Chapter 2
Recent Mortality Trends in China

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Introduction

Analysing and understanding China's demographic patterns and trends must start with an appreciation of its extraordinary mortality changes over the past six decades. This transition can be divided broadly into two stages: very rapid mortality decline from the early 1950s to the late 1970s, and slower but still appreciable improvement in the next three decades. In the first period, China's life expectancy improved at an average speed of 10 years per decade. While China's life expectancy at birth was only around 35 years in the late 1940s, it rose significantly to 50 in 1957, 61 in 1970 and 65 in 1981 (Banister 1987). This change not only brought about a rapid population growth, but also laid foundation for an equally remarkable fertility transition later. This great achievement was directly attributable to a series of socio-economic transformations and public health campaigns and programs, such as nationwide land reform, establishment of government controlled food redistribution, effective control and prevention of infectious disease, rural cooperative medical system and urban free medical care, widespread primary education, and nationwide family planning program. Despite China's relatively low level of economic development at the time and that a large part of the population still lived in poverty, China's

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mortality decline was faster than many countries with similar or markedly higher socio-economic development levels. This together with the successful experience of some other countries, such as Sri Lanka and Costa Rica, were widely regarded as "routes to low mortality in poor countries" (Caldwell 1986). However, it is important to note that China's mortality improvement was not smooth during this period. It was significantly interrupted between 1958 and 1961 by the famine. This great disaster, which was at least partially attributable to the policy failure and mismanagement by the government, led to a marked increase in mortality and China's only population decline in the second half of the twentieth century (Zhao and Reimondos 2012).

Since the 1980s, China's pace of mortality reduction has slowed to a level similar to that observed in the rest of the less developed countries but its life expectancy has been much higher. According to some estimates, China's life expectancy reached more than 70 years by the end of the twentieth century (Banister and Hill 2004) and is now round 75 years. While the mortality decline in the first 30 years of the People's Republic of China was highly related to or determined by major social changes and some institutional factors, the slower but still significant mortality improvement in the last three decades has been considerably affected by China's rapid economic development and related factors. The Chinese government launched economic reform in the late 1970s, which resulted in one of the fastest growing economies in the world in recent history. China's great social and economic transformation has brought about some negative consequences such as increasing inequality, the collapse of the rural cooperative medical system, and commercialization and marketization of medical services, which in turn led to some unwelcome health outcomes. The Chinese government has made major efforts to address these issues. This is particularly impressive in the areas of improving people's standards of living, poverty alleviation, further improving education, especially the universal 9-year compulsory education, and establishing a nationwide new rural cooperative health care system. As a result, China's life expectancy at birth continued to increase. Currently, it is about 9 years higher than the average of other less developed countries and only about 3 years lower than the average of the more developed countries in the world (United Nations 2013).

Following the above brief review, this chapter provides a more detailed examination of mortality changes in China in the first decade of the twenty-first century. In comparison with fertility research, mortality studies have been less developed in China. This is largely due to the fact that for a long time, the research interest of both governments and academics has been focused on fertility changes and China's family planning program. While China's mortality changes are also an important topic, research in this area has often been regarded as less urgent. The accessibility of detailed mortality data is a specific issue (Huang 2008). Because of that, it is also difficult to evaluate the quality of China's mortality data and make required adjustments. In this chapter, we will examine China's major sources of mortality data and comment on data collected by the 2010 census. Following that, we will examine China's recent mortality trends and patterns based on officially published data.

China's Mortality Data

Major Sources of Mortality Data

China's mortality data are collected for different purposes by various government agencies, which include Ministry of Health (MOH), National Bureau of Statistics (NBS), Ministry of Public Security, and National Population and Family Planning Commission (Ministry of Health and National Population and Family Planning Commission were merged together and became National Health and Family Planning Commission in the early 2013).

The MOH has made great effort in collecting mortality data. It has organized three national retrospective surveys on causes of death. These surveys, conducted in the mid-1970s, early 1990s and 2006, aimed to review registered deaths and causes of death in China for the periods 1973–1975, 1990–1992, and 2004–2005. They provided very useful information for the study of age-specific mortality, causes of death, and their regional variations over these periods. The 1973–1975 survey covered 98.5 % of counties, which had a total population of 841.7 million people or approximately 93 % of the national population recorded at the end of 1974 (Banister and Preston 1981). The completeness of death registration for the survey was most likely to have fallen within the range of 80–90 %. The life expectancy during these years was within the range 61.7–64.4 years (Banister and Preston 1981; Rong et al. 1981). In the early 1990s and 2006, MOH conducted the second and third national retrospective surveys on causes of death. The two surveys collected information from a national representative sample and recorded deaths which occurred in the study years in approximately 150 counties. Because only limited data have been released for the second national survey, it is difficult to examine the quality of the survey data in detail. As for the third survey, the representativeness of sample areas and completeness of the survey were generally satisfactory, as indicated by the comparison with 2000 census results (Chen 2008).

