



## Population Age Structure and Sex Composition in Bangladesh, China and India: A Comparative Study

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### Abstract

Understanding past, present, and future population dynamics is essential for development planning for any country, particularly for the most populous nations like Bangladesh, China, and India, where almost 38 percent of the world population lives, according to World Population Prospects 2022 of the United Nations. Due to the non-availability of comparative analysis in age structure and sex composition in these countries, this study aims to examine the following questions: (i) What has been the course of age and sex composition trends, and why? and (ii) to what extent have the age structure transition and sex composition been similar or dissimilar? This study utilizes time-series data from national-level population censuses, surveys, population projections, and estimates produced by the United Nations Population Division. Bangladesh and India are currently experiencing the third phase of demographic transition due to a decline in birth and death rates at an almost similar pace where a majority of the people are aged 15-64 years (working-age population), which will be diminishing between 2030 to 2040 with the increase of older persons. On the other hand, China has completed the fourth stage of the demographic transition and is going through a further decline in population growth rate and an increasing aging trend. The sex ratio at birth and the general sex ratio are both higher in India and China than in Bangladesh. A strong presence of Gender-Biased Sex Selection (GBSS) has been found in Bangladesh, India and China. The child dependency ratios are currently low and almost similar in Bangladesh and India. In China, old-age dependency is already increasing, and both Bangladesh and India will eventually observe an increase in the old-age dependency ratio by 2040, according to the projection. For Bangladesh and India to achieve the maximum benefits of the first demographic dividend and SDG 8, 5, and 3- the countries need short- and long-term policy actions on education, health, economy, and good governance, considering the age structure and sex composition. For China, the challenges will be to sustain future economic growth with a declining working-age population and ensure healthy aging to achieve a second demographic dividend.

**Key Words:** Age structure transition; Sex composition; Potential Support Ratio; Ageing index; Bangladesh; India; China

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## INTRODUCTION

Bangladesh, India, and China are among the most populous countries in the world with many similar demographic characteristics. But, the demographic transition in these three countries has differed significantly over the past 50 years. Bangladesh and

India are currently experiencing the third phase of demographic transition, characterized by a relatively high concentration of the population in the working-age group (15-64 years or 15-59 years). This segment is often referred to as the economically active population, which can significantly contribute to economic growth and development in both countries (DPSDU and UNFPA, 2019; McDonald, 2016), whereas China will see a gradual decrease in their working-age population and has observed the completion of the fourth stage of demographic transition with slow and even declining population growth (Yuan & Gao, 2020). The fourth stage of demographic transition involves low fertility and mortality rates, leading to a stable population. In this phase, the annual population growth rate is typically around 0.4%, reflecting a balance between births and deaths (Antoine 2011).

Due to China's considerable efforts in population and development policy and programs, the country has undergone a quicker demographic transition (Ren, 2020). The country has also achieved enormous economic growth by utilizing the workforce during this period. (Taketoshi, 2020; Yuan and Gao, 2020). Bangladesh and India may gain the same benefits of demographic dividend by improving their labor productivity through education and training (Hayes & Jones, 2015; McDonald, 2016). If this window of opportunity is duly utilized, there is a more significant potential for demographic dividend through increased savings and investment for economic growth (Lee et al., 1997; Bloom & Williamson, 1998; Pool, 2000; Mason, 2003).

A country's economy depends on the age structure (Coale & Hoover, 1958; Easterline, 1967; Simon, 1981; Ehrlich & Ehrlich, 1990; Bloom et al., 1999; Mason, 2005). Age structural transition and socioeconomic development depend on the institutional context, including public policies (Navaneetham & Dharmalingam, 2012). Fertility decline reduces poverty and brings economic development via demographic dividend (Eastwood & Lipton, 1999; Mason & Lee, 2004; Menashe-Oren et al., 2017).

In many South and Southeast Asian countries, success in demographic and economic development can be attributed to various factors. Bangladesh has seen positive outcomes from family planning programs and improvements in health. India has focused on primary and secondary education and advancements in the technology sector. Thailand has emphasized better healthcare, market liberalization, and attracting foreign investments, contributing to its thriving economy. (Hayes & Jones, 2015; Caldwell et al., 1999; Bloom et al., 2003).

Bangladesh is likely to get the benefit of a demographic dividend until 2035 (Islam et al., 2019; Khondker & Rahman, 2018). However, China has completed the fourth stage of the demographic transition and is now rapidly observing a significant rise in the number of older persons. The UN projection indicates that economic growth rates significantly increase during the first demographic dividend phase, as fewer dependents free up investment resources. (Bloom & Canning, 2011; Lee and Mason, 2006, 2011) The economies of these countries are most likely to be affected by future population trends. For example, Bangladesh and India are experiencing the third stage of demographic transition, with a major proportion of the population in the economically active age group (15-64) or (15-59). (Islam et al., 2019; DPSDU and UNFPA, 2019). In contrast, for China, the challenges will be to maintain the growth of the past that the country has enjoyed from a high proportion working-age population (Haltmaier, 2013).

In India, fertility rates began to decline in the 1960s and have gradually decreased over the decades, reaching an average of three children per woman between 2000 and 2005. According to the Sample Registration System (2018), the TFR in India was 2.2 children per woman, and according to the National Family Health Survey (NFHS 5), 2019–21, the TFR of India is 1.9.

Interestingly, Bangladesh's fertility rate was above six children per woman until the late 1980s, after which it rapidly declined. The TFR declined to 2.8 children per woman from 2000- to 2005, more than 50 percent in 20 years (Bairagi & Dutta, 2001). The latest Sample Vital Registration System (2020) of the Bangladesh Bureau of Statistics (BBS) shows that the TFR is 2.05, whereas a very recent publication of the Bangladesh Demographic and Health Survey, 2017-2018, refers to 2.3 (BBS, 2019; NIPORT et al., 2020).

The transition from high to low fertility in China was quicker than in Bangladesh and India due to firm population policy. The TFR of China drastically declined from 2.74 in 1980 to 1.93 in 1991 (UN, 2022). China's fertility decline is largely due to strict population control policies and socioeconomic changes resulting from development. (Du & Yang, 2015; Ren, 2020).

The fertility transition has been the subject of much scholarly debate in Bangladesh and India. Explanations for Bangladesh's fertility decline include a successful family planning program, poverty-induced factors, and the diffusion hypothesis, which suggests the spread of new attitudes and behaviors about family size through social networks. (Adnan, 1998; Barkat-e-Khuda & Hossain, 1996; Caldwell et al., 1999; Cleland et al., 1995). Here, age structural transition is an integral part of demographic transition where the levels and pace of mortality and fertility declines determine their trajectories (Pool et al., 2006). Bangladesh is a highly densely populated country with an intercensal population growth rate of 1.22 percent in 2022 (BBS, 2022). Demographic transition has increased the proportion of working-age people, leading to the emergence of this demographic dividend in India (Kelkar, 2004; Mason, 2005; Chandrasekhar et al., 2006; James, 2008). There are ambiguities regarding the potential impacts of this working-age population on economic growth, and these effects remain largely unexplored.

Several types of research show a strong positive correlation between demographic dividend and financial performance, with India and Bangladesh already benefiting from age structure changes. (Aiyar and Mody, 2011; Islam et al., 2019; Khondker and Rahman, 2018; DPSDU and UNFPA, 2019; Islam, 2016; Bidisha et al., 2020) However, the benefits will be enjoyed when the incentives are in place, especially on education, health, and employment fronts (Chandrasekhar et al., 2006; James, 2008; Bidisha et al., 2020).

As with the age structure of the population, sex composition is another essential demographic characteristic that is vital to any meaningful demographic analysis. Changes in sex composition largely reflect the underlying socioeconomic and cultural patterns of society in different ways, where the sex ratio is mainly the outcome of the interplay of sex differentials in mortality, sex-selective migration, the sex ratio at birth, and, at times, the sex differential in population enumeration (Registrar General of India, 2001). Available literature shows that sex-selective abortions and excess postnatal female mortality are found in the northwestern and northern parts of

India (Guilmoto et al., 2018). The impact of excess female mortality remains considerable and is equivalent to the effects of prenatal sex selection (Bongaarts & Guilmoto, 2015).

