prevalence of diabetes than Chinese (7.8% versus 4.2%).

Although both China and India spent slightly more than 4% of their GDP on health, health expenditure per capita (i.e., per person) was two times higher in China than in India (Table 1). Moreover, the proportionate government expenditure on health was 2.6 times larger in China than in India. Health care infrastructure (physicians and hospital beds per capita) was also more favorable in China than in India. In terms of access to improved sanitation facilities, rural Indians lag behind their Chinese counterparts (Table 1). Stunting and malnutrition is a major problem among Indian children under age 5 as nearly half of them are stunted and underweight. The prevalence of malnutrition is low among Chinese kids (Table 1).

Inequalities in Socioeconomic Conditions and Human Development

Approximately 42% of Indians live below the international poverty line (<$1 per day), compared with 16% of Chinese. Only half of the female adult population in India has achieved literacy, compared with 91% of Chinese women (Table 1). Both countries have experienced rapid urbanization during the past five decades. In 2009, 44% of the Chinese population and 30% of the Indian population lived in urban areas (Figure 5). Historically, female labor force participation (the proportion of total labor force) has been much lower in India than in China (Figure 5). More than 67% of Chinese women are currently in the workforce, compared with 33% of Indian women (Table 1).

Although India ranks lower than China in human development, improvements in human development have been impressive (Figure 6). Between 1980 and 2011, the HDI score increased from 0.34 to 0.55 for India and from 0.40 to 0.69 in China. Levels of gender inequality remain very high in India, and there has hardly been any improvement in this arena during the past two decades. China, on the other hand, is on par with many western industrialized countries and even exceeds the United States in gender equality[1]. In terms of life satisfaction, both Indians and Chinese score in the middle of the 11-point scale (Table 1). Out of 151 countries, India ranked 90th and China 102nd in life satisfaction, with people in Denmark and Canada reporting highest levels of life satisfaction[1].

Inequalities within India and China

Health and socioeconomic conditions vary greatly both within India and China, and, consequently, health inequalities within India and China are quite large[22-24]. Children in the poorest quintile in India had 3 times higher mortality than their wealthiest counterparts (Table 3). The urban and economically affluent women in India were 2-to-5 times more likely to have births attended by skilled health personnel than their rural and socioeconomically disadvantaged counterparts. Percentage of births attended by skilled health personnel is a measure of health service access and utilization. Life expectancy at birth in India varied from a low of 58 for Chhattisgarh, Madhya Pradesh, and Jharkhand to 74 years in Kerala. State differences in infant mortality were similar, with Madhya Pradesh having the highest infant mortality rate of 61 deaths per 1,000 live births and Kerala the lowest rate of 13 (data not shown)[25].

Health inequalities between the Indian states coincide with those in human development and poverty rates. According to the Indian Government estimates, poverty rates in 2009-10 were highest in Bihar (54%) and Chhattisgarh (49%) and lowest in Himachal Pradesh (10%) and Kerala (12%)[25]. Kerala ranked the highest on human development

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Table 1. Non-Communicable Disease (NCDs) Mortality Rates, Health-Risk and Health Care Factors, and Social Determinants, 2008-2011