In addition to the nationwide mortality surveys, the MOH has been collecting cause-of-death data through its Vital Registration (MOH-VR) system and Disease Surveillance Points (DSP) system, and child and maternal mortality data through its National Child and Maternal Mortality Surveillance Points system. The MOH-VR System was established in 1987 and it covered about 8 % (110 million) of the national population (Rao et al. 2005). The DSP system was established in 1990 and had 145 disease surveillance points nationwide. It covered 1 % (around 10 million people) of China's population (Rao et al. 2005; Yang et al. 2008). Death registration recorded through both systems was affected by under-recording (Rao et al. 2005), but the quality of cause-of-death data collected by the DSP is better than that obtained through MOH-VR, as the DSP sample is more representative and more effort has been made in verifying causes of death and in collecting data from a much smaller population.

The Ministry of Health has also been collecting data on child and maternal mortality since the early 1990s. The National Child and Maternal Mortality Surveillance

Points system was established in 1996 by integrating two earlier systems: National Maternal Mortality Surveillance Points and National Child Mortality Surveillance Points systems. The new system initially covered 116 county-level points and a population of 80 million. It further expanded to 336 county-level surveillance points, covering 140 million people in 2006. Generally, the system provides detailed information on under-5 child mortality, maternal mortality by age and the sex of children, and cause of death. The data (including live births, child and maternal deaths) reported by National Child and Maternal Mortality Surveillance Points system are obtained largely from hospitals, although it was claimed that all child and maternal deaths, including those occurring at home, were recorded in the surveillance areas from 1996. It is also worth noting that the surveillance system recorded only the death of children whose guardians lived in surveillance areas for more than 1 year and women who belonged to the surveillance areas according to the household registration.

China's National Bureau of Statistics (NBS) is another government agency that has played a major part in collecting mortality data. Such data were collected through recent population censuses (in 1982, 1990, 2000 and 2010) and 1 % population sample surveys (in 1987, 1995 and 2005), which generally recorded information about the age, sex, education, ethnicity, marital status and in some cases the previous occupation of those who died during the 12 months preceding the enumeration. The quality of death records made by the 1982 and 1990 censuses was high and this was particularly the case for adult mortality (Banister and Hill 2004). In recent years, however, the quality of the data seems to have deteriorated. Underreporting of infant and under-5 mortality was high in recent censuses and population sample surveys (Banister and Hill 2004; Huang 2008). NBS also conducts the Annual Population Change Survey every year, but this survey is less known. As far as mortality is concerned, the survey collects data about the age and sex of the deceased. These data have a good coverage, and the quality of data is relatively high. While the annual population change survey has been conducted from a sample of around one-per-thousand of the national population for the last 20 years, the data gathered by the survey have rarely been used in demographic research, especially the study of mortality changes.

The third government agency that keeps good death records is the Ministry of Public Security. It controls China's household registration system, which was set up nationwide by the household registration legislation passed by the National People's Congress in 1958. According to the legislation, all deaths should be registered within 1 month after the death. However, a large number of deaths are not reported to the local office of public security within the time period required by the legislation. For example, according to the 1982 census, 8 million deaths were not recorded in household registers over the period from 1964 to 1981 (Huang 2008). Despite their potential, detailed household registration data including death registration data have not been released and used in research.

Apart from the data sources discussed above, mortality data collected by other government agencies are also available. For example, detailed death registration including causes of death are made and kept in some large cities. China's National

Population and Family Planning Commission also gathered information on infant and child mortality through several fertility sample surveys. These data also provide very useful information for the study of mortality changes, especially changes in infant and child mortality in recent history, although they will not be detailed here because of space constraints.

Mortality Data Collected by the 2010 Census

Even though the NBS suggested the quality of China's 2010 census was very high and its net under-enumeration rate was only 0.12 %, mortality data recorded by the census were affected by three major problems: under-reporting of infant deaths, over-reporting of young adult deaths and under-reporting of old age deaths. They resulted in an under-reporting of mortality rates at these ages by either deflating the numerator or inflating the denominator.

Under-Reporting of Infant Mortality

Infant mortality rate was considerably under-reported by the 2010 census. It recorded that infant mortality was surprisingly low, at 3.8 deaths per thousand births. In contrast, infant mortality rate obtained from the National Child and Maternal Mortality Surveillance Points was significantly higher, at 13.1 per thousand in 2010. It should be noted that the MOH's surveillance points covered areas with higher levels of economic development and better health care and medical services. Accordingly, even the much higher infant mortality rate observed at the surveillance points was very likely to have been underestimated. When compared with mortality experiences of other countries, the 2010 census recorded an infant mortality rate similar to that observed in Northern and Western European countries where per capita GDP was some 5–6 times higher than China. On the other hand, in countries where the per capita GDP was similar to that in China, the infant mortality rate tended to be much higher. The above comparison of results suggests that China's census-recorded infant mortality rate was too low.