Various studies show that a significant imbalance in the sex ratio has been reflected in India and China (Guilmoto, 2009; 2007; Mishra et al., 2006; Chen & Zhang, 2019). The imbalance was affected by gender-biased sex selection (GBSS), a practice favoring sons over daughters in an offspring's sex preference (The Daily Star, 2024). In the 1980s, GBSS at birth started to be observed in the 1980s in Asian countries including China and India, and it is currently impacting SRB in Bangladesh despite having the National Guideline for Prevention of Son Preference and the Risk of Gender-Biased Sex Selection (The Daily Star, 2024).

Due to the non-availability of comparative studies on population dynamics in Bangladesh, India, and China, this paper provides a comparative analysis of the age structure and sex composition of the population of these nations. The three countries experienced remarkable demographic changes in birth and death rates, which considerably impacted the labor forces, the dependency ratio of the population, and the sex composition. They also have some similar and dissimilar characteristics in terms of language and other demographic parameters. All three countries are considered populous globally and are in different stages of demographic transition.

The main focus of the present paper is on the age structure and sex composition of the populations of Bangladesh, India, and China. These factors are likely relevant to economic growth, social advancements, women's empowerment, and improved living standards. Demographic changes and economic progress can go hand in hand.

Thus, this paper explores two specific questions: (i) what has been the course of age and sex composition trends in Bangladesh, India, and China, and why? (ii) To what extent have the age structure transition and sex composition been similar in Bangladesh, India, and China?

As Pakistan is a neighboring country, there are many cultural and religious similarities between Bangladesh and India. However, considering the demographic transition model, this country has demographic shortcomings. For instance, Pakistan's total fertility rate (TFR) is 3.28 in 2024, much higher than 1.92 in Bangladesh and 1.98 in India (UNDESA 2022). Hence, the high fertility rate in Pakistan sustains the high birth cohorts in the present decade. In contrast, the high birth cohort has been eliminated in Bangladesh, India, and China in a couple of earlier decades. According to the UNDESA projection, Pakistan will not enter the fourth stage of the demographic transition in 2050. Moreover, the Pakistan population pyramid will remain triangle-shaped in 2050, which indicates dissimilarities in the age structure transition between Pakistan and the three countries studied in this paper. Thus, a significant gap has been found between Pakistan and the three study countries considering the demographic determinants. Therefore, this paper did not include Pakistan.

Indonesia is the fourth largest populous country in the world (UNFPA, 2024). However, this paper did not include Indonesia as a study country, because the demographic profile is almost similar in comparison to Bangladesh and India. In terms of age structure, Bangladesh, India, and Indonesia have almost similar pattern of age structure. Likewise, the age structure, the percentages of older persons in these three countries are symmetrical not only in the current rate but also in the projected

data (UNDESA, 2022). According to the State of world population report 2024, the percentages of total population in the working-age population (15-64 years old) around 68 percent in each of these three countries (UNFPA, 2024). Moreover, the percentages of youth and adolescents are also similar (UNFPA, 2024). These indicators suggest a similar type of dependency, such as the potential support ratio, in terms of age structure transition in the coming decades. Therefore, Indonesia does not necessarily depict a unique pattern of demographic transition. Indonesia was not included as a study country in this research.

Instead, it selected China due to its rapid demographic changes in the last decades including negative population growth, rapidly growing ageing population, uneven age and sex structure pattern and rapid changes in policies such as one child to three child policy. These uneven demographic transition patterns and estimated age structure imbalances in coming decades could be educational not only for Bangladesh and India but for any country in the world to decision-making and potential policy implications through appropriate agenda setting.

Moreover, China has reached the end of the fourth stage of the demographic transition model. China's population pyramid loses its triangle shape, indicating a low birth rate and a low birth cohort, with an increasing number of years into the life expectancy. Bangladesh and India are experiencing low birth rates, increasing life expectancy, and decreasing mortality rates, leading to an increasing number of older persons in the coming decades, while China already started to tackle the challenges of the rising number of older persons. Studying the demographic pathways China already marked in recent decades could be a lesson to Bangladesh and India to understand how these demographic changes could affect the determinants of population and development and what policies would be taken to overcome the challenges in coming decades. Eventually, this paper selects China as a pioneer country, considering its demographic pattern. Overall, this paper aims to fill the gap in understanding the current demographic trends of three of the most populous countries in the world by observing the demographic data of age and sex composition trends and those resemblances.

## DATA AND METHODS

This paper uses time-series data from the United Nations Population Division to describe the changes in the population's age structure and sex composition of three countries: Bangladesh, China, and India. It reviews available secondary literature by searching the web. It uses the reported and projection data under the medium variant for 1950-2050. It explores the population compositions of age and sex over 100 years (1951-2050) through the time series and the projected data. Web-based interactive data from the United Nations World Population Prospects (2022) have been used to estimate three countries' changing age and sex compositions. Such data has also been used to examine the consequences of changing age structures by demonstrating the trends of potential support ratio and child and old-age dependency ratios and to estimate the extent of the economically inactive elderly population against the younger age group (0-14 years) through calculating the Aging Index.

## FINDINGS

### Current and Future Demographics of Bangladesh, China and India

Table 1 shows the demographic profiles of the three populous countries in the world, including Bangladesh, China, and India. According to the United Nations Department of Economic and Social Affairs (UNDESA), India's population reached 1429 million, overtaking China's 1426 million population last year. Meanwhile, Bangladesh is the eighth-most populated country globally, with a 173 million of population.

Bangladesh, India, and China have different annual population growth rates, with China having the lowest at 0.0%. Bangladesh and India have 1.0 percent and 0.9 percent respectively. The decadal population growth rate in India is 17.64 percent, higher than 14.75 percent in Bangladesh according to the last population censuses of both countries. Bangladesh and India's total fertility rates (TFR) are roughly the same, at 1.9 and 2.0, respectively. At the same time, China's TFR has reduced to 1.1, one of the world's lowest fertility rates. Bangladesh and India have roughly comparable crude birth rates (CBR) of 17.3 and 16.1, respectively. Yet, in China, it is 7.5. At the same time, China's crude death rate (CDR) is 7.5, which is comparable to its CBR. Bangladesh has the lowest CDR of 5.3, and India has a CDR of 6.6.

The difference between Bangladesh and India regarding infant mortality rate (19 vs. 24) and under-five mortality rate (24 vs. 30) is not much. In contrast, China has a relatively low infant and under-five mortality rate of 5.7 and 6.9, respectively. When it comes to maternal mortality, this rate is significantly higher in Bangladesh (163) in comparison to India (97). The life expectancy at birth is higher in China (78 years) than in Bangladesh (73 years) and India (72 years).

In terms of age structure, roughly 68 percent of the total population in these three countries are working-age population (15-64 years). Accordingly, in Bangladesh, India, and China, 67.99, 67.80, and 69.03 percent of the total population falls into the 15-64-year age range. Moreover, one-fourth of total population of Bangladesh and India is in 0-14 years age group, including 6.04 percent and 6.90 percent of elderly population in Bangladesh and India respectively; while China has the largest elderly population (13.72%) including 17.25 percent of 0-14 years old population.

