Research Reports

The Re-emergence of "Missing Women" in China

Erwin Bulte*, Chih-Sheng Hsieh†, Qin Tu‡ and Ruixin Wang§

Abstract

Empirical evidence suggests that close to 100 million women are "missing" worldwide. We revisit the empirical evidence for China, the country with the most missing women. Nearly ten million girls born in the 1980s and 1990s who were "missing" according to earlier census data can be found again in the 2010 population census. We discuss two possible explanations for the re-emergence of these formerly missing girls: the delayed registration of girls owing to economic reasons, and the response to amendments to the Chinese Statistics Law in 2009 and policy changes in the 2010 population census. Using the most recent statistics, we document patterns of the underreporting of women over time and across regions as well as explore the basic determinants of underreporting of women. Important policy challenges remain. For the unregistered children, the lack of access to public services will increase their vulnerability and adversely affect their quality of life.

Keywords: missing women; sex ratio; "underreporting" of women; Chinese Statistics Law; population census; one-child policy

Parental preferences for sons over daughters and technologies for sex-selective abortion have created the so-called "missing women" problem. Researchers claim that up to 100 million girls and women are "missing" worldwide – with strong adverse consequences for society. We revisit the empirical evidence for this problem in China, the country with the largest number of missing women. While nearly 15 million girls born in the 1980s and 1990s were originally believed to be missing according to census data collected in 2000, more than half of them re-emerge in more recent statistics. The reason is the extensive underreporting of (newborn) girls during the 1980s and 1990s. Parents may decide to postpone registration in response to economic factors (penalties associated with the one-child policy), but they may also intend to permanently hide their daughters

* Wageningen University, Wageningen, the Netherlands. Email: erwin.bulte@wur.nl.
† National Taiwan University, Taipei, Republic of China. Email: cshsieh@ntu.edu.tw.
‡ Beijing Normal University at Zhuhai, Zhuhai, the People's Republic of China. Email: tuqin@bnu.edu.cn.
§ Harbin Institute of Technology, Shenzhen (HITSZ), Shenzhen, the People's Republic of China. Email: wangruixin@hit.edu.cn (corresponding author).

© The Author(s), 2021. Published by Cambridge University Press on behalf of SOAS University of London
doi:10.1017/S0305741021000503 First published online 24 June 2021

https://doi.org/10.1017/S0305741021000503 Published online by Cambridge University Press

from public view. We argue that many parents may have decided to hide their daughters from the census, but then changed their minds in response to recent policy changes encouraging truthful reporting. Important policy challenges remain. Since unregistered children can hardly access public services (for example, education and healthcare), they are severely disadvantaged compared to their registered peers.

Distorted Sex Ratios

Nobel prize winner Amartya Sen was the first to draw attention to the missing women phenomenon. Based on a comparison of measured sex ratios and "natural sex ratios," the world was approximately 100 million girls and women short.[1] Later studies have updated Sen's estimate, in upward and downward directions, but his basic observation remains undisputed.[2] In many countries, especially in South Asia and West Africa, sex ratios are severely distorted. This is believed to have consequences for marriage markets,[3] (mental) health[4] and crime.[5]

China is the country with the largest number of missing girls and women. According to the 2000 census, the Chinese sex ratio was 1.23 in 1999, so 123 boys were born for every 100 girls. In some provinces, sex ratios were more distorted, reaching peak values of up to 1.36. This may be compared to the natural sex ratio, which is in the range of 1.02–1.05. For the period 1980–1999, approximately 15 million girls were missing according to the 2000 census.

The one-child policy (OCP) was an important factor shaping the Chinese missing women problem. The government's attempt to regulate fertility has prevented the birth of many millions of children;[6] however, in combination with strong parental preferences for male offspring, it has also contributed to distorted sex ratios. After ultrasound technologies became widely available, sex ratios started to increase, especially among those ethnic groups whose fertility was restricted by the OCP (for example, the Han Chinese).[7] In pursuit of a son, many households decided to have an abortion if their first child was a daughter. Or so it seemed.

