

# Impact of Chinese one-child policy on sibling structure: experience from rural areas in three provinces

Elina Hemminki,<sup>1</sup> Qian Long,<sup>2,3</sup> Zhuochun Wu,<sup>4</sup> Reija Klemetti<sup>1</sup>

**To cite:** Hemminki E, Long Q, Wu Z, *et al.* Impact of Chinese one-child policy on sibling structure: experience from rural areas in three provinces. *BMJ Open* 2012;**2**:e001010. doi:10.1136/bmjopen-2012-001010

► Prepublication history for this paper are available online. To view these files please visit the journal online (<http://dx.doi.org/10.1136/bmjopen-2012-001010>).

Received 10 February 2012  
Accepted 10 May 2012

This final article is available for use under the terms of the Creative Commons Attribution Non-Commercial 2.0 Licence; see <http://bmjopen.bmj.com>

<sup>1</sup>Department of Children, Young People and Families, National Institute for Health and Welfare, Helsinki, Finland

<sup>2</sup>Department of Maternal and Child Health, School of Public Health and Management School of Public Health, Chongqing Medical University, Chongqing, P.R. China

<sup>3</sup>Department of Public Health, University of Helsinki, Helsinki, Finland

<sup>4</sup>Department of Health Statistics and Social Medicine, School of Public Health, Fudan University, Shanghai, P.R. China

**Correspondence to**  
Dr Elina Hemminki;  
[elina.hemminki@thl.fi](mailto:elina.hemminki@thl.fi)

## ABSTRACT

**Objectives:** To study the influence of population policy and boy preference on the sibling structure, that is, in which order and combinations boys and girls are born into families.

**Design:** A population-based survey with a representative sample of new mothers in 2008–2009 in rural China.

**Setting:** Two provinces (Anhui and Shaanxi) where authorisation for a second child was usually given if the first birth was a daughter and one province (Chongqing) where only one child was authorised.

**Participants:** The mothers giving birth in 2008–2009 were identified from family planning and hospital birth registers (including births outside hospitals) (n=5049). Of them, 3673 were interviewed by trained medical university staff members and students using structured questionnaire (response rate 73%).

**Main outcome measures:** Children's distribution by sex and families' distribution by children's birth order and sex composition were calculated and compared with theoretical values based on the assumption that family planning policy is fully followed.

**Results:** The recommended family policy was varyingly followed in the three provinces. In all provinces, there were more second children than allowed. If the policy allowing a second child only after a first-born girl were fully followed, it would result in a sibling structure in which the one-child family is always with a boy and in the two-child family the first one is always a girl. This sibling structure was partly seen in Anhui but weakly in Shaanxi. The policy allowing only one child would result in an equal number of boys and girls, but in Chongqing, there were more boys. In Anhui, unlike the other provinces, there were many more first-born girls than boys, which the authors could not fully explain.

**Conclusion:** Population policy and boy preference influence the actual and relative number of girls and boys and also sibling structure.

## INTRODUCTION

Previous studies have shown that many more boys than girls are born in China,<sup>1–3</sup> and also elsewhere in Asia,<sup>4 5</sup> being far more than

## ARTICLE SUMMARY

### Article focus

- Influence of population policy on sibling structure in families.
- Two of our study provinces (Anhui and Shaanxi) authorised in rural areas a second child if the first birth was a girl and one province (Chongqing) authorised only one child.
- If the policy allowing a second child only after a first-born girl were fully followed, it would result in a sibling structure in which the one-child family is always with a boy and in the two-child family, the first one is always a girl. In the policy allowing only one child, an equal number of boys and girls in one-child families would occur. However, sex-selective abortions may change this structure.

### Key messages

- The recommended family policy was varyingly followed. In all provinces, there were more second children than allowed and there were more boys than girls.
- The theoretical sibling structure was partly seen in Anhui but weakly in Shaanxi. In Chongqing, there were more boys.
- Both the population policy and boy preference influence the sibling structure in rural China.

