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The polygyny paradox: Several male biased populations exhibit a high prevalence of polygyny

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ABSTRACT

Polygyny is the most common mating system in mammals and is widespread in human cultures. The population sex ratio shapes human social patterns and mating strategies. When women are scarce relative to men, one might imagine that a relative surplus of men would predict a greater presence and extent of polyandry, as one woman could find more than one husband. However, we predict that high sex ratios, indicating a relative surplus of men, will instead be more likely to be associated with a greater extent of polygyny, where some men have multiple wives. Although the opposite pattern is numerically intuitive, we base our prediction on the divergence in reproductive strategies between men and women. These sex differences shape how men and women leverage advantages associated with numerical scarcity for different reproductive goals. In support of our hypothesis, five countries with high proportions of men to women (ages 15-64) and a combined population of 33 million individuals have relatively high levels of polygyny, even when controlling for GDP per capita. We demonstrate the power of and evolutionary theoretical framework for understanding behavioral, social, and demographic patterns.

KEYWORDS

Polygyny, Operational Sex Ratio, Sex Differences, Mating Strategies, Marital Patterns

Polygyny is the most common mating system in mammals, probably because females usually specialize in infant care and nutritional provisioning, whereas males tend to specialize in mating effort (Low, 2003, 2007; Reichard & Boesch, 2003). The vast majority (84%) of human cultures documented by anthropologists allow polygyny (Ember, Ember, & Low, 2007). In these populations, a man may take multiple wives; however, men with polygnynous marriages are

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usually high in the status hierarchy. Even in polygnynous societies, most marriages are monogamous. A small proportion of human cultures (1-2%) include polyandry, where one woman marries multiple men. These men are usually brothers, and the practice may result from ecological constraints on population size. For example, in the mountainous terrain of Tibet, fraternal polyandry prevents the scarce farmland from division into parcels that would be too small to support a family (Goldstein, 1987).

The relative proportions of reproductively capable males and females in a population have a strong influence on reproductive dynamics across species. Darwin (1871) noted that the higher average reproductive success of the scarcer sex would tend to maintain a stable equilibrium over evolutionary time. Darwin (1871) also noted that some human populations will have imbalanced sex ratios at certain times, and in these populations, the rare sex would have an advantage in the mating market (see also Fisher, 1930).

The relationship between variation in the sex ratio and marital systems has yet to be explored. If humans were perfectly rational and the sexes had identical roles in reproduction, a relative surplus of men would predict a prevalence of polyandry, as one woman could find more than one husband. On the other hand, a relative surplus of women might be associated with a greater extent of polygyny, as there would be more marriageable women than there would be marriageable men. Yet, we have reason to believe that the opposite will be true, that high sex ratios, indicating a relative surplus of men, will be associated with a greater extent of polygyny. Although an association between polyandry and a relative surplus of men is numerically intuitive, we base our prediction on the divergence in reproductive strategies between men and women. These sex differences shape how men and women leverage the advantages associated with numerical scarcity for different reproductive goals.

Sex differences in reproductive goals are rooted in gamete production. Sexual reproduction involves the combination of gametes, and disruptive selection for gamete size results in parents that specialize in producing either large or small gametes (Bulmer & Parker, 2002). By definition, females produce larger gametes and males produce smaller gametes. Most contrasts between females and males ultimately stem from this sex difference in investment. Because females invest considerably more in gametes, and invest relatively more than males in offspring beyond gamete size in most animals and all mammals, they are inclined to be more selective in considering partners (Bateman, 1948; Trivers, 1972). High female investment in offspring, including a 9-month pregnancy, breastfeeding, and childcare, results in numeric constraints on their reproductive success. On the other hand, males are limited more so by their ability to secure mating opportunities (Darwin, 1871). Thus, men invest more in reproductive effort at the expense of somatic effort, and more in mating effort at the expense of parental effort, compared to women (Stearns, 1992).

