“Asia’s Missing Women” as a Problem in Applied Evolutionary Psychology?

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Abstract: In many parts of Asia, the Middle East and North Africa, women and children are so undervalued, neglected, abused, and so often killed, that sex ratios are now strongly male biased. In recent decades, sex-biased abortion has exacerbated the problem. In this article I highlight several important insights from evolutionary biology into both the origin and the severe societal consequences of “Asia’s missing women”, paying particular attention to interactions between evolution, economics and culture. Son preferences and associated cultural practices like patrilineal inheritance, patrilocality and the Indian Hindu dowry system arise among the wealthy and powerful elites for reasons consistent with models of sex-biased parental investment. Those practices then spread via imitation as technology gets cheaper and economic development allows the middle class to grow rapidly. I will consider evidence from India, China and elsewhere that grossly male-biased sex ratios lead to increased crime, violence, local warfare, political instability, drug abuse, prostitution and trafficking of women. The problem of Asia’s missing women presents a challenge for applied evolutionary psychology to help us understand and ameliorate sex ratio biases and their most severe consequences.

Keywords: sex ratio, parental care, violence, Trivers-Willard, Local Resource Enhancement, infanticide

Introduction

In 1990, economist Amartya Sen argued in the New York Review of Books that “More than 100 Million Women are Missing” (Sen, 1990). He noted that in many parts of the world, girls and women are so much more likely to be neglected, abused and even killed that female life expectancy is much lower than it is for boys and men. As a result, by his estimate, 100 million women who would have been alive - had males and females received” roughly similar treatment in matters of life and death” - were dead.

Since 1990, the spread of new technologies has granted progressively easier and earlier sex-determination of fetuses, paving the way for sex-specific abortion. Pre-implantation genetic diagnosis and sperm sorting now also make sex selection via In-Vitro
Fertilization possible, raising the prospect of even more efficient son selection in the near future.

The immense human tragedy of neglect, infanticide and unnecessary abortion makes Asia’s missing women one of the most pressing humanitarian issues of our time. But that is only half the story. The profoundly male-biased sex ratios leave millions of young men unable to find a mate or have a family, causing problems of crime, human trafficking and violence that threaten the cohesion and security of entire regions (Edlund, Li, Yi, and Zhang, 2007, 2010; Hudson, 2002; Hudson and den Boer, 2004).

In this article I argue that evolutionary theory offers important insights into both the origins and the consequences of this “missing women” problem. Asia’s missing women are, in economic terms, an aggregate outcome of millions of parenting decisions. The individual drivers behind those decisions emerge from interactions between our evolved parenting preferences and social and economic circumstances. Applied evolutionary psychology must take its place alongside economics and sociology if this complex problem and its tragic consequences are ever to be mitigated (Brooks, 2011).

Scope of the Problem

Birth sex ratios in societies without sex-biased abortion consistently sit between 105 and 107 (median 105.9) males born per 100 females (Coale, 1991). Globally, across all ages, this ratio drops to about 101.6 males per 100 females because boys and men generally experience greater mortality in childhood, adolescence and early adulthood, than girls and women.

In countries where girls and women enjoy the same health care and food and in which they are not aborted, killed, or neglected as a consequence of their sex, population sex ratios vary between even (100) and very slightly female biased (98). But across large parts of North Africa, the Middle East, South Asia, and East Asia, population sex ratios are strikingly male-biased. By comparing national sex ratio data with data from countries where women enjoy more equitable circumstances, it is possible to infer the number of “missing” women and girls - females who should be alive but are not. Hesketh and Xing (2006) estimate that between 67 and 92 million females are missing in total from just eight countries: China (34-41 million), India (27-39 million), Pakistan (2.6-4.9 million), Bangladesh (1.8-3.7), Iran (0.8-1.2 million), Afghanistan (0.5-1 million), Taiwan (0.4-0.6 million) and South Korea (0.2-0.3 million). In figure 1, I show the sex ratio bias in these countries relative to the rest of the world, for the most male-biased cohort – infants and children.