Double Counting of Young Adults

People in their age 20s were over-enumerated by the 2010 census. If we compare the size of the same birth cohort recorded by two successive censuses, for example censuses conducted in 2000 and 2010, survival ratios of all birth cohorts are expected to be lower than 1 at the time when the late census was undertaken. However, according to the 2010 census, survival ratios were greater or considerably greater than 1 in many age groups among those aged 20–40 in 2010. This pattern is particularly notable among female population (see Fig. 2.1). Chinese population has been

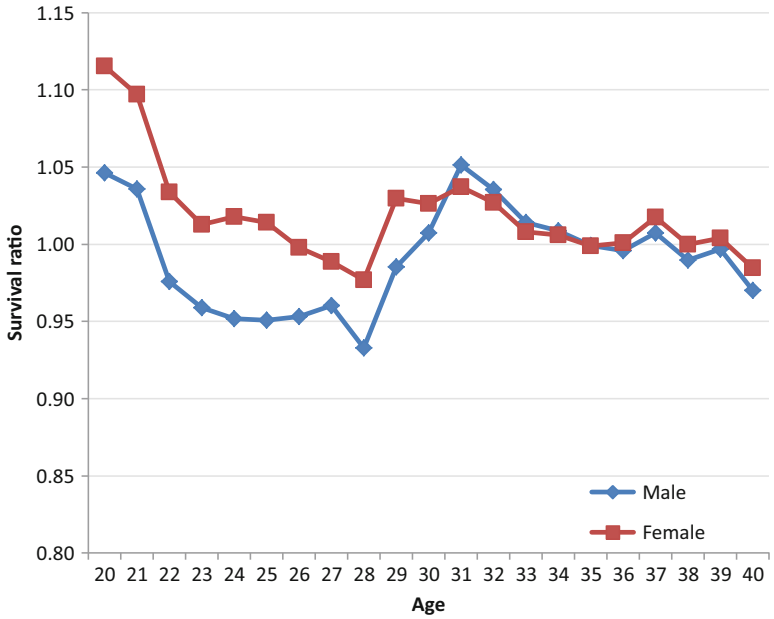

Fig. 2.1 Survival ratios computed over 2000–2010 for those aged 20–40 in 2010, China (Source: NBS (2002, 2012a))

largely a closed one where population changes caused by international migration have been rather small. Under this circumstance, population of the same birth cohorts would become smaller from 2000 to 2010. Survival ratios of larger than 1 were more likely to have caused by the following reasons. There was under-enumeration in 2000 census or over-enumeration in 2010 census, or both. Since under-enumeration of those aged 10 and over was unlikely to have reached a high level in Chinese censuses, the abnormal survival ratios were most likely to have resulted from over-enumeration in the 2010 census. This will be further explained below.

First, in the 2010 census, the authority changed the enumeration rules and registration procedures. In conducting the 2000 census, people were enumerated according to the *de jure* principle. In the 2010 census, both *de jure* and *de facto* methods were used. That is to say, migrants or the floating population were enumerated in both the place of their current residence, and the place where their household registration was held. This practice could effectively lower the impact of under enumeration, but it could increase the chance of double counting although the census authority suggested that the problem of double counting had already been eliminated before the census results were released.

Second, in contemporary Chinese population, infant and child mortality is already fairly low and the difference in its levels between males and females is rather small. Accordingly, changes in the sex ratio of male to female population will be

small before people reach age 30 or higher. The 2010 census results showed that sex ratio for those aged 20–24 was 101. This was much lower than the sex ratio at birth of 110 observed in the late 1980s when they were born. This difference cannot be explained by the excessive male mortality. If it was not caused by significant under-enumeration of female children in the 2000 census, then it was more likely to have arisen from the double counting of females, especially female migrants in the 2010 census. Migrants or floating population have often moved away from the place of their household registration. Because of the new enumeration rules used in the census, they could easily be counted twice (Tao and Zhang 2013).

Thirdly, a comparison of census data with those from other sources also indicates that double counting indeed existed among people aged 20 and above as recorded by the 2010 census. Table 2.1 presents population of the same birth cohort recorded by different data sources. It shows that in comparison with the number of births reported by the NBS, the figure recorded by the household registration records, and the 2000 census, the number of people recorded by the 2010 census was notably larger. This may have been caused by the over-enumeration of population of these ages.

Under-Reporting of Deaths at Old Ages

Information recorded in household registers is used extensively in the Chinese censuses. It is common for census enumerators to produce a list of residents and then to interview these residents, as well as other people, and to fill the census form against this list. According to the household registration legislation, when a person dies, his or her household registration should be cancelled within 1 month. However, it is not uncommon that when people pass away, their registration may not be cancelled for a rather long time. The out-of-date information may still be filled in the census form. For a similar reason, people who died before the census may not be recorded by the census enumeration. This could arise from the fact that reporting death itself is a complex procedure. In addition, the family members of the deceased may do this intentionally, because it could bring some benefits to the family (such as continuing to receive the allowance previously given to the deceased). All these lead to an under-reporting of mortality at old ages.

Table 2.1 Population of same birth cohorts from different data Sources (in million)

Data source	Population age 20 in 2010	Population aged 21 in 2010
2010 census data by NBS	28.30	26.71
2000 census data by NBS	26.21	25.14
2010 household registration data by MPS	27.19	25.32
Number of births by NBS in 1989–1990	23.91	24.07

Source: Tao and Zhang (2013)

Because of the above registration problems, it seems important to adjust recorded mortality or to estimate China's recent mortality from different data sources. Despite that, we have decided not to make such adjustments in this chapter. Instead, we will assess the levels and trends of mortality through comparing mortality statistics from different data sources, especially the adjusted mortality data published by NBS. While these results have some limitations, they are sufficient in describing the major trends in China's mortality changes and their main characteristics.