In female biased populations, where women are more plentiful than men, there is less incentive for men to provide relationship commitment and paternal investment (Pederson, 1991) and greater returns on mating effort. These conditions are associated with a destabilization and devaluation of marriage, as indicated by higher divorce rates, more out-of-wedlock births and single mother households, and

lower paternal investment (Guttentag & Secord, 1983; Trent & South, 1989). Across nations, those with greater proportions of women (e.g., Lithuania, Latvia, Estonia, Ukraine) show relatively more promiscuous mating strategies (Schmitt, 2005).

As the sex ratio becomes more male biased, intrasexual competition among males increases, as indicated by greater sex differences in body size (Mitani, Gros-Louis, & Richards, 1996). When female Rhesus macaques outnumber males, it is difficult for the dominant males to monitor all of the fecund females. However, when females are scarce, dominant males are able to control females and ward off competitors (Berard, Nürnberg, Eplen, & Schmidtke, 1993). In human societies, men compete for female partners both directly through physical competition and through resource acquisition and signals of willingness to commit to long-term relationships and provide resources for offspring. These competitions are exacerbated when women are scarce (Pederson, 1991), resulting in relatively low status men with fewer resources having greater difficulties in finding a partner. For example, Pollet and Nettle (2007) found that men in US states with high sex ratios needed jobs with 2-3 times the occupational prestige to get married as men in states with low sex ratios.

Men also use their social power to constrain female advantages from scarcity and high sex ratios are associated with an emphasis on traditional sex roles (Guttentag & Secord, 1983). The stresses on sexual morality are especially prominent for women (Guttentag & Secord, 1983), as the primary physiological engines of reproduction become an ever more scarce resource. This leads to practices that attempt to enforce a monopoly on women's reproductive output, with extreme cases such as the confinement of high-caste women to their homes in India and surgical infibulations to prevent women from having intercourse in the Sudan and other parts of Africa (Daly & Wilson, 1978).

We propose that the intensification of male competition for female marital partners and the higher salience of women as the limiting factor in reproduction will lead to a greater acceptance and prevalence of polygyny in societies with high male numerical bias. Men with high social status, economic power, and resource holdings will attempt to monopolize as much reproductive output as possible by creating legally binding unions with multiple women. We are making this prediction for the prevalence of polygynous marriages, where control of women's reproductive output is socially sanctioned, rather than polygynous matings in terms of sexual promiscuity. As reviewed above, sexual promiscuity (and the associated paternal uncertainty) decreases when women are scarce.

METHODS

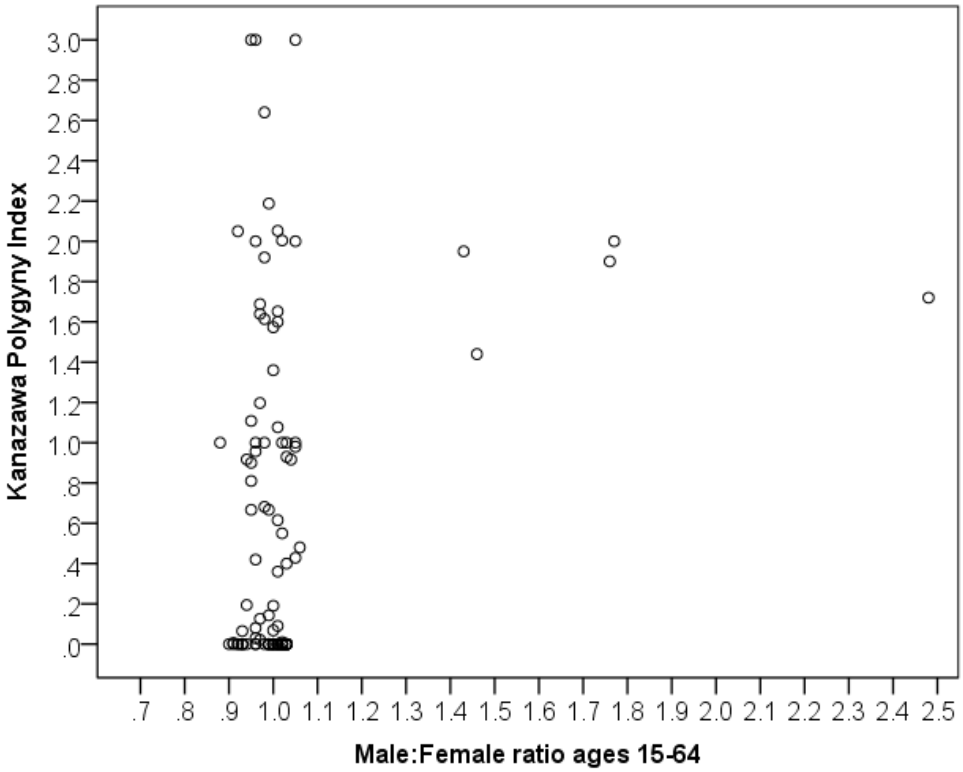
We tested this hypothesis with publicly available data on relevant constructs across nations. We included the proportion of men to women for ages 15-64 from the USA's Central Intelligence Agency's World Factbook (https://www.cia.gov/library/publications/the-world-factbook/). We included the polygyny index created by Kanazawa and Still (1999) based on anthropological classifications of the degree to which polygyny is accepted and considered widespread. We examined the relationship between these two indicators, and their