Causes of Biased Sex Ratios

Sex biases can arise due to unequal rates of male and female conception, unequal probabilities of fetuses being carried to term, and unequal age-specific survival rates. At each of these stages, inequalities can be introduced via parental behavior, but other factors such as disease also play a role.
Figure 1. Childhood sex ratios in eight countries responsible for the largest number of missing women and girls, compared with the childhood sex ratio for the rest of the world (dashed line).

Note: Data from CIA World Factbook.

Some diseases alter the probability of a woman giving birth to a boy or girl. Infection with the protozoan parasite *Toxoplasma gondii*, for example, can cause sex ratios as dramatic as 260 boys born for every 100 girls (Kankova et al., 2007). And, similarly, 150 boys are born for every 100 girls to mothers with Hepatitis B. The economist Emily Oster (2005) suggested that Hepatitis B infection rates might explain as much as half of the “missing women”, but she has since admitted that she was wrong about the potential for Hepatitis B infection rates to explain a large proportion of Asia’s missing women, based on better estimates of the effects of Hepatitis B infection on sex ratios (Oster, Chen, Yu, and Lin, 2010).

Throughout the region where population sex ratios are so strikingly male biased, parents express very strong son preferences (Hesketh and Xing, 2006), and the lives of women and girls are often less valued by both families and communities as a whole than they are in other parts of the world (Bandyopadhyay, 2003; Hesketh and Xing, 2006).

Son preferences can bias the sex ratio toward males in a number of ways. Most
dramatically, female infants are sometimes killed at birth upon the wishes of the parents or their family. But the systematic neglect of daughters and women whose families don’t feed, immunize, seek medical attention and care for them as well as they do for brothers and husbands has long been the main cause of elevated female mortality (Hesketh and Xing, 2006; Jeffery, Jeffery, and Lyon, 1984; Oster, 2009).

In the last three decades, differences in male and female mortality have shrunk in most of the countries concerned, probably due to improved sanitation and childhood healthcare (Hesketh and Xing, 2006; Zhu, Lu, and Hesketh, 2009). But in India, China, and South Korea, these gains have been undone by other losses. Since the advent of amniocentesis in the mid-1970s and the spread of affordable ultrasound mid-1980s - both technologies that allowed pre-natal sex testing - sex-specific abortion has become a major driver of contemporary skews in birth sex ratios (Das Gupta et al., 2003; Hesketh and Xing, 2006; Zhu et al., 2009).

In India, the phenomenon is referred to as “female feticide” in English and khanya bhronn hatya (literally “the killing of young girls”) in Hindi (Goldberg, 2010). Although abortion is a legal means to ending unwanted pregnancies in India, the law prohibits abortion for sex selection, mandating up to 10 years imprisonment (Sudha and Irudaya, 1999), but there has never been a successful prosecution (Bandyopadhyay, 2003). Reports of fetuses aborted at clinics suggest that well over 99 percent of them are female (Goldberg, 2010).

In India and China, sex-biased abortion usually manifests in the second and subsequent parity after the birth of a daughter (Hesketh and Xing, 2006; Zhu et al., 2009). Families let nature take its course for the first child, but become less likely to do so at higher parities. When in the past child-bearing continued until the desired number of sons had been born, declining fertilities (due to urbanization, the fertility decline phase of the demographic transition, and, in the Chinese case, the one-child policy) place greater urgency on selecting the sex of the second and subsequent children.

**Evolutionary Theories of Son Preferences**

Evolutionary theory can help us understand why son preferences are so strong in societies like India, China, and South Korea, and how social and economic factors lead both to the expression of strong son preferences and the under-valuation of girls and women. Selection has driven the evolution of a deep parental devotion to the safety and welfare of offspring (Hrdy, 2009). Yet humans are capable of both infanticide and lethal neglect of their own genetic offspring, and there are a number of adaptive reasons that could underlie these behaviors (Daly and Wilson, 1988a; Dickemann, 1975, 1979a, 1979b; Hrdy, 1999, 2009).

Selection usually acts to equalize parental investment in the sexes (Fisher, 1930). Because every offspring has exactly one father and one mother, the total number of offspring sired by males always equals the total number borne by females. This is the Fisher condition, and under most circumstances it mandates that negative frequency dependent selection will favor any mechanisms that bias parents toward rearing and caring for the rarer sex, restoring the sex ratio to approximate parity (see Jennions and Kokko,
2010 for a review).