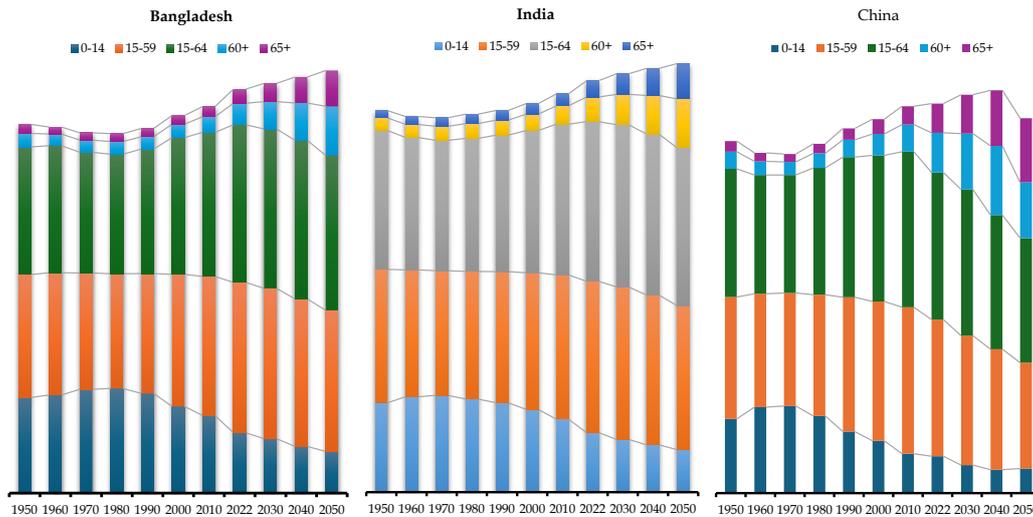
Regarding the current age distribution, Table 1 indicates that Bangladesh, India, and China have a disproportionately high number of working-age people (aged 15-64 and 15-59), with minor differences among these nations (around 68%). This suggests that the age structure transition will present opportunities for demographic dividends. China is currently reaping the benefits of this demographic advantage. (Taketoshi, 2020; Yuan and Gao, 2020).

Figure 1 illustrates the trends of various age structures since 1950, with projections extending up to 2050. Since the fertility rates are declining in these countries, the population of the 0-14 year age group is also following the negative slope and eventually decreased to 25.97, 25.3, and 17.25 % for Bangladesh, India, and China, respectively. Since the 1980s, child dependency ratio has declined, while increasing life expectancies lead to a growing number of older persons, increasing dependency on the working-age population. Simultaneously, the high fertility in the last few decades in these countries have led to the working-age population (15-64 years) making up the majority of the current population.

**Table 1. Demographic Profile of Bangladesh, India and China in 2023**

Indicators	Bangladesh			India		China	
Total Population (Million)	173 <sup>1</sup>		1429 <sup>1</sup>	1426 <sup>1</sup>			
Annual Exponential Growth rate (%)	1.0 <sup>1</sup>		0.9 <sup>1</sup>	-0.0 <sup>1</sup>			
Decadal Growth (%)	14.75 <sup>2</sup>		17.64 <sup>3</sup>	-			
Sex Ratio at Birth	104.9 <sup>1</sup>		107.3 <sup>1</sup>	110.8 <sup>1</sup>			
TFR (Children per woman)	1.9 <sup>1</sup>		2.0 <sup>1</sup>	1.1 <sup>1</sup>			
IMR (Infant deaths per 1,000 live births)	19.4 <sup>1</sup>		24.5 <sup>1</sup>	5.7 <sup>1</sup>			
Under 5 Mortality (U-5 deaths per 1,000 live births)	24.1 <sup>1</sup>		30.5 <sup>1</sup>	6.9 <sup>1</sup>			
MMR (Deaths Per 100,000 live births)	163 <sup>4</sup>		97 <sup>5</sup>	-			
Life Expectancy at Birth <sup>1</sup> (Years)	73.9 <sup>1</sup>		72.03 <sup>1</sup>	78.79 <sup>1</sup>			
Crude Birth Rate	17.3 <sup>1</sup>		16.1 <sup>1</sup>	7.5 <sup>1</sup>			
Crude Death Rate	5.3 <sup>1</sup>		6.6 <sup>1</sup>	7.5 <sup>1</sup>			
<b>The population of Bangladesh, India, and China by Broad Age Groups in 2023<sup>1</sup></b>							
Broad Age Groups	Male	Female	Male	Female	Male	Female	Total
0-14	26.71	25.24	25.97	25.60	24.99	25.31	18.08
15-59	64.40	65.14	64.77	64.56	63.82	64.20	65.10
15-64	67.51	68.45	67.99	68.04	67.53	67.80	69.76
60+	8.89	9.62	9.26	9.83	11.19	10.49	16.81
65+	5.78	6.31	6.04	6.35	7.48	6.90	12.16

Sources: United Nations, Department of Economic and Social Affairs, Population Division. (2022)<sup>1</sup>; Bangladesh Bureau of Statistics (BBS). (2015)<sup>2</sup>; Registrar General of India. Census of India 2011.<sup>3</sup>; Bangladesh Bureau of Statistics, Statistics and Informatics Division (SID), Ministry of Planning. (2020)<sup>4</sup>; Sample Registration System SRS, 2018-19



**Figure 1.** Trends in Changing Population of Different Age Categories in Percentage  
Source: United Nations, Department of Economic and Social Affairs, Population Division (2022).

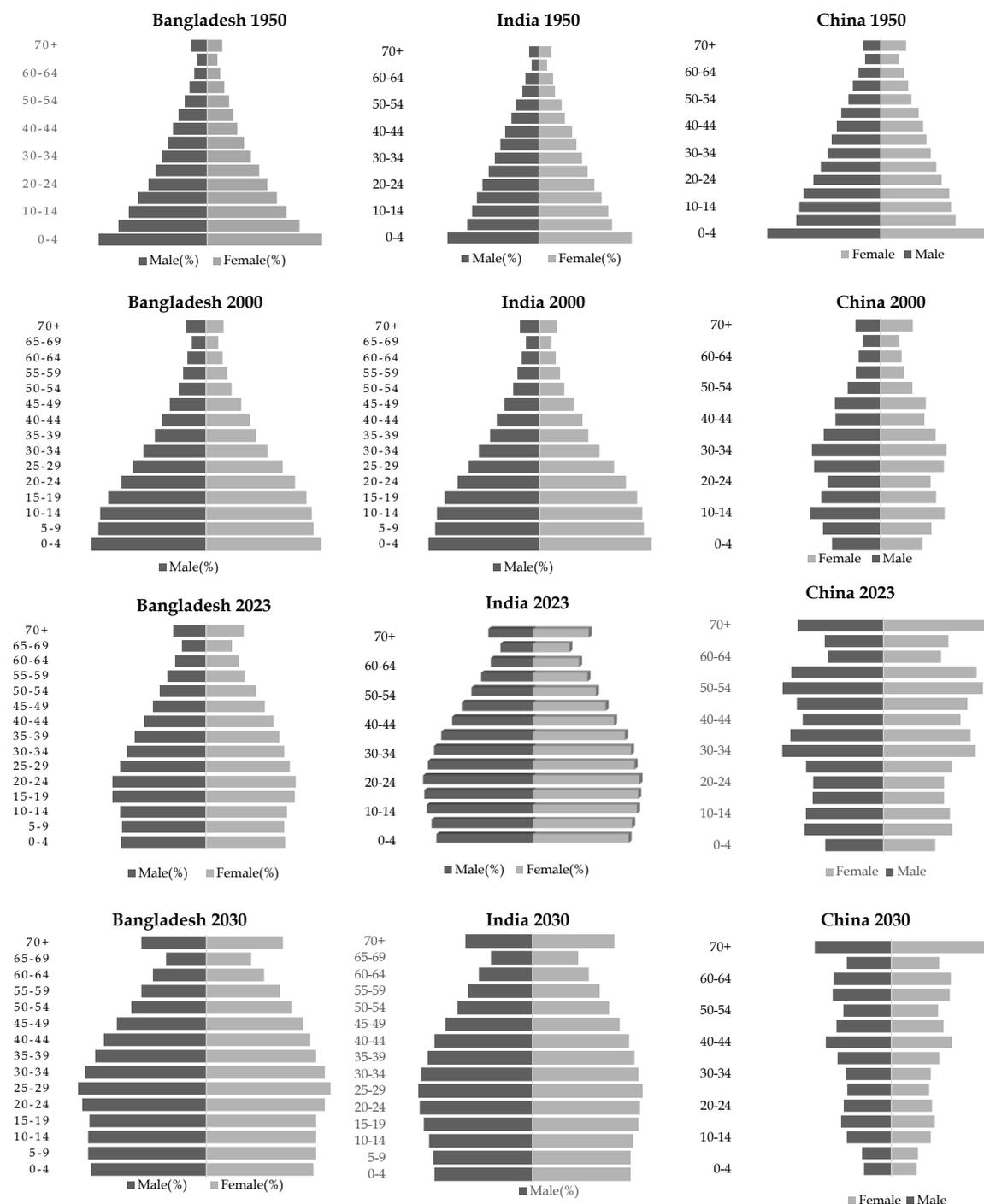
In the next decade, Bangladesh and India are projected to have approximately 68 percent of their population in the working-age group. However, the working-age population will decline during the 2040 decade in all these three countries. Also, the percentages in the age group 0-14 population in Bangladesh, India, and China are projected to decrease to 17.9 percent, 18.04 percent, and 11.45 percent, respectively, in 2050. Therefore, Bangladesh and India are projected to have 61% of their populations in the working-age group, whereas China's percentage is expected to decline significantly to 50 percent by 2050.

