

Original Article

WHEN MEN ARE SCARCE, GOOD MEN ARE EVEN HARDER TO FIND: LIFE HISTORY, THE SEX RATIO, AND THE PROPORTION OF MEN MARRIED.

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Abstract: We used a life history framework to clarify the relationship between the operational sex ratio (OSR) and the proportion of men who are married across adulthood. Previous studies have found a direct relationship between the OSR and the likelihood of male marriage, although these analyses did not distinguish among age groups. We predicted that more women than men would be married at younger ages, but women would be less likely to be married than men in later adulthood, reflecting age related trends in male and female reproductive values. We predicted that men would use scarcity in a low sex ratio population to their advantage differentially by age, being less likely to marry while young but having higher marital rates than women in older age. This would be consistent with the shift from mating effort to parental investment across the male life course which is apparent in modern societies. Census data from the ten largest metropolitan areas in the United States supported these hypotheses.

Key Words: sex ratio, sexual selection, life history, mating effort, marriage

Introduction

This paper examines the relationship between variation in the sex ratio and male likelihood of marriage, contingent on age, in a modern human population. Darwin (1871) deduced that the sex ratio of a species was usually nearly balanced between males and females and described several influential factors that would later appear as components in the formal mathematical models of Düsing (1884) and Fisher (1930). Because each offspring has one mother and one father, on average males and females in a population will have equivalent reproductive success. If there are more daughters in a population than sons, the daughters' average reproductive success will be lower, and selection will favor

the production of sons. A stable equilibrium is generated through the advantageous production of the rarer sex.

The numerical equilibrium of males and females occurs on an evolutionary time scale. At least since Darwin (1871), researchers have documented specific human populations with imbalanced sex ratios. As Fisher (1958) noted, the rare sex is more valuable in any marriage market. In human populations with high sex ratios (where men outnumber women), it may be more difficult for men to obtain female partners because of the greater degree of female choice. This is especially the case for men with lower socio-economic status (Pollet & Nettle 2007), as women evaluate male socio-economic status in considerations of partner suitability (Buss, 1989). Trivers and Willard predicted that parents would bias the sex ratio of their offspring contingent on their socio-economic status (1973). Because of hypergyny (the tendency for women to marry men of higher socio-economic status), daughters of low status parents would have greater mate value than sons, but sons of high status parents may have greater mate value than daughters.

Sex ratio bias following from maternal condition has been demonstrated in red deer (Clutton-Brock, Albon, & Guinness, 1984), however the results of other studies have been mixed (see Cameron, 2004) and the pattern was absent in modern human populations (Keller, Nesse, & Hofferth, 2001). There is some suggestion that maternal glucose levels soon after conception may be the critical trigger, where high glucose levels favor male zygotes (Cameron, 2004).

If numerical scarcity alone determined the likelihood of marriage, the rarer sex would have a higher marriage rate. Yet, high sex ratios (where men outnumber women) may actually be associated with higher male marriage rates because of sex differences in human reproductive strategies (Pederson, 1991). Women are generally more selective than men in mate choice because of their greater paternal investment and significantly lower reproductive ceiling (Trivers, 1972). Children who grow up without a father present suffer higher mortality rates (Hill & Hurtado, 1996), and paternal investment in offspring may enhance the offspring's reproductive success (Geary 2005). Across a wide variety of societies, women favor men with high social and economic status (Hopcroft 2006).

Thus, men compete for relationships through resource acquisition and signals of willingness to commit to long-term relationships and provide resources to offspring. When males are scarce, there will be less competition among men for relationship commitment and paternal investment (Pederson, 1991). Females will have less selective power and may also exhibit lower commitment thresholds for sexual relations.

Cultural phenomena associated with imbalanced sex ratios

Low sex ratios tend to destabilize marriages and lead to higher divorce rates, more out-of-wedlock births and single mother households, and lower paternal investment (Guttentag & Secord, 1983; Trent & South, 1989). High sex ratios are associated with the reverse pattern. These patterns were demonstrated in the "baby boom" generation in the United States, where a population bulge

created sex ratio imbalances due to sex differences in average marital age, coinciding with increasing divorce rates and other changes in the socio-political climate that lasted until the 1980s (Pederson, 1991).