Even though the population-wide aggregate effect of selection should be for parents to invest equally in sons and daughters, under some circumstances parental biases toward bearing or investing in offspring of one sex rather than the other might be adaptive. These adaptive scenarios fall into three categories: local competition, local resource enhancement, and the Trivers-Willard effect.

When one sex does not disperse far from their natal range, same-sex relatives can compete for local resources such as mates, territories or food. Hamilton (1967) first argued that under these circumstances, selection would favor those parents who invested more in the dispersing sex and less in the philopatric sex in order to avoid local competition among relatives. Female parasitoid wasps, for example, lay mostly female (i.e., fertilized) eggs when they are first to parasitize a host and her sons are likely to compete only among themselves. But the second and subsequent females that lay on a host increase the number of male (i.e., unfertilized) eggs they lay (e.g., Werren, 1980).

Local resource enhancement occurs when offspring of the philopatric sex help the parents to defend their territories and rear offspring, providing fitness returns both through their own reproduction and by directly enhancing the parents’ reproductive success. In many cooperatively breeding bird species, sons stay in their natal territory and help their parents breed. Under such circumstances, parents adaptively bias their investments toward sons (Emlen, Emlen, and Levin, 1986) creating male-biased adult sex ratios.

The third adaptive pathway to sex ratio bias was outlined forty years ago by Bob Trivers and Dan Willard (1973). They noted that the human practice of hypergyny (women marrying into families wealthier than their natal families) could make the benefits of investing in sons and daughters dependent on wealth. The stronger the hypergyny, the more sexual competition girls from the wealthiest families would face from less wealthy contemporaries to mate with the few wealthy eligible men. At the other end of the spectrum, daughters from poor families have more options to marry upward into slightly wealthier families, whereas their brothers have fewer prospects of starting a family of their own. Trivers and Willard predicted that wealthy parents that bias conception or the investments they make in care toward sons, and the poorest families that conceive or invest more in daughters would enjoy greater fitness returns than similar parents who invested equally in daughters and sons.

They predicted that in those mammals in which males compete to be among the few winners who win a harem or territory and thereby enjoy a paternity bonanza, a pregnant mother’s condition might influence the size, strength and thus the fitness prospects of her sons more than it alters the prospects of her daughters. In such species, mothers in good condition should produce more sons and invest more in post-natal care (e.g. lactation) when they have a son than a daughter. This prediction has been verified in a large number of mammal species (see Cameron, 2004a for review; Wild and West, 2007). The predictions are also often upheld in studies of humans living in historic (Voland, 1984; Voland and Dunbar, 1995) societies and in contemporary industrialized (Cameron and Dalerum, 2009) and subsistence farming (Pollet, Fawcett, Buunk, and Nettle, 2009) societies.
**Patrilineal patrilocality**

Much of the literature on Asia’s missing women considers factors special to each country. Those circumstances peculiar to each country (e.g. Indian dowries and Chinese one-child policy) have given each a unique trajectory, but as Das Gupta et al. (2003) argue, “the striking similarities in patterns of son preference stem from commonalities in the kinship systems in these [countries]”. These shared kinship features are the key to understanding son preferences, gender inequality, and the observed sex ratio biases. They do so in ways that are consistent with local resource enhancement and Trivers-Willard theories for the adaptive biasing of sex ratios.

Das Gupta et al. (2003) argue that Han Chinese, Northern and Northwest Indian, and South Korean societies, while different, are all among the most rigidly patrilineal societies in their organization and patrilocal in their spatial structure. In each of these societies, it is highly unusual for daughters to inherit land. And the patriline is crucial in important funerary rites in North-west India and in ancestor worship in Korea and China (Das Gupta et al., 2003).

Patriliny is reinforced by patrilocality, with women leaving both their home and their lineage to marry, whereupon they are absorbed into their husband’s lineage and their niche in their natal lineage ceases to exist. According to Das Gupta et al. (2003), “Thus it is that only men constitute the social order, and women are the means whereby men reproduce themselves”.