With the increasing trends in life expectancy, the demographic transition effect has led to a significant increase in the older persons in these countries. Bangladesh and India have 6.04 percent and 6.9 percent of the population as older persons respectively. In addition, China's aged population surged to 14 percent in 2022 and is projected to reach one-third of its population by 2050, much higher than Bangladesh and India's 15.41 percent and 14.98 percent, respectively. The pyramids in Figure 2 illustrate the UNDESA's population projection, which shows the age and sex distributions over a century.

The triangle population pyramids from the 1950s depict a significant youth population in Bangladesh, India, and China, with the number of older age groups decreasing as the age categories progress. This is evident in the first stage of demographic transition, with low life expectancy and high birth and death rates. Following the year 2000, the population of the age groups 0-4 to 30-34 had lessened due to declining fertility rates during the last fifty years in these three countries. China's 2000 population pyramids reveal uneven distribution, with less population in the 15-19 and 20-24 age groups, indicating a sharp decline in fertility during the 1970s and 1980s. Meanwhile, fertility decline levels in Bangladesh and India were gradual.

In 2023, noticeable declines in the number of young people and increases in the number of older persons can be observed in these pyramids, reflecting decreasing

fertility trends in Bangladesh, China, and India. During this period, China experienced a particularly sharp decline in its youth population.



**Figure 2.** Population Pyramids of Bangladesh and India, 1950, 2000, 2022, 2030 and 2050. Source: United Nations, Department of Economic and Social Affairs, Population Division (2022). Note: Calculated from United Nations, Department of Economic and Social Affairs, Population Division (2022). World Population Prospects 2022, Interactive data via the website.

On the other hand, China's aged population (65 years and above) dramatically increased. Apart from this, more than 60 percent of the total population of all these three countries belong to the working-age populations. The youth age groups (15-19 and 20-24 years) are substantial compared to any other age group in Bangladesh and

India, indicating a high-fertility cohort in recent decades. Hence, the youth bulge resulting from these cohort populations will persist in both countries in the following decades, as shown by the population pyramids for the year 2030. Therefore, this signifies the window of opportunities for Bangladesh and India to boost each country's economy by utilizing the maximum number of working-age population resulting from the age structure transition. Moreover, China's population pyramid indicates that it is below the replacement level of fertility, causing a decrease in younger age groups and low or even negative population growth in the coming decades.

According to the United Nations projection, these three countries will see a decrease in mortality and fertility rates by 2050. Bangladesh, India, and China are expected to experience an increase in old-age dependency, coupled with a decline in their working-age populations. At the same time, China began experiencing a decrease in working-age populations in 2022. The growing number of older persons and shrinking working-age populations presents challenges for countries, which could be mitigated through effective population policy interventions.

**Table 2.** Sex Ratio at Birth (SRB) and General Sex Ratio (GSR) Bangladesh, India, and China 1950-2050

Year	Bangladesh		India		China	
	SRB	GSR	SRB	GSR	SRB	GSR
1950	105	109.2	105	105.6	106	106.1
1960	105	107.9	105	106.6	106	104.7
1970	105	107.5	106	107	106	103.8
1980	105	105.1	107	107.4	107	103.6
1990	105	105	107	107	111	103.8
2000	104	104	110	107.1	117	104.6
2010	104	100	110	107	117	104.8
2023	104	98.1	107	106.5	110	104.1
2030	105	97.2	106	105.9	107	103.3
2040	105	96	105	104.9	106	102.5
2050	105	95.2	105	103.8	106	102.5

Note: Number of males per 100 females. Sources: United Nations, Department of Economic and Social Affairs, Population Division (2022).

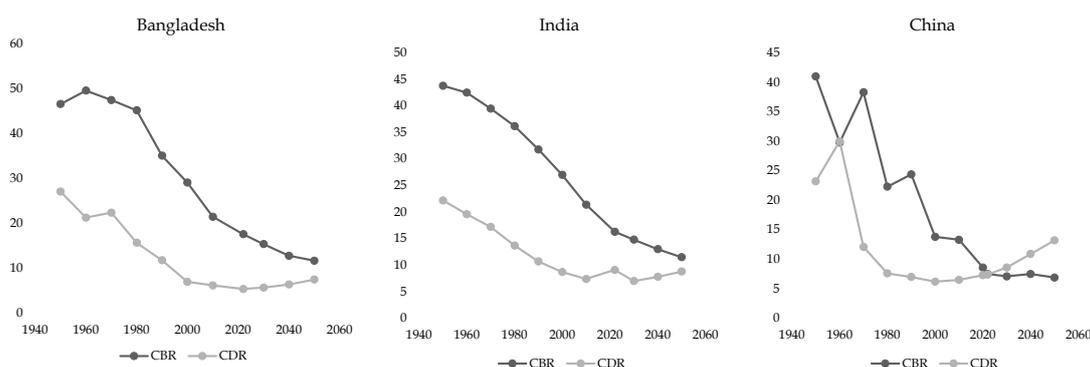
Furthermore, these countries have a propensity for sex ratio imbalances. Table 2 demonstrates that India and China had 105.6 and 106.1 men per 100 women in the last century, whereas it was 109.2 in Bangladesh. However, this sex ratio trend has gradually decreased in Bangladesh and China. Consequently, it will be 98.1 and 104.1, respectively, in 2023. On the other hand, the sex ratio trend in India is fluctuating; currently, it is 106.5 in 2023, and was at its peak in 1980 (107.4). Though the sex ratio in these countries is following a downward trend, Bangladesh is remarkably contrasting from India and China by having a lower number of men per 100 women

currently and in the coming decades. According to the UNDESA, China and India will see a decrease in sex ratio imbalances, whereas Bangladesh will experience an increasing trend of sex ratio imbalance (95.2 men per 100 women) in 2050.

Table 2 also shows that Bangladesh, India, and China had higher male birth trends between 1950 and 2050, while the sex ratio at birth in Bangladesh remained unchanged from 1950 to 2000 (SRB was 105). The SRB in Bangladesh, which decreased slightly in 2000 (104) and stayed the same in 2024, is projected to remain unchanged until 2050, according to UN projections. The trend of SRB in Bangladesh remains consistent with high male birth rates, but the population's sex ratio indicates the opposite, indicating an exciting matter to investigate. Because the SRB in India and China fluctuates over time, both countries experienced high male births during the first decade of the current century.

In 2000 and 2010, the SRBs of India and China were 110 and 117, respectively. This sex ratio at birth has decreased and reached 107 and 110 in 2023, respectively, in India and China, and it will decrease in the following decades in both countries. Following these trends of SRB in these countries could lead to a substantial gender imbalance in the population composition.