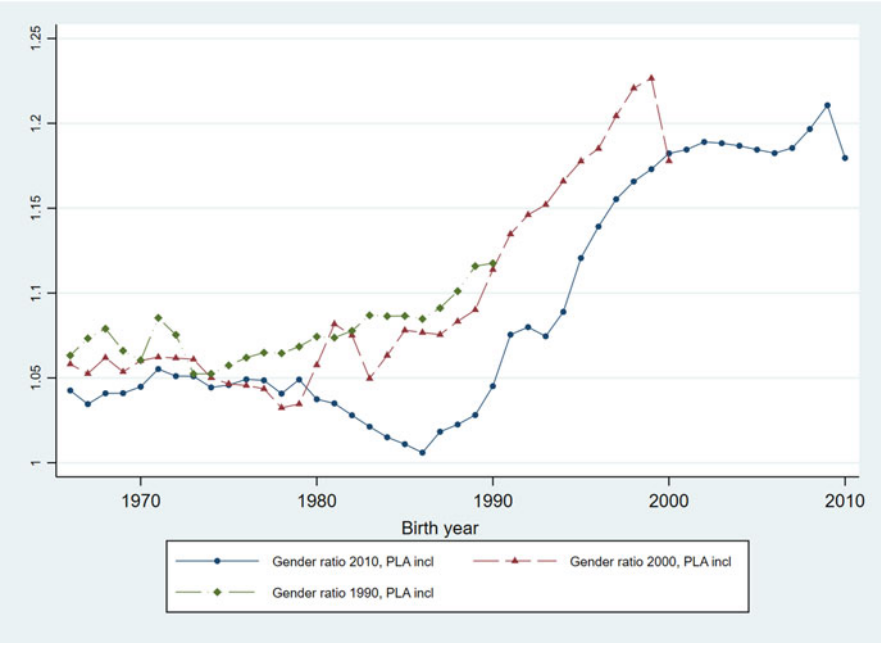
The Re-emergence of Missing Women

The most recent Chinese census, undertaken in 2010 and published in 2011, contained a major surprise. Compared to sex ratios calculated according to data from the 1990 and 2000 censuses, sex ratios were adjusted downwards for all

1 Sen 1990.
2 Klasen and Wink 2003.
3 Wei and Zhang 2011.
4 Ebenstein and Sharygin 2009.
5 Edlund et al. 2013.
6 Zhang 2017.
7 Bulte, Heerink and Zhang 2011.

https://doi.org/10.1017/S0305741021000503 Published online by Cambridge University Press

Figure 1: **Gender Ratios as Reported in Different Censuses**



Source:
NBS 1991; 2001; 2011.

cohorts born between 1980 and 1999. Importantly, the magnitude of this adjustment is massive. This is evident from Figure 1, which summarizes sex ratios for different age cohorts based on three different censuses, undertaken in 1990, 2000 and 2010. Three important observations can be made.

First, according to the 2010 census there is little evidence of distorted gender ratios during the 1980s. This stands in contrast to analyses based on earlier censuses, but it makes sense. Although ultrasound technologies started to spread during the 1980s, the great majority of Chinese households in the countryside could not access these technologies at that time.[8] Prenatal sex selection and differential abortion should have had little impact on Chinese sex ratios in the 1980s.[9] Instead, the OCP may have improved the nutritional status of girls in one-child families owing to a well-known quantity–quality trade-off. Consequently, measured sex ratios during the 1980s are among the lowest in the history of the People's Republic of China.

Second, the 2010 census indicates that sex ratios became increasingly distorted during the 1990s, as access to prenatal gender diagnosis improved. Changes in the number of missing girls correspond with the diffusion of ultrasound technology,

8 Chen, Li and Meng 2013.
9 Johansson and Nygren 1991.

https://doi.org/10.1017/S0305741021000503 Published online by Cambridge University Press

which presumably lowered the cost of effectuating a preference for boys. In 1999, the average sex ratio was 1.17, which differs markedly from the natural rate.