Patrilocality leaves newlywed women without allies once they move into their conjugal village - often into a home populated by their husband’s parents and brothers. It is the sons and their wives who support and care for parents in their old age. And women only ever rise to positions of prestige and prominence as the mothers of sons (Das Gupta et al., 2003). The mother’s power and influence depends on the sons’ loyalty to her, over and above his loyalty to his wife or either’s relationship with his unmarried sisters. “Unfortunately, the successful self-assertion of women in a such a kinship system is at the expense of younger women, which helps perpetuate the cycle of female subordination” (Das Gupta et al., 2003).

In general, women in matrilocal societies tend to enjoy greater autonomy, more power within the home and society, lower levels of violence and spousal abuse, and more opportunity to do visible work outside the home than women in patrilocal societies (Hrdy, 2009). These differences manifest not only at national levels, but also among ethnic groups, between regions, and, presumably, among clans, families and individuals. In non-Han Chinese minorities, for example, where kinship is less rigidly patrilineal, son preferences are weaker or not detectable (Hua, 2001).

In India, population and especially childhood sex ratios are most dramatically male-biased in the northern and northwestern regions (Chandramouli, 2011; see Figure 2) and least male-biased in southern regions (like Kerala), some central states (notably Chhattisgarh) and the northeast (e.g., Arunachal Pradesh).
Figure 2. Sex ratio for children 0 to 6 years in age in Indian States and Territories

Note: Data come from the 2011 Indian Census.

In general, North and Northwest India have historically been wheat-based agrarian economies with higher fertilities and more developed dowry customs than in the central, northeastern and southern regions (Bandyopadhyay, 2003). Throughout India, a newlywed couple is more likely to settle near to the man’s parents and other relatives, but this
patrilocality is much more pronounced in the North and Northwest where the movement of brides between villages is also less likely to be reciprocal than in the South (Das Gupta et al.; Hudson and den Boer, 2004). Thus, new brides move a considerable distance into a village where they know nobody and have no allies, but live close to the groom’s parents and male relatives who prosecute his interests at the expense of hers. In these male-dominated economies, women are less educated, experience lower status, and are more often secluded than in the other regions.

In the southern and eastern regions, women generally enjoy more status, better education, higher literacy and better healthcare as well as more prominent roles in the rice-based agrarian economy (Bandyopadhyay, 2003; Das Gupta et al.; Hudson and den Boer, 2004). Brides move shorter distances from their natal villages to marry, have more opportunities to return to their natal villages, and maintain mutually supportive relationships with their parents. Kerala is also notable for its history of educating girls and for its matrilineal inheritance system among some castes (Sen, 1990). All of these differences make for weaker son preferences by reducing the difference in value between a daughter and a son, and for overall less rigid construction of gender in South Indian kinship systems (Das Gupta et al., 2003; Hudson and den Boer, 2004).

Extreme patrilineal customs and patrilocal living, when they arise, tend to reinforce one another and consistently marginalize and devalue women and girls. But can evolutionary theory reveal any useful insights into how this occurs?

The broad patterns are certainly not consistent with Hamilton’s (1967) ideas about local competition for mates or other resources. The dispersing sex, females, is discriminated against. Instead, the pattern is consistent with local resource enhancement as the sex that remains close to the parents is favored and outnumbers the dispersing sex. Sons also deliver direct benefits to the parents in terms of status, economic support and legitimacy through funerary and ancestor worship customs. Thus far, we know of no attempts to measure the economic or fitness benefits of having sons versus daughters within the framework of Hamilton’s (1967) local resource enhancement hypothesis.

**Wealth and Urbanization**

The strength of son preferences in India is also linked to the intensity of hypergamy and the relative wealth of parents. Dickemann (1979b) suggested, on the basis of evidence that early colonial female infanticide was practiced largely by the highest castes and wealthiest families, that historic son preferences and male-biased sex ratios may have originated from the kind of wealth- or state-dependent selection first proposed by Trivers and Willard (1973).