Figure 3 shows that Crude Birth Rate (CBR) and Crude Death Rate (CDR) of study countries from 1950-2050 illustrate Bangladesh and India's demographic transitions, reaching its third stage with low birth and death rates. *In contrast, China has reached the fourth stage of the demographic transition, where the death rate surpasses the birth rate. Moreover, China's decline from high to low birth and death rates was achieved through a downwardly and uneven birth rate and a drastically declining mortality rate between 1950 and 1980. Meanwhile, the CBR and CDR have decreased gradually since 1950 in Bangladesh and India. Hence, Bangladesh and India are currently experiencing the replacement level of fertility rates. In 1960, China experienced similar birth and death rates, indicating zero-population growth but with a momentum effect.*



**Figure 3.** Trend in Crude Birth Rate and Crude Death Rate of Bangladesh, India and China, 1950-2050. Sources: United Nations, Department of Economic and Social Affairs, Population Division (2022).

Moreover, the CBR was higher than the CDR in these countries. In particular, these three graphs show that the CBR declined gradually, but the CDR plummeted dramatically between 1970 and 2000. Therefore, the differences between the CBR and CDR lead to significant population growth in these countries. Besides, China in the late 1950s experienced steeply decreased crude death rates, which indicates a baby boom era in that country. In contrast, China's CDR exceeded the CBR in 2020, directly

affecting population growth and age structure, including the possible shortage of working-age people with the increasing number of aged dependencies.

### **Dependent Population, Potential Supports for Elderly, and Aging Index**

This paper aims to inquire into the past, present, and future of the population dynamics of Bangladesh, India, and China. Besides this, it intends to understand the prospects of changing age structure, hence looking into the increasing aging population, dependency, and support statistics for the dependent population by observing the time series data of UNDESA.

Table 3 focuses on the trends of the dependency ratio in Bangladesh, India, and China that are immediately affected by the changing age structure. As mentioned in earlier, these countries experienced high birth and death rates; hence, the people had more children and lower life expectancy levels. Thus, a high child and youth dependency ratio existed at that time, along with a lower level of old-age dependency.

In 1980, 45.08 percent of Bangladesh's population was aged 0-14, compared to 41.04 percent in India and 40.89 percent in China in 1970. These figures represent the highest percentages of the younger persons, alongside the lowest percentage of the older persons. However, the demographic transition results in high fertility and low mortality rates, leading to large birth cohorts. Over time, these cohorts enter the working-age population, which can significantly increase the number of births. Therefore, in the late 1980s, Bangladesh, India, and China experienced a youth bulge, resulting in a sizeable working-age population with low dependency rates. At the start of the 21st century, around 60 percent of the population in Bangladesh (58.93%) and India (60.46%) was within the working age group of 15-64 years. In 2000, China had a higher percentage, with 68.55 percent of its population in that age group. In addition to the working-age population bulge in 2000, Bangladesh, India, and China had proportions of older persons (65 years and above) at 3.76 percent, 4.49 percent, and 6.92 percent, respectively.

The demographic transition effect has led to lower mortality rates and an increase in the aged population in these countries. Not only that, after 2040, the working population bulge in Bangladesh and India is predicted to decline, while the workforce in China is expected to contract over the next ten years. In terms of the changing population composition in these countries, the old-age dependency ratio will increase over the years.

However, the dependency rate of the young population (0-14 years) will decline due to the low or replacement level of the fertility rate. The percentages of older persons in Bangladesh, India, and China are 6.35 percent, 7.06 percent, and 14.24 percent in 2023. By 2050, this percentage will reach 30%, and one-third of the total population in China will be older adults. Additionally, the gradual increase in older persons in Bangladesh and India will result in this group comprising 15.41 percent of the total population in Bangladesh and 14.98 percent in India. Many difficulties need to be overcome because of the growing number of older persons in these nations. The working-age people of these countries will need to contribute a significant amount of their support concerning issues like food, security, and health.

This section probes the potential support ratio (PSR) of Bangladesh, India, and China. Table 4 illustrates the PSR of these three countries based on three different age groups: 15-64 years, 20-64 years, and 25-64 years.

**Table 3.** Trends of Dependency Ratio in Bangladesh, and India, and China 1950-2050

Year	0-14 Years	15-59 Years	15-64 Years	60+ Years	65+ Years	Dependency Ratio (15-59) ( $\leq 14 + 60 \geq \div 15 - 59$ ) $\times 100$	Dependency Ratio (15-64) ( $\leq 14 + 65 \geq \div 15 - 64$ ) $\times 100$
<b>Bangladesh</b>							
1950	41.15	53.05	54.95	5.8	3.9	88.5	81.98
1960	42.26	52.7	54.73	5.03	3.01	89.7	82.71
1970	44.7	50.04	52.07	5.19	3.17	99.7	91.93
1980	45.08	49.46	51.48	5.46	3.43	102.18	94.23
1990	42.89	51.73	53.61	5.38	3.49	93.31	86.51
2000	37.31	56.94	58.93	5.76	3.76	75.64	69.69
2010	33.38	59.95	62.17	6.67	4.45	66.8	60.84
2023	25.43	64.73	68.2	9.24	6.35	53.56	46.59
2030	23.43	64.81	68.68	11.77	7.9	54.31	45.61
2040	20.41	63.53	68.39	16.05	11.2	57.39	46.22
2050	17.9	60.84	66.7	21.27	15.41	64.38	49.94
<b>China</b>							
1950	34.79	57.18	60.17	8.02	5.04	74.86	66.19
1960	40.34	53.2	55.69	6.45	3.97	87.95	79.56
1970	40.89	52.96	55.39	6.15	3.71	88.82	80.51
1980	36.13	56.97	59.48	6.91	4.39	75.54	68.12
1990	28.88	63	65.82	8.12	5.3	58.73	51.92
2000	24.53	65.38	68.55	10.08	6.92	52.93	45.87
2010	18.45	68.79	72.93	12.76	8.62	45.36	37.11
2023	16.76	63.67	68.93	19.49	14.23	56.93	44.95
2030	13.08	60.7	68.7	26.19	18.23	64.69	45.57
2040	10.94	56.61	62.91	32.45	26.15	76.64	58.95
2050	11.45	49.74	58.46	38.81	30.09	101	71.05
<b>India</b>							
1950	37.91	56.73	56.73	5.35	3.1	76.25	69.53
1960	40.52	53.85	53.85	5.63	3.29	85.7	77.96
1970	41.04	52.97	52.97	5.99	3.62	88.78	80.71
1980	39.52	54.21	54.21	6.28	3.98	84.48	76.71
1990	37.97	55.63	55.63	6.4	4.08	79.75	72.56
2000	35.05	58.05	58.05	6.9	4.49	72.26	65.39
2010	30.98	61.26	61.26	7.77	5.07	63.25	56.36
2023	24.91	64.38	64.38	10.7	7.06	55.31	47
2030	22.32	64.8	64.8	12.88	8.81	54.32	45.2
2040	20.05	63.56	63.56	16.39	11.56	57.33	46.22
2050	18.04	61.15	61.15	20.81	14.98	64.12	49.3

Sources: United Nations, Department of Economic and Social Affairs, Population Division (2022).