Although they actively avoided ultimate evolutionary or biological explanations for sex ratio phenomena, Guttentag and Secord (1983) compiled considerable documentation of cultural responses to imbalanced sex ratios throughout history. Guttentag was initially inspired by the contrast between how male characters in the popular media of the 1930s-1950s spoke about making life long commitments and considerable investments in their partners, whereas the male characters of the 1960s and 1970s expressed “love ‘em and leave ‘em” attitudes. Prior to World War II, the sex ratio in the United States was always higher than 100, due to the greater immigration of males. The sex ratio declined from 1910 to 1970, passing equity in the early 1940s. Some of the consequences for the “baby boom” generation are noted above.

Guttentag and Secord (1983) hold that low sex ratios result in powerless women who are treated as sex objects. The proportion of father absent, female headed households would rise dramatically under these conditions. Men could have serial or simultaneous polygyny. The level interest in Feminism may increase, as women attempt to change the balance of power between the sexes and establish their independence. In high sex ratio populations, Guttentag and Secord (1983) predict that monogamy and (female) virginity at marriage will be favored, as men push for social norms that favor stability in existing relationships, preventing women from taking advantage of their relative scarcity by seeking multiple investing partners. Women will be loved, respected, admired, and cherished, but only within a narrowly defined traditional role. For example the Southern Belles of the high sex ratio American South in the 19th Century were expected to love, honor, and obey their husbands and raise his children. They were thought to be physically weak and dependent on men for protection, but intuitive and adept at understanding people.

After the collapse of the Western Roman Empire, the European population declined and cities were abandoned as their residents fled into the countryside to escape invading tribes. The predominantly rural early European Middle Ages developed a high sex ratio resulting from the preferential treatment of sons, who were highly valued for agricultural labor. High sex ratios fostered notions of “Courtly love,” where men emphasize devotion to their partners, restraint, tenderness, and avoidance of pleasure for pleasure’s sake. Other men who were not able to secure a partner would instead serve an unobtainable, already married, woman and be rewarded only by her approval. The high sex ratio gradually gave way to a low sex ratio in the late Middle Ages due to the loss of men to Crusades, monasteries, and the plagues. Increasing populations resulted in urban areas which were beneficial to the longevity of women, as it freed them from the hard physical labor of agriculture. Marriage payments gradually shifted from bride prices to dowries. Sexually libertarian male bachelors proliferated, and many women were unable to find husbands, not only because of the relative scarcity of men, but also because of the reluctance of these males to marry (Guttentag & Secord, 1983).

In the 12th and 13th centuries, religious orders for women became so prolific that the church refused to recognize new orders and placed restrictions on existing ones. Other women flocked to Beguine communities, which resembled quasi-secular communes. Women began questioning their roles in traditional societies. The Beguines produced radical feminist literature, but found little support among the large mass of women, who were largely uneducated and illiterate. Guttentag and Secord (1983) document striking parallels between cultural conditions in the late European Middle Ages and the similarly low sex ratio United States of the 1960s and 1970s.

The effect of a low sex ratio on sexual relationships in a modern population

Large cities in the Northeast United States tend to have low sex ratios, due to the migration of women for office labor (Gwin, 2007). A New York City area entertainment magazine has run several articles on the abundance of single women in the New York metropolitan area. One article interviewed 50 non-married women of various ages and socio-economic levels (Time Out New York, 2007). These women report experiences remarkably consistent with the expected cultural conditions in low sex ratio populations. Women consistently reported that “it was difficult to find a mate, [and] that men here aren’t looking to settle down.” Even the men who are available are not seen as good partners because they are not interested in long-term relationships, and some women even explicitly mentioned the availability of potentially promiscuous women who do not give men a reason to commit in these circumstances. Many men are described as simultaneously polygynous or just looking for short-term sexual relationships. Men are seen as emotionally unavailable or unsuitable for a partnership because they are in another relationship and just interested in a sexual affair. There are some reports of men cheating on their partners, then forming a new partnership with the other woman, and even cheating on her as well. Some women note that some men may not have father figures, which may make them prone to multiple simultaneous relationships and a fear of commitment.

Women express a preference for a settle-down partner, but often end up settling for less (Time Out New York, 2007). They find it difficult to stay with one person, partially because the men they are dating are not interested in marriage. Relationships are often “fast and casual,” even when the women are middle aged, and women find themselves becoming accepting of this fact. Some women remarked that they were puzzled why many of their friends, who are intelligent, have good careers, and interesting personalities, are still unmarried. Some women advise other women to take advantage of their situation and “have fun” with the opportunities they are presented. Several women report ending up single with children. Similarly, one study noted that the rate of teenage pregnancies increases when the sex ratio is low (Barber, 2000). One woman reported that she was “single not by choice, but because my baby’s father cheated on me.” Other women become accepting of being single for the long term. They see themselves as independent, someone who does not need a man to take care of them or support them.