Non-Communicable disease mortality rates and health determinants	China Rate	India Rate	India/China Rate Ratio	India-China Difference
Age-adjusted death rate from all non-communicable diseases, male	665.2	781.7	1.18	116.5
Age-adjusted death rate from all non-communicable diseases, female	495.2	571.0	1.15	75.8
Age-adjusted death rate from chronic respiratory diseases, male	118.4	178.4	1.51	60.0
Age-adjusted death rate from chronic respiratory diseases, female	88.7	125.5	1.41	36.8
Age-adjusted death rate from cardiovascular diseases & diabetes, male	311.5	386.3	1.24	74.8
Age-adjusted death rate from cardiovascular diseases & diabetes, female	259.6	283.0	1.09	23.4
Percentage contribution of NCDs to years of potential life lost	65.0	35.0	0.54	-30.0
Current smoking prevalence (%), male	49.3	25.1	0.51	-24.2
Current smoking prevalence (%), female	2.1	2.0	0.95	-0.1
Physical inactivity prevalence (%), male	29.3	10.8	0.37	-18.5
Physical inactivity prevalence (%), female	32.0	17.3	0.54	-14.7
Raised blood pressure (%)	38.2	32.5	0.85	-5.7
Raised blood glucose (%)	9.4	10.0	1.06	0.6
Diabetes prevalence (%)	4.2	7.8	1.86	3.6
Overweight prevalence (%), male	25.5	9.9	0.39	-15.6
Overweight prevalence (%), female	25.4	12.2	0.48	-13.2
Obesity prevalence (%), male	4.7	1.3	0.28	-3.4
Obesity prevalence (%), female	6.7	2.4	0.36	-4.3
Raised cholesterol (%)	33.5	27.1	0.81	-6.4
Number of physicians per 10,000 population	14.2	6.0	0.42	-8.2
Number of hospital beds per 10,000 population	41.0	9.0	0.22	-32.0
Health expenditure as percentage of GDP	4.3	4.2	0.98	-0.1
Per capita total expenditure on health (PPP international $)	265.0	122.0	0.46	-143.0
General goverment expenditure on health as % of total govt expenditure	10.3	4.0	0.39	-6.3
Population using improved drinking water-sources (%), urban	98.0	96.0	0.98	-2.0
Population using improved drinking water-sources (%), rural	82.0	84.0	1.02	2.0
Population using improved sanitation (%), urban	58.0	54.0	0.93	-4.0
Population using improved sanitation (%), rural	52.0	21.0	0.40	-31.0
Children under age 5 years stunted [low height-for-age] (%)	11.7	47.9	4.09	36.2
Children under age 5 years underweight (%)	4.5	43.5	9.67	39.0
Low birth weight (%)	2.7	27.6	10.22	24.9
Births attended by skilled health professionals (%)	96.0	47.0	0.49	-49.0
Adolescent fertility rate per 1000 girls aged 15-19 years	5.0	45.0	9.00	40.0
Adult female literacy rate (%)	91.0	51.0	0.56	-40.0
Female labor force participation rate (%)	67.4	32.8	0.49	-34.6
Population below the poverty line (international, <$1/day)	15.9	41.6	2.62	25.7
Gross national income per capita (PPP international $)	6,890	3,250	0.47	-3,640
Overall Life Satisfaction Scale (0 = least satisfied, 10 = most satisfied)	4.7	5.0	1.06	0.3

Age-adjusted death rates are per 100,000 population and are age-adjusted to the world standard population.

Source: WHO, World Health Statistics Report 2011 and NCD Country Profiles; United Nations, Human Development Report 2011.

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Table 2. Cancer Incidence and Mortality Rates in China and India, 2008