A similar dynamic may be at play in modern India and elsewhere. In addition to the North/Northwest versus South/East divide, rural Indian sex ratio is less male-biased than in urban areas (106 versus 108 males per female across the whole population and 109 versus 111 for children younger than six years old -2011 Census data, Chandramouli, 2011). And wealth significantly predicts the odds of having a son in contemporary India. Both before and after the spread of ultrasound, the odds of having a son rose with socioeconomic status, but this effect of wealth has become much stronger in the post-ultrasound period as
technology made it easier for parents to discriminate by aborting female fetuses (Subramanian and Selvaraj, 2009).

The importance of wealth and urban living as determinants of Indian sex ratio biases might be understood simply as urban and wealthy families having the best access to sex-determination and abortion clinics. Furthermore, both wealth and urbanization depress fertility, and so the need to have at least one son early on is more pressing in urban and rich families. On the other hand, one might also expect wealthy and urbanized families to have more progressive attitudes regarding gender, and for their daughters to have employment prospects more similar to those of their brothers than daughters of rural and poor families.

The Hindu caste system and associated marriage practices might also contribute to the higher rates of sex-bias in urban and relatively wealthy families. Making a good marriage for one’s daughter is an important source of social prestige (Rao, 1993; Roulet, 1996). India’s Hindu caste system virtually enforces hypergyny, with the mere idea of a young woman marrying a man of lower sub-caste considered unacceptable (Dickemann, 1979b). It is also desirable, in making a good marriage, to marry into a wealthier family. As a result of this double-barreled hypergyny, the marriage prospects of girls born into wealthy and high-caste families are much worse than those of their brothers, because there are likely to be more eligible women competing to marry sons of families that are wealthier and from higher sub-castes than their own. The stratification caused by the caste system reinforces considerable hypergyny within castes.

This strong hypergyny is almost certainly the main engine behind Hindu India’s dowry system. Parents from wealthy and powerful families and castes, especially in the northwest, have long had to compete via the payment of lavish dowries to marry their daughters to the sons of higher-born and wealthier families (Dickemann, 1979b; Hudson and den Boer, 2004). This dynamic placed a strong incentive on wealthy families to raise sons and avoid raising daughters, which historically led to strong links between caste, wealth, and poor survival among daughters (Dickemann, 1979b).

When hypergyny intensifies female competition for the wealthiest grooms, then according to Trivers and Willard’s model, the wealthiest families should have disproportionately more sons. The evidence suggests that this is exactly what happened in India. Pre-colonial infanticide was most noticeable in the wealthy castes of the northwest, such as the Rajputs of Rajasthan (Dickemann, 1979a, b). Contemporary sex ratios, especially since abortion replaced neglect as the main process skewing sex ratios, increase steadily with wealth (Subramanian and Selvaraj, 2009) and with caste. In rural Haryana, the poor laboring Harijan caste has sex ratios of 102, whereas the land-owning Jats and Yadavs have strong male biases of 127 (George and Dahiya, 1998).

In the 20th Century, dowry customs spread – probably by imitation and the growth of the middle class - from the high castes of the northwest to other regions and to less wealthy families and lower castes. While 1961 legislation attempted to limit the spread of dowries, dowry payments remain a widespread practice and an arena of social prestige (Patel, 2007; Roulet, 1996). Dowries have also become more materialist in nature and more financially crippling for the bride’s family. Part of the cause for the spread of the dowry system can be found in India’s ballooning middle class of avid status-conscious consumers, keen to imitate the elites. According to Michelle Goldberg (2010), “in recent years, with
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India suddenly awash in consumerist bounty, dowry demands have exploded, turning the whole thing into a materialistic free-for-all”. Even when there is no negotiated dowry payment to the groom or his family, lavish weddings, associated gifts and materialistic shows of status can financially cripple a bride’s natal family (Roulet, 1996).

The inflating dowry and wedding customs make the economic cost of raising daughters ever more extortionate, even when the original scarcity of marriageable men that gave rise to the dowry custom within the elite castes no longer applies. In doing so, these customs create strong incentives among a growing segment of the population to abort female fetuses; reports suggest that clinics sometimes advertise that the financial cost of terminating a pregnancy today is outweighed by the expense saved on a dowry later on.

