

Recetioeae iSexRatBh iVietNam

Christophe Z. Guilmoto^{1*}, Xuy n Hoang², Toan Ngo Van³

¹ CEPED (Unit e de Recherche sur les Politiques de Population), Paris, France,

² General Statistics Office, Hanoi, Vietnam,

³ Hanoi Medical University, Hanoi, Vietnam

Abstract

Objetif Since the 1980s, sex ratio at birth (male births per 100 female births) has increased in many Asian countries. A rise in the sex ratio at birth has been observed in Viet Nam. Our aim in this paper is to assess the extent of sex ratio at birth in Viet Nam over the past few years.

M ethodes Original data were obtained from a sample survey in Viet Nam conducted in 2007. The sample size was 450,000 women aged 15–49 years. The data were analyzed for the first time in 2007 (1.1 million births). The analysis of the specific information on the sex ratio at birth and the associated differences in Viet Nam.

R esultats Birth sex ratio at birth in Viet Nam has exceeded a steady decline since 2001. Starting from a level of 105, the SRB reached 108 in 2005 and 112 in 2006, a statistically significant increase. An independent variable was selected from the 1996 birth in health facilities which yielded a SRB of 110 in 2006/07. High SRB is linked to a lack of access to health care, a higher level of higher education, employment, age, income and education. These results suggest that sex ratio at birth is affected by economic development. The sex ratio at birth has recently become more common in Viet Nam. This is due to a lack of access to health care and a declining fertility rate as well as the increased availability of health facilities.

Citation: Guilmoto CZ, Hoang X, Ngo Van T (2009) Recetioeae iSexRatBh iVietNam. PLoS ONE 4(2): e4624. doi:10.1371/journal.pone.0004624

Editor: Rebecca Sears, London School of Economics and Political Science, UNITED KINGDOM

Received: July 30, 2008; **Accepted:** January 8, 2009; **Published:** February 27, 2009

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Funding: The General Statistics Office, Hanoi, has provided the survey data. The National Population and Family Planning Commission has provided the primary data. Additional funding from CEPED is gratefully acknowledged. The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

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Competing Interests: The authors have declared that no competing interests exist.

* E-mail: guilm@id.fr

Introduction

The rise in the sex ratio at birth (SRB, number of male births per 100 female births) has been evidenced in many Asian countries since the 1980s [1,2]. It was first made visible by census results in China (1990 and 2000) [3] and in several Indian States (1991 and 2001 censuses, and surveys) [4,5] as well as in South Korea [6]. The trend was detected more recently in other countries such as Georgia, Armenia or Azerbaijan where birth registration showed a rise in the masculinity of births over the course of the 1990s [7]. Other areas such as Singapore or Taiwan have been slightly affected, as well as Asian migrant populations living in Europe or North America [8,9]. The recent rise in SRB across Asia is closely linked to the entrenched preference for sons, the decline in fertility levels and the spread of new sex determination technology. [2]

Viet Nam's SRB has also received a lot of attention for various reasons. To start with, Viet Nam shares more than a border with China: a lot of cultural communalities stem from their common history and shared cultural tradition, as illustrated by the impact of Confucianism, the patriarchal family system and the degree of son preference [10,11]. Moreover, both countries have experienced a degree of social and economic change characterized by rapid economic development and a rapid decline in fertility accompanied by vigorous family planning campaigns by the Government and easy access to abortion facilities [12]. The main difference

between the two countries is a gap of about 10 years in the onset of social, political and economic transformations in Viet Nam.

Beyond such comparison with China, late 20th century's Viet Nam therefore presents many traits typical of countries where sex ratio at birth has risen above normal over the last 25 years. It has in particular undergone a rapid demographic transition over the last ten years. While child mortality rates have come down from 37 per 1000 to 16 in 1999–2006, fertility rates have recorded a fast decline in less than 20 years from 3.8 children per woman in 1989 to 2.1 in 2006 [13]. The population growth rates stands now at 1.3 percent and is poised to further decline in the future because of enduring low fertility.