All Ages **Cancer site**	China Incidence **Cases**	China Incidence **ASR (W)**	India Incidence **Cases**	India Incidence **ASR (W)**	China/India Incidence **RR**	China/India Rate Ratio **95% CI**	China Mortality **Deaths**	China Mortality **ASR (W)**	India Mortality **Deaths**	India Mortality **ASR (W)**	China/India Mortality **RR**	China/India Rate Ratio **95% CI**
All cancers	2,817,210	181.0	948,858	98.5	1.84	1.83–1.84	1,958,347	124.6	633,455	68.0	1.83	1.83–1.84
Bladder	54,927	3.5	14,812	1.7	2.06	2.02–2.10	21,024	1.3	8,203	1.0	1.30	1.27–1.33
Brain, nervous system	66,454	4.4	21,835	2.1	2.10	2.06–2.13	45,573	3.0	17,941	1.8	1.67	1.64–1.70
Breast	169,452	21.6	115,251	22.9	0.94	0.94–0.95	44,908	5.7	53,592	11.1	0.51	0.51–0.52
Cervix uteri	75,434	9.6	134,420	27.0	0.36	0.35–0.36	33,914	4.2	72,825	15.2	0.28	0.27–0.28
Colorectum	221,313	14.2	36,476	3.9	3.64	3.60–3.68	110,486	6.9	25,690	2.8	2.46	2.43–2.50
Corpus uteri	86,066	11.1	8,772	1.9	5.84	5.71–5.97	19,126	2.4	4,851	1.1	2.18	2.11–2.25
Gallbladder	25,852	1.6	17,262	1.9	0.84	0.83–0.86	19,459	1.2	10,279	1.1	1.09	1.06–1.12
Hodgkin's lymphoma	5,600	0.4	7,371	0.7	0.57	0.55–0.59	2,734	0.2	3,587	0.4	0.50	0.48–0.52
Kidney	32,508	2.1	8,900	0.9	2.33	2.28–2.39	10,675	0.7	5,733	0.6	1.17	1.13–1.20
Larynx	21,135	1.4	23,058	2.5	0.56	0.55–0.57	12,549	0.8	14,794	1.7	0.47	0.46–0.48
Leukemia	70,826	5.0	33,307	3.1	1.61	1.59–1.63	54,606	3.8	26,282	2.5	1.52	1.50–1.54
Lip, oral cavity, pharynx	22,134	1.4	115,091	12.4	0.11	0.11–0.11	11,496	0.7	86,999	9.5	0.07	0.07–0.08
Liver	402,208	25.7	20,144	2.2	11.68	11.52–11.85	372,079	23.7	18,043	2.0	11.85	11.67–12.03
Lung	522,050	33.5	58,567	6.6	5.08	5.03–5.12	452,813	28.7	52,269	5.9	4.86	4.82–4.91
Melanoma of skin	3,825	0.2	945	0.1	2.00	1.86–2.04	2,067	0.1	483	0.0		
Multiple myeloma	5,909	0.4	6,789	0.8	0.50	0.48–0.52	3,945	0.3	5,941	0.7	0.43	0.41–0.45
Nasopharynx	33,101	2.1	3,333	0.3	7.00	6.75–7.25	20,899	1.3	2,412	0.2	6.50	6.23–6.77
Non-Hodgkin's lymphoma	32,016	2.1	23,718	2.4	0.88	0.86–0.89	18,487	1.2	16,243	1.7	0.71	0.69–0.72
Esophagus	259,235	16.7	48,099	5.3	3.15	3.12–3.18	211,084	13.4	43,351	4.8	2.79	2.76–2.82
Ovary	28,739	3.8	28,080	5.7	0.67	0.66–0.68	11,419	1.5	19,558	4.1	0.37	0.36–0.37
Pancreas	44,217	2.8	8,960	1.0	2.80	2.74–2.86	39,817	2.5	7,766	0.9	2.78	2.71–2.85
Prostate	33,802	4.3	14,630	3.7	1.16	1.14–1.18	14,297	1.8	10,422	2.5	0.72	0.70–0.74
Stomach	464,439	29.9	35,059	3.8	7.87	7.78–7.95	352,315	22.3	33,564	3.6	6.19	6.13–6.26
Testis	2,795	0.4	3,864	0.6	0.67	0.63–0.70	680	0.1	1,665	0.3	0.33	0.30–0.36
Thyroid	21,883	1.4	12,899	1.2	1.17	1.14–1.19	3,264	0.2	3,029	0.3	0.67	0.63–0.70

Cancer Incidence and Mortality Rates for Children Aged 0-14 Years in China and India, 2008

Children aged 0-14 years **Cancer site**	China Incidence **Cases**	China Incidence **Rate**	India Incidence **Cases**	India Incidence **Rate**	China/India Incidence **RR**	China/India Rate Ratio **95% CI**	China Mortality **Deaths**	China Mortality **Rate**	India Mortality **Deaths**	India Mortality **Rate**	China/India Mortality **RR**	China/India Rate Ratio **95% CI**
All cancers	19,974	7.2	29,932	8.0	0.90	0.88–0.92	12,620	4.6	13,867	3.7	1.24	1.21–1.27
Brain, nervous system	3,011	1.1	3,265	0.9	1.22	1.16–1.28	2,636	1.0	2,036	0.5	2.00	1.88–2.12
Leukemia	9,100	3.3	9,604	2.6	1.27	1.23–1.31	6,933	2.5	5,054	1.3	1.92	1.85–1.99
Non-Hodgkin's lymphoma	974	0.4	2,031	0.5	0.80	0.74–0.86	426	0.2	1,050	0.3	0.67	0.59–0.74

Note. Age-standardized rates, ASR(W), are per 100,000 population and age-adjusted to the world standard population. RR = relative risk. CI = confidence interval.

Source: GLOBOCAN 2008, International Agency for Research on Cancer (IARC); http://globocan.iarc.fr/

Table 3. Health Inequalities within India, 2005-2011

Health indicator	Rate	Ratio
Under-5 mortality rate/1,000 live births, poorest quintile, 2005-06	118.0	3.0
Under-5 mortality rate/1,000 live births, wealthiest quintile, 2005-06	39.0	
Under-5 mortality rate/1,000 live births, rural areas, 2005-06	94.0	1.5
Under-5 mortality rate/1,000 live births, urban areas, 2005-06	61.0	
Births attended by skilled health personnel (%), poorest quintile, 2005-06	19.0	
Births attended by skilled health personnel (%), wealthiest quintile, 2005-06	89.0	4.7
Births attended by skilled health personnel (%), rural areas, 2005-06	37.0	
Births attended by skilled health personnel (%), urban areas, 2005-06	73.0	2.0