### Strengths and limitations of this study

- First empirical paper on sibling structure in a country with a strong population policy (China).
- Large number of respondents in three different kinds of provinces.
- All data were based on mother's self-reports. Mothers who had unauthorised births might have avoided the survey or misreport the number and sex of their children.

suggested by the normal ratio (about 1.02 to 1.06). This is due to a strong preference for boys in a situation when either government regulations or a family's own preferences restrict the number of children to one or two. The easy availability of ultrasound and sex-selective abortions is apparently the current main method to guarantee that at least one son is born.<sup>3 5</sup> It has been considered that the

## Impact of Chinese one-child policy on sibling structure

**Table 1** Theoretical number (%) of children in 100 families, if the family planning policy were fully followed\*, Anhui and Shaanxi study areas

	First child		Total
	Girl	Boy	
One child	50 (33.3)	50 (33.3)	
Second child			
Girl	25 (16.7)	—	
Boy	25 (16.7)	—	
Total	100 (66.6)	50 (33.3)	150 (100)

\*All families with first-born girl want and can have two children.

bias in the sex ratio, besides being a difficult ethical problem, also entails notable social problems when sons grow up and cannot find wives.<sup>6</sup>

The previous literature has focused on the number of boys and girls. But boy preference and population policy rules may also impact the sibling structure, that is, in which order and combinations boys and girls are born in families. We found no previous studies on sibling structure in modern China. One study found that in several countries in Asia (not including China) and North Africa, girls are more likely to be born into larger families and at earlier parities; these patterns were absent in sub-Saharan countries.<sup>7</sup> Sibling structure has been of interest in educational and psychological research but not so much in health or sociological research.<sup>2 8–13</sup> However, girls being born into larger families and as older siblings may mean less resources and more family responsibilities and less schooling for girls, both of which influence health.<sup>7</sup>

The purpose of this study is to investigate the influence of population policy on the sibling structure, that is, in which order and combinations boys and girls are born into families. We report findings from rural areas in three Chinese provinces, based on surveys of new mothers in 2008–2009. In China, the governmental regulations for the number of permissible children vary locally. In two of the study provinces (Anhui and Shaanxi), the usual interpretation of family planning policy was that the second child was authorised (with a 4-year interval) if the first birth was a daughter. In the third province (Chongqing), only one child was authorised. For minorities, the regulations were more relaxed, although they were few in number in the study

**Table 2** Theoretical number (%) of children in 100 families\*, if the family planning policy were fully followed, Chongqing study area

	First child		Total
	Girl	Boy	
One child	50 (50)	50 (50)	
Second child	—	—	100 (100)

\*This is also the family structure.

areas. Anhui province was the wealthiest (per capita annual income US\$ 815 in 2008), followed by Chongqing (US\$ 758), while Shaanxi was the poorest (US\$ 443).<sup>14</sup> In Anhui and Chongqing one-third and in Shaanxi one-quarter of the women who had given birth in 2008 were rural-to-urban migrants.

## METHODS

### Theoretical models

If no sex-selective abortions were made, and all families followed the family planning rules and wanted and could have two children (when allowed), and the natural male dominance at birth is ignored, the theoretical sibling composition would be as given in tables 1–3. In Anhui and Shaanxi, once childbearing is completed, for 100 families, there would be 150 children, with equal numbers of girls and boys (75 each). Half of the families (50) would have only one child, all of them boys. The other half would have two children, the first-born always a girl and the second born either a boy (25 families) or a girl (25 families). This would result in a society in which single children would always be boys, and for those with siblings, the oldest one would always be a girl. In Chongqing (table 2), all families would have only one child, with equal numbers of girls and boys.