Recent Mortality Changes in China

Changes in Life Expectancy at Birth

As mentioned earlier, China's most rapid mortality decline took place between the early 1950s and late 1970s. There are notable differences in mortality levels estimated by various researchers, but they all indicate that remarkable improvements in population health and mortality were made over this period. This can be easily observed from rapid changes in China's life expectancy at birth. Over the period between 1949 and 1957, life expectancy increased some 15 years. After the great famine, which resulted in a notable increase in mortality from 1958 to 1961, further mortality reduction added another 15 years to China's life expectancy between the early 1960s and early 1980s. During these three decades, except during the famine, China's mortality decline was on average faster than the decline in developing regions and the world average.

According to estimates made by the NBS on the basis of mortality data collected by the last four censuses (Table 2.2), mortality improvement was slow in the period from 1981 to 1990, during which life expectancy at birth rose by only 0.8 years. This was slower than the change in Japan and Taiwan at the points in time when they were at a similar level of life expectancy (Japan in the late 1950s and Taiwan in the early 1970s). In the next two inter-censal periods, China's mortality improvement gained pace. It increased by 2.8 years in the period 1990–2000. This increase, however, was still slower than that in Japan and Taiwan, where the same increase took only 5–7 years to complete. During the period from 2000 to 2010, China's life expectancy increased by 3.4 years, which was as fast as that in Japan and more rapid than that in Taiwan.

Table 2.2 Life expectancy at birth, 1981–2010, China

	Total	Male	Female
1981	67.77	66.28	69.27
1990	68.55	66.84	70.47
2000	71.40	69.63	73.33
2010	74.83	72.38	77.37

Source: NBS (2012b)

Rapid mortality improvement in the last decade has also been indicated by the data from the Annual Population Change Surveys (APCS) conducted by the NBS and those gathered from the Disease Surveillance Points (DSP) by the MOH. The data from these two independent systems show similar levels and trends (see Fig. 2.2) in mortality changes, although they are both affected by under-registration of deaths (Zhao et al. 2014). This is indicated by the markedly higher life expectancies computed directly from these data compared to those adjusted and published by NBS (shown in Table 2.2) and those estimated by the World Bank (plotted in Fig. 2.2).

Improvements in mortality were relatively slow in China in the last two decades of the twentieth century. This was closely related to the socio-economic changes at that time, and some of the negative effects they brought. China has achieved rapid economic growth in recent decades, but this is not without cost. In the 1980s and 1990s, the economic reform led to an increase in unemployment, the old medical care system collapsed in many areas, the commercialization and marketization of

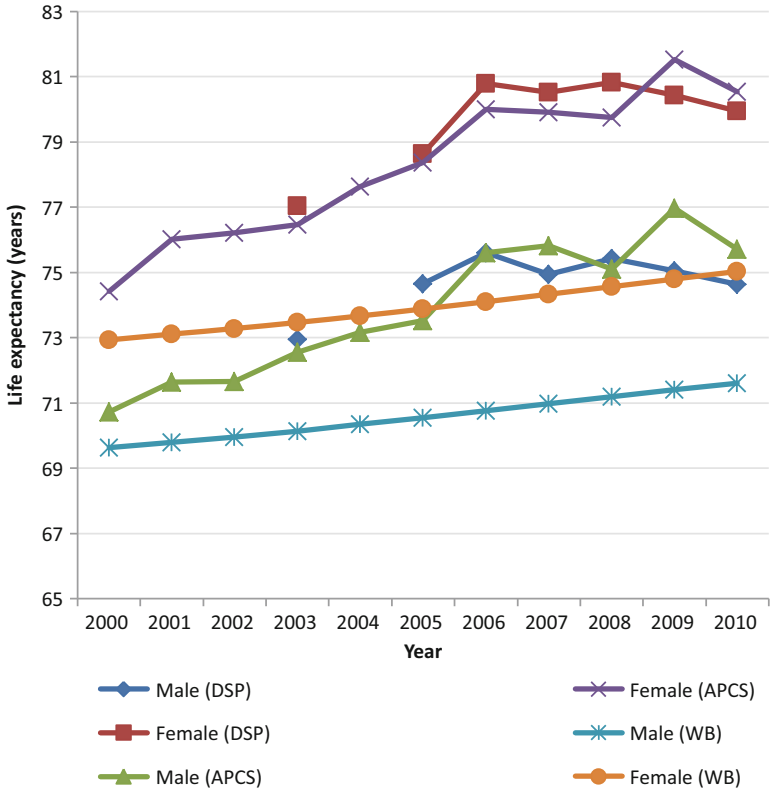

Fig. 2.2 Life expectancy at birth, 2000–2010, China. Note: Life expectancies in this figure are directly derived from various data sources, without any adjustment for any data problems (Source: China Population and Employment Statistical Yearbook, various years from 2001 to 2011; China Health Statistical Yearbook, various years from 2004 to 2011; World Bank data from http://data.worldbank.org/topic/health)

health services greatly increased their cost, and the increasing income inequality made it difficult for poor people to get the needed health care. These changes notably slowed down the mortality decline during that period (Zhao 2006).