Third, and most importantly, there is a large "gap" between sex ratios for 1980–1999 cohorts according to the 1990 and 2000 censuses, and sex ratios for these same cohorts according to the 2010 census. Earlier estimates of the number of missing women born between 1980 and 1989 appear to be overestimates of the actual number of missing women. Assuming a normal sex ratio for this age group is approximately 1.02–1.03, 4.55 million girls were missing in the 1980s and some 10.4 million girls in the 1990s.[10] Performing the same analysis, but now based on the 2010 census data, the number of missing girls falls to 200,000 in the 1980s, and to 6.3 million in the 1990s.

These are still large numbers that can be potentially disruptive for local marriage markets and a cause for concern and alarm. However, the missing women problem appears less pressing than initially perceived. By comparing the 2000 and 2010 census data, we "retrieve" no less than 8.4 million girls who were earlier considered to be "missing": 4.3 million in the 1980s and 4.1 million in the 1990s. The underreporting of girls and young women in the 1990 and 2000 censuses accounts for most of the missing women problem. Migration cannot explain the patterns in these data, as Figure 1 is based on national statistics. Migration flows within China, from countryside to urban centres, surely influence sex ratios at the local or provincial level, but they cannot matter at the aggregate level where one province's "loss of men" is another province's gain.

Registration of Girls

The importance of underreporting versus sex-selective abortion has received some attention in the literature. Gender biases in reporting emerge if parents register their firstborn if it is a boy but choose not to register it if it is a girl.[11] This makes sense in the context of the OCP if parents want to keep open the option of having a registered son.

Hukou 户口 registration is an important issue in China. It provides an individual with access to public services such as healthcare, education, welfare, and so on. Individuals without a *hukou* do not qualify for any public support and cannot even register for public transport passes.[12] Censuses are also conducted based on *hukou* registration.

There are two possible scenarios that may explain the non-registration of live-born girls. First, parents may decide to postpone *hukou* registration – most likely until the girl should enrol in junior high school (usually at 13 years old). Parents may delay registration until they are able to pay the fine associated with reporting out-of-plan births. Second, parents may not plan to register their daughters at all, hiding them permanently from the government. It is, of course, difficult to hide

10 Cai and Lavely 2003.
11 Merli and Raftery 2000.
12 Vortherms 2019.

https://doi.org/10.1017/S0305741021000503 Published online by Cambridge University Press

young children in a small community setting, and local officials are typically able to observe these children.[13] However, local officials may not report these out-of-plan births since their incentives may be aligned with the parents – they will want to report as few deviations from top-down plans as possible, and are unable or unwilling to force the parents, who are typically co-villagers with strong social ties, to pay the financial penalty.

Distinguishing between these two scenarios is not easy but doing so may shed light on an important question: why did so many girls re-appear in the 2010 census? Can this outcome be explained by the desire for delayed registration, or did parents who intended to not register their daughters at all suddenly change their minds?

Delayed Registration of Girls

Delayed registration was proposed by Yaojiang Shi and John Kennedy.[14] They consider girls emerging in later censuses as delayed registrants, arguing that families may decide to register their daughters with a delay of several years – until these girls reach school age.[15] Yong Cai argues that if delayed registration explains under-registration, then missing girls should show up later.[16] Additional females should show up in national education statistics, which should be less distorted than earlier census data. However, Shi and Kennedy show that these education statistics are flawed and incomplete and, until 2010, failed to include migrant children.[17]

Delayed registration likely explains part of the discrepancy between sex ratios in the 2010 and 2000 censuses. However, delayed registration is unlikely to provide a complete picture. If registration is delayed until girls reach school age, then the sex ratio of older cohorts in our sample should be less distorted than that of younger cohorts. Assume that children go to school out of their village when they turn 13 and need to have *hukou* then. In the 2000 census, the sex ratios of the pre-1987 cohorts should be more balanced than the sex ratios of the post-1987 cohorts. If delayed registration explains (temporarily) distorted sex ratios, then the discrepancy between sex ratios in the 2010 and 2000 censuses should be trivial for the pre-1987 cohort, but significant for 1987–1999 cohorts.