### Data and analysis

We carried out a survey on a representative sample of new mothers in 2008–2009 in rural China as part of an evaluation of interventions to increase the use and to improve the quality of maternity care.<sup>14 15</sup> The survey was made in five counties and utilised cluster random sampling, yielding 5049 women who had given birth between March 2008 and March 2009. We asked about the gender of all children they had given birth to; the experience thus comes mainly from the 2000s. The new mothers were identified from family planning registers

**Table 3** Family structure in 100 families, if the family planning policy were fully followed\*, Anhui and Shaanxi study areas, n (%) of families

	First child			Second child		
	Girl	Boy	Total	Girl	Boy	Total
1 Child	—	50 (100)	50 (100)	—	—	—
2+ Children	50 (100)	—	50 (100)	25 (50)	25 (50)	50 (100)
Total	50 (50)	50 (50)	100 (100)			

\*And all families with first-born girl want and can have two children.

## Impact of Chinese one-child policy on sibling structure

**Table 4** Observed number (%) of children, by child's sex and province

	Anhui		Shaanxi		Chongqing	
	Girl	Boy	Girl	Boy	Girl	Boy
First child	896 (59.1)	619 (40.9)	837 (51.9)	776 (48.1)	247 (45.6)	295 (54.4)
Second child	227 (46.7)	259 (53.3)	297 (44.0)	378 (56.0)	94 (44.3)	118 (55.7)
Total	1123 (56.1)	878 (43.9)	1134 (49.6)	1154 (50.4)	341 (45.2)	413 (54.8)

in Anhui and hospital birth registers (including births both in and outside hospitals) in Chongqing and Shaanxi.<sup>14</sup> Family planning workers or village doctors contacted the mothers by telephone or by home visit before the survey. Due to the data collection method, the likelihood of including mothers with illegal births into the survey sample is unknown in Anhui.

Ethical approval for the study was obtained from the International Centre for Reproductive Health, Ghent University (2008/143). The mothers voluntarily participated in the study. Using a structured questionnaire, trained medical university staff or students interviewed participants at home or in public places. Overall, 73% of mothers (3673 of 5049) completed the interview. The main reasons for non-response were no-one at home at the time of survey (10%) and no or incomplete contact information (7%); 2% refused the interview.

Cross-tabulation was used to describe the sex of the two first-born children (including families having three or more children). Children's distribution by sex and families' distribution by children's birth order and sex composition were calculated and compared with the theoretical numbers in tables 1–3. SAS V.9.1 was used to analyse the data.

## RESULTS

### Number and sex of children of the first-born child

The actual number of children by the sex is given in table 4. In Anhui, the first-born child was more often a girl (sex ratio 0.69) and the second-born child a boy (sex ratio 1.14). Also in Shaanxi, there were more first-born girls and more second-born boys, but the difference for first-born was smaller (sex ratio 0.93) and for second born larger (sex ratio 1.27).

Because childbearing was not yet completed, we could not test the theoretical model of number of children in Anhui and Shaanxi (table 1). However, the experience this far suggests that the theoretical model of the number of children (table 1) will be only partly followed.

In Chongqing, there were relatively more first-born boys (sex ratio 1.19) and many second children. More of the second children were boys (sex ratio 1.26).

### Number of families by the sibling structure

In Anhui, of those families who had at least two children, most of the first-borns were girls, as suggested by the theoretical model (table 5). But 14% of the families, rather than 0%, had a boy as the first-born. Of those families who had only one child, somewhat more had a boy. However, as many of these families may not have completed childbearing, we cannot judge what the final composition of one-child families will be.

In Shaanxi, of those families who had at least two children, the first-born was a boy in many (40%) (table 6). However, the number of first boy families was still less than the number of first girl families.

In Chongqing, there was little indication of the theoretical model of only one child: 38% of the families had more than one child (table 7). There were also many two-child families in which the first-born was a boy.

Combining the three provinces, of those families having two or more children, the first-born was a girl in 68% and a boy in 32% (data not shown). The latter figure would be 0% in the theoretical model.