The Chinese government realised these problems and took the necessary actions. In addition to the very successful poverty alleviation program, the government has made significant effort in re-establishing the nationwide healthcare system. For example, a medical insurance system for urban workers was implemented in 1998, and the medical insurance system for urban residents (largely the unemployed residents) was enforced in 2007. Furthermore, a new rural cooperative medical care system started in 2003. It now provides health insurance and care to about 95 % of China's rural population. According to China's National Health Service Survey, 70 % of the population was not covered by any health insurance (45 % for urban and 79 % for rural) in 2003. But the proportion without medical insurance fell sharply to 13 % in 2008 (urban 28 % and rural 7.5 %). Similar changes also took place in the share of health expenditures paid by the government, social sector, and individual, which are shown in Fig. 2.3. These changes made a major contribution to the mortality decline in the first decade of the twenty-first century.

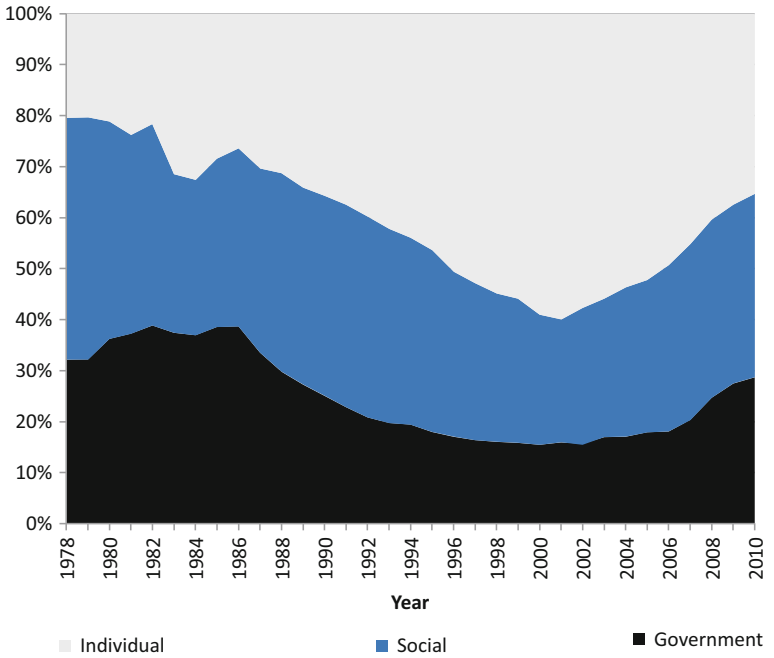

Fig. 2.3 Shares of health expenditures paid by individuals, social and government in China, 1978–2010 (Source: China Health Statistical Yearbook 2011. http://wsb.moh.gov.cn/htmlfiles/zwgkzt/ptjnj/year2011/index2011.html)

Decrease in Infant Mortality

Another important indicator is the level of infant mortality. China's 1988 retrospective fertility survey showed that China's infant mortality rate was over 200 per 1000 at the end of 1940s (Yan and Chen 1991). It fell to 50 per 1000 by 1991 and further declined to 32 in 2000 according to the data from National Child and Maternal Mortality Surveillance Points (NCMMSP) set up by the MOH. Although some differences have been found in estimated infant mortality rates obtained from different sources, they have shown that infant mortality rates declined rapidly in China in the past six decades. This decline has been faster than that in many countries in the world.

Both the APCS and NCMMSP recorded much higher infant mortality for the 1990s compared to that reported by the 1990 and 2000 censuses. For example, infant mortality derived from the 1990 census was 32.9 per 1000, while infant mortality was 40–50 per 1000 in the early 1990s according to both APCS and NCMMSP. Infant mortality rate was 33 per 1000 in 1998 as recorded by both APCS and NCMMSP and 32 per 1000 in 2000 according to NCMMSP, higher than the 27 per 1000 reported by the 2000 census. Until 1998 infant mortality rates obtained from APCS and NCMMSP were much the same. But the gap between them started to increase thereafter. Infant mortality rates reported by the APCS were on average lower than NCMMSP-reported rates by 7 per 1000 points over the period 2000–2010. While NCMMSP data showed smooth and continuous reductions in infant mortality rates, some fluctuations were observed in the infant mortality recorded by the APCS (Fig. 2.4). The 2010 census reported extremely low infant mortality, less than one-third of the figure from the NCMMSP. The estimates released by the World Bank have been largely similar to those observed in the NCMMSP and published by the MOH. They are likely to be closer to China's actual infant mortality than those published by the NBS.

According to the data published by the MOH and World Bank, there has been an appreciable reduction in China's infant mortality in the last decade. Infant mortality rate was around 30 per 1000 in 2000, and fell to about 15 per 1000 in 2010. For the same year, the NBS adjusted infant mortality rate was 13.9 per 1000, very close to those reported by the MOH and World Bank.