However, this is not evident from Figure 1. The sex ratios taken from the 2000 and 2010 census are almost parallel during the 1980s and 1990s. Moreover, if delayed registration was the reason for the difference in sex ratios between the 2000 and 2010 censuses, then there should also be a gap in sex ratios between the 2010 census and the 1 per cent national population sample survey of 2015. But Figure 2 shows there is no systematic difference in sex ratios between these two samples.

13 Shi and Kennedy 2016.
14 Ibid.
15 Ibid.
16 Cai 2017.
17 Shi and Kennedy 2017.

https://doi.org/10.1017/S0305741021000503 Published online by Cambridge University Press

Figure 2: **Gender Ratios as Reported in the 2010 Census and Population Sample Survey in 2015**

Source:
NBS 2011; 2016.

Policy Changes

We speculate that the most likely explanation is a policy change in the implementation of the 2010 census. *Hukou* registration serves as the basis for population enumeration in China's censuses. As an important part of the preparations for the censuses, a *hukou* rectification is conducted by the police bureau beforehand to correct non-registration or misregistration. The Chinese government was becoming increasingly concerned about the problem of the non-registration of Chinese citizens, which is rooted in the contradiction throughout the 1980s and 1990s between the local Family Planning Office (FPO), which aims to control out-of-plan births, and the police bureau, which aims to register all people (all births) regardless of their status.[18] To resolve this problem and improve the quality of *hukou* registration data, an announcement was made leading up to the 2000 census proclaiming that: "residents without *hukou* owing to a violation of the one-child policy are allowed to register *hukou* during the *hukou* rectification

18 Li, Zhang and Feldman 2010.

https://doi.org/10.1017/S0305741021000503 Published online by Cambridge University Press

before the census."[19] However, many parents still had concerns since no promise was made regarding the confidentiality of *hukou* rectification data.

In 2010, the census authority made a concerted effort "to promise that information would not be passed to the birth control authority as a basis for fines, nor would the rectified fertility data be used for the evaluation of local government performance in family planning."[20] This followed an amendment of the Statistics Law of the People's Republic of China in 2009. An important revision stipulated that data collected for the census could only be used for statistical purposes and not for the enforcement of laws and policies. Only anonymized data would be shared with other government branches, and confidentiality regulations stipulated that "users" of these data should be unable to trace back information to specific households.[21] Following the amendment, it was emphasized that "information [gathered] from the *hukou* rectification is not allowed to be used as the basis for administrative actions, citation or penalty."[22]

Policy changes were widely publicized and communicated to the public in the period preceding the census.[23] In some regions, such as Beijing, census takers signed agreements of confidentiality with households before collecting data. Equally important is the fact that local officials were aware of the policy change and were given incentives to encourage residents without *hukou* to register during the *hukou* rectification stage running up to the 2010 census. As the policy changes temporarily severed the link between *hukou* rectification and punishment for out-of-plan births, local officials more likely placed "the accurate enumeration and full coverage of the population as a high priority."[24]

