Chapter 3
A Geography of Discrimination

3.1 Disparities Between Urban and Rural Areas in the Treatment of Girls

It is highly relevant in the case of China to distinguish between urban and rural areas in the analysis of pre- and post-natal discrimination against girls, because of the profound socioeconomic disparities that exist between the two places of residence. Since the almost simultaneous introduction of economic reform and the one-child policy in the late 1970s, urban and rural areas have experienced divergent economic, social and demographic trends, accentuating already considerable differences in way of life and standard of living. Moreover, since the 1970s family planning regulations have differentiated between urban and rural areas and between provinces (see Inset 2.1 above), and couples vary their reproductive strategies according to the number and sex of their offspring. The preference for sons is not as obvious and does not have the same impact on the sex ratio at birth or on female infant mortality across the country.

3.1.1 An Even More Widespread Phenomenon in Rural Areas

A Worsening Situation in the 1980s

Chinese censuses and surveys define the rural population as living in a rural county (*xian*), and the urban population as living in a city (*shi*) or a town (*zhen*) (Blayo 1997). In 1980, prenatal sex selection did not have a visible impact on the sex ratio, which was still relatively balanced in both urban and rural areas (Table 3.1). In the 1980s, selection practices increased everywhere, but especially in rural China, where the sex ratio at birth reached 114.5 boys per 100 girls in 1989, four points higher than in cities (110.5). The masculinization of births increased over the next two decades on the same scale in cities, towns and rural counties (+8 points between

I. Attané, *The Demographic Masculinization of China: Hoping for a Son*,
INED Population Studies 1, DOI 10.1007/978-3-319-00236-1_3,

Table 3.1 Sex ratio at birth by place of residence, 1980, 1989, 2000 and 2010

	Cities (*shi*)	Towns (*zhen*)	Rural counties (*xian*)	Total
1980	106.8	107.3	106.3	106.7
1989	110.5	114.0	114.5	113.9[a]
2000	114.2	119.9	121.7	119.9[a]
2010	118.3	122.8	122.1	121.1[a]

Sources: PCO (1993, 2002, 2012). For 1980: estimates based on the author's backward projections calculated from the sex structure in the 1982 census (PCO 1985), taking account of mortality

[a]These figures do not match those cited above (see footnote 3 in Chap. 2, p. 17)

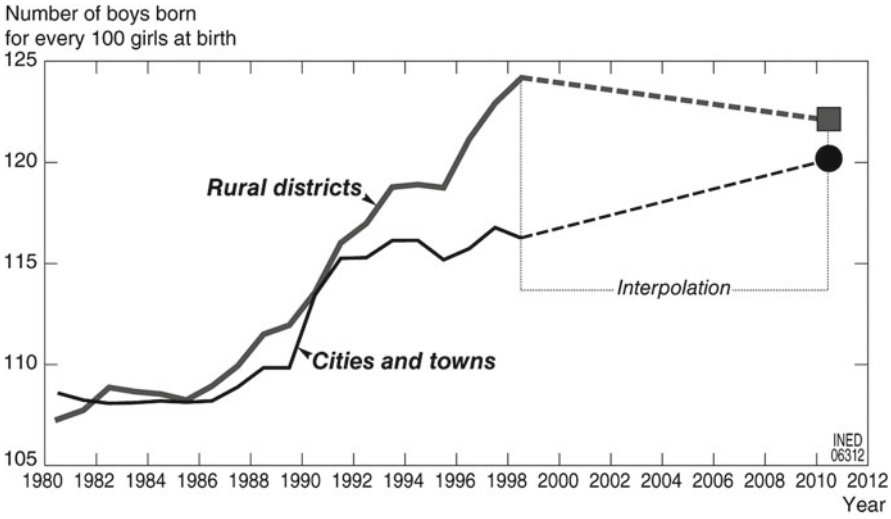

Fig. 3.1 Trend in sex ratio at birth, by place of residence, China, 1980–2010 (Sources: The data in this graph are based on backward projections calculated by the author using data from the 1990 census (PCO 1993) and the 2000 census (PCO 2002); for 1999–2009: interpolations; for 2010: PCO (2012))

1989 and 2010). However, discrimination is still more massive in rural areas, where the sex ratio at birth rose to 122.1 boys per 100 girls in 2010, almost four points higher than in cities (118.3) (PCO 2012).

Backward projections based on data from the last two censuses (Fig. 3.1) confirm that the sex ratio in 1980 was relatively close to the norm, both in urban areas (cities and towns) and in rural areas. The trend in the sex ratio at birth was relatively similar in urban and rural areas until the mid-1980s, before the gap widened in the second half of the 1990s.

Since the spread of discrimination against girls in the 1980s, resulting in an imbalance in the sex ratio at birth, the problem has been more prevalent in rural than in urban areas, which is paradoxical in several respects. As explained above, the

increase in the sex ratio at birth seems to be linked, on the one hand, to the pressure on couples to reduce the number of their offspring and their consequent concern to have at least one son, and on the other hand, to the availability of modern techniques of prenatal sex determination, which varies with place of residence. In the light of these factors, we might have expected the sex ratio to increase first in urban areas, where restrictions on the number of children are more stringent than in rural areas and where modern techniques are theoretically more widely available. But this has not been the case.