Reductions of Age-Specific Mortality Rates and Their Contribution to the Increase of Life Expectancy

The speed of mortality reduction differs considerably across all age groups and thus the age pattern of mortality often changes notably in the process of epidemiologic and mortality transitions. Such transitions typically start with the decline of infant and child mortality. When mortality falls to a lower level, further improvement in life expectancy is largely driven by mortality reduction at older ages. This was also

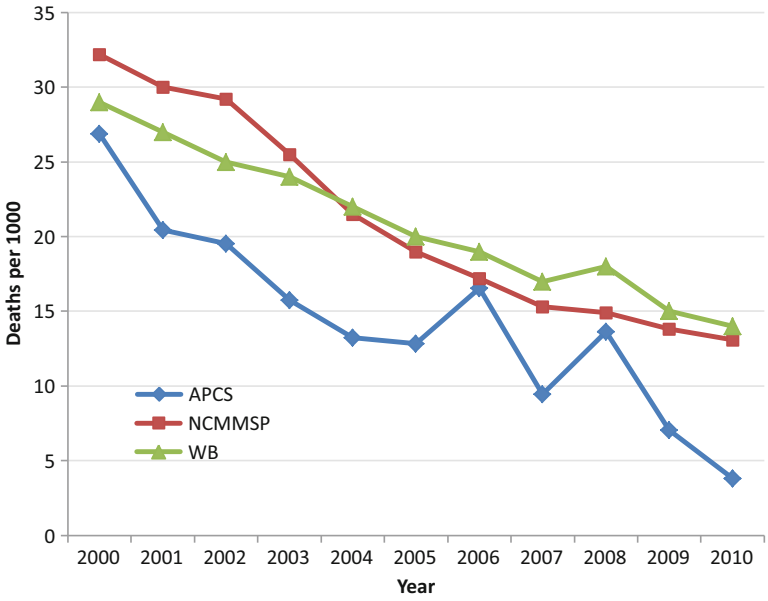

Fig. 2.4 Infant mortality rate, 2000–2010, China. Note: Infant mortality rates in this figure are directly derived from various data sources, without any adjustment for any data problems (Source: China Population and Employment Statistical Yearbook, various years from 2001 to 2011; China Health Statistical Yearbook, various years from 2004 to 2011; World Bank data from http://data.worldbank.org/topic/health)

the case in China, where rapid mortality decline occurred mainly among infants and young children in the early stage of mortality transition. While early life mortality has continued its decline, mortality improvement has become more noticeable among adult and old people in the last 30 years in China. Using data from the Annual Population Surveys and 4-year averages of age-specific mortality rates for periods 2001–2004 and 2006–2009, this sub-section examines changing age patterns of mortality and the relative contribution of mortality decline in different age groups to the overall improvement of life expectancy at birth in the last decade.

China's crude death rate dropped from more than 20 per 1000 in the early 1950s to 7 per 1000 in the late 1970s. During this period, the reduction of age-specific mortality was about 80 % among those aged 0–4 and 5–9, 40–55 % for those aged 10–14 to 55–59, and 20–50 % for those aged 60–64 and over. A similar pattern of decline was observed over the last 30 years. Around a 70 % reduction was recorded in early life mortality, 50–60 % reduction recorded in mortality of young people and mid-aged adults, and 35–50 % reduction witnessed at older ages. Despite that, the crude death rate has been relatively stable, around 6–7 per 1000, for the last 30 years. This was largely caused by changes in the age structure of the population.

Although the relative reduction in age-specific mortality rates was broadly similar in the above two periods (early 1950s – late 1970s and early 1980s – 2010), the absolute level of their decline differed markedly. In the first 30 years, for example,

the age-specific mortality rate at ages 0–4 declined by more than 60 per 1000 points, but in the second 30 years the decline was only 9 per 1000 points. As a result, further increase in life expectancy has been increasingly attributable to mortality decline at older ages. Gu et al. (2007) decomposed the contribution to the increase in life expectancy due to the decline of mortality by different age groups. According to their research, mortality decline in the youngest age groups made the greatest contribution to the improvement in life expectancy before 1990. Since then, notable change has taken place. The contribution made by the reduction of old-age mortality has become increasingly important. This trend continued into the first decade of the twenty-first century.

The comparison of age-specific mortality rates between 2001–2004 and 2006–2009 shows that during the last decade, mortality decline continued across all age groups. In the male population, the relative decline was greater among young children and people of old ages. In the female population, percentage decline in mortality among those aged 5–49 was either similar to or greater than that for males. However, in terms of absolute mortality levels, the reduction was greater for males than females at the very young and older ages.

To examine these changes to the increase in life expectancy, we also use Arriaga's method (Arriaga 1984) to decompose their contribution to the recent improvement of longevity. Our results suggest that in both male and female populations, two thirds of the increase in life expectancy was attributable to the mortality decline among people aged 60 and over, 19 % of the increase was attributable to the mortality decline among people aged 15–59, and slightly more than 10 % of the increase was due to the decline of infant mortality. The remaining 3 % of increase in life expectancy was contributed by mortality reduction among those aged 1–14. However, for males this decrease was largely observed among those aged 1–4 years. For females it was almost entirely recorded among those aged 5–14. These patterns are very different from those observed in the early stages of mortality decline.

The analysis presented in this section also indicates that while China has been very successful in lowering infant mortality, its level is still notably higher than that in most of the developed countries. Reductions in infant mortality can still have a non-trivial impact on the increase of life expectancy in China in the next decade.