However, so far interest in the sex ratio at birth in Viet Nam has to a large extent been frustrated by a lack of evidence. The 1999 census results on the sex ratio of the youth population and on the sex ratio of the birth prior to the census point to a possible slight bias towards male births with SRB values ranging from 105 to 108, even if the evidence has remained somewhat inconclusive according to the most detailed analysis [14]. Disaggregated data failed to reveal any pronounced regional bias against daughters in the 1990s [15]. Results of successive DHS survey conducted in 1997 and 2002 do not provide any further strong evidence of active sex selection [16,17]. In fact, these two successive surveys yield conflicting estimates of both high and low sex ratio at birth for the 1988–1997 period, a discrepancy most likely due to the

small size of the birth samples used for SRB calculations. In conclusion, while the possibility of a SRB level slightly higher than normal in 2000 cannot be ruled out, the absence of undeniable evidence and the uncertainty prevailing over available sources has led us to assume sex ratio at birth in Viet Nam to be close to expected biological values in the 1990s.

The lack of hard evidence from these sources is compounded by the absence of published civil registration statistics in the country. While surveys such as the MICS conducted in 2006 [18] attest to the reasonably good rate of birth registration across the country (88%), no data is available to monitor annual variations or regional differentials. A further deficiency is the almost complete absence of reliable abortion statistics in the country. The only available evidence pointing to the possibility of gender bias among Vietnamese parents is still indirect and limited to local data, small-scale surveys focusing on abortions and more qualitative field studies [14,19–22].

The objective of this study is to collate the most recent information on the number of births by sex in the country and re-examine the possibility of a gradual demographic masculinization resulting from prenatal sex selection. To do this we will review newly available data collected by the Vietnamese General Statistics Office (GSO) and compute the recent trends in sex ratio at birth. We will also investigate some of its social and demographic correlates to help us understand the diffusion process at work. Other dimensions of gender discrimination among children such as sex specific mortality rates among children will not be examined here.

Materials and Methods

Estimating SRB is made difficult by the sensitivity of this statistical indicator to sample size: estimates derived from a limited number of births from hospitals [23] or surveys [16,17] may fluctuate within a large confidence interval. SRB therefore needs to be calculated from a large number of births. Misreporting is another potential issue, but we have no reason to believe that it plays a role in Viet Nam as significant as in China [24]. Furthermore, even series available from large countries with quality registration data always display minor year-to-year fluctuations that are partly attributable to random factors related to the number of annual births.

Two kinds of sources will be used in this paper and examined in turn. The principal source is the annual population survey conducted by the GSO from 2000 [13]. These surveys are based on a 3% sample drawn from the 1999 Census. Information collected refers to households, general population as well as women of childbearing age. The sample is of considerable size, compared to other surveys such as the DHS. For the most recent survey conducted in March–April 2007, no less than 461,000 women aged 15–49 were surveyed. From this source, two types of data of interest to our analysis were collected. First, the surveys record the “last birth” born to all women aged 15–49. Using only births during the previous 12 months, we can thus estimate the sex ratio at birth during the previous year. But from 2006, the surveys have also included the birth history of all women of childbearing age by recording the year and sex of the last five live births and whether children are still alive. Using the raw data files, we will reconstruct the birth histories of mothers in the past from both the 2006 and the 2007 surveys and average them. The bias linked to missing mothers and mothers with more than six children appears limited. The survey also provides several variables including prenatal health care, prior knowledge of the sex of the foetus, social and economic characteristics of the women. After testing for

significant differences with a chi-square statistic, we will identify a few variables characterizing subpopulations with significantly lower or higher SRB.

The main limitations of this source are of various types. On the one hand, the sample itself may still be too small for a detailed analysis of SRB differentials, such as regional variations among Vietnamese provinces, and may need updating as it is based on the 1999 census. Equally, available variables recorded in the survey are at times limited and of varying quality. In particular, data on the “last birth” by mothers tends to be biased towards sons in a population where women have often stopped bearing children after the birth of a son. The recently added retrospective question on the entire birth history of women corresponds precisely to the way in which to avoid this bias in the study of past variations in SRB.