Discrimination Increases with the Number of Offspring

Despite an evident time delay in the emergence of this imbalance, urban dwellers are now no less likely to eliminate daughters than rural dwellers. Although the sex ratio at birth was still lower in urban areas than in rural areas in 2010, when this indicator is broken down by birth order, urban/rural differences are much less distinct.

Indeed, while the sex ratio of firstborn children was normal in rural areas in 2000, it was imbalanced in cities and urban districts (Table 3.2). Moreover, the imbalance was bigger in urban areas (cities and towns) than in rural areas for births of order 2 and higher, which exhibit sex ratios 40–60% above the normally expected levels. Thus, the main difference between urban and rural areas is the distribution of births by birth order, since births of order 2 and higher have the most imbalanced sex ratios. In 2000 these births accounted for slightly more than one-third (38.6 %) of total births in the countryside, compared with only 15.0 % of the total in cities and 23.4 % in urban districts.

While the increase in the sex ratio at birth in the last two decades was less pronounced in urban areas, this was chiefly because first births, generally less affected by sex selection, make up a larger percentage of the total there. When urban couples decide to have a second, third or subsequent child, however, sex selection is even more drastic than in rural areas, with a sex ratio for births of order 3 and 4 exceeding 160 boys per 100 girls on average in cities and towns, versus an average of around 20 points less in the rural counties in 2010 (Table 3.2).

Birth order thus seems to be a stronger determinant of the sex imbalance at birth in China than the overall fertility rate. Unlike India, where excess masculinity is found mainly in urban areas (Choudhury 2005; Guilmoto 2005a), in China the impact of discrimination against girls through sex-selective abortion is more visible in rural areas. We can nevertheless assume that the fertility decline – much more rapid in the Chinese countryside (2 children on average in 2000) than in the Indian countryside (around 3.5 children) (Fig. 3.2) – has affected couples' propensity to select the sex of their offspring.

The data in Table 3.3, although relatively old, confirm the influence of birth order and the even greater influence of birth status (whether the birth is authorized or unauthorized under the China's family planning policy) on the probability of a baby being a girl, which can be seen in the rapid increase in the sex ratio of unauthorized

Table 3.2 Sex ratio at birth, by birth order and place of residence. China, 1989, 2000 and 2010

	Birth order 1	Birth order 2	Birth order 3	Birth order 4	Birth order 5+	Total
Sex ratio at birth						
Cities (*shi*)						
1989	105.6	121.3	128.9	137.3	137.4	110.5
2000	108.9	147.6	164.9	195.2	164.2	114.2
2010	113.4	132.2	178.2	160.6	147.8	118.3
Towns (*zhen*)						
1989	107.7	126.1	125.0	136.1	130.5	114.2
2000	110.4	154.6	180.5	188.6	163.3	119.9
2010	114.5	132.9	171.1	157.6	163.0	122.8
Rural counties (*xian*)						
1989	104.7	121.2	124.0	130.5	127.8	115.1
2000	105.7	152.1	158.2	157.7	147.0	121.7
2010	113.6	129.0	157.3	143.4	140.6	122.1
Breakdown of births by birth order (as a % of total)						
Cities (*shi*)						
1989	71.3	20.9	5.4	1.6	0.8	100.0
2000	85.0	13.3	1.3	0.3	0.1	100.0
2010	76.5	21.1	2.1	0.3	0.1	100.0
Towns (*zhen*)						
1989	63.9	26.5	6.5	2.0	1.1	100.0
2000	76.6	19.8	2.7	0.6	0.3	100.0
2010	61.7	32.8	4.6	0.7	0.2	100.0
Rural counties (*xian*)						
1989	41.7	34.8	14.8	5.2	3.5	100.0
2000	61.4	31.1	5.4	1.4	0.7	100.0
2010	55.4	35.7	7.1	1.4	0.4	100.0

Source: Calculations based on data from censuses and corresponding surveys, long form questionnaires (PCO 1993, 2002, 2012)

births. When rural couples were forced to further restrict the number of their offspring from 1979 to 1980 onwards, they appear to have implemented strategies to ensure the desired sex composition of their offspring, either by having more than the authorized number of children, or by selecting the sex of their children more systematically. A combination of the two strategies cannot be ruled out either. Infanticide (Bianco and Hua 1989) and abandonment of baby girls (Johnson 1993, 1996) were fairly common in the 1980s, before the phenomenon was accentuated by sex-selective abortion, when techniques to determine the sex of the fetus became available to a growing percentage of the population.

The availability of these modern techniques has enabled couples to have a son rather than a daughter. This concerns not only couples that would have practiced infanticide or abandonment had these techniques not been available, but also those that would otherwise have accepted the natural sex composition of their children. The availability of a simple and less emotionally and morally painful way to choose the sex of their child and eliminate potential daughters has led to a rapid increase in the excess masculinity of births.