Increase in Sex Differentials of Mortality

Mortality transition was also accompanied by considerable changes in sex differentials of mortality. In many historical populations where mortality was high, female mortality was close to or even higher than male mortality. During the mortality transition, the mortality decline was generally faster among females than males, and this increased the gender gap in mortality or survival. High female mortality in historical China was strongly affected by the very high female infant mortality and maternal mortality. Since the 1950s, rapid social and economic development and health improvement have greatly lowered mortality in China. According to the

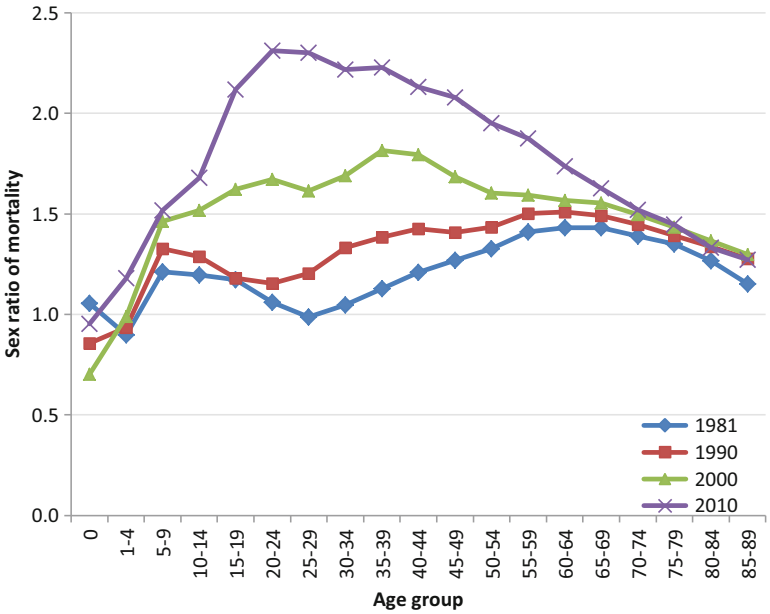

Fig. 2.5 Sex ratios (male/female) of death rates by age groups, 1981–2010, China (Sources: NBS (1985, 1993, 2002, 2012a)

estimates by Yan and Chen (1991) and those by NBS, males and females made similar gains in their life expectancies from the early 1950s to the early 1980s, while the gains have been greater for females than males in the last 30 years. As a result, the gap between female and male life expectancies has doubled, from less than 2.5 years before the mid-1970s to 5.0 years in 2010.

Changes in sex differentials of mortality are not the same across the whole life span. Figure 2.5 plots sex ratios of mortality by age for the last four censuses, which are computed through dividing male death rate by female death rate for each age group. Generally, male mortality is higher than female mortality, and the sex ratios of mortality are greater than 1 at most ages.

In many age groups, sex ratios of mortality have gone through considerable change over the last 30 years. This is particularly notable among people aged 20–44, and the largest increase was among those aged 20–29, an age group among which mortality however remains limited. Sex ratios of death rates in age groups 15–19 and 45–49 were also high in 2010, and were much higher than those calculated from the West Model of Coale-Demeny Model Life Tables. Nonetheless, these patterns are quite normal, and similar high sex ratios of mortality have been observed at these ages in Japan and Taiwan.

In Mainland China, however, a very low sex ratio of mortality was recorded among very young children. For example, sex ratios of infant mortality were all lower than 1 in 1990, 2000 and 2010. The ratio was 0.7 in 2000 and 0.95 in 2010.

While there was a notable reduction in the past decade, female infant mortality was still higher than male infant mortality in 2010. This pattern differs from those observed in most countries, but it has been consistent in recent decades. It is partially related to strong son preference and the resulting neglect of or discrimination against daughters. Such practices have a long history in China, and its effects more noticeable in the presence of low fertility levels attributable to the government-led birth control program (Zhao 2007). This is a major reason for the high sex ratio found among Chinese children. It is also worth mentioning that in China's recent censuses, young children and infant deaths were significantly under-enumerated. If such under-enumerated cases were not randomly distributed among male and female children, and male and female infant deaths, the recorded sex differentials of infant mortality could have been distorted.

Concluding Remarks

China has had an impressive mortality transition in the past six decades. This change was particularly fast in the first 30 years except in the 1958–1961 famine. In the 1980s and 1990s, mortality decline slowed, partly because of the negative impact brought about by some social economic changes at the time. In the last 10 years, China's mortality reduction sped up again. This change was closely related to China's very successful poverty alleviation program, rapid economic development, further progress made in disease prevention and treatment, and the re-establishment of the nationwide medical care system. China's life expectancy at birth is now around 75 years.

Marked mortality decline has been recorded across all age groups in the past 60 years. However, such reduction did not take please simultaneously, and this led to significant changes in the age patterns of mortality. For the same reason, the contribution of declining mortality at different age groups to the increase of life expectancy also varies considerably. In the early stage of mortality transition, prolonged life expectancy was mainly driven by falling mortality among children and young adults, but in recent years, it has been largely attributable to improving survival at older ages.

During the mortality transition, females' survival advantages over their male counterparts have become more apparent. In most age groups, female mortality has been falling faster than male mortality. As a result, the sex ratio of mortality has increased in many age groups, those between 20 and 44 in particular. Gender gap in life expectancy at birth has doubled in the past 35 years and reached 5 years in 2010. This gap however is smaller than that observed in many developed countries when their life expectancy was similar to that recorded in China in 2010. This is related to the relatively high female mortality recorded among young children, which is partly caused by the strong son preference and related to the neglect of female children found in some Chinese populations.

