

### Original Article

## Male Scarcity is Differentially Related to Male Marital Likelihood across the Life Course

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**Abstract:** If marriage markets were only subject to the influences of numerical supply and demand, one would expect that the scarcer sex in a population would have a greater proportion married. Previous research has demonstrated that when males are scarce, they are actually less likely to be married, presumably because their market scarcity enhances their short term mating success and decreases incentives for commitment. However, males in modern societies appear to shift from mating effort to parental investment across the life course. Also, women preferentially value indicators of phenotypic quality for short term relationships, and these signals may be increasingly difficult to display with progressive physiological senescence. We predicted that men in low sex ratio populations would use market scarcity to their advantage for mating effort when young, but would shift towards commitment strategies when older. Data from the 50 largest Metropolitan Statistical Areas in the USA confirmed that a female biased sex ratio was associated with a lower proportion of men married between ages 20 and 29, but a higher proportion of men married between ages 35 and 74.

**Keywords:** operational Sex Ratio, sexual selection, life history, marital status

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### Introduction

The sex ratio of a sexually reproducing species is usually nearly balanced between males and females (Darwin, 1871). The numerical equilibrium is maintained because each offspring has one mother and one father, and on average males and females in a population will have equivalent reproductive success. If there is a surplus of one sex, the production of the rarer sex will be advantageous because of their higher average reproductive success, facilitating a stable equilibrium.

The sex ratio equilibrium occurs on an evolutionary time scale, as researchers since Darwin (1871) have documented imbalanced sex ratios in specific human populations. When these imbalances occur, the rare sex is more valuable in the marriage market (Fisher, 1958). The Operational Sex Ratio (OSR) describes the average ratio of sexually active males to sexually receptive females in a population (Emlen and Oring, 1977). Across species, polygyny is expected when the OSR is skewed toward males and polyandry is expected when the OSR is skewed toward females (Emlen and Oring, 1977).

When the sex ratio is imbalanced within a human population, the less populous sex may have increased leverage in inter-sexual relationships. Because males and females have somewhat divergent reproductive strategies, there will be contrasting consequences for male biased OSRs and female biased OSRs. Women are generally more selective than men in mate choice because of their greater paternal investment and significantly lower reproductive ceiling (Trivers, 1972). The reverse is true for males, who have greater returns on reproductive success from having a greater number of mating partners (Bateman, 1948). The attributes of what each sex offers as enticements and requires of partners for relationships will shift based on the leverage conferred by numerical scarcity.

Men compete for partners through signals of potential commitment to long-term relationships and resource provisioning. Across a wide variety of societies, women favor men with high social and economic status (Hopcroft, 2006). Children who grow up without a father present suffer higher mortality rates (Hill and Hurtado, 1996), and paternal investment in offspring may enhance offspring reproductive success (Geary, 2005). When the OSR is male biased, available men outnumber available women and the greater degree of female choice will raise the quality of male attributes necessary for securing female partners. Men with lower socio-economic status may have an especially difficult time getting married (Pollet and Nettle, 2007), as male socio-economic status is evaluated for partner suitability (Buss, 1989).

In the early European Middle Ages, the population declined and moved from cities to rural areas to avoid invading tribes. Sons were highly valued for agricultural labor, and preferential treatment resulted in a surplus of males. Monogamy and (female) virginity at marriage were favored, as men promoted social norms that favored stability in existing relationships, preventing women from using their scarcity to secure multiple investing partners. Men who were not able to obtain a partner would do good deeds for the approval of an already married woman, very rarely consummating the relationship (Guttentag and Secord, 1983).

When men are scarce in a female biased population, there is less incentive for competition among men for relationship commitment and paternal investment because male scarcity enhances their short term mating success (Pederson, 1991). Females have less selective power and may exhibit lower thresholds for male commitment in order to have sexual relations. Women compete for partners through signals of fecundity and sexual availability (Cunningham, 1986; Tesser and Martin, 1996). In female biased populations, female mating effort and sexual receptivity increase, as can be seen in trends for skirt length (Barber, 1999) and teenage pregnancies (Barber, 2000). Sociologists have noted that women have greater difficulties in obtaining their first marriage when there is a relative shortage of men (Lichter, Kephart, McLaughlin, and Landry, 1992).