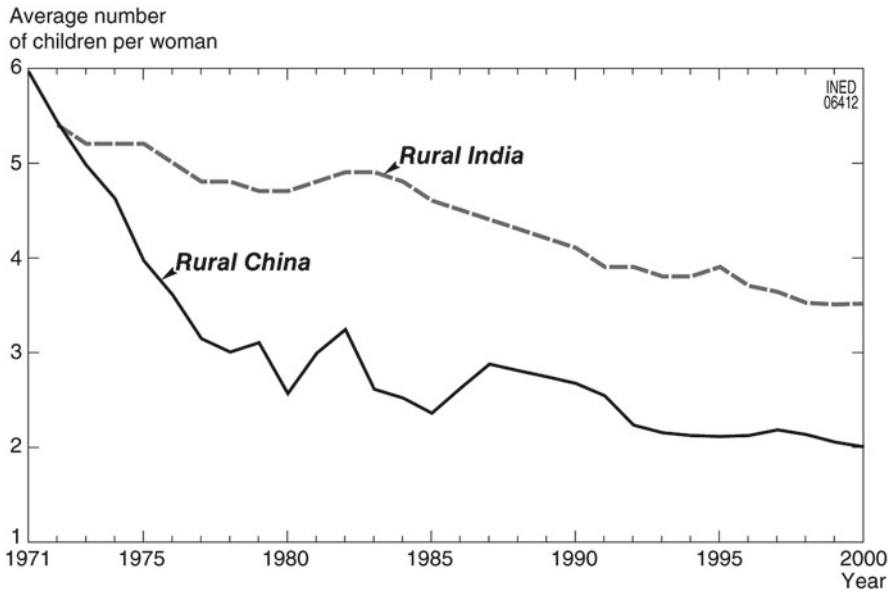

Fig. 3.2 Fertility trends in rural China and India, 1971–2000 (Sources: India: series reconstituted from data from the Sample Registration System (SRS), kindly provided by Indian demographer Rajan Irudaya (Centre for Development Studies, Thiruvananthapuram, Kerala). China: 1971–1988: Chen and Coale (1993); 1989–2000: interpolations based on fertility estimations from Choe et al. (2004) and Gu (2002))

Table 3.3 Sex ratio at birth by birth order and birth status. Rural areas. 1981 and 1987

	Authorized births				Unauthorized births				
	Birth order 1	Birth order 2	Birth order 3+	All birth orders	Birth order 1	Birth order 2	Birth order 3+	All birth orders	Total
1981	104.8	109.6	101.9	105.2	105.6	106.1	109.2	107.8	106.6
1987	107.5	110.3	128.2	108.7	113.8	114.4	120.2	116.6	112.4

Source: NBS (1989)

3.1.2 Lower Excess Mortality of Baby Girls in Urban Areas

The data for urban and rural areas extracted from the Maternal and Child Surveillance System indicate that the infant mortality rate has dropped dramatically in the past two decades, both in urban and rural areas. However, these data reveal differences in both levels of infant mortality – with rates in rural areas in 2009 almost three times as high as in urban areas (Table 3.4) – and in trends.

Table 3.4 Infant mortality rate by sex and place of residence (per 1,000 live births) and excess female mortality. China. 1981–2009

	1981		1991		2000		2009	
	Urban areas	Rural areas	Urban areas	Rural areas	Urban areas	Rural areas	Urban areas	Rural areas
Boys	25.3[a]	41.2[a]	17.0	53.4	10.3[b]	29.1[b]	6.2	16.5
Girls	23.0[a]	39.2[a]	17.6	62.6	13.2[b]	43.6[b]	6.2	17.7
Both sexes	24.2[a]	40.3[a]	17.3	58.0	11.8	37.0	6.2	17.0
Female-to-male ratio (a)	0.909	0.951	1.035	1.172	1.278	1.498	1.008	1.071
Hill & Upchurch's ratio (b)	0.778	0.778	0.767	0.767	0.767	0.767	0.767	0.767
Gap (%) [(a–b)/b*100]	+16.8	+22.2	+34.9	+52.8	+66.6	+95.3	+31.4	+39.6

Sources: For infant mortality rates, line 3: 1981: CPIRC (1995); for both sexes in 1991, 2000 and 2009: Maternal and Child Surveillance System (MOH 2010); Boys/girls, lines 1 and 2, in 1981: CPIRC (1995); for 1991, 2000 and 2009: author's estimates based on rates for both sexes adjusted using the gender gap in infant mortality rates observed at the 2010 census, unadjusted data (PCO 2012); Lines 4 and 6: author's calculations based on the corresponding census unadjusted data; Line 5: Hill and Upchurch (1995)

[a]The comparatively low levels of infant mortality in 1981 are attributable to under-registration of infant deaths (see Inset 3.1)

[b]Infant mortality rates for 2000 are not fully consistent with those displayed in Table 2.8, Chap. 2, as they are extracted from different sources

It is important to note, however, that a reversal occurred from the early 1980s. While female infant mortality was slightly lower than that of males in 1981,[1] as usually observed when there is no discrimination against girls (Hill and Upchurch 1995), it became higher at the end of the decade. Excess female infant mortality reached a peak in 2000, with a female-to-male ratio of infant mortality as high as 1.465 at the country level (see Table 2.8, p. 31), and 1.278 and 1.498 in urban and rural areas respectively (Table 3.4). It then fell significantly in the next decade, with the female-to-male ratio of 1.05, as reported in the 2010 census, now indicating a much better treatment of girls.[2]

However, excess female infant mortality, the second factor in the masculinization of the population, is not equally high everywhere. It remains higher in rural than in urban areas (Fig. 3.3), and also varies considerably between provinces, as shown in Table 3.6.

[1]Note, however, that infant mortality rates were lower in 1981 than in 1991. This discrepancy is attributable to under-registration of infant deaths at the 1982 census (see Inset 3.1, p. 41). Although the estimates for infant mortality differ (see Inset 1.1, p. 9), the gaps between boys and girls are on a similar scale.

[2]However, as for overall infant mortality, excess female infant mortality may be strongly underestimated by the 2010 census (see Inset 1.1, p. 9, and Inset 3.1, p. 41).