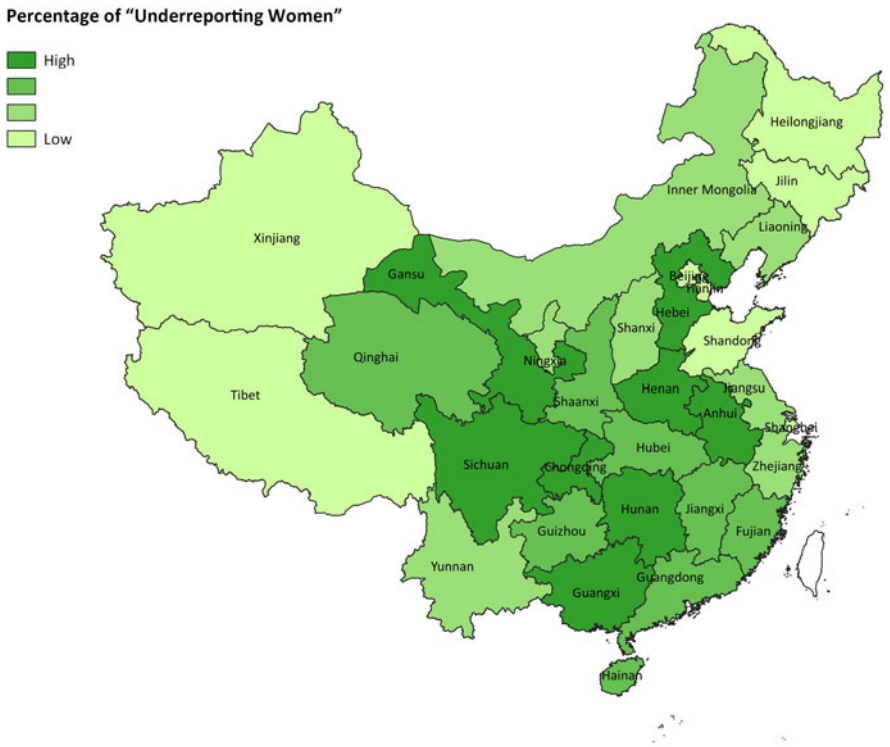
Nonetheless, not all families registered their girls. However, as any "information learnt from the census about any individuals shall be kept confidential according to the Statistics Law," girls and young women without *hukou* but identified by enumerators in the census were recorded as "population with undetermined *hukou*" and details were not shared with FPOs.[25] As a result, the number of people with undetermined *hukou* increased by more than 70 per cent between the 2000 and 2010 censuses.[26]

In other words, we believe "statistics by law" is a key reason for the success of the 2010 census.[27] The Chinese government succeeded in convincing a majority

19 "Opinions on the work of residence rectification prior to the 5th National Census." *Gov.cn*, 9 March 2000, http://www.gov.cn/gongbao/content/2000/content_60093.htm. Accessed 9 March 2000.
20 Wu and He 2015.
21 Gordon 2015.
22 "Opinions on the work of residence rectification prior to the 6th National Census." *Gov.cn*, 4 May 2010, http://www.gov.cn/zhengce/content/2016-09/22/content_5110749.htm. Accessed 4 May 2010.
23 Lu 2010.
24 Wu and He 2015.
25 "Program for the 6th National Population Census." *Gov.cn*, 23 June 2010, http://www.stats.gov.cn/tjsj/pcsj/rkpc/6rp/html/fu07.htm. Accessed 23 June 2010.
26 "Interview with Mr Jiantang Ma, director of National Bureau of Statistics on the 6th National Population Census." *Gov.cn*, 29 April 2011, http://www.stats.gov.cn/tjgz/tjdt/201104/t20110429_17540.html. Accessed 29 April 2011.
27 "Press conference on the 6th National Population Census." *Gov.cn*, 28 April 2011, http://www.scio.gov.cn/xwfbh/xwbfbh/wqfbh/2011/0428/index.htm. Accessed 28 April 2011.

https://doi.org/10.1017/S0305741021000503 Published online by Cambridge University Press

Figure 3: **Distribution of the Missing Women Retrieved in the 2010 Census.**



Source:
NBS 2001; 2011.

of its constituency to provide truthful demographic information. Although this can hardly be statistically proven, we believe the discussion provides an important starting point for future enquiry and discussion.[28]

Another interesting possibility emerges, which must be treated as conjecture until future data become available. To the extent that citizens remained either uninformed about the judicial amendment or unconvinced about the nature of the confidentiality message they received, it is possible that they continued to underreport their children. In that case, the 2010 census-based estimates of the number of missing women could still be an overestimate of the actual number of aborted girls.