Consistent with historical trends in low sex ratio populations, there are reports of tendencies for women to wear revealing clothing (Barber, 1999; Time Out New York, 2007). Women report being self-conscious about their own appearance and also hypersensitive to the appearance and dress of other women. Some women derogate other women wearing skimpy clothing, while others adopt revealing attire themselves.

Of course, these reports alone are not sufficient to draw conclusions about the effects of sex ratio variation. All of the responses are sampled from non-married women, and there is also no comparison sample from a high sex ratio population. However, the stories collected provide an elaborated understanding of statistical relationships. Qualitative description provides a rich flavor for issues and circumstances, which complements quantitative relationships (Kruger, 2003). Some psychologists have suggested that people organize their experiences in the form of narratives, and this is how they understand the world (Crossley, 2000). This may be one of the reasons that personal anecdotes are often more salient than statistical trends.

Life History Theory and the effects of imbalanced sex ratios

Life history theory (LHT) is the study of life cycles and life history traits in an ecological context (Chisholm, 1999), integrating evolutionary, ecological, and socio-developmental perspectives in the study of sex differences in developmental patterns (Geary, 2002). LHT illustrates how organisms must make trade-offs in the allocation of resources between somatic effort and reproductive effort, mating effort and parenting effort, and offspring quantity vs. quality (for more detailed discussion, see Roff, 1992; Stearns, 1992). LHT can also be used to predict and illustrate how the optimal degree of a trade-off varies based on social and ecological conditions.

Life History Theory may be used to help clarify the relationship between the sex ratio and marital patterns. In modern societies, male resource allocation shifts from mating effort to paternal effort across adulthood, as indicated by fertility levels (Tuljapurkar, Puleston, & Gurven, 2007), mortality rates from risky behaviors (Kruger & Nesse, 2006), and declines in androgen levels with age (Baker & Hudson, 1983). In early adulthood, those men in low sex ratio populations may have less incentive to shift effort towards committed relationships due to ample mating opportunities (Gangestad & Simpson, 2000).

In later decades, a high mating effort strategy may not be as effective due to sex differences in short term relationship costs, benefits, and preferences. Male reproductive success will benefit because even a brief sexual affair may increase the number of a man's descendents. For women, the reproductive benefit of short term sexual relationships could be in high-quality genes promoting health, attractiveness to the opposite sex, and ultimately reproductive success that are passed on to offspring (Fisher, 1930). Cues of potential genetic benefits may be especially important when male commitment and paternal investment are relatively lower (Gangestad & Simpson, 2000).

Women tend to prefer males with observable characteristics signaling high genetic fitness for short-term relationships (Kruger, Fisher, & Jobling, 2003; Kruger, 2006) and preferences are especially strong when women are fertile (Penton-Voak, Perrett, Castles, Burt, Koyabashi & Murray, 1999; Penton-Voak & Perrett, 2000). The ability to signal phenotypic quality may decline as men age, due to the observable physiological correlates of senescence. Among Ache foragers, where both men and women form multi-year pair bonds across adulthood, younger men were usually the fathers of offspring from extra-pair sexual affairs, whereas older men tended to produce most of their offspring within long-term relationships (Hill & Hurtado, 1996). As males' opportunities for short-term relationships decline with age, older men in low sex ratio populations may benefit from a relatively greater ability to secure long-term partnerships with women. Thus we predict that men would use a low sex ratio to their advantage in alternative ways contingent on age; being less likely to commit to marriage while young to increase mating opportunities but obtaining higher marital rates in older age.

We also predict sex differences in marital likelihood, reflecting sex divergent life histories and reproductive values. On average, men mature later than women (Low, 1998) and males may also marry later because they need to build up sufficient social status and resource control (Geary, 2002). Men evaluate prospective female partners on fecundity (Buss, 1989), and female fertility peaks dramatically in the early 20s and declines rapidly afterwards (Tuljapurkar, Puleston, & Gurven, 2007). Thus, we expect that a higher proportion of women will be married in early adulthood than men, but this trend will be reversed by the fourth decade of life. Recently, both high and low sex ratios have been noted in large American cities, due mostly to economic migration (Gwin, 2007). These populations provide an opportunity to examine the relationship between the sex ratio and marital patterns in a modern society at one point in time and test the predictions from our life history framework.