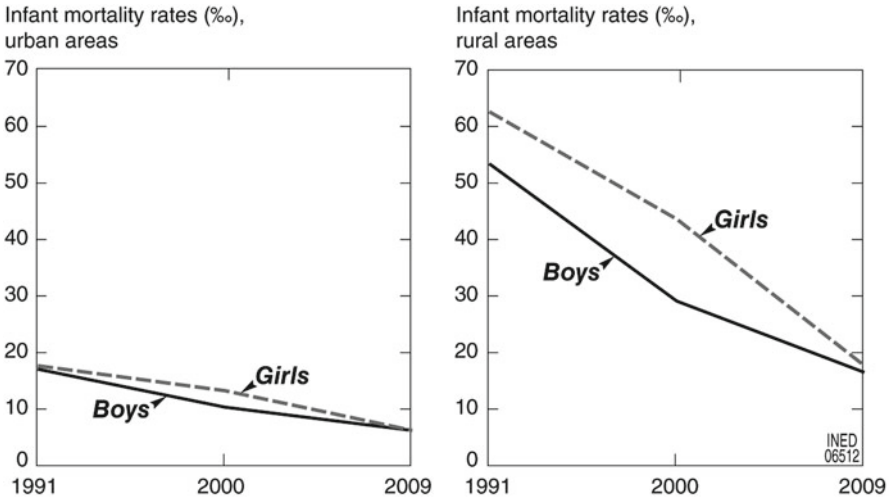

Fig. 3.3 Infant mortality rates by place of residence, China, 1991–2009 (Sources: Same as for data in Table 3.6)

Inset 3.1 Under-Registration of Infant Deaths

Trends in infant mortality are hard to interpret due to the recurrent problem of under-registration of infant deaths (Banister 1987). In an article on infant mortality data collected by the China National Working Committee for Children and Women (CNWC), Banister (2007) concludes that the reported increase in the 1990s did not actually take place, although she accepts the mortality rates for 2000. Banister attributes the apparent increase to a severe underestimation of infant mortality in the 1990s. She suggests a rate of 50 per 1,000 live births in 1991, which is almost twice as high as the rate calculated after correction by the China Population Information and Research Center (CPIRC 1995). A survey conducted by the Ministry of Health in the mid-1980s to assess the under-registration of infant deaths identified an infant mortality rate of 51 per 1,000 live births in 1986, well above the rates identified by the other available sources (Zhai 1993; CPIRC 1995), confirming Banister's hypothesis. According to the CNWC survey, the infant mortality rate in 1991 was 17 per 1,000 live births in urban areas and 58 per 1,000 births in rural areas (MOH 2010), compared with 17.1 per 1,000 and 29.9 per 1,000, respectively, in 1989–1990 according to the adjusted census data. In 2000, infant mortality rates in urban and rural areas reportedly fell to 12 and 38 per 1,000 births respectively. These new estimates demonstrate that under-registration almost exclusively affects rural areas, and confirm the considerable gap between urban and rural areas (Banister 2007). Despite a sharp decline in infant mortality in recent years, this gap still existed in the late 2000s, with rates of 6.2 per 1,000 in urban areas and 17.0 per 1,000 in rural areas in 2009 according to the Maternal and child Surveillance system (MOH 2010). These levels are significantly higher, however, than those reflected by the 2010 census (PCO 2012).

3.2 Variations Between Provinces

3.2.1 A Generalized Masculinization of Births

The imbalance in the sex ratio at birth, perceptible at national level from the early 1980s, is now manifest in the overwhelming majority of China's provinces.[3] The imbalance did not arise everywhere at the same time, however, and there are considerable variations between provinces and between ethnic minorities (see Inset 3.2).

In the 2000 census, the national sex ratio at birth was 116.9 boys per 100 girls, but the provincial ratios fell within a wide range. The lowest level was observed in Tibet with 97.4 boys born for every 100 girls, and the highest in Jiangxi in southern China, with 138. Of the 31 Chinese provinces, 11 recorded a sex ratio at birth of over 120 (three of which – Jiangxi, Guangdong and Hainan – reported a ratio of over 135) in 2000, whereas only three still recorded a figure in line with the norm: Guizhou (105.4), Qinghai (103.5) and Xinjiang (106.7) (Table 3.5). The masculinization of births is thus found mainly the provinces in the south, south-east and centre of the country, where the majority population group is Han Chinese (Banister 2004).

The case of Tibet, where the abnormally low sex ratio at birth (97.4 boys per 100 girls compared with 104–107 under ordinary conditions) recorded in 2000 remains unexplained. While the hypotheses of an under-registration of male births attributable to vestiges of Tibet's matriarchal society, or maternal malnutrition[4] can be advanced, we do not have sufficient information to verify them. It seems, however, that excess female births in Tibet mainly concern the non-Tibetan ethnic groups living there, since the national sex ratio at birth of Tibetans is closer to normal levels[5] (101.7 boys per 100 girls in 2000) (PCO 2002).

Inset 3.2 Variable Prevalence of Discriminatory Practices Between Ethnic Groups

In 2010, all of the nine ethnic groups[a] with populations of more than five million – except for the Mongols and Tibetans – had total population sex ratios higher than the expected value for China defined by Ansley Coale (1991)

[a]China has 56 officially recognized ethnic groups, including the Han, who make up more than 90 % of China's population.