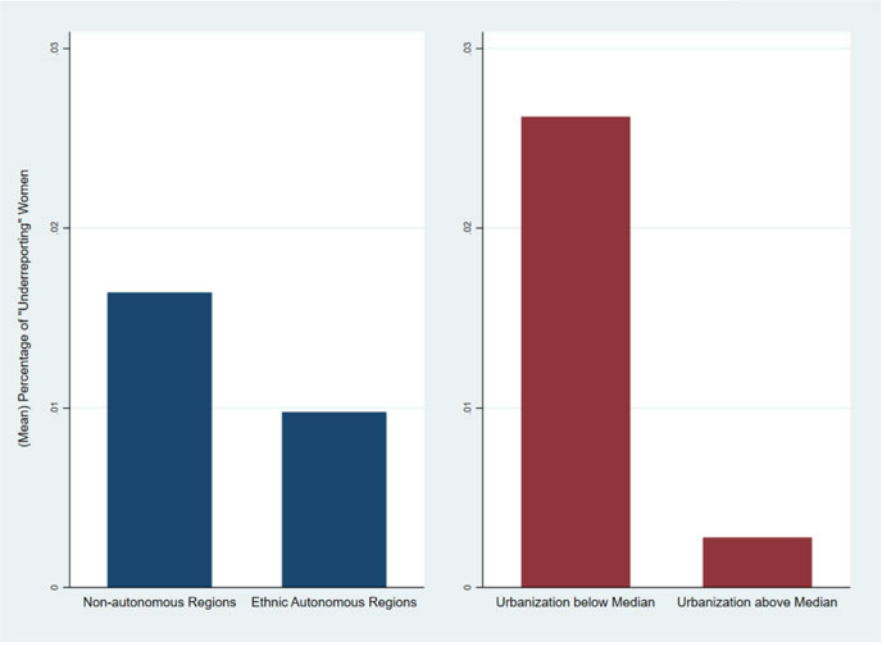
Determinants of Re-emerging Missing Women

We also analyse the distribution of re-emerging missing women at the provincial level, which may help us to understand the determinants of underreporting of

28 Since there is no counterfactual because the policy change affected all Chinese simultaneously, there are no data on the extent to which people were aware of the policy changes or believed the announcements to be credible, and no detailed data about the timing of registration.

https://doi.org/10.1017/S0305741021000503 Published online by Cambridge University Press

Figure 4: **Determinants of Underreporting of Women (Cohorts 1996–2000)**



Source:
NBS 2001; 2011.

Note:
The five ethnic autonomous regions are Guangxi, Inner Mongolia, Tibet, Xinjiang and Ningxia. The degree of urbanization is measured by the percentage of population in urban areas.

women. People have an incentive to underreport if their fertility is restricted by the OCP and if enforcement of that policy is limited (so that they are unlikely to be caught and punished). As shown in Figure 3, underreporting was especially common in provinces with few ethnic minorities and in rural areas. The reason is that the OCP allows exemptions for some ethnic minorities[29] and the enforcement of the OCP in rural areas was relatively weak.[30] So, underreporting was rare in the ethnic autonomous regions (for instance, Tibet and Xinjiang) and more urbanized areas (for instance, Beijing and Shanghai).

Figure 4 confirms the pattern, and regression analysis provides further support.[31] Both the percentage of ethnic minorities and the degree of urbanization significantly reduce the percentage of underreported women.[32] The link between

29 Bulte, Heerink and Zhang 2011.
30 Zhang 2017.
31 This is not shown but is available on request.
32 Considering that massive migration between provinces may change local sex ratios, we only use the subsample of cohorts born between 1996 and 2000 – a subgroup of individuals unlikely to be migrated in 2000 and 2010 because they were too young.

https://doi.org/10.1017/S0305741021000503 Published online by Cambridge University Press

re-emerging missing women and enforcement (targeting) of the OCP is strong and direct.