Pederson (1991) described the how the demographic bulge of the “baby boom” generation in the United States combined with sex differences in average marital age to

result in an effectively female biased OSR. This resulted in increasing divorce rates and other socio-political trends that lasted until the 1980s, when the OSR reversed (Pederson, 1991). Across history, female biased OSRs tend to destabilize marriages and lead to higher divorce rates, more out-of-wedlock births and single mother households, and lower paternal investment (Guttentag and Secord, 1983; Pederson, 1991). Male biased OSRs are associated with the reverse pattern.

In the late European Middle Ages the loss of men to Crusades, monasteries, and the plagues gradually contributed to create a female biased OSR. Also, generally increasing population sizes re-established urban areas that promoted female survival because of the freedom from the hard physical labor of agriculture. Men could more easily attain serial or even simultaneous polygyny, and marriage payments shifted from bride prices to dowries, reflecting market conditions. Sexually libertarian male bachelors proliferated, and many women remained unmarried, not only due to the scarcity of men, but also because the men available were reluctant to marry (Guttentag and Secord, 1983).

#### *Male life history in modern societies*

We propose that Life History Theory can be used to clarify the relationship between the OSR and male marital patterns in technologically advanced cultures. There are multiple indicators that male resource allocation shifts from mating effort to paternal effort across adulthood in such societies. These include declines in fertility levels (Tuljapurkar, Puleston, and Gurven, 2007), mortality rates from risky behaviors (Kruger and Nesse, 2006), and androgen levels (Baker and Hudson, 1983), beginning in the third decade of life. The shift in male life history effort may occur as a response to diminishing returns from mating effort.

In early adulthood, men in modern female biased populations may have less of an incentive to shift effort towards committed relationships due to ample mating opportunities (Gangestad and Simpson, 2000). Male reproductive success will benefit from multiple partnerships because even a brief sexual affair may increase the number of a man's descendents. However, the returns from a high mating effort strategy may decline with age.

When males do not commit to long-term investment, the reproductive benefits of these relationships for women may be high-quality genes promoting health, and attractiveness to the opposite sex. For short-term relationships, women tend to prefer males with high phenotypic quality, signaling high genetic quality (Kruger, Fisher, and Jobling, 2003; Kruger, 2006). These characteristics are passed on to offspring, ultimately benefitting reproductive success (Fisher, 1930). Indicators of genetic quality may be especially important when the likelihood of paternal investment is relatively low (Gangestad and Simpson, 2000).

Males' abilities to signal genetic quality through phenotypic quality may decline as men age, because of the observable physiological correlates of senescence. Younger men were usually the fathers of offspring from extra-pair sexual affairs among Ache foragers, whereas older men tended to produce most of their offspring within long-term relationships (Hill and Hurtado, 1996). As males' enhanced abilities to acquire short-term relationships in a female biased population decline with age, they may still benefit from their market scarcity by a relatively greater ability to form long-term committed partnerships compared to men in male biased populations.

### *Predictions*

We predict that the OSR and the proportion of males who are married will be directly related in young adulthood and inversely related in later adulthood. This pattern would indicate that males leverage a low sex ratio to their advantage for increase mating opportunities when young and for securing committed relationships when older. The reversal is expected to occur in the third decade of life, consistent with indicators of male life history shifts from mating effort to parental effort in modern societies. Cities in the United States exhibit variation in the OSR, mostly due to economic migration (Gwin, 2007). In the Northeastern United States, women have moved from predominantly rural areas to large cities for careers in office labor and men have moved to cities in the Western United States for technology oriented careers (Gwin, 2007). This sex ratio variation provides an opportunity to test our hypothesis across populations in one technologically advanced nation. We previously noted this pattern in the 10 largest cities in the USA (Kruger and Schlemmer, 2009). However, these results were based on ZIP Codes as the unit of analysis, and it is highly unlikely that ZIP Code boundaries define separate breeding populations. We attempt to replicate these results here with a broader sample and a more appropriate unit of analysis, the Metropolitan Statistical Area.