(continued)

[3]Administratively, China is divided into 22 provinces, 5 autonomous regions, 4 municipalities and 2 special administrative regions: Hong Kong (since 1997) and Macao (since 1999). For the sake of concision, we have grouped them here under the term "provinces".

[4]The theory that maternal malnutrition influences the selection of spermatozoa and leads to a lower sex ratio at birth has been developed by Clarke (2000) and Andersson and Bergström (1998).

[5]This may be a consequence of the family strategies implemented by Han Chinese who have settled in Tibet, who are generally allowed to have one more child than if they had continued living in their home province. They might thus take advantage of migration to have a daughter during their time in Tibet. This is only a hypothesis, however, and we do not have the resources to verify or support it at the present time.

Inset 3.2 (continued)

as 101 males per 100 females. The Han, Zhuang, Manchu, Miao (or Hmong) and Yi exhibited the highest sex ratios, around or above 105 men per 100 women. The two Muslim groups, the Hui and Uighur, had total population sex ratios of 103.1 and 102.5, respectively, while the Mongols and Tibetans had the lowest sex ratios, closer to the levels usually observed (see above, pp. 4–5).

	Sex ratio of total population				Sex ratio of children aged under 1 year		
	1982	1990	2000	2010	1990	2000	2010
Han	105.6	106.1	106.3	104.9	112.2	118.6	118.5
Zhuang	101.6	104.3	107.4	105.5	115.4	122.5	121.4
Manchu	114.5	109.5	108.0	108.3	110.8	113.0	112.1
Hui	103.4	103.2	103.9	103.1	106.6	110.2	114.0
Miao	105.2	107.9	108.7	106.9	106.8	116.3	123.1
Uighur	105.1	104.5	103.5	102.5	101.9	103.8	104.7
Yi	101.9	103.6	105.7	104.7	104.3	110.8	111.2
Mongols	105.6	103.3	97.9	100.6	106.4	107.2	111.9
Tibetans	95.8	97.6	99.2	100.9	102.1	103.6	107.2

Sources: PCO (1985, 1993, 2002, 2012)

The sex ratio of children aged under 1 year increased or remained almost unchanged in all these ethnic groups over the last inter-census period, but the situation is not uniform. The highest sex ratios are observed among the Han, Zhuang, and Miao (exceeding 118 boys for 100 girls). Conversely, and despite a fertility decline in the 1990s and the 2000s, the Uighur and Tibetans exhibit sex ratios among infants aged under 1 year close to normal levels (around 105–106 boys per 100 girls) with only a slight increase in the last two decades. These divergences reflect cultural differences between these groups, particularly the strength of the preference for sons and the tolerance of abortion.

Between 1989 and 2000, the sex ratio at birth increased in all of the Chinese provinces, with the noteworthy exception of Zhejiang on the east coast (where the sex ratio fell from 117.1 – the highest in the country in 1989 – to 113.1) and Tibet already mentioned (where the ratio declined from 103.5 to 97.4). The biggest increases occurred in Guangdong and Jiangxi, where the sex ratio rose by 23.4 % and 24.9 % respectively over the decade. There were smaller but still sizeable increases in Hainan (+17.6 %), Anhui (+17.7 %), Henan (+12.7 %), Guangxi (+10.7 %), Hubei (+17 %), Hunan (+15.2 %) and Shaanxi (+13 %). The sex ratio at birth also increased in the two biggest Chinese municipalities, Beijing and Shanghai, where levels were normal only 11 years earlier. The change there could be partly linked to in-migration from the countryside, since the more traditional reproductive behaviours and values of rural dwellers are not immediately modified by migration (Wu et al. 2007; Feng and Zhang 2002).

Table 3.5 Sex ratio at birth in Chinese provinces. 1989, 2000 and 2010

	Sex ratio at birth (boys per 100 girls)			Percentage change in sex ratio	
	1989	2000	2010	1989–2000	2000–2010
Beijing	107.3	110.6	109.5	+3.0	−1.0
Tianjin	110.1	112.5	113.7	+2.2	+1.1
Hebei	111.7	113.4	114.9	+1.5	+1.3
Shanxi	109.4	112.5	110.2	+2.8	−2.1
Inner Mongolia	108.5	108.5	112.1	+0.0	+3.4
Liaoning	110.1	112.8	110.2	+2.5	−2.3
Jilin	108.5	111.2	111.2	+2.5	+0.0
Heilongjiang	107.5	109.7	112.4	+2.1	+2.5
Shanghai	104.6	110.6	111.1	+5.8	+0.4
Jiangsu	114.4	116.5	116.2	+1.8	−0.3
Zhejiang	117.1	113.9	118.1	−2.8	+3.7
Anhui	111.1	127.8	128.6	+15.1	+0.6
Fujian	109.5	117.9	125.6	+7.7	+6.5
Jiangxi	110.5	114.7	122.8	+3.8	+7.0
Shandong	114.5	112.2	119.4	−2.0	+6.4
Henan	115.6	118.5	117.8	+2.5	−0.6
Hubei	109.4	128.2	124.1	+17.2	−3.2
Hunan	110.2	126.2	123.2	+14.5	−2.3
Guangdong	111.6	130.3	120.3	+16.8	−7.7
Guangxi	116.3	125.5	122.7	+8.0	−2.3
Hainan	114.8	135.6	125.3	+18.2	−7.6
Chongqing	112.5	115.1	112.5	+2.3	−2.3
Sichuan	112.5	116.0	111.6	+3.1	−3.8
Guizhou	102.7	107.0	122.1	+4.2	+14.1
Yunnan	107.6	108.7	111.8	+1.0	+2.8
Tibet	103.5	102.7	106.6	–0.7	+3.8
Shaanxi	110.7	122.1	115.3	+10.3	−5.6
Gansu	109.6	114.8	117.4	+4.8	+2.2
Qinghai	104.1	110.4	112.4	+6.0	+1.9
Ningxia	106.8	108.8	113.9	+1.9	+4.7
Xinjiang	104.6	106.1	106.1	+1.5	+0.0

