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The causes and consequences of women's status in Himba pastoralists

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ABSTRACT

Gender inequalities in status and prestige are common across many populations, but while considerable attention has been paid to understanding the drivers of men's status, the causes and consequences of women's status have received scant attention, particularly outside industrialized contexts. We combine demographic, health and dyadic rating data from an endogamous community to show that women of higher status have improved outcomes for themselves and their children. We find perceptions of generosity, intelligence, and respectfulness best predict women's status. Women of greater status marry higher quality partners and have children with better growth outcomes, results similar to those found for men across cultures, but rarely demonstrated in women. The results suggest women's status can be an important driver of fitness-related outcomes, and should be considered alongside men's status in evolutionary studies.

1. Introduction

Across a wide spectrum of group living mammals, status has direct benefits on reproductive success. Historically, the majority of these studies focused on males, with repeated demonstrations of dominant males attracting more partners (Cowlishaw & Dunbar, 1991; Huck & Banks, 1982), and having increased access to fertile females (De Ruiter & Van Hooff, 1993; Dixon et al., 1994; Le Boeuf, 1974). While male dominance hierarchies are often more visible (via male-male aggression and stronger reproductive skew), there is a large literature in behavioral ecology illustrating similar relationships among females (for reviews see Fedigan, 1983; Majolo et al., 2012; Pusey, 2012). These studies are representative of a shift in the discipline that breaks down traditional dichotomies of competitive males and passive females and represents status as a critical feature in both sexes (Clutton-Brock & Huchard, 2013; Hrdy, 2000; Stockley & Bro-Jørgensen, 2011). A key sex difference, however, is how status leads to improved fitness (Fedigan, 1983). Reflecting basic principles of sexual selection, higher status among males tends to correlate with advantages in intrasexual competition, and subsequently greater mating success. Males may compete directly for females or for the resources that attract females (Robinson, 1982). For females, higher status is often associated with preferential access to resources, which can improve fecundity and offspring survival (Holekamp et al., 1996; Hurst, 1987; Murray et al., 2006; Thompson et al., 2007). More dominant females in some species are also able to suppress the reproduction of lower-ranked conspecifics and outcompete subordinates for access to mates (Wasser & Barash, 1983). Relatedly, another consequence of the breakdown of the traditional sexual selection dichotomization is the increased attention to male choice (Edward & Chapman, 2011; Gwynne, 1991; Kokko & Monaghan, 2001), with empirical studies pointing to the role of status in female intrasexual competition for mates (Clutton-Brock et al., 2006; Szykman et al., 2001; Zumpe & Michael, 1989).

In the human literature, studies of status continue to be male-biased, with emphasis on the roles of both dominance and prestige in male-male competition (Cheng, 2020; Henrich & Gil-White, 2001; Redhead & von Rueden, 2021; von Rueden, 2014; von Rueden et al., 2011; von Rueden et al., 2019). A large literature within evolutionary anthropology, particularly from small-scale societies, has emphasized the role of male status across subsistence strategies, environments, and cultural repertoires (for a recent review see von Rueden & Jaeggi, 2016). Male status has been linked to a variety of attributes including physical size and strength (Blaker & van Vugt, 2014; von Rueden et al., 2008), income and wealth (Cronk, 1991), hunting ability (Gurven & von Rueden, 2006; Smith et al., 2003), social connectedness or position (von Rueden et al., 2008; von Rueden et al., 2018), education (von Rueden et al., 2018; von Stumm et al., 2010), and sense of humor (Giritlioglu & Chaudhary, 2022), among others. In turn, these traits, serving as proxies for status,

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have been linked to greater reproductive success (Cronk, 1991; Gurven & von Rueden, 2006; Hopcroft, 2006; Pawlowski et al., 2000; Smith, 2004; Turke & Betzig, 1985; von Rueden, 2014; von Rueden & Jaeggi, 2016).

In contrast, the predictors of women's status and their impact on women's reproductive success is largely underexplored, and women's status is often represented as secondary to men's. One reason for this is that women have historically been less visible in status-seeking roles. For example, cross-culturally, men are more likely than women to hold formal positions of leadership. In one comparison, 88% of societies prohibited women from holding formal political positions (Whyte, 1978). In addition, the gendered division of labor common in many societies often allowed men more frequent travel opportunities and greater access to high value resources, allowing them to diversify their social networks though resource exchange and cooperation and gain status (Pasternak et al., 1997). At the same time, women's greater emphasis on the domestic sphere, including childcare, can constrain opportunities to network, limiting their opportunities to gain status (Moore, 1990; Werner, 1984). For example, Tsimane men had 34% more cooperation partners than women had, including 305% more non-kin partners, which partially accounts for sex differences in leadership (von Rueden et al., 2018).

Others have highlighted sex differences in control over resources, ties with kin, and participation in warfare as explanations for status differentials between men and women (Garfield et al., 2019; Glowacki et al., 2020; Low, 1992; Reiter & Rapp, 1975; Smith et al., 2021; Yanca & Low, 2004). However, our understanding of women's status has also been hampered by the fact that most anthropological studies of status were historically conducted by male scientists, informed by male interlocutors, often presenting inaccurate or only partial accounts of women's roles (Fox et al., 2023; Post & Macfarlan, 2020; Reiter & Rapp, 1975; Weiner, 1976). As an example, in a sample of ethnographic texts from eHARAF, only 30 of 1212 texts across 59 non-industrial societies directly discuss female leadership (Garfield et al., 2020). As the number of women contributing ethnographic texts represented in cross-cultural databases increases, so too does the amount of female specific subject matter, although thus far, quantitative studies haven't shown increased reporting of female leadership (Garfield et al., 2020; Post & Macfarlan, 2020). However, the qualitative, ethnographic literature often contains rich description of the ways in which women's status can manifest across productive, reproductive, political and ritual domains (Kramer, 2023; Quinn, 1977).