In addition to its age differences and sex differentials, mortality has also shown remarkable variations among populations in different regions, with dissimilar economic conditions, or living in urban and rural areas. Such variations are particularly notable in China and attract considerable attention. While addressing these issues is of great importance in mapping China's mortality changes, it has not been covered in this chapter because of the constraint of space. Relevant discussion of these topics can be found in other recent publications (Banister 2007; Zhao 2006; Zhao et al. 2014).

According to the experience of many developed countries, mortality decline did not stop when life expectancy reached 70 or 80 years. This is by and large similar to what has been observed in China in recent decades. After its relatively slow change in the 1980s and 1990s, China's mortality decline has speeded up in recent years, and this trend is likely to continue in the near future.

China of course also faces some major challenges brought by these changes and the rapid approach of an aging society. Despite the fact that China now has several medical insurance programs which cover almost its entire population, the quality of the care and the level of insurance provided by these programs vary significantly. These and the great inequality in peoples' income levels, living conditions, and huge regional variations in health services are some of the major difficulties that need to be overcome if China wants to further improve the healthy life expectancy and longevity of its citizens.

Finally, it should be pointed out that there are major data and research gaps in the study of mortality in China. Detailed mortality data are difficult to find. Some known or collected data are either not accessible or suffer from under-registration. Partly affected by data restrictions, only a few mortality studies were published in China in the last decade. To improve this unsatisfactory situation and also to improve our understanding of mortality changes and their major determinants, China needs to strengthen its mortality data collection and mortality research.

References

Arriaga, E. E. (1984). Measuring and explaining the change in life expectancies. *Demography, 21*(1), 83–96.

Banister, J. (1987). *China's changing population*. Stanford: Stanford University Press.

Banister, J. (2007). Poverty, progress, and rising life expectancy. In Z. Zhao & F. Guo (Eds.), *Transition and challenge: China's population at the beginning of the 21st century* (pp. 140–159). Oxford: Oxford University Press.

Banister, J., & Hill, K. (2004). Mortality in China 1964–2000. *Population Studies, 58*(1), 55–75.

Banister, J., & Preston, S. H. (1981). Mortality in China. *Population and Development Review, 7*(1), 98–110.

Caldwell, J. C. (1986). Routes to low mortality in poor countries. *Population and Development Review, 12*(2), 171–219.

Chen, Z. (2008). *The report of the third national retrospective survey on causes of death causes*. Beijing: Peking Union Medical College Press.

Gu, D., You, D., Zhu, H., Tom, S., & Zeng, Y. (2007, March 29–April 31). *Decomposing changes in life expectancy at birth by age, sex, and residence from 1929 to 2000 in China*. Paper Presented at the 2007 annual meeting of the American Population Association, New York.

Huang, R. (2008). Study of mortality in China. Accessed in August, 2014, at Http://www.aboluowang.com/2008/0210/73709.html

National Bureau of Statistics. (1985). *Tabulation on the 1982 population census of the People's Republic of China*. Beijing: China Statistics Press.

National Bureau of Statistics. (1993). *Tabulation on the 1990 population census of the People's Republic of China*. Beijing: China Statistics Press.

National Bureau of Statistics. (2002). *Tabulation on the 2000 population census of the People's Republic of China*. Beijing: China Statistics Press.

National Bureau of Statistics. (2012a). *Tabulation on the 2010 population census of the People's Republic of China*. Beijing: China Statistics Press.

National Bureau of Statistics. (2012b). *China statistical yearbook 2012*. Beijing: China Statistics Press.

Rao, C., Lopez, A. D., Yang, G., Begg, S., & Ma, J. (2005). Evaluating national cause-of-death statistics: Principles and application to the case of China. *Bulletin of the World Health Organization, 83*(8), 618–625.

Rong, S., Li, J., Gao, R., Dai, X., Cao, D., Li, G., & Zhou, Y. (1981). The statistical analysis of the average life expectancy for the Chinese population: 1973–1975. *Population and Economics, 1*, 24–31.

Tao, T., & Zhang, X. (2013). Under-reporting and over-reporting in China's sixth population census. *Population Research, 37*(1), 42–53.

United Nations. (2013). World population prospects: The 2012 revision. http://esa.un.org/unpd/wpp/unpp/panel_indicators.htm

Yan, R., & Chen, S. (1991). The study of China's age-specific mortality and life expectancy in the last forty years. In C. Chang (Ed.), *China's fertility and contraception sample survey: Selected essays*. Beijing: Population Dynamic Editorial Board.

Yang, G., Kong, L., Zhao, W., Wan, X., Zhai, Y., Chen, L. C., & Koplan, J. P. (2008). Emergence of chronic non-communicable diseases in China. *The Lancet, 372*(9650), 1697–1705.

Zhao, Z. (2006). Income inequality, unequal health care access, and mortality in China. *Population and Development Review, 32*(3), 461–483.

Zhao, Z. (2007). Changing mortality patterns and causes of death. In Z. Zhao & F. Guo (Eds.), *Transition and challenge: China's population at the beginning of the 21st century* (pp. 160–176). Oxford: Oxford University Press.

Zhao, Z., & Reimondos, A. (2012). The demography of China's 1958–1961 famine: A closer examination. *Population, 67*, 281–308.

Zhao, Z., Chen, W., Zhao, J., & Zhang, X. (2014). Mortality in China: Data sources, trends, and patterns. In I. Attane & B. Gu (Eds.), *Analyzing China's population* (pp. 205–225). London: Springer.

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