Method

We graphed the proportion of men and women who were unmarried by age across 681 ZIP Codes in the metropolitan areas for the ten largest cities in the United States (New York, Los Angeles, Chicago, Houston, Philadelphia, Phoenix, San Antonio, San Diego, Dallas, and San Jose) with 2000 U.S Census data (2001). We calculated the Operational Sex Ratio (OSR; ratio of unmarried men to unmarried women) and proportion of men and women who were married across for each Census age group age 18 and above. We graphed the correlation between the OSR and the proportion of men who were married in each census age group across these ZIP Codes.

Results

The OSR for individuals ages 18 to 64 ranged from 92 in Philadelphia to 112 in Phoenix. Across these populations, the proportion of women and men who were unmarried followed a second degree polynomial (inverted U-shaped) curve,

with higher values in younger age groups. The male curve lagged the female curve, with a later and lower bottom (See Figure 1). Women were more likely to be married than men from age 18 to 34; men were more likely to be married than women at age 45 and above. A maximum of 61.5% of women were married in the 35 to 44 year age group, a maximum of 73.1% of men were married in the 60 to 64 year age group. [20]

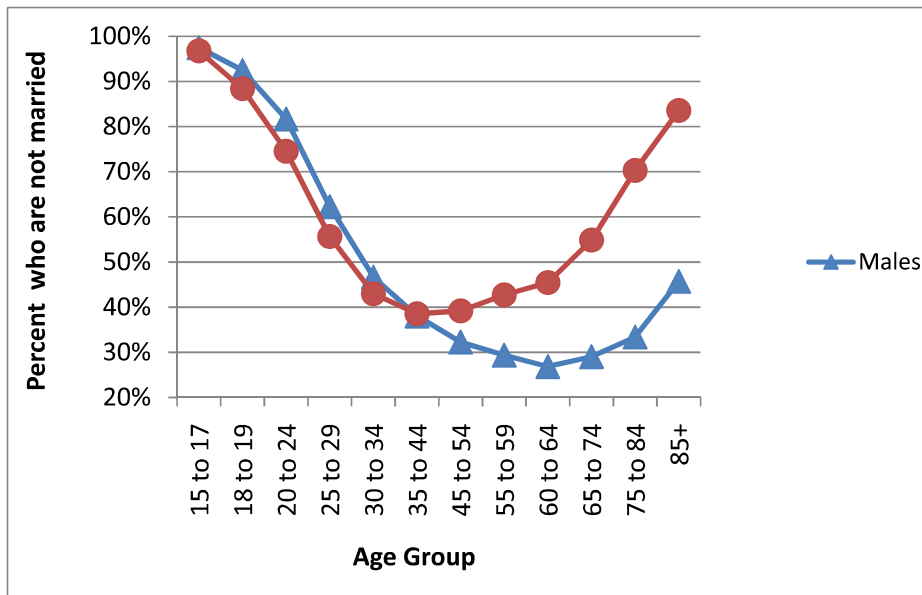


Figure 1. Percentages of men and women who are unmarried across adulthood

The OSR was directly related to the proportion of men who were married in early adulthood, but inversely related to the proportion of men who were married in later adulthood (see Figure 2). In Figure 2, bars above the plane indicate a direct relationship between the OSR and the proportion of men who are married- indicating that men are more likely to be married when they are plentiful than when they are scarce. Bars below the plane indicate an inverse relationship between the OSR and the proportion of men who are married- indicating that men are more likely to be married when they are scarce than when they are plentiful. These relationships were significant at the $\alpha = .001$ level, except for the non-significant correlation in the 18-19 year age group, when fewer than 3% of men were married.