Policy Implications

Our findings have immediate and urgent implications for policy. The gradual abolishment of the OCP in 2015 implies that the problem of underreporting will become less important in the future. But this does not diminish the fact that there are many unregistered individuals born before 2015 who have stayed under the government radar until now. There are strong reasons to suspect that not all is well with these individuals.

As mentioned, unregistered children in China do not have a *hukou.* And while young children without a *hukou* may be able to benefit from locally organized schooling (through home tutoring and domestic care, or otherwise), this is not a suitable option for children who should enter secondary education. On average, unregistered girls are likely to suffer from a large shortfall of human capital. This will adversely affect their quality of life and their employment and marriage opportunities. Unregistered girls are socially and economically vulnerable.

The state should help these individuals to gain access to public services by investing in the formation of human capital. Examples include programmes that provide unregistered girls with access to the education levels they need to qualify for gainful employment. Such public investments may not only have decent rates of return from an economic perspective but may also reflect an opportunity for the state to take responsibility for and remedy a situation that is to a large extent an unintended side effect of the one-child policy.

Acknowledgements

We appreciate the insightful comments of the editor and two anonymous reviewers. We would also like to thank our research assistant, Sihan Zhang, for her excellent work. All errors are our own.

Conflicts of interest

None.

Biographical notes

Erwin BULTE is professor of development economics at Wageningen University. He is also Flagship leader of the Policies, Institutions and Markets (PIM) programme of IFPRI, and a research fellow at the department of land economy, University of Cambridge.

Chih-Sheng HSIEH is associate professor at the department of economics, National Taiwan University.

https://doi.org/10.1017/S0305741021000503 Published online by Cambridge University Press

Qin TU is professor of economics at the Center for Innovation and Development Studies, Beijing Normal University at Zhuhai.

Ruixin WANG is assistant professor of economics at the School of Economics and Management, Harbin Institute of Technology, Shenzhen.

摘要: “消失的”女性这一问题，因其严重的社会经济影响而广受关注。而这一问题在中国尤为严重。但利用第六次全国人口普查（2010）数据我们发现 1980 和 1990 年代出生的人口，性别比失衡状况并没有此前估计的严重；而在此前普查中被认为“消失的”女性人口中，有八百多万重新出现在第六次人口普查数据中。造成这一现象的关键是 2009 年中华人民共和国统计法的修订以及在普查操作层面相应的政策调整。该修订对数据保密的严格要求，导致大量在此前普查中“被瞒报”的女性重新出现。而利用 2010 年普查数据，我们整理了“被瞒报”女性随时间和地域变化的基本模式，并初步考察了计划生育政策执行力度与“被瞒报”女性规模的内在联系。而尽管“被瞒报”女性并未“消失”，但由于长期缺乏“合法身份”，无法获得充分的公共资源，她们的生活处境仍然堪忧。

关键词: “消失的”女性; 性别比; “被瞒报”女性; 中华人民共和国统计法; 人口普查; 计划生育政策

References

Bulte, Erwin, Nico Heerink and Xiaobo Zhang. 2011. “China’s one-child policy and ‘the mystery of missing women’: ethnic minorities and male-biased sex ratios.” *Oxford Bulletin of Economics and Statistics* 73(1), 21–39.

Cai, Yong. 2017. “Missing girls or hidden girls? A comment on Shi and Kennedy’s ‘Delayed registration and identifying the ‘missing girls’ in China’.” *The China Quarterly* 231, 797–803.

Cai, Yong, and William Lavely. 2003. “China’s missing girls: numerical estimates and effects on population growth.” *China Review* 3(2), 13–29.