Sources: PCO (1993, 2002, 2012)

Zhang Liping's (2005b) more detailed map of the 343 Chinese prefectures (*diqu*), based on data from the 2000 census (see Map 9), reveals the highly heterogeneous spatial distribution of the sex ratio at birth within the provinces. Unlike India, where a few pockets of high excess masculinity stand out clearly in a spatial analysis, China exhibits more dispersed clusters (Guilmoto 2005a), which are relatively independent of the provincial borders, especially in 1990. The spatial distribution of masculinization did not change significantly between 1989 and 2000, but spread outwards over the decade from Guangdong, Hebei, Henan, Anhui and Shanxi. The masculinization of births also increased strongly in the north-east and a large south-eastern quarter of the

country, and the biggest distortions in the sex ratio at birth were observed mostly in the prefectures of Guangdong, southern Guangxi, Jiangxi, Hunan, eastern Fujian, eastern Zhejiang, Shanxi and Shaanxi. Most of the prefectures that still had a normal sex ratio at birth in 2000 were located in the least developed, most remote regions, which have both the highest proportions of ethnic minorities and higher fertility (Attané 2007). Normal ratios were also found in prefectures in northern Guizhou, eastern Sichuan and western Inner Mongolia. In 2000, half of China's prefectures (173 out of 343, i.e. 50.4 %), home to 57.4 % of the population, had a "very imbalanced" or "extremely imbalanced" sex ratio at birth, i.e. above 113 boys per 100 girls. Only 82 prefectures (or 23.9 %) showed no imbalance (Zhang 2005b).

The situation did not radically change between 2000 and 2010. The one-point increase in the sex ratio at birth at the national level over the period (from 116.9 to 117.9 boys per 100 girls) has resulted, at the provincial level, in a convergence of the ratios: the sex ratio at birth declined in all the provinces where it was above 120 in 2000 (Anhui excepted) while it increased in all those where it was below 110 in 2010. Nevertheless, there is a strong positive correlation between sex ratio at birth in 2000 and 2010 (with a regression coefficient $r=0.744$), indicating that the "hot spots" of discrimination against girls through sex-selective abortions remained practically unchanged between 2000 and 2010.

3.2.2 Excess Female Infant Mortality Varies Between Provinces

As for the sex imbalance at birth, the different provinces show very different trends in female infant mortality. While China remains a highly unequal country in demographic terms, with child survival probabilities that vary widely from one part of the country to another, differential treatment of girls causing excess female infant mortality does not overlap with the spatial distribution of total infant mortality (Table 3.6). In other words, it is not the provinces with the highest total infant mortality that discriminate the most against girls.

Gender inequality varies from one province to another. In 2000, girls born in the large cities of Beijing, Shanghai and Tianjin, in former Manchuria (Liaoning, Jilin or Heilongjiang) and in the north-eastern provinces (especially Xinjiang, Ningxia, Qinghai and Sichuan) had roughly the same chance as boys of surviving until their first birthday (Table 3.6 and Map 5). But everywhere else, contrary to the usual observation, baby girls died more frequently than baby boys. In 1990, the record was held by the southern province of Guangxi, one of the poorest in China, where the female infant mortality rate was almost twice as high as that of males. Girls born in southern provinces (especially in Guangxi, Guangdong, Fujian and Hainan) and central China (Jiangxi, Anhui, Henan, Hubei, Hunan, Shaanxi and Gansu) were exposed to the highest excess mortality. In all the provinces – with the notable exceptions of Guangxi, where the situation was by far the worst in 1990, Zhejiang, Shandong and Sichuan – infant mortality of girls worsened

Table 3.6 Infant mortality rate by sex and female-to-male ratio of infant mortality rates in Chinese provinces