## DISCUSSION

Our results from these three rural areas show that the recommended family policy was varyingly followed in different areas. If the policy allowing a second child only after a first-born girl were fully followed, it would result in a sibling structure in which the one-child family is always with a boy and in the two-child family the first one is always a girl. This sibling structure was seen, even though not in pure form, in Anhui province. It was weakly reflected in Shaanxi. In the policy allowing only one child, no such pattern would be seen, but an equal number of boys and girls in one-child families. However, our results from Chongqing showed somewhat more boys and many second-born children. Furthermore, our

**Table 5** Observed number (%) of families by the number and order of children and by sex, Anhui (1515 families)

	First child			Second child*		
	Girl	Boy	Total	Girl	Boy	Total
1 child	476 (46.2)	554 (53.8)	1030 (100)	–	–	–
2+ children	420 (86.6)	65 (13.4)	485 (100)	223 (46.7)	255 (53.4)	478 (100)
Total	896 (59.1)	619 (41.1)	1515 (100)			

\*Data were missing for seven children.

## Impact of Chinese one-child policy on sibling structure

**Table 6** Observed number (%) of families by the number and order of children and by sex, Shaanxi (1613 families)

	First child*			Second child		
	Girl	Boy	Total	Girl	Boy	Total
1 child	429 (45.7)	509 (54.3)	938 (100)	—	—	
2+ children	408 (60.4)	267 (39.6)	675 (100)	297 (44.0)	378 (56.0)	675 (100)
Total	837 (51.9)	776 (48.1)	1613 (100)			

\*Data were missing for one child.

study found the well-known phenomenon of more boys than girls among second children in Anhui and Shaanxi.

A finding that could not be explained by the recommended family planning policy or sex-selective abortions was the extra number of first-born girls in Anhui and Shaanxi provinces, particularly in Anhui. We do not know the reason for the finding, but in theory, it could be explained by the following factors. First, women do selective abortions for boys in the first pregnancy to have a girl first, as this allows them to have another child later. Second, the mothers may have hidden their first-born boys to allow them to have another child. Third, they may have given wrong information during the interview if they suspected that the researchers communicate with family planning officials. Fourth, mothers with first-born boys were more often away from home at the time of interview than mothers with girls. Fifth, notably more girls are born as a result of environmental contaminants. All factors may have contributed, but we think that the fourth explanation most likely. Our Chinese collaborators had not heard of the first and second explanations. The third explanation is unlikely in the interview situation. But when women were approached to agree about the interview, they had time to think and disappear from home if they did not want to be interviewed on their childbearing which they knew was against the rules. However, we wonder why this did not occur in Chongqing too. Environmental contamination has been proposed, but we know no studies from China supporting an impact of that size.

Anhui has traditionally had a high sex ratio favouring males.<sup>16</sup> It is also the richest and most developed of our study areas. Shaanxi is the poorest and has many remote areas. Thus, Anhui results may be indicative of future trends elsewhere in rural China.

### Can we trust our results?

All data were based on mothers' self-reports. There is no memory bias on children's sex, but two other biases may

have existed: first, those having illegal unauthorised births may have not wanted to tell the number and sex of their previous children correctly. Second, a mother not being at home during the interview or the interviewers not having the right address may have been dependent on the number and sex of children.

We did not analyse for minority status or other reasons that allowed for exceptions of the recommended policy. Considering the small number of minorities in our study areas, ignoring minorities should not introduce bias. Our theoretical model assumed that no sex-selective abortions occur, but the actual numbers and gender of children showed that in all provinces, they must have been common. Many mothers had not completed their families, and a more accurate picture would be obtained from older mothers, though in the latter case, the current or future situation would not be as apparent: Chinese childbearing habits are changing.

### More than one child

Because of the commonness of sex-selective abortions and the rule allowing another child if the first one is a girl, the Chinese population policy is sometimes called 'one-boy policy'. However, the number of families having a second child after the first-born boy suggests that not only the sex but also the number is important. Not simply boys but children in general are valued.

If the finding of more girls in Anhui and Shaanxi is true and women use selective abortions to have a girl first, this is a very interesting finding, indicating how people can find ways of circumventing regulations to fulfil their own wishes. It is possible that to some families, the number of children is more important than the gender of the child.