In addition to its annual surveys, the General Statistics Office also initiated a special survey in 2007 across health facilities in the country to assess the number of births recorded in 2006. In terms of sample size, this survey is by far the best source to estimate sex ratio at birth as it is based on almost 1.1 million births in 2006 – amounting to about three quarters of the total number of expected births in the country. The survey was repeated the following year and preliminary results are also available. Results presented here have been corrected for the potential bias caused by the number of smaller, commune-level health centres that were omitted [25].

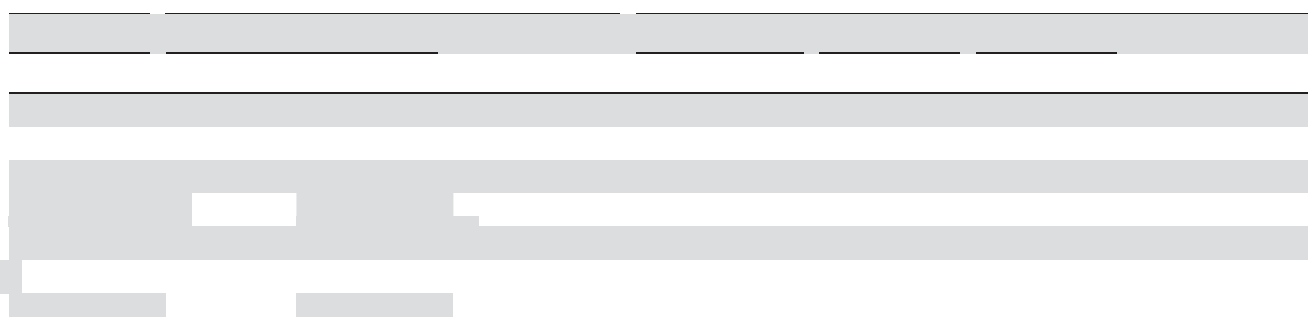
Compared to other available sources, this source has the unique advantage of allowing for the examination and mapping of spatial variations in SRB levels across the country. We will combine here the data from both surveys for 2006 and 2007. Since the number of births often remains limited when disaggregated for the 70-odd administrative provinces of Viet Nam, we have used a geostatistical technique to identify the clusters of high sex ratio in the country [26]. The technique is based on the computation of local indicators of spatial association (LISA), for which the statistical significance for regional clustering can be tested by randomized permutations using a technique developed by Luc Anselin [27]. Owing to Viet Nam’s peculiar elongated shape, the procedure used here to test the statistical significance of this spatial clustering relies on first-order contiguity measurements rather than kilometer distance between provinces. This geostatistical method will allow us first to assess the level of spatial autocorrelation of SRB in Viet Nam and then to identify the cluster of high-SRB provinces found in the North of the country.

Results

Trends in SRB

We first examine the annual SRB estimates (Table 1, Figure 1). A first series is based on each survey, beginning with the 1999 census data (3% sample) up until the last survey conducted in 2007, and refers to the births over the previous 12 months. Data does not correspond exactly to the calendar year as annual sample surveys were usually conducted in April 1 or July 1 every year. A second series is prepared from the raw data files provided by the GSO. We have computed the retrospective annual SRB levels based on the birth history of mothers collected in 2006 and 2007, for which these data were available. Series from the 2006 and 2007 surveys were then averaged to yield a single annual series based on birth history.