**Table 4.** The Trend of Potential Support Ratio (PSR) of Bangladesh, India and China 1950-2050

Year	Bangladesh		India			China			
	15-64 <sup>1</sup>	20-64 <sup>2</sup>	15-64 <sup>1</sup>	20-64 <sup>2</sup>	25-64 <sup>3</sup>	25-64 <sup>3</sup>	15-64 <sup>1</sup>	20-64 <sup>2</sup>	25-64 <sup>3</sup>
1950	14.0	11.4	19.0	15.7	12.8	9.2	11.9	10.0	8.3
1960	18.2	14.9	17.0	14.3	11.7	12.0	14.0	11.9	9.9
1970	16.7	13.5	15.2	12.4	10.2	10.9	14.9	11.9	9.7
1980	15.0	12.1	14.1	11.5	9.3	9.7	13.5	11.0	9.0
1990	15.3	12.3	14.2	11.7	9.5	9.8	12.4	10.4	8.3
2000	15.6	12.6	13.5	11.2	9.2	10.0	9.9	8.6	7.5
2010	13.9	11.6	12.6	10.6	8.8	9.5	8.4	7.5	6.5
2023	10.7	9.3	9.6	8.3	7.1	7.7	5.0	4.4	4.0
2030	8.6	7.7	7.8	6.9	5.8	6.6	3.7	3.4	3.0
2040	6.1	5.6	5.9	5.3	4.7	5.4	2.4	2.2	2.0
2050	4.3	3.9	4.5	4.0	3.6	3.5	1.9	1.8	1.6

Sources: *United Nations, Department of Economic and Social Affairs, Population Division (2022).*

Notes: <sup>1</sup> Number of people aged 15–64 per one older person aged 65 or older, <sup>2</sup> Number of people aged 20–64 per one older person aged 65 or older, <sup>3</sup> Number of people aged 25–64 per one older person aged 65 or older.

Because of the low birth and death rates in the present decade, the number of working-age people per older person is decreasing. There are 10.7 persons, 8.3 persons, and only 5 persons for one older person (65 years and above) in 2023 in Bangladesh, India, and China, respectively. At the same time, this number was 14 persons, 15.7 persons, and 11.9 persons in 1950 in Bangladesh, India, and China, respectively. Due to the high birth cohort population, working-age people have grown in these countries until the last decades. Moreover, the increasing life expectancy and low death rate result in the emerging aging population in these countries. Therefore, the ratio of working-age people to older persons is declining in these countries, implying a decrease in the Potential Support Ratio (PSR).

Furthermore, by 2050, the potential support ratio (PSR) is projected to decline to 4.3 in Bangladesh, 4.5 in India, and 1.9 in China. This trend indicates significant challenges for these nations in supporting an increasing number of older persons with a decreasing active workforce in the coming decades. The PSR number also indicates that more than half of China's population will be aged in 2050. Meanwhile, around one-fourth of the total population of Bangladesh and India will be aged. This situation of Bangladesh, India, and China will require some policies to enable a friendly environment in the coming decades. Significantly, China's population composition is primarily concerned with increasing support for older persons. Similarly, the upward trend of the older population of Bangladesh and India will bring various challenges.

To understand the effects of the changing age structure in these countries, it is essential to inquire about the dependent groups of the population, including the aging index of a particular population. Table 5 shows the percentages of older persons (aged 65 and over), who are assumed to be economically inactive, to the number of young

persons (from 0-14), known as the aging index. This table demonstrates the increasing number of economically inactive populations and the reduction of under-15 populations with escalating aging index ratios in Bangladesh, India, and China.

**Table 5.** Percentages of Young and Old Population and Aging Index in Bangladesh, China and India, 1950-2050.

Year	Bangladesh					China					India				
	% of the total population			Aging index		% of the total population			Aging index		% of the total population			Aging index	
	0-14	60+	65+	>60÷<15	>65÷<15	0-14	60+	65+	>60÷<15	>65÷<15	0-14	60+	65+	>60÷<15	>65÷<15
1950	41.2	5.8	3.9	14.1	9.5	34.79	8.02	5.04	23.05	14.48	37.9	5.4	3.1	14.2	8.1
1960	42.3	5.0	3.0	12.0	7.1	40.34	6.45	3.97	15.98	9.84	40.5	5.6	3.3	13.8	8.1
1970	44.8	5.2	3.2	12.0	7.1	40.89	6.15	3.71	15.04	9.07	41.0	6.0	3.6	14.6	8.7
1980	45.1	5.5	3.4	12.3	7.5	36.13	6.91	4.39	19.12	12.2	39.5	6.3	4.0	15.9	10.1
1990	42.3	5.4	3.5	13.0	8.3	28.88	8.12	5.30	28.11	18.4	38.0	6.4	4.1	16.8	10.7
2000	37.3	5.8	3.8	16.0	10.2	24.53	10.08	6.92	41.09	28.2	35.1	7.0	4.5	19.9	12.8
2010	33.4	6.7	4.5	20.0	13.5	18.45	12.76	8.62	69.15	46.7	31.0	8.0	5.1	25.8	16.4
2023	25.5	9.5	6.3	37.3	24.7	16.89	19.50	14.27	115.5	84.5	24.9	10.7	7.1	43.0	28.5
2030	23.4	11.8	8.0	50.4	34.2	13.08	26.19	18.23	200.2	139.4	22.3	13.0	8.8	58.2	39.4
2040	20.4	16.0	11.2	78.4	55.0	10.94	32.45	26.15	296.6	239.0	20.1	16.4	11.6	81.5	57.7
2050	18.0	21.3	15.4	118.3	86.0	11.45	38.81	30.09	338.9	262.7	18.0	20.8	14.9	111.5	82.7

Sources: Calculated from *United Nations, Department of Economic and Social Affairs, Population Division (2022)*.

Note: Aging index demonstrates the percentages of the population aged 65 years and above divided by percentages of the population aged 0-14 years. This table also shows the aging index with the percentages of the population aged 60 years and above divided by percentages of the population aged 0-14 years by considering the age structure trends of Bangladesh and India.

In the middle of the 19th century, around one-third of the total population in Bangladesh (41.2%), India (37.9%), and China (34.79%) was in the 0-14-year age groups. At the same time, the number of older persons was very insignificant. In Bangladesh, India, and China, respectively, only 3.9 percent, 3.1 percent, and 5.04 percent of the total population are older persons. The baby boom effect increased fertility in countries like India, Bangladesh, and China, while the percentage of older persons increased gradually in India, while fluctuating in Bangladesh and China. After 1990, all of these countries experienced an increasing trend in the aging index due to the escalating percentages of older persons. This upsurge reached 24.7 in Bangladesh, 28.5 in India, and 46.72 in China in 2023 (Table. 5).

This growing number of older person dependents will be an increasingly pressing concern for government and policymakers to ensure older persons' rights, dignity, and well-being (Islam et al. 2022). For instance, the healthcare system of these countries will face a dominant challenge in tackling the rising number of older persons with chronic illnesses (Rony et al. 2024).

Concerning the aging index of China, the percentage of older persons is increasing rapidly compared to Bangladesh and India. As a result, China's older person will be larger than the 0-14-year-old group, doubling in the 2040s. Moreover, around 30 % of China's population will be older persons in 2050. To what extent will this large number of older persons in these countries pose several challenges?

Moreover, this population scenario indicates various aspects to study and understand in the coming decades.

## DISCUSSIONS

This paper has attempted to answer two questions- (i) what has been the course of age and sex composition trends and why? and (ii) to what extent has the age structure transition and sex composition been similar in one of the three most populous nations? First of all, during 1950-2023, the age structure of the populations in the three countries has changed significantly. They have transitioned from experiencing very high fertility levels to near replacement-level fertility. This shift has led to the creation of a youth bulge and a large working-age population. Secondly, in terms of the age and sex structure transition, major similarities have been observed between these three countries. Therefore, the current features of the age-sex transition in these three countries, along with the implications and ongoing challenges, will be discussed later.

### **Changing Age-sex Transition and Relevant Utilization of the Working Age Population**

China has experienced a rapid increase in its working-age population from the late 70s to the early 80s before the trend started to decrease again after the 2010s. On the other hand, Bangladesh and India have experienced an increasing trend of the working age 15-59 and 15-64 from the 1990s; according to current UN projections, this growing trend of the working age population will continue for both countries until 2036-37. Afterward, there will be a gradual decrease of the working age groups 15-59 and 15-64.