Life expectancy at birth (years) by State, 2011	Life Expectancy	Difference from Kerala
Andhra Pradesh	64.4	-9.6
Assam	58.9	-15.1
Bihar	61.6	-12.4
Chhattisgarh	58.0	-16.0
Gujarat	64.1	-9.9
Haryana	66.2	-7.8
Himachal Pradesh	67.0	-7.0
Jharkhand	58.0	-16.0
Karnataka	65.3	-8.7
Kerala	74.0	0.0
Madhya Pradesh	58.0	-16.0
Maharashtra	67.2	-6.8
Orissa	59.6	-14.4
Punjab	69.4	-4.6
Rajasthan	62.0	-12.0
Tamil Nadu	66.2	-7.8
Uttar Pradesh	60.0	-14.0
Uttarakhand	60.0	-14.0
West Bengal	64.9	-9.1

Source: WHO, World Health Statistics Report 2011 and United Nations, Human Development Report 2011.

(HDI = 0.92) and Madhya Pradesh, Orissa and Bihar ranked the lowest on HDI (0.45-0.49)[22].

Health inequalities in China are evident between urban and rural residents and by region or province. In 2005, under-five mortality was 2.4 times higher and maternal mortality 1.8 times higher in rural than in urban areas of China (Table 4). The under-five child mortality rates in Beijing and Qinghai were 5.1 and 35.0 per 1,000 live births, respectively. In 2000, the average life expectancy of China's urban residents was 75.2 years and that of its rural resident was 69.6 years. Like India, inter-provincial differences in life expectancy in China were very marked[23]. Shanghai had the highest life expectancy of 78.1 years, 2 years more than Beijing. Tibet had the lowest life expectancy of 64.4 years, followed by

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Table 4. Health Inequalities within China, 2005

Health indicator	Rate	Ratio
Under-5 mortality rate/1,000 live births, rural areas, 2005-6	25.7	2.4
Under-5 mortality rate/1,000 live births, urban areas, 2005-6	10.7	
Maternal mortality rates (per 100,000 live births), rural areas, 2005-6	45.5	1.8
Maternal mortality rates (per 100,000 live births), urban areas, 2005-6	24.8	
Life expectancy at birth (years) by province, municipality, autonomous region, 2005	**Life Expectancy**	**Difference from Shanghai**
Beijing	76.1	-2.0
Tianjin	74.9	-3.2
Hebei	72.5	-5.6
Shanxi	71.7	-6.4
Inner Mongolia	69.9	-8.2
Liaoning	73.3	-4.8
Jilin	73.1	-5.0
Heilongjiang	72.4	-5.7
Shanghai	78.1	0.0
Jiangsu	73.9	-4.2
Zhejiang	74.7	-3.4
Anhui	71.9	-6.2
Fujian	72.6	-5.5
Jiangxi	68.9	-9.2
Shandong	73.9	-4.2
Henan	71.5	-6.6
Hubei	71.1	-7.0
Hunan	70.7	-7.4
Guangdong	73.3	-4.8
Guangxi	71.3	-6.8
Hainan	72.9	-5.2
Chongqing	71.7	-6.4
Sichuan	71.2	-6.9
Guizhou	65.9	-12.2
Yunnan	65.5	-12.6
Tibet	64.4	-13.7
Shaanxi	70.1	-8.0
Gansu	67.5	-10.6
Qinghai	66.0	-12.1
Ningxia	70.2	-7.9
Xinjiang	67.4	-10.7

Source: United Nation Development Programme, China Human Development Report 2007-2008.

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the other two Southwest provinces Yunnan (65.5) and Guizhou (65.9). Provincial patterns in income and human development were similar to those in life expectancy. For example, Tianjin, Shanghai, and Beijing had the highest income per capita, while Tibet, Gansu, Yunnan, and Guizhou had the lowest income per capita. Shanghai and Beijing had the highest HDI scores of 0.91 and 0.89 respectively, while Tibet and Guizhou had the lowest HDI scores of 0.69 and 0.63, respectively[23].

Discussion

By using contemporary global health and socioeconomic statistics, we have highlighted similarities and differences in health, socioeconomic, and developmental factors between India and China. Because of the faster improvements in mortality in China during the past five decades, the health gap between India and China, particularly in infant, child, and maternal mortality and life expectancy, has widened.