### **Method**

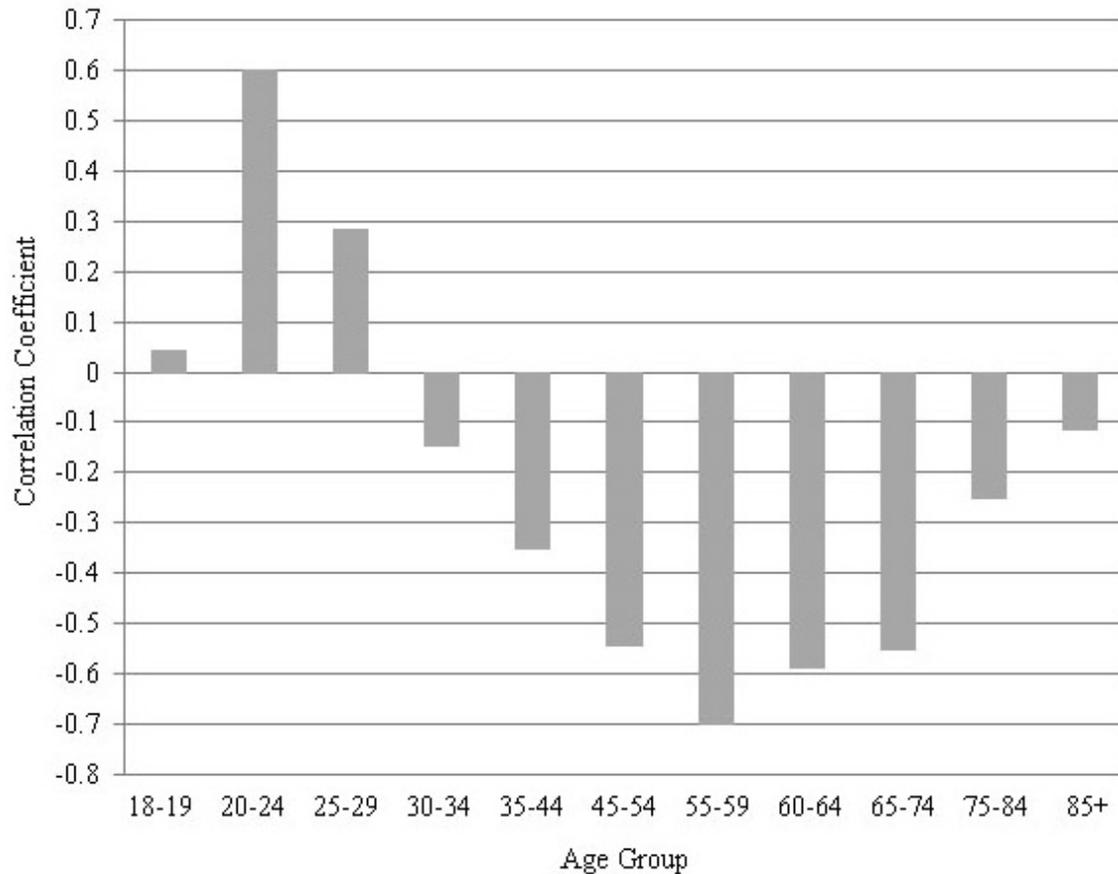
The Operational Sex Ratio (OSR) in humans is operationally defined as the ratio of unmarried men to unmarried women, multiplied by 100. Thus, an OSR of 100 indicates a balance between available men and available women, a male biased OSR of 110 indicates 11 men available for every 10 women available. We calculated the OSR and the proportion of men who were married for the 50 largest Metropolitan Statistical Areas (MSAs) in the United States with 2000 U.S Census data (2001). We calculated these figures separately for each Census age group from the age of 18 years and graphed their correlation within each age group. We also calculated the OSRs for unmarried individuals aged 18 to 64 as a whole in each MSA to examine the extent of regional variation. We examined the relationship between the OSR for ages 18 to 64 with U.S Census data for median family, household, male, and female incomes to identify possible economic confounds.

### **Results**

The OSR for individuals ages 18 to 64 ranged from 88 in Birmingham, AL and Memphis, TN, to 116 in Las Vegas, NV ( $M = 99$ ,  $SD = 7$ ). The OSR had a significant direct (positive) relationship to the proportion of males who were married in the 20-24 and 25-29 year age groups, but a significant inverse (negative) relationship to the proportion of males who were married in the 35-44, 45-54, 55-59, 60-64, and 65-74 year age groups (See Figure 1). The correlation for the 30-34 year age group was negative but not statistically significant and appeared to exemplify a continuous transition. The non-significant correlations for the 75-84 and 85+ year age groups appeared to exemplify an attenuation of the inverse relationship. The strength of the relationships between the OSR and proportion of males married were quite substantial in each direction,  $r^2 = .36$  and  $r^2 = .49$ , respectively in the 20-24 and 55-59 year age groups. There were no significant relationships between

the OSR for ages 18 to 64 and median family, household, male, and female incomes;  $r = .13, .26, -.15, \text{ and } .02$ , respectively (all  $p > .05$ ).