Chen, Yuyu, Hongbin Li and Lingsheng Meng. 2013. “Prenatal sex selection and missing girls in China: evidence from the diffusion of diagnostic ultrasound.” *Journal of Human Resources* 48(1), 36–70.

Ebenstein, Avraham Y., and Ethan Jennings Sharygin. 2009. “The consequences of the ‘missing girls’ of China.” *The World Bank Economic Review* 23(3), 399–425.

Edlund, Lena, Hongbin Li, Junjian Yi and Junsen Zhang. 2013. “Sex ratios and crime: evidence from China.” *The Review of Economics and Statistics* 95(5), 1520–34.

Gordon, Stephanie. 2015. “China’s hidden children.” *The Diplomat*, 12 March, https://Thediplomat.Com/2015/03/Chinas-Hidden-Children/. Accessed 12 March 2015.

Johansson, Sten, and Ola Nygren. 1991. “The missing girls of China: a new demographic account.” *Population and Development Review* 17(1), 35–51.

Klasen, Stephan, and Claudia Wink. 2003. “‘Missing women’: revisiting the debate.” *Feminist Economics* 9(2–3), 263–299.

Li, Shuzhuo, Yexia Zhang and Marcus Feldman. 2010. “Birth registration in China: practices, problems and policies.” *Population Research and Policy Review* 29(3), 297–317.

Lu, Chang. 2010. “Fears over privacy confront census takers.” *China Daily*, 6 September, https://www.chinadaily.com.cn/china/2010-09/06/content_11259656.htm. Accessed 6 September 2010.

Merli, M. Giovanna, and Adrian E. Raftery. 2000. “Are births underreported in rural China? Manipulation of statistical records in response to China’s population policies.” *Demography* 37(1), 109–126.

https://doi.org/10.1017/S0305741021000503 Published online by Cambridge University Press

NBS (National Bureau of Statistics). 1991. *Zhongguo 1990 nian renkou diaocha ziliao* (*China 1990 Census Data*). Beijing: Zhongguo tongji chubanshe.

NBS. 2001. *Zhongguo 2000 nian renkou diaocha ziliao* (*China 2000 Census Data*). Beijing: Zhongguo tongji chubanshe.

NBS. 2011. *Zhongguo 2010 nian renkou diaocha ziliao* (*China 2010 Census Data*). Beijing: Zhongguo tongji chubanshe.

NBS. 2016. *2015 nian quanguo 1% renkou chouyang diaocha ziliao* (*2015 China 1% Population Sample Survey Data*). Beijing: Zhongguo tongji chubanshe.

Sen, Amartya. 1990. "More than 100 million women are missing." *The New York Review of Books*, 20 December, www.nybooks.com/articles/1990/12/20/more-than100-million-women-are-missing/.

Shi, Yaojiang, and John James Kennedy. 2016. "Delayed registration and identifying the 'missing girls' in China." *The China Quarterly* 228, 1018–38.

Shi, Yaojiang, and John James Kennedy. 2017. "Missing girls, indirect measures and critical assumptions: a response to Yong Cai's comments." *The China Quarterly* 231, 804–810.

Vortherms, Samantha A. 2019. "China's missing children: political barriers to citizenship through the household registration system." *The China Quarterly* 238, 309–330.

Wei, Shang-Jin, and Xiaobo Zhang. 2011. "The competitive saving motive: evidence from rising sex ratios and savings rates in China." *Journal of Political Economy* 119(3), 511–564.

Wu, Xiaogang, and Guangye He. 2015. "The evolution of population census undertakings in China, 1953–2010." *China Review* 15(1), 171–206.

Zhang, Junsen. 2017. "The evolution of China's one-child policy and its effects on family outcomes." *Journal of Economic Perspectives* 31(1), 141–160.

https://doi.org/10.1017/S0305741021000503 Published online by Cambridge University Press