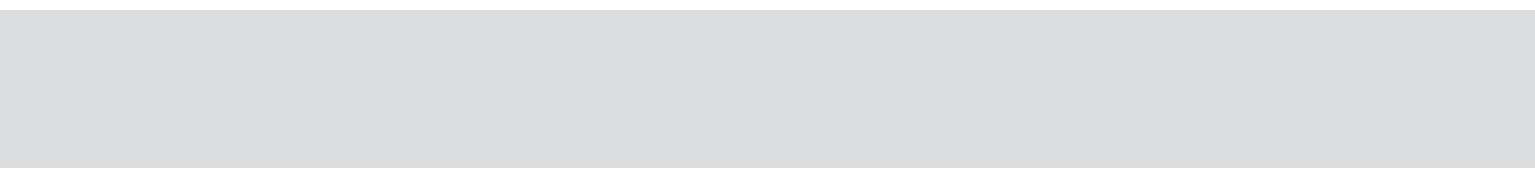
No clear trend seems visible from the last birth estimates up to year 2004: SRB values seem to fluctuate almost randomly within the 104–109 range. While this interval is above the normal sex ratio at birth (105–106), the difference is not however significant. Because of the limited size of the birth sample (about 25,000 births



per year), the range of variations around 105–106 is in fact of ± 3.5 and observed SRB values prior to 2004 in the successive surveys may be compatible with a normal SRB of 105–106. However, this series exceeded the 110 threshold in 2005. The latest SRB value for 2006 is 111.6 (± 3.5), a level significantly higher than the

biological standard, which corresponds to an active manipulation of the gender composition of the births.

The birth history data over the 1999–2006 period provides however a more precise picture of recent variations in SRB. While random fluctuations can be detected before 1999 (not shown here),



the series is almost flat during the initial 1999–2001 period at a level close to 105. But after 2001, SRB values tend to increase gradually. The SRB starts at the level of 105 in 2001, reaches 108 in 2005 and 112 the following year. While the two series (births during the previous year and birth history) are similar for the most recent period, the SRB calculated using birth history yields a more robust estimate of the trend for the first years following the 1999 census. Obviously, the reconstruction of the entire birth history of mothers during the latest 2006 and 2007 annual surveys provides a more reliable picture of past SRB variations.

An independent confirmation of these results comes from the survey of births conducted in 2007 and 2008 across health facilities in Viet Nam. The SRB from this source –based as it is on a far larger sample– is 108.7 for births occurring in 2006. While it is possible that the sampling could be biased in favour of larger health facilities, this figure appears fairly consistent with the estimates derived from annual survey. Moreover, the confidence interval for this estimate is much smaller (108.7 ± 0.4). The now available provisional SRB estimated from the subsequent survey of the 2007 births conducted in early 2008, based on 1 443 526 births, is 111.0 and confirms the continuous rise in SRB in Viet Nam. While it remains difficult to date the onset of the rise in SRB, its magnitude is now unmistakable.

SRB differentials in Viet Nam

The examination of SRB differentials within Viet Nam is of crucial importance for understanding the ongoing process of masculinization in the country by identifying some of the characteristics of the couples resorting to sex selection as well as their geographical location. Differentials may also help to monitor the potential diffusion in the near future of sex selection among other groups and regions that have been so far unaffected by the trend of rising sex ratio at birth.

Further processing of the data from the annual surveys allows us to identify several demographic and other characteristics associated with normal or skewed SRB within the Vietnamese population (Table 2). To do this, we will restrict our analysis to the 78,500 births recorded in 2007 which occurred in the three years prior to the survey to identify features associated with low or high sex ratio at birth. The first observation relates to women who reported no prenatal care, a home delivery or a delivery without

medical personnel amongst whom SRB is significantly lower than among other women. These variables closely correspond to poorer access to modern health facilities, which is itself dependent on a host of factors such as distance to infrastructure, geographical remoteness and low financial means. Table 2 further indicates that low SRB is observed among less educated women and women reporting homemaking as their occupation. We find here a broad positive relationship between education and SRB, as often found in other Asian countries. Conversely and as could be expected, women who knew the sex of the children had a high SRB. Contraception users also have significantly more sons than the remainder of the sample. Other factors for higher SRB are also apparent, such as young age and specific economic sector such as collective sector and foreign company.

All these characteristics correspond to younger, more educated women who closely monitor their fertility and who are often from a more privileged background. However, it is worth mentioning that some of the usual correlates of high SRB such as urban residence, absence of male birth or high parity, do not appear to be significant in Viet Nam.