	Infant mortality rates				Female-to-male ratio of infant mortality rates			Percentage change in female-to-male ratio of infant mortality rates	
	1990		2000						
	Boys (per 1,000 live births)	Girls (per 1,000 live births)	Boys (per 1,000 live births)	Girls (per 1,000 live births)	1990	2000	2010[a]	1990–2000	2000–2010
Beijing	11.2	9.6	3.6	3.7	0.857	1.006	0.946	+17.4	−6.0
Tianjin	13.2	12.7	4.0	4.0	0.962	0.999	0.648	+3.9	−35.2
Hebei	13.0	12.5	15.0	20.6	0.962	1.375	0.917	+43.0	−33.3
Shanxi	22.1	22.0	15.2	18.0	0.995	1.188	1.075	+19.4	−9.5
Inner Mongolia	34.1	37.5	26.7	30.0	1.100	1.122	0.765	+2.1	−31.8
Liaoning	19.7	19.4	9.4	9.8	0.985	1.048	0.766	+6.4	−26.9
Jilin	29.8	26.8	15.6	16.0	0.899	1.025	0.841	+13.9	−18.0
Heilongjiang	27.3	23.2	9.5	8.5	0.850	0.892	0.748	+5.0	−16.2
Shanghai	13.5	10.8	4.1	4.4	0.800	1.084	0.711	+35.4	−34.4
Jiangsu	18.9	19.3	10.9	12.9	1.021	1.181	0.871	+15.7	−26.2
Zhejiang	19.0	23.1	10.1	11.8	1.216	1.163	0.925	−4.3	−20.4
Anhui	30.2	34.1	21.7	33.9	1.129	1.561	1.022	+38.2	−34.5
Fujian	24.1	32.9	14.5	21.4	1.365	1.475	1.103	+8.1	−25.2
Jiangxi	45.1	63.5	25.9	60.2	1.408	2.328	1.230	+65.4	−47.2
Shandong	14.4	18.3	12.7	15.7	1.271	1.236	1.018	−2.7	−17.7
Henan	20.9	27.2	15.7	24.8	1.301	1.581	0.978	+21.5	−38.1
Hubei	31.9	32.7	14.8	19.3	1.025	1.303	1.026	+27.2	−21.3
Hunan	44.9	51.5	19.9	27.2	1.147	1.367	1.012	+19.1	−26.0
Guangdong	16.4	19.3	11.1	18.6	1.177	1.672	1.087	+42.1	−35.0
Guangxi	31.6	73.3	17.8	31.8	2.320	1.788	1.048	−22.9	−41.4
Hainan	31.3	34.2	12.7	23.7	1.093	1.859	1.334	+70.2	−28.2
Chongqing[b]	–	–	20.6	20.8	–	1.007	0.883	–	−12.3

Sichuan	43.1	50.1	19.4	20.3	1.162	1.047	0.930	−9.9	−11.1
Guizhou	63.7	69.0	50.7	63.8	1.083	1.259	1.205	+16.2	−4.3
Yunnan	79.4	77.3	52.2	66.7	0.974	1.277	1.104	+31.2	−13.5
Tibet	111.8	90.0	37.8	36.7	0.805	0.971	1.003	+20.7	+3.3
Shaanxi	25.0	26.2	23.2	35.2	1.048	1.517	0.958	+44.7	−36.9
Gansu	31.7	37.5	35.2	47.9	1.183	1.362	1.239	+15.1	−9.0
Qinghai	83.6	74.0	37.5	40.0	0.885	1.065	0.907	+20.3	−14.8
Ningxia	44.8	38.9	22.8	22.1	0.868	0.966	0.904	+11.2	−6.4
Xinjiang	76.8	64.9	28.2	25.0	0.845	0.886	0.841	+4.9	−5.1

Sources: 1990 (columns 1 and 2): data adjusted by Lu et al. (1994); 2000 (columns 3 and 4): 2000 census, unadjusted official figures (PCO 2002); For columns 5, 6, 8 and 9: author's calculations; For column 7: 2010 census, unadjusted official figures (PCO 2012)

[a]Adjusted infant mortality rates for 2010 at the province level are not available at the time of publication. The female-to-male ratios presented here are those calculated on the basis of the unadjusted census data (PCO 2012)

[b]Chongqing Municipality, formerly the eastern part of Sichuan province, was established in 1997. We therefore have no data for the municipality for 1990

relative to boys over the decade to 2000 (Maps 4 and 5). Not only did excess female infant mortality increase in the provinces where it had already been observed in 1989 (such as Anhui, Henan, Hunan and Gansu), but it appeared in provinces that had exhibited a normal or near-normal situation at the beginning of the decade. The most striking examples are Hubei (where the female-to-male ratio of infant mortality rates increased from 0.96 in 1989 to 1.38 in 2000), Qinghai (from 0.89 to 1.07) and Shaanxi (from 1.05 to 1.52). Over the period, excess female infant mortality increased by 42 % in Guangdong, by 43 % in Hebei, by 44 % in Shaanxi, and by 65 % in Jiangxi. The fastest deterioration was observed on Hainan Island, where the female-to-male ratio of infant mortality rates increased by 70 % over those 10 years.

In 1990, the female-to-male ratio of infant mortality rates ranged from expected values, as in Shanghai (0.80), to almost three times that figure (2.32) in Guangxi. In 2000, while the range remained largely unchanged, from 0.89 (in Xinjiang) to 2.33 (in Jiangxi), the overall situation deteriorated considerably. In 1989, only 17 provinces out of 30 showed a female-to-male ratio of infant mortality rates higher than 1, but by 2000 the ratio exceeded 1 in 26 out of 31 provinces. The female-to-male ratio of infant mortality rates decreased in only four provinces: Guangxi (−23 %), Sichuan (−10 %), Zhejiang (−4 %) and Shandong (−3 %). The prenatal elimination of girls through sex-selective abortion, and the post-natal neglect of girls leading to excess mortality, are the two main forms of discrimination that account for the increasing female deficit.