Bangladesh and India have the advantage of having a high proportion of their population in the working age group 15-64 and 15-59 until the late 2030s. However, proper policy planning and interventions are required to utilize this high working-age population for economic success in Bangladesh and India. According to the International Labor Organization (ILO) estimates, Bangladesh and India have an unemployment rate of 5.1 percent and 7.7 percent in 2021; for females, the unemployment rate stood for Bangladesh at 6.7 percent in 2017 and 6.8 percent for India in 2021. (ILO, 2020). Furthermore, the unemployment rate is even higher among youth (ages 15-24). According to recent ILO estimates, the youth unemployment rate stands at 12.6 percent for Bangladesh in 2017, and for India, it is 24.5 percent in 2021 (ILO, 2020). There is high unemployment among the highly educated youth as well. Also, youth employment is crucial for both countries to achieve SDG Goal 8. Specifically, target 8.6 focuses on significantly reducing the proportion of young people not in employment, education, or training.

Both countries need further investment to generate jobs and skilled workforce to increase youth employability. (Majumder & Mukherjee, 2013; Chandrasekhar et al., 2006; Maria, 2019; Farid & Mostari, 2022). Bangladesh and India face the challenges of unemployment, high youth unemployment, and low female force participation, which could be significant obstacles to achieving the first demographic dividend. (Islam, et al. 2022, Islam, et. al 2021, Dev & Venkatanarayana, 2011, Chandrasekhar et al. 2006)

In this regard, the example of China is noteworthy, where the demographic change of the high working-age population has resulted in tremendous economic growth. (Liu & Hu, 2013). Alongside economic growth, China has seen a massive

poverty reduction, with nearly 800 million lifted out of poverty from 1980 to 2020. (World Bank, 2022).

However, this economic growth and poverty reduction did not occur on its own. Active government policies were instrumental, including efforts to reduce overall poverty, address regional inequalities, increase investment in education and innovation, develop infrastructure, plan urban growth and migration, improve agricultural and industrial productivity, and promote rural development and entrepreneurship. These factors all contributed to China's significant economic progress. (Liu, 2022; World Bank 2022; Wu & Si, 2018; Wang, 2013; Liu, et.al. 2020).

Bangladesh and India can benefit from the demographic dividend by increasing labor productivity through greater investment in technical and vocational education and training (TVET). This approach will help them capitalize on the working population bulge.

Furthermore, India and Bangladesh have low female labor force participation rates for the 15-64 age group, at 22 percent and 38 percent respectively (WB, 2021). Half of the working-age population in each country is female. In this regard, both countries need immediate policies and intervention to increase the participation rate of the female labor force. Without achieving equal opportunity for both males and females, the country will be short of achieving gender balance and ultimately achieving the economic gain of demographic dividend. Moreover, ensuring female labor force participation will be vital for both countries to attain SDG 5, which states that gender equality should be achieved and all women and girls empowered. The governments of both countries should implement policies to increase employment opportunities and provide quality education and training for this segment of the population

### **Rising Life Expectancy and the Challenge of Healthy Aging**

The global population has seen a significant rise in the aging demographic, particularly in nations experiencing high urban growth and industrialization. This is due to reductions in child mortality and shifts in disease patterns from communicable to non-communicable diseases. (Leeson, 2018; Wilmoth, 2000). However, this increase is uneven, with significant inequalities in healthy life expectancy both among and within nations (Cambois, Duthé, & Meslé, 2023). This ongoing trend of overall life expectancy is growing with an increased number of older populations aged 60 and above (Mathers et al., 2015).

Both Bangladesh and India have similarities in terms of a growing percentage of the 60+ aged population, 5.80 and 5.35 in 1950, respectively, which has risen to 9.26 and 10.49 percent in 2022 and is projected to be 21.27 and 20.81 percent in 2050 as per the United Nation's projection respectively. On the other hand, for China, the increase in the 60+ and 65+ aged population started to occur much earlier than in Bangladesh and India due to the earlier nature of the fast demographic transition. China has become an aging society, with a large share of elderly population aged 65+ in 2021. (Zhao, 2022) Consequently, the potential support ratio for older persons, defined as the number of persons aged 15 to 64 per person aged 65 or older, has decreased over the years in all three countries and is projected to decline further. For example, the support ratios of Bangladesh, India, and China in 1950 were 14, 19, and 11 persons per 65+, which will be reduced to 4.3 and 4.5, 1.1 in 2050, respectively.

Furthermore, Bangladesh and India have undergone a similar demographic transition pattern, captured by both countries' declining CBR and CDR. According to the UN projection, the CBR and CDR of both countries will continue to fall in the coming decades. However, CDR will gradually increase after a specific time because of the high concentration of the older persons in the age-sex structure (UNDESA,2022). China is already witnessing an increase in its older persons due to past declines in the crude birth rate (CBR) and the completion of its first demographic transition into the second. Looking ahead, a key priority for China should be to enhance the productivity of its elderly population and increase their labor force participation rate. (Cai, 2020).

The declining fertility rate and economic upsurge could lead Bangladesh and India into a second demographic transition. All these three countries have observed a shift in their disease burden from communicable diseases to non-communicable diseases in recent decades. (Yadav, & Arokiasamy, 2014, Quigley, 2006, Ahsan, et al.2017, Islam, 2010; Yang, 2010; Zhou, 2019). According to WHO Global Health estimates in 2019, non-communicable diseases such as heart disease, pulmonary disease, stroke, diabetes, liver cirrhosis, lung cancer, and stomach cancer were among the top ten causes of death in Bangladesh, India, and China. (WHO, 2020). Evidence suggests that older persons are suffering from comorbidities and chronic conditions in all three countries. (Asghar, et al, 2007, Khanam, et.al. 2011, Jana & Chattopadhyay, 2022; Chauhan, et al., 2022; Juan, 2016; Fan, 2021; Zhang, 2022).

In this regard, a healthy aging population will be vital for all three countries. Healthy aging is "the process of developing and maintaining the functional ability that enables wellbeing in older age" (Rudnicka et al., 2020). Therefore, a healthy aging population free from comorbidities and disease burdens can significantly contribute to the economy, potentially leading to a second demographic dividend. Ensuring and increasing universal health coverage for all the population and creating dedicated social safety net programs for older persons could play a vital role in the countries.

Hence, ensuring workforce sustainability in the coming decades and supporting older persons will be key challenges. Implementing effective policy alternatives can accelerate economic growth by achieving both the first and second demographic dividends. Both Bangladesh and India have poor expenditures on health per GDP. Therefore, budgetary allocation to health should be a top priority for both countries. Currently, according to WHO (2023), Bangladesh's current health expenditure (percent of GDP) is only 2.48 percent, and India's is 3.01 percent as of 2019. This is significantly lower compared to the global average of 9.83 percent and many other countries in the region.

Moreover, adequate settlement policies for growing cities must be provided to ensure safe spaces and habitations for older persons following SDG-11, and population features must be provided for both countries to intervene in appropriate policy actions.

### **Uneven Sex Ratio and Gender Equality**

The general human sex ratio at birth is usually observed at 105–107 male births for every 100 female births under normal circumstances across the different regions of the world. (Hesketh & Xing, 2006). Sex composition analysis reveals significant differences in the sex ratio at birth (SRB) between India and China, reflecting gender inequality. This inequality is attributed to societal preferences for sons, the availability

of technology for sex-selective procedures, norms favoring small family sizes or declining Total Fertility Rates (TFRs), underreporting of female children in China, instances of female infanticide, and issues such as abandonment and abusive behavior towards girls in India. Additionally, China's previous one-child policy has also influenced these dynamics (Guilmoto, 2009; Goodkind, 2011; Srinivasan, & Li, 2018; Li, 2011).

The SRB in India after the 1970s shows higher male births (106 male births per 100 female births), which peaked at 110 and was sustained for one decade. In China, a sharp increase in the sex ratio at birth (SRB) was observed during the 1990s and continued into the following two decades, the 2000s and 2010s. The highest recorded SRB reached 117 males per 100 female births. The SRB of India is 108 in 2022, and the UN projection shows it will be 105 in 2050. While the SRB of China is still high at 111 in 2022, according to the projection, a further gradual decrease will be observed in the coming decades. This SRB situation beyond the normal range in India and China indicates a significant sex composition imbalance, impacting nuptiality, birth rates, and the working-age population.