Another feature systematically observed in Asia is the spatial patterning of skewed SRBs as seen in Northwest India or Eastern China [2,28]. Many province-level estimates from the 2006 and 2007 birth surveys point in fact to SRB values clearly above 110. Using the geostatistical techniques described in the previous methodology section, we can indeed observe that Viet Nam's regional data from the two subsequent surveys of births display a very significant level of spatial autocorrelation in 2006–07 (Moran's $I = 0.29$): this indicates that contiguous provinces tend to share similar SRB levels. Provincial data that are mapped on Figure 2 are limited to the only regional cluster that is significant ($p > .01$) when testing with local indicators of spatial autocorrelation. This “hot spot” of skewed SRB encompasses the five provinces of Bac Giang, Bac Ninh, Hai Duong, Hung Yen and Thai Binh –with estimated SRB ranging from 112 to 121. This predominantly rural cluster is located between Hanoi and Hai Phong cities, at the heart of the Red River Delta: it corresponds to a densely populated agricultural region, which is both part of historical core of the country and deeply influenced by the economic transformations in post-reform Viet Nam. It is also surrounded by several more provinces with SRB greater than 110, with the notable exception of Hanoi and Hai Phong cities where SRB is below 110.

Discussion

Our analysis establishes for the first time that SRB has increased

demand for sex selection technology has been first felt among sections of the population with the strong preference for sons and lowest birth rates and our previous analysis point for instance to specific populations in North Viet Nam.

But very low fertility is not the only condition for sex selection in Asia. For instance, sex ratio at birth was already as high as 114 in 1991 in the Indian state of Haryana with a fertility level still well above 3 children per woman. In Viet Nam, the growing demand for sex selection has also been frustrated by existing infrastructures in the country during the 1990s. In fact, a recent qualitative study conducted in different settings shows that a lot of Vietnamese women still rely on various folk methods—ranging from specific food diets to appropriate coital positions—to ensure the birth of a son [22]. Such age-old techniques of sex selection are no doubt inefficient, but their presence today confirms indirectly the rather recent introduction of modern prenatal technology in the countryside. The recent *Viet Nam Health Report* indeed stresses recent progress over the past ten years in the quality and availability of medical equipment in the country [31]. To a large extent, this overall picture also applies to the specific case of ultrasound machines imported from various countries: not only has it been easier to import better equipment, but the quality/cost ratio has improved with portable or 3-D units and decreasing production costs. In Viet Nam there are now some joint-venture companies producing imagery equipment. Though detailed data are not available, medical imaging equipment for ultrasonography, CT scan or MRI existing in the 1990s appeared to have been on the whole both scarce and of poor quality (equipment imported second-hand).

Statistics of access to ultrasounds performed in government health facilities are available from the Yearbooks of the Ministry of Health [32]: they point to an exceptional ten-fold upsurge in the number of ultrasound tests from 1.0 million in 1998 to 3.7 million in 2002 and 10.8 million in 2007. While these figures do not pertain specifically to obstetric sonography and do not include tests taken in private health centres, they demonstrate the rapid rise in the use of ultrasonography in the country. Similarly, studies conducted among Vietnamese women have already confirmed the very recent advance of ultrasonography in Viet Nam and the quality of newly available equipment. Prior determination of the sex of the foetus and its later confirmation through further scans are a major objective of pregnant mothers and explain in part the large public enthusiasm observed for the new technology [33,34].

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Acknowledgments

We thank the General Statistics Office and the United National Population Fund Country Office for help towards this investigation. We are especially grateful to Ms Tran Thi Van (UNFPA) and Dr Do Thuc (GSO) for their support and insights. This paper has also benefited from very useful observations from two anonymous reviewers. The opinions expressed here are only those of the authors.

Author Contributions

Conceived and designed the experiments: XH. Performed the experiments: XH. Analyzed the data: CZG TNV. Contributed reagents/materials/analysis tools: CZG XH TNV. Wrote the paper: CZG.

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