It appears likely that Trivers-Willard effects feed into the vicious cycle of hypergyny, dowries, gender-related violence, and son preference in India. Evidence also suggests that changing economic circumstances and cultural imitation might mediate the strength of these effects. The evolutionary and economic factors behind this cultural imitation, as well as the consequences for sex-selection and the potential to reverse current harmful sex-selection practices, remain to be formally explored.

Dickemann (1979b) also argued that strong hypergamy and dowries led to the well-documented infanticide of pre-20th Century China, as well as infanticide, infant abandonment, and female claustrophobia (e.g. in nunneries) in late mediaeval and early modern Europe. Independent support for a similar Trivers-Willard dynamic with society-wide consequences comes from Boone’s (1986) analysis of inheritance and reproduction in 15th and 16th Century Portuguese nobility, in which patriarchal family structure and inheritance arises from the wealthiest elite parents investing preferentially in sons.

Fixing the Problem

The problem of Asia’s missing women appears to be a complex aggregate outcome of several individual and family-level behaviors. These behaviors emerge from interactions between economic circumstances, cultural traditions and values, and evolved parenting biases and mating preferences. I have only touched lightly here on some of the areas where evolutionary biology impinges on this complex tragedy.

Both the local resource enhancement and Trivers-Willard theories of sex ratio bias are consistent with the observed patterns of son preference and gender discrimination, especially under the strong patrilineal and patrilocal customs throughout the afflicted parts of Asia, the Middle East and North Africa. Evolved son preferences may contribute to the strength of patriline and patrilocality, which may in turn reinforce the strength of son preferences in a positive feedback loop.

Complex problems of this nature do not yield to exclusively evolutionary thinking. Instead, the unique predictions from evolutionary theories (like local resource enhancement and Trivers-Willard) will need to be integrated with economic and socio-cultural theories and tools; this is no time to be shoring up outdated “last wall” (sensu Pinker, 2002) dichotomies between evolution and culture, nature and nurture, or genes and social environment.

There are many good reasons for trying to break the self-reinforcing evolutionary-
economic-cultural cycle responsible for Asia’s missing women: reducing the suffering caused by neglect and infanticide, eliminating the parental grief associated with unnecessary terminations or infanticide, and as we shall shortly see, ameliorating the society-wide problems caused by excess men. But a problem of this scale requires social and cultural change on a continent-wide scale, which, even with appropriate political will, presents an immense challenge.

Here are some brief recommendations informed by the evolutionary ideas I have mentioned here. In many cases one doesn’t need to be an evolutionary scientist to understand the positive effects they will have. The root causes of patriliney and patrilocality and the massive discrimination against women and girls that they engender in India, China and Korea will need to be challenged in order to make any serious progress.

1. Raise the economic value and prospects of women by subsidizing female education and promoting the role of women in society. Daughters and wives who earn good salaries are valued by their natal and marital families, and have more to aspire to than being the mothers of sons. This must happen society-wide, not just in higher castes or wealthier groups.

2. Change and enforce laws on property ownership and inheritance that discriminate against wives, daughters and granddaughters.

3. Challenge, where possible, burial and worship customs that require the agency of sons or male relatives.

4. Educate society to warn of the dangers of male-biased sex ratios, the shortage of brides and the consequences of hypergyny.

5. Reduce the dependence of aging parents on sons by building retirement savings and old age support, and by making it easier for daughters to support parents equally.

6. Strictly enforce laws forbidding sex selective abortion and IVF-based sex selection. Governments should be careful, however, not to simply raise the cost of sex selection technology or to allow loopholes that elites can use to choose sons, as it is the very richest and most powerful people that have the greatest evolutionary incentives to prefer boys, and who are most imitated by the middle class.

7. In India, there is a more pressing need than ever to strictly enforce the ban on dowries or dowry-like payments across society, reducing the economic burden of having daughters as well as the incentive for the wealthiest and most powerful families to raise the intensity of hypergyny.

8. In China, there needs to be recognition that the one-child policy has had a perverse effect on sex ratios. In particular, the rules allowing families with one or two daughters to have another child might improve the lot of those daughters but they probably worsen sex ratios in general. The government might find that improving the education and empowerment of women might have the dual effect of reducing fertility and improving the sex ratio.