The sharp decline in overall infant mortality between 2000 and 2010, both at the national level and in urban and rural areas (see Table 2.8, Chap. 2, and Table 3.4 above), was accompanied by a significant reduction in excess female infant mortality in all the provinces, as indicated by the unadjusted data from the 2010 census (Table 3.6). A similar trend is observed for the sex ratio at birth over the period, characterized by a convergence between the provinces: the higher the female-to-male ratio of infant mortality rates in 2000, the greater the decline between 2000 and 2010 (with a regression coefficient $r=-0.672$); on the contrary, in general, the lower the ratio in 2000, the smaller the decline. Nevertheless, as observed for the sex ratio at birth, there is also a rather strong positive correlation between the female-to-male ratio of infant mortality in 2000 and 2010 (with a regression coefficient $r=0.690$), indicating that the "hot spots" of discrimination against girls through neglect leading to premature death remained almost the same between 2000 and 2010.

Both practices increased sharply in the 1990s. In 1990, a positive linear correlation could already be seen between the sex ratio at birth and excess female infant mortality in the provinces (with $r=0.588$ and p value $=0.001$). Ten years later, the correlation was even closer ($r=0.851$ and $p=0.000$), signalling an upward trend in discrimination against girls (Fig. 3.4). This also provides strong evidence that, at provincial level, sex-selective abortion and neglect of girls leading to their premature death were practiced side by side in a complementary manner in the 1990s. Over that period, the two forms of discrimination increased simultaneously and, contrary to what some authors suggest (Goodkind 1996), neglect of girls leading to their excess mortality – which can be described as a "traditional" discriminatory

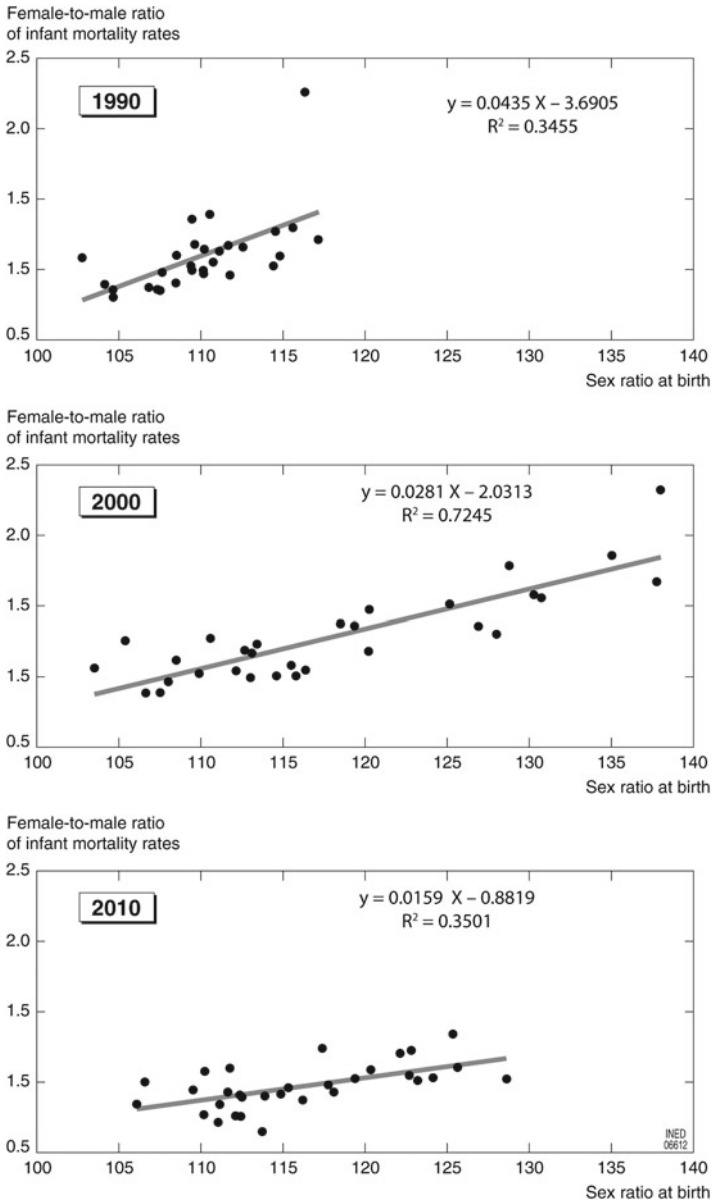

Fig. 3.4 Correlation between sex ratio at birth and excess female infant mortality in Chinese provinces, 1990, 2000 and 2010 (Sources: sex ratio at birth: PCO (1993, 2002, 2012) (see Table 3.5); female-to-male ratio of infant mortality rates (see Table 3.6))

practice – did not disappear with the availability of sex-selective abortion using modern techniques.[6]

While in some provinces like Heilongjiang, Ningxia and Xinjiang, sex-selective abortion and elimination of daughters through neglect were relatively rare in 2000, in others, especially Anhui, Jiangxi, Henan, Guangdong and Hainan, the two practices had expanded simultaneously. Zhang Erli (2005a) has also shown a close correlation between the two discriminatory practices at the prefecture level: in the regions with a strong imbalance in the sex ratio at birth, excess female mortality before age 1 is also high.

Again, the situation did not change radically between 2000 and 2010. At the 6th census, the correlation between sex ratio at birth and excess female infant mortality was still visible but much weaker than 10 years earlier (with a regression coefficient $r=0.592$, a level comparable to that observed in 1990). However, the disparities between provinces in the sex ratio at birth and in excess female infant deaths are now significantly smaller.

[6]Note that the births of some of the baby girls who die from neglect were probably not registered. In statistical terms, those deaths contribute to the gender imbalance in the sex ratio at birth and not to the gender imbalance in infant mortality. But the number of deaths in this category is unknown, and we have no data to support this hypothesis.