**Figure 1.** Correlations between the Operational Sex Ratio and the proportion of males who are married by age group.



## Discussion

The results confirmed our expectations that the shift in male life history strategy across adulthood in a modern society would moderate the relationship between the Operational Sex Ratio and the proportion of men who were married. Most prominently seen in the third decade of life, there is an increasing tendency for men to use their market scarcity for establishing marital relationships. Young men in female biased populations have lower marital likelihood than their peers in male biased populations, whereas older men in female biased populations are more likely to be married than their counterparts in male biased populations. These findings advance the understanding of the relationship between the OSR and male marital patterns, as previous analyses did not take age into account.

We believe that the male shift towards relationship commitment in female biased populations is a consequence of diminishing returns with age from mating effort for short-

term relationships without marital commitment. Our results suggest that men in modern female biased populations undergo a more dramatic life history shift than men in male biased populations, with a greater emphasis on mating effort for short-term relations in young adulthood. The attenuation of the relationship between the sex ratio and marital likelihood in very late adulthood is likely related to the higher mortality rate for men than women, and the sex differences in mortality rates is especially high among those who are unmarried (Kruger and Nesse, 2006).

The data in this study demonstrate population demographic patterns. Further research may uncover the beliefs and experiences that may relate to this shift in strategies. Longitudinal studies of men living in male and female biased cities could assess whether the degree of psychological, behavioral, and physiological changes correspond with the magnitude of the demographic shift in marital likelihood.

The data available may give a simplified account of the relationship patterns in the populations of interest. For example, men in female biased populations may have a greater ability to obtain simultaneous polygyny, whether they are married or not. Some men may practice serial polygyny, and their ability to secure subsequent partners may be enhanced by their market advantage in a female biased population. The census data indicates an individual's legal relationship status, not the actual number of relationship partners or marital order.

The patterns described here are representative of a modern society with institutionalized (serial) monogamy. In Western industrial cultures social norms promote ostensible monogamy. In other cultures, increased levels of stable simultaneous polygyny may be a legitimate outcome of female biased populations. The vast majority of cultures (84%) allow for simultaneous polygyny (Ember, Ember, and Low, 2007), a likely feature of many human ancestral environments. The data also do not include sexual orientation, and although this may potentially confound other analyses, it would not explain the reversal in the direction of the effect.

As discussed previously, women evaluate prospective partners on socio-economic status and show a preference for men of moderately older age (Buss, 1989), presumably because of the time needed to accrue resources and social status. Male competition for partners is more intense and socio-economic status may be more important in male biased populations (Pollet and Nettle, 2007). Given these patterns, one may wonder about the higher marital rates for young men in male biased cities, how could they be so successful in obtaining partners so early in adulthood? Although males may peak in social status and resource potential in mid to late adulthood, young women in modern populations do not restrict their relationships with such men. Women are more likely evaluating potential partners on the potential for resource provisioning through the period of potential offspring dependency, which can last around two decades in modern human populations. At marriage, men make an explicit commitment to provide such resources gradually as they are needed, rather than instantaneously transferring accumulated resources to female partners in one lump sum. As females usually have greater reproductive incentives for relationship commitments, men offering such commitments and demonstrating resource potential through educational and career trajectories will likely find interested partners.

Given that men in female biased populations eventually shift towards commitment strategies and the relationship between the OSR and the proportion of males married is strongest in the 55-59 age group, one may wonder about the marital expectancies for non-

married middle aged women in female biased populations. Unfortunately for these women, the higher marital rates for older men are likely to benefit women who are substantially younger than their husbands, because of male preferences for partner fecundity (Cunningham, 1986; Tesser and Martin, 1996). We expect to see larger mean sex difference in age at marriage in female biased modern populations than in male biased modern populations.

Overall, this study demonstrates the power of evolutionary life history theory for understanding human behavioral patterns. The pattern of behaviors exemplified here would be difficult to explain with any non-evolutionary theory of relationship behavior. Evolutionary theory is the most powerful framework in the life sciences and has considerably advanced our understanding of human psychology. As this study indicates, the evolutionary framework also holds considerable promise for other social sciences such as demography.

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