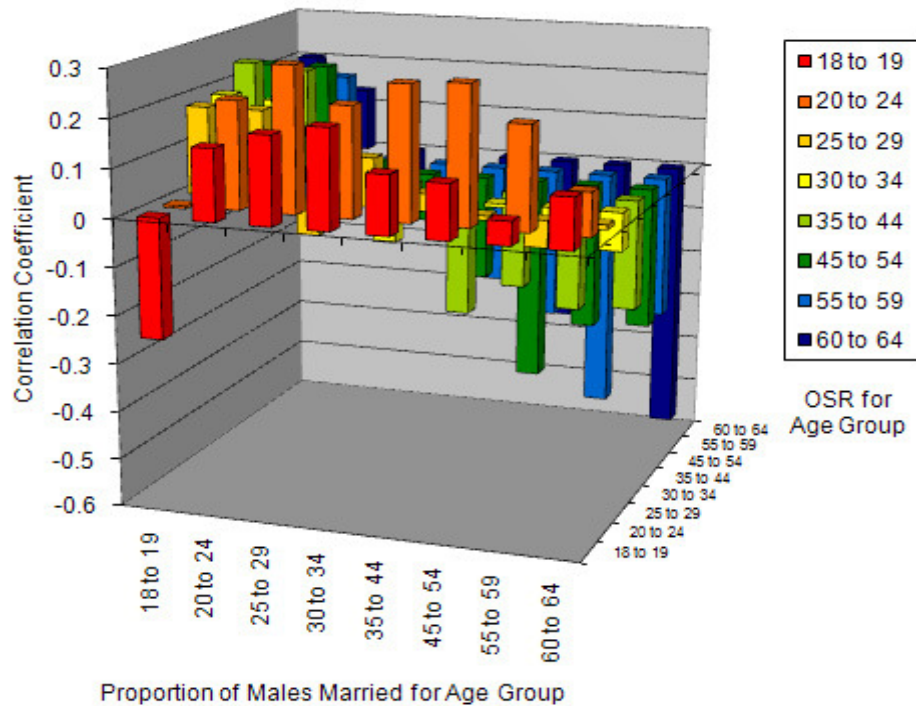


Figure 2. Strength and direction of correlation between proportion of men who are married and the Operational Sex Ratio.

Discussion

Results supported the hypothesized relationship between the sex ratio and male marital rates across adulthood, consistent with modern life history patterns and a population pattern of serial polygyny. We demonstrated that the male scarcity advantage in low sex ratio populations leads to contrasting outcomes contingent on age. Young men in low sex ratio populations have lower marital rates than their peers in high sex ratio populations, whereas older men in low sex ratio populations are more likely to be married than their counterparts in high sex ratio populations. In young adulthood, men appear to use their relative scarcity in low sex ratio populations to their advantage for short-term relationships. In older adulthood, men appear to leverage their relative scarcity to increase their chances of marriage.

These results suggest that men in modern low sex ratio populations undergo a more dramatic Life History shift, with a greater emphasis on mating effort for short term relations in young adulthood. Men in high sex ratio populations appear to commit to marriage earlier in life, and would then signal relationship commitment and paternal investment in an attempt to retain their partners. Even when in committed relationships later in life, men in low sex ratio populations may exhibit less paternal investment in offspring and may even benefit through mating effort for Extra-Pair Copulations (EPCs).

The discrepancy between the proportion of men and women married in late adulthood is likely influenced by the higher male mortality rate, including relatively higher mortality rates for unmarried men (Kruger & Nesse, 2006). However the majority of this discrepancy is likely due to the greater likelihood of men remarrying after divorce (Buckle, Gallup, & Todd, 1996). Men value potential female partners in terms of fecundity, with a preference for youthful features (Cunningham, 1986; Tesser & Martin, 1996). Thus, women's mate value declines with age. One might wonder about expectancies for non-married middle aged women in low sex ratio societies, where men demonstrate an increasing interest in marriage with age. Unfortunately, despite increased marital rates for older men, the women who benefit from these relationships are likely to be substantially younger than their husbands.

As with all studies, there are assumptions and limitations in our analyses. For example, the analyses assume that each metropolitan area is a single intermarrying population. This is unlikely to be true for several reasons. First, residents may marry someone who lives outside of their metropolitan area. Second, large cities are often a mix of different ethnic and language groups which may be less likely to intermarry, especially among first generation immigrants. Third, differences in social class may constrain the likelihood of certain marital relationships, as hypergamy (marrying someone of a higher social class) may be more common for women than for men. The predicted results would likely be more difficult to obtain because the assumption of a unitary mating population was not met.

The data represent the largest population centers in one nation; however Guttentag and Secord (1983) describe generally similar patterns across history and in different regions of the world. The cities under study are legally monogamous with a socially accepted pattern of serial polygyny, in contrast to the greater prevalence of simultaneous polygyny in ancestral populations. The vast majority of cultures (84%) allow for simultaneous polygyny (Ember, Ember, & Low, 2007). Thus, the patterns described here are representative of a modern society with institutionalized monogamy. A minority of men may benefit from polygynous mating because of high social status and/or economic power. These men are expected to have a reduced numerical impact on the overall population trends because of legal prohibitions against polygyny. However, these men may serve as role models for other men who seek to model strategies conferring high reproductive success.

Overall, this study extends the understanding of how the sex ratio affects marital patterns. The findings clarify how age moderates the relationship between male scarcity and the male likelihood of marriage. Our results further demonstrate the power of an evolutionary approach, and a life history framework in particular, for describing, predicting, and understanding human behavioral patterns.

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