Public health problems and the burden of disease from specific conditions vary greatly between the two nations. While childhood diseases, maternal mortality, cardiovascular disease, diabetes, and cervical and oral cancers are major public health problems in India, high rates of stomach, liver, lung, and esophageal cancers, cardiovascular disease, and smoking are major health concerns in China. More than a quarter of all cervical cancer cases and deaths in the world occur in India alone[16, 19]. India has the highest number of oral cancer cases and accounts for 39% of oral cancer deaths in the world[16]. India also accounts for approximately one-fourth of all under-5 deaths and one-fifth of maternal deaths globally[26, 27]. China accounts for one-third of all lung cancer cases and deaths, 54% of liver cancer cases and deaths, and 48% of all stomach cancer cases and deaths worldwide[16].

Smoking prevalence among Chinese adult men aged ≥15 years is 60%, which is among the highest in the world[9]. Men in Russia, Ukraine, Laos, Greece, and Indonesia have higher smoking prevalence. Interestingly, although the adult smoking prevalence is lower in India than in China, Indian teens are twice as likely to smoke as their Chinese counterparts. About 19% of males and 8% of females aged 13-15 in India are smokers, compared with 7% and 4% in China, respectively[9]. Thus, the potential exists in India for substantial increases in adult smoking prevalence and premature death from smoking-related diseases.

The two countries share other health and development concerns such as high levels of disparities between socioeconomic groups and between rural and urban areas. As shown here, there is a substantial health and socioeconomic divide, particularly between rural and urban areas and among states, both within India and China.

In the decades ahead, India faces twin challenges of having to reduce deaths from infectious diseases and maternal and perinatal conditions as well as from major chronic diseases such as heart disease, stroke, diabetes, and cancer[9]. With expanding industrialization and urbanization levels, people in both India and China are increasingly more likely to adopt lifestyles, dietary, and consumption patterns that are currently prevalent in the West[12]. Consequently, rates of obesity, physical inactivity, and smoking (particularly in women) are expected to increase dramatically in the years ahead and chronic diseases are expected to become an even bigger threat to public health in India and China.

Because of the massive size of their population and economy and their growing influence in global matters, the world is paying increasing attention to existing conditions and changes that are occurring in the socioeconomic, political, and public health domains in both China and India. As the two nations make further improvements in their levels of social and economic development, substantial gains in health are expected for both India and China. Despite the marked improvements in health during the past 5 decades, much needs to be done to increase life expectancy and improve maternal and

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child health. Mainland China's life expectancy of 74 years is still 8-9 years less than that of Japan, Hong Kong, Singapore, Iceland, and Switzerland and 5 years less than Taiwan's[9]. India's life expectancy and child survival have to improve a great deal to reach the level seen in many middle- and high-income countries. India's southern neighbor, Sri Lanka, does significantly better than India in life expectancy, child survival, and maternal mortality[9]. One way to improve health at the national level is to reduce inequalities in health and social conditions between population groups and areas both within India and China[6, 9, 14].

Conclusions and Public Health Implications

India and China differ greatly in their levels of health, human development, and gender inequality[1, 9]. China does better than India on several key health measures, with much of the health disparity stemming from higher rates of mortality in India from communicable diseases and maternal and perinatal conditions, which are largely preventable[9]. Health and social development often go hand in hand. Our analysis of the WHO data (not shown) indicates that the nations that perform poorly on the human development and gender inequality indices tend to have lower levels of life expectancy and higher infant, child, and maternal mortality ($\gamma > 0.70$). Not only does India have lower levels of human development than China, it also does poorly with respect to gender equality. Indian women fare worse in reproductive health, educational achievements, empowerment, and labor force participation than their Chinese counterparts.

Benefits of rapid, sustained economic growth need to be shared more broadly and evenly across population groups, particularly among rural, remote regions in the two countries where the majority of the Indian and Chinese people still live. Unfavorable socioeconomic conditions and low human development levels can be a hindrance for public health improvement, but both India and China need to invest more in their health care infrastructure, provision of health services, and in education and rural sectors. Broad societal initiatives are, of course, needed to address important health and developmental goals, including poverty reduction, larger investments in women's health and education (particularly in India), expanding economic opportunities for women, and a greater commitment toward gender and social equality in the distribution of power, money, and resources[1, 5-7, 9, 14]. Both countries can make further health gains by reducing social inequality, greater investments in human development and preventive health services, and by implementing policies related to the prevention and control of chronic-disease risks such as hypertension, smoking, obesity, and physical inactivity.

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