The skewed sex ratio at birth (GBSS - gender-based sex selection) poses considerable challenges to achieving Sustainable Development Goal (SDG) 5, which aims to promote gender equality and empower all women and girls. GBSS at birth leads to infringing on a woman's reproductive rights, and this also goes against the Program of Action (PoA) of the International Conference on Population and Development (ICPD) in 1994 and ICPD+25 commitments by 2030. Given the age structure of both countries, a significant portion of the population is of reproductive age. Notable percentages of the population will enter the reproductive age group, which needs attention to get priority in implementing the ICPD PoA and SDGs.

This study has limitations, but they are within acceptable bounds. For example, this study has not included the migration component, one of the key demographic processes in population dynamics. However, this study helps to understand the patterns of demographic changes and variations in terms of the age-sex distribution of the population in Bangladesh, India, and China. Additionally, the future effects are inferred based on the demographic transition of past decades, including the UNDESA projection which conveys a 100-year periodical understanding. This indicates that policymakers should take the appropriate steps to address the socioeconomic effects of the demographic transformation. As an illustration, the current age-sex structure in both countries highlights the necessity of policies that support and upsurge education, health, and job development to achieve both the first and second demographic dividends.

### **Challenges of Updated and Timely Policy Responses in Achieving Demographic Dividend**

Within the scope of this study, three particular policy responses have been identified inside the realm of the age-sex structure transition of a country's population: national population policy, national health policy, and policy for tackling the rising aging population. Population policy refers to intentionally creating or modifying institutional arrangements and targeted initiatives that allow governments to bring demographic changes directly or indirectly. (Demeny, Paul, 2003). Bangladesh, India, and China have substantially progressed in reducing the high population growth rate and maintaining population control. For example, Bangladesh and India have

observed a high reduction in total fertility rate (TFR) and a high increase in contraceptive prevalence rate (CPR) within the countries with some variations..

On the other hand, China experienced faster demographic changes compared to both Bangladesh and India, largely due to radical policy shifts initiated by the Chinese government. The 'One Child Policy', introduced in the 1980s, underwent revisions over the years, allowing couples to have two children starting in 2015 and further modified in 2021 to permit up to three children. (Basten, S., & Jiang, Q. 2014; Chen, Qian, et al.2023) Furthermore, ensuring a healthy population through crucial age categories, such as youth and older persons, persists in all these countries. All of these factors are expected to lead to further increases in the aging population and in the number of people living with non-communicable diseases. Therefore, policy materials regarding population and health issues should be up-to-date and research-oriented to tackle these issues for Bangladesh and India.

The UNDESA (2022) data shows around 68% of the total population of Bangladesh and India stand to benefit from the demographic dividend by enhancing the labor productivity of their working-age populations through education and training in digital technology. Additionally, preparing them for the ethical use of artificial intelligence (AI) and training in robotics could further enhance their potential (Arif et al., 2021). The integration of technology and AI has already significantly impacted productivity worldwide. In this regard, the governments of these countries should focus more on technical and vocational education and training (TVET) to reap the benefits of the working population bulge and demographic dividend.

Adopting appropriate policies for Bangladesh and India can capitalize on the demographic dividend by generating skilled human resources. Meanwhile, China's challenge will be maintaining the previous economic growth rate and achieving a healthy aging population for the dividend with the second demographic transition. Population aging and increasing life expectancy at birth will necessitate a more comprehensive policy response, particularly in providing care and support for older persons in the coming decades. However, to benefit from the second demographic dividend, these countries should take necessary measures to ensure healthy longevity and economic savings for older persons. Governments should create an environment to maximize financial benefits by providing such policies.

China has adopted the three-child policy to address population challenges such as low birth rates, negative population growth, and potential labor force shortcoming (Zhang et al. 2024). The country's population pyramids show uneven distribution, with decreasing birth rates and a rapidly decreasing 0-14-year-old group (UNDESA, 2024). The number of older persons is expected to double by 2040, with 30 percent of China's population being elderly by 2050, compared to 15.4 percent in Bangladesh and 14.9 percent in India (UNDESA, 2022). Moreover, China's potential support ratio is expected to be less than 2 by 2050, compared to Bangladesh and India's 4.3 and 4.0 (UNDESA, 2022).

This picture clearly indicates acute labor supply shortages and an increasing burden of older dependents in China in the coming decades, or even years. In contrast, Bangladesh and India exhibit more evenly distributed populations, as indicated by UNDESA data showing an increase in old-age dependency and potential support ratio. In this regard, China has adopted a three-child policy aimed at optimizing the population structure and fostering a new fertility culture to address anticipated labor force shortages (Zhang et al., 2024; Kuhn et al., 2022). Meanwhile, Bangladesh and

India still have opportunities to shape their population compositions through appropriate policy interventions, drawing insights from China's experiences.

Different scenarios are also evident across these countries. The sex ratio at birth in India and China is higher than in Bangladesh. Along with this, both Bangladesh and India have some of the highest percentages of child marriage in the world. Bangladesh and India require immediate and long-term policies focusing on population, youth employment, education, health, and gender equality to achieve a demographic dividend. Interventions are needed to ensure gender equality by 2030 (Sustainable Development Goals -5: Achieve gender equality and empower all women and girls). Moreover, Bangladesh and India will need policy intervention to reduce the female population's youth unemployment rate and labor force participation rate to achieve (SDG goal number - 8: Decent work and economic growth) for all. Nevertheless, better policy options or interventions under the changing dynamics of age structure and sex composition of these three populous nations are required.

## CONCLUSIONS

The analysis of Bangladesh, India, and China's age structure and sex composition demonstrate common and uncommon features of population dynamics. Currently, both Bangladesh and India are in the third phase of the demographic transition model, characterized by a decline in birth and death rates at a similar pace. China is ahead of both Bangladesh and India in terms of declining birth rate and death rates and also rising older age populations. The majority of the population of both Bangladesh and India belongs to the working-age population, whereas in China, the working-age population has already started to shrink. The trend of age structure refers to a bulge of the increased working-age population in Bangladesh and India from the previous decade, which will diminish between 2030 and 2040. Appropriate educational, employment, and training policies to generate skilled human resources should be undertaken to capitalize on demographic dividends in Bangladesh and India.

However, over the years, both countries will experience the trend of increasing life expectancy at birth, followed by the growth of older persons, as evidenced by the aging population in China. Thus, policy response to population aging- especially care and support for older persons in the coming decades will be more required. However, to benefit from the second demographic dividend, Bangladesh and India should take necessary measures to ensure healthy longevity and economic savings for older persons. Governments should create an environment to gain maximum economic benefits by ensuring such policies are in action.

In comparison to China, which experienced a rapid and uneven demographic transition around 30 years ago, Bangladesh and India are going through a slow and consistent population transition. In this way, China has important insights to offer Bangladesh and India about demographic transition and age structure. Regarding age structure and demographic transition, Bangladesh and India could make a good understanding to illuminate each country's policies and agendas to grab the opportunities of demographic dividend. China's long-term economic growth and demographic transition strategy is a distinct example for Bangladesh, India, and other countries, particularly those in the third stage of the demographic transition.

In terms of the demographic dividend, China should serve as a model for Bangladesh and India by prioritizing labor-intensive technology in small manufacturing enterprises and self-employment. Moreover, Bangladesh and India

can benefit from understanding that the demographic dividend is not solely dependent on youth bulge or working population size but also on the size of the labor force, and education and training play a vital role in enhancing this dividend.

Furthermore, the economic expansion from 1990 to 2018 significantly increased China's people's economic stability and living standards due to the integrations of good governance, education and training, and the working population bulge. By drawing on the experiences of China, Bangladesh, and India, we can consider these factors to optimize their demographic dividends and drive economic growth effectively.

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### **Conflicts of Interest**

None declared.

### **Author's Contributions**

All the authors equally contributed to this work.

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