The Korean Example

Evidence from South Korea supports the case for several of these recommendations. South Korea was the first country in which access to sex-testing and abortion skewed sex
ratios dramatically, reaching 116 (Hesketh and Xing, 2006). But several recent changes have effected a dramatic reversal such that by 2007, the birth sex ratio had returned to 107. These changes included a strictly-enforced 1987 government ban on sex-selective abortion (Kim, 2004), greater education and workforce participation for women, parents accumulating significant savings for old age (Ganatra, 2008; Guilmoto, 2007), improvements in the legal status of women (greater autonomy, recognizing their property rights, rights to head their own households), and the ‘Love your Daughter’ public awareness campaign warning of the dangers of biased sex ratios and the shortage of women (Chung and Das Gupta, 2007; Hesketh and Xing, 2006).

**Consequences of Male-Biased Sex Ratios**

When sex ratios become dramatically male-biased, large numbers of men have little or no prospect of finding a mate and starting a family of their own (Hudson and den Boer, 2004). In India, South Korea, and China, marriage and having children are considered essential steps toward status and acceptance as a full member of society (Hesketh and Xing, 2006). In China, male-biased sex ratios constrain so many men from ever taking this step that these men are called “bare branches” – limbs of the family tree that will never bear fruit (Hudson and den Boer, 2004).

“Bare branches” are seldom the offspring of the wealthy and powerful families who contribute the most to the problem, but rather the offspring of the poorest peasant families. This has a number of negative consequences for the society as a whole and for those unlucky men in particular. It also highlights the fact that the decisions made by a family to terminate a female fetus or kill a newborn daughter create a massive externality, impacting poorer families far more profoundly than their own (Brooks, 2011).

Several times in Chinese history, female infanticide and neglect created large surpluses of males. These men drifted into criminal gangs that terrorized other citizens; sometimes, these men formed larger militias that wreaked large-scale havoc. The Nien rebellion in 19th Century China was one such event that resulted in the death of 100 000 troops and civilians over a 15-year period; the rebellion devastated the economy and eventually contributed to the demise of the Qing dynasty (Hudson and den Boer, 2004).

Although spectacular sex-ratio biases on the scale of Asia’s missing women are relatively rare, polygynous traditional societies are more likely to experience between-group and within-group violence because poor young men have little prospect of finding a single wife (Ember, 1974; Ember et al., 2007). Similarly, the renowned lawlessness of the early American West is often attributed to strongly male-biased sex ratios (Courtwright, 1996). The intense jockeying by young men for status, respect and economic success that so often spills over into violence and, occasionally, homicide (see Daly and Wilson, 1988b) is made all the more intense by the fact that the prospect of never finding a mate is higher in polygynous and, by extension, male-biased societies.

In a similar vein, in late medieval and early modern Europe, elite titled and landed families proliferated beyond the number of titles and area of land available. The younger sons of these families, jockeying for status and titles, regularly threatened the political stability of their societies, becoming the “spearhead of feudal aggression” (Duby, 1977).
Expansionist campaigns, from the Crusades (Duby, 1977) to colonialism (Boone III, 1986), were driven, at least in part, by this surplus of ambitious and aggressive younger sons with otherwise poor reproductive prospects.

Male-biased sex ratios trigger the phenotypically plastic hyper-competitive masculine traits that allow young men - especially poor and low-status young men - to compete furiously for status and wealth in order to win a mate. They also appear to be triggering related behaviors: risk-taking, violence, gambling, alcohol and drug abuse, kidnapping and trafficking of women, and the use and abuse of prostitutes. All of these maladies are on the steep rise in India, China and elsewhere where sex ratios are male-biased (Edlund et al., 2007, 2008; Hudson, 2002; Hudson and den Boer, 2004).

Not only can we trace the causes of Asia’s missing women to interactions between evolution, economics and culture, but the direst consequences are also evolutionary in origin. Even if childhood sex ratio biases can be eliminated, societies with skewed sex ratios will continue to experience high rates of violence and crime for at least one generation. Those disaffected gangs of young men also make perfect fodder for fundamentalism and violence of a more global nature. An important future challenge for applied evolutionary psychology will be to recognize and ameliorate the frustrations and challenges created by male-biased sex ratios.

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