### Sibling structure

There was some indication that the family planning policy in China has created a new sibling structure, and

**Table 7** Observed number (%) of families by the number and order of children and by sex, Chongqing (542 families)

	First child			Second child*		
	Girl	Boy	Total	Girl	Boy	Total
1 child	147 (44.7)	182 (55.3)	329 (100)	—	—	
2+ children	100 (46.9)	113 (53.1)	213 (100)	94 (44.3)	118 (55.7)	212 (100)
Total	247 (45.6)	295 (54.4)	542 (100)			

\*Data were missing for one child.



possibly more so in the future, if people more fully accept the policy. If so, is that important? The literature has focused on being one child<sup>2 10–13 17</sup> and much less is known of the impact of the order of siblings by sex. Generally, relationships between siblings offer children unique opportunities for learning about self and other and have an effect on children's development and well-being.<sup>8</sup> It is known that parental favouritism or differential treatment can contribute to a negative relationship between siblings.<sup>9</sup>

Basu and de Jong<sup>7</sup> found that in some Asian (China was not included) and North African countries, girls are born into larger families and that they have to share resources. This may put them at a disadvantage even when parents do not discriminate against girls. Furthermore, they suggested that the fact that girls are born at relatively earlier parities might also work to their disadvantage. In poorer and larger families, parental responsibility for younger children is passed on to older girls, who may not be able to devote their full time and energy to their own education or recreational activities. However, this is not very likely in the current Chinese culture or two-child families. The new patterns of sibling structure may not have any health implications, but they are likely to influence family dynamics.

**Contributors** EH conceptualised the study and data analysis, interpreted findings and drafted the manuscript. QL conducted the analysis and participated in the interpretation of findings. ZW and RK participated in the conception and commented on the article. All authors have full access to data and read and approved the final manuscript.

**Funding** This study is part of the output of the CHIMACA project (015396) funded by the European Commission INCO Programme and coordinated by the National Institute for Health and Welfare, Helsinki. The researchers are independent from funder.

**Competing interests** None.

**Ethics approval** Ethics approval was approved by the International Centre for Reproductive Health, Ghent University (2008/143).