unique relationship when controlling for Gross Domestic Product (GDP) per capita, also provided by the CIA World Factbook. We used CIA data from the years closest to the publication of Kanazawa and Still's (1999) polygyny index (usually from 1999 or 2000).

RESULTS

Confirming our hypothesis, countries with a relatively higher proportion of men to women ages 15-64 have higher levels of polygyny, $r(101) = .272$, $p = .006$. This relationship is still significant when controlling for GDP per capita, $r(59) = .321$, $p = .012$. Five countries with high proportions of men to women (ages 15-64) have relatively high levels of polygyny, even when controlling for GDP per capita. There were no countries with high sex ratios exhibiting trends of lower polygyny.

Figure 1. Prevalence of polygyny by the ratio of adult men to women.



DISCUSSION

Our study provides further evidence for how the sex ratio shapes human social patterns. Additionally, we demonstrate the power of evolutionary theoretical framework for understanding behavioral, social, and demographic patterns. The more populous sex faces greater intra-sexual competition for partners, and the

intensity of male competition in male biased populations leads to a higher skew in male reproductive outcomes. Men have greater recognition of women as a scarce reproductive resource, and attempt to monopolize as much of women's reproductive output as possible. Thus, they establish legally and/or socially sanctioned marriages with multiple women when possible to increase their advantage over male competitors. We note that this pattern applies to polygynous marriage, not polygynous matings, which are more prevalent in female biased populations.

There are likely many factors related to the prevalence of polygyny across human populations, and considerable variation exists across populations with nearly balances sex ratios. The five nations with both high sex ratios and high degrees of polygyny (Bahrain, Kuwait, Qatar, Saudi Arabia, and United Arab Emirates) are all in predominantly Muslim Middle Eastern nations where polygyny is legally permitted. These countries represent a combined population of over 33 million individuals, and thus a substantial demographic pattern.

We do not make a prediction for the extent of polyandry. Human polyandry is relatively rare and women's strategies are constrained by male social power. In pre-literate societies with high sex ratios, husbands were allowed to severely punish their wives for acts of infidelity Guttentag & Secord, 1983). Consequently, women were unable to use their market scarcity to their advantage in mating competition and instead were treated as their husband's property.

Limitations

We base our analyses on the best data available, although we recognize that these are not perfect indicators of the intended constructs. The accuracy of census data may be questionable in many countries. The polygyny indicator is based on classifications of the degree to which polygyny is accepted and considered widespread. The legal status of polygyny may affect the accuracy of measures indicating its prevalence. A quantitative indicator of the distribution of male marital partners would provide a more sophisticated analysis. These limitations would interfere with our ability to identify a relationship between male numerical bias and polygyny, rather than provide an alternative explanation. Finding the predicted relationship suggests that even crude and approximate indicators are sufficient to reveal a genuine association.

Future Research

We base our analyses on demographic indicators at the population level. Future research may incorporate individual level data from psychological measures; attitudes towards polygynous marriage for example. Examination of indicators at multiple levels would produce a more comprehensive understanding of the relationship between the sex ratio and marital patterns.

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