**Provenance and peer review** Not commissioned; externally peer reviewed.

## REFERENCES

1. Li S. *Imbalanced Sex Ratio At Birth And Comprehensive Intervention in China*. Hyderabad, India: Paper prepared for the 4th Asia and Pacific Conference on Sexual and Reproductive Health and Rights, 2007. [http://www.unfpa.org/gender/case\\_studies.htm](http://www.unfpa.org/gender/case_studies.htm) (accessed 29 Nov 2011).
2. Zhu WX, Lu L, Hesketh T. China's excess males, sex selective abortion, and one child policy: analysis of data from 2005 national intercensus survey. *BMJ* 2009;338:b1211.
3. Zhou XD, Wang XL, Li L, *et al*. The very high sex ratio in rural China: impact on the psychosocial wellbeing of unmarried men. *Soc Sci Med* 2011;73:1422–7.
4. Jha P, Kesler M, Kumar R, *et al*. Trends in selective abortions of girls in India: analysis of nationally representative birth histories from 1990 to 2005 and census data from 1991 to 2011. *Lancet* 2011;377:1921–8.
5. World Health Organization, Department of Reproductive Health and Research. Preventing gender-biased sex selection. An Interagency Statement OHCHR, UNFPA, UNICEF, UN Women and WHO, 2011. [http://www.who.int/reproductivehealth/publications/gender\\_rights/9789241501460/en/](http://www.who.int/reproductivehealth/publications/gender_rights/9789241501460/en/) (accessed 29 Nov 2011).
6. Zhou C, Wang XL, Zhou XD, *et al*. Son preference and sex-selective abortion in China: informing policy options. *Int J Public Health* 2012; 57:459–65.
7. Basu D, de Jong R. Son targeting fertility behavior: some consequences and determinants. *Demography* 2010;47:521–36.
8. Dunn J. Sisters and brothers: current issues in developmental research. In: Boer F, Dunn J, eds. *Children's Sibling Relationships: Developmental And Clinical Issues*. Hillsdale, NJ: Lawrence Erlbaum Associates, 1992:1–13.
9. Boer F, Goedhart AW, Treffers PDA. Siblings and their parents. In: Boer F, Dunn J, eds. *Children's Sibling Relationships: Developmental And Clinical Issues*. Hillsdale, NJ: Lawrence Erlbaum Associates, 1992:41–50.
10. Ding QJ, Hesketh T. Family size, fertility preferences, and sex ratio in China in the era of the one child family policy: results from national family planning and reproductive health survey. *BMJ* 2006;333:371–3.
11. Zhu WX. The one child family policy. *Arch Dis Child* 2003;88:467–71.
12. Hesketh T, Lu L, Xing ZW. The effect of China's one-child family policy after 25 years. *N Engl J Med* 2005;353:1171–6.
13. Falbo T, Poston DL Jr. The academic, personality, and physical outcomes of only children in China. *Child Dev* 1993;64:18–35.
14. Klemetti R, Regushevskaya E, Zhang WH, *et al*. *New Mothers' Survey In 2008 In Rural China: A Chimaca Report*. Helsinki, Finland: THL Report 23/2010, THL, University print. [http://groups.stakes.fi/NR/rdonlyres/E4C55881-5B94-4962-A428-74E6D3C6D671/0/RAP023\\_2010.pdf](http://groups.stakes.fi/NR/rdonlyres/E4C55881-5B94-4962-A428-74E6D3C6D671/0/RAP023_2010.pdf) (accessed 29 Nov 2011).
15. Zhang WH, Raven J, Zhang TH, *et al*. *Implementation Of Interventions In The Chimaca Project*. Helsinki, Finland: THL Discussion Paper 13/2010, THL, University print. <http://www.thl.fi/thl-client/pdfs/682e76d7-c16e-45a7-ab61-6ba2dc611405> (accessed 29 Nov 2011).
16. Wu ZC. *Perinatal Health and Maternal Care in Rural China*. Academic dissertation. Helsinki, Finland: University of Helsinki, 2011.
17. Falbo T. Social norms and the one-child family: clinical and policy implications. In: Boer F, Dunn J, eds. *Children's Sibling Relationships: Developmental And Clinical Issues*. Hillsdale, NJ: Lawrence Erlbaum Associates, 1992:71–8.

**BMJ Open**

# Impact of Chinese one-child policy on sibling structure: experience from rural areas in three provinces

Elina Hemminki, Qian Long, Zhuochun Wu and Reija Klemetti

*BMJ Open* 2012 2:

doi: 10.1136/bmjopen-2012-001010

---

Updated information and services can be found at:  
<http://bmjopen.bmj.com/content/2/3/e001010>

---

*These include:*

## Supplementary Material

Supplementary material can be found at:  
<http://bmjopen.bmj.com/content/suppl/2012/06/08/bmjopen-2012-001010.DC1.html>

## References

This article cites 9 articles, 3 of which you can access for free at:  
<http://bmjopen.bmj.com/content/2/3/e001010#BIBL>

## Open Access

This is an open-access article distributed under the terms of the Creative Commons Attribution Non-commercial License, which permits use, distribution, and reproduction in any medium, provided the original work is properly cited, the use is non commercial and is otherwise in compliance with the license. See: <http://creativecommons.org/licenses/by-nc/2.0/> and <http://creativecommons.org/licenses/by-nc/2.0/legalcode>.

## Email alerting service

Receive free email alerts when new articles cite this article. Sign up in the box at the top right corner of the online article.

---

## Topic Collections

Articles on similar topics can be found in the following collections

[Health policy](#) (508)  
[Paediatrics](#) (462)  
[Public health](#) (1668)  
[Sociology](#) (91)

---

## Notes

---

To request permissions go to:  
<http://group.bmj.com/group/rights-licensing/permissions>

To order reprints go to:  
<http://journals.bmj.com/cgi/reprintform>

To subscribe to BMJ go to:  
<http://group.bmj.com/subscribe/>