One of the richest areas of study on women's status comes from the literature on matriliny. Descent type has long been thought to play a role in gender egalitarianism and female autonomy, where matrilineal and double descent systems grant women more power in domestic and public spheres (Scelza et al., 2019; Schneider & Gough, 1961). In cross-cultural samples, evidence suggests that women in matrilineal societies are more likely to hold formal political positions than women in patrilineal populations (Low, 1992). Inheritance type has also been shown to impact sex differences in assessments of risk and competitiveness, which can influence tolerance for competition and risk associated with leadership responsibilities (Lee Cunningham et al., 2023; Marinova et al., 2013; van Kleef et al., 2021). Cross cultural comparisons of risk highlight a smaller sex difference in risk aversion in matrilineal communities compared to patriarchal ones (Gong & Yang, 2012). Similarly, prior to schooling, matrilineal girls are less risk adverse than boys, but this reverses after attending school with boys from more patriarchal groups as children from matrilineal communities appear to adopt outgroup gender norms (Liu & Zuo, 2019). Similar results are seen in studies of competition, where matrilineal women have stronger preferences for competition, while the opposite is true for men in more patriarchal societies (Gneezy et al., 2009). Unlike girls in patriarchal groups, girls from economically similar matrilineal groups show no decline in competitiveness at puberty (Andersen et al., 2013). These studies indicate that sex differences in competition are likely the result of cultural norms and local incentive structures rather than biology (Cassar & Zhang, 2022), and those norms and incentives may be fundamentally different in matrilineal populations. These features may contribute to women's greater power, status, and leadership in matrilineal populations.

More broadly, matrilineal/matrilocal societies are associated with increased autonomy and decision making power for women, greater social network connectivity and less restrictive norms related to mobility and sexuality (Biery, 1971; Mattison et al., 2021; Yanca & Low, 2004). One recent study showed that women in matrilineal societies have lower incidence of intimate partner violence, more say in household decision-making, and have smaller gender gaps in the education of children relative to patrilineal populations (Lowes, 2022). Another study, comparing matrilineal and patrilineal Mosuo communities showed that women in matrilineal communities had less son-biased fertility preferences and better markers of cardiovascular health (Mattison et al., 2016; Reynolds et al., 2020). While these studies did not measure status directly, they indicate that communities where women have greater autonomy and power are also ones where women's health and well-being is improved.

There are multiple plausible pathways for women to leverage their status to increase reproductive success. Unlike men, women don't typically utilize status to increase their number of marital or sexual partners. Instead, women may brandish clout to increase their number of alloparenting partners, child health, child survival, and children's social and reproductive success (Alami et al., 2020; Kramer, 2023; Low, 1992; Lowes, 2022). One way to utilize status is by influencing others to engage in collective labor. This should be particularly important where cooperative labor is necessary for subsistence, so that individuals with greater access to pools of labor increase household level returns, and thus calories to children. In Ecuadorian forager horticulturalists, women's status (and to a lesser extent – men's status) predicted access to labor pools which were necessary for building, garden work, and the fabrication of canoes (Bowser & Patton, 2010). Status also predicted garden richness, as women in this community increase garden diversity by sharing plant propagules with others. In turn, greater garden diversity and recruitment for collective labor may increase household level subsistence returns which can be utilized to bolster offspring nutrition. High status women may also gain advantages in intra-household decisions over resource allocations, which they can divert to benefit children's health. Extensive evidence suggests that when women gain more control of household income it is preferentially used to benefit their children (Handa, 1996; Lundberg et al., 1997). In Brazil, income controlled by mothers as compared to fathers resulted in a 20 fold increase in child survival (Thomas, 1990). Among Tsimane forager-horticulturalists, husbands and wives are often in conflict over labor and spending decisions (Stieglitz et al., 2011), but women with higher status are able to exert more control over household level decision making and men's engagement in wage labor (Alami et al., 2020). In turn, children of high-status women had better anthropometric outcomes and were less likely to be diagnosed with anemia, gastrointestinal or respiratory infections. Cultural norms related to women's autonomy in decision making vary, but these results suggest that when women gain social power relative to their husbands, they can redirect household resources to increase reproductive success through investments in their children.

While the benefits of high status for women have been clearly shown in a number of societies, we know less about how women gain status in the first place. In industrialized contexts there is significant research on women's leadership, which highlights gendered differences in leadership styles and contexts (Appelbaum et al., 2003; Eagly & Johnson, 1990; Van Vugt & Spisak, 2008). Only a few studies have been done in non-industrialized, small scale, and politically acephalous populations like the ones where we conduct our research. Age may play some role in women's ability to attain status. Older and post-menopausal women are more likely to be freed from the demands of childcare and may be able to exert influence over younger women and other family members (Brown

et al., 1982). Other predictors of status like subsistence productivity, prosocial personality traits or social connectedness, which have been demonstrated in men, have also been shown to be important to women's status (Bowser & Patton, 2010; Garfield & Hagen, 2020; von Rueden et al., 2018, 2008). Alternatively, it may be that the predictors of women's status differ from those of men's, just as mate preferences differ between the sexes (Buss, 1989; Vandermassen, 2008).

In this study we aim to address several of the gaps in the current literature on women's status by using multi-modal data from a longitudinal study of Himba pastoralists. We note that interpretations of status and methods of measuring status are numerous, and are often conflated with domains that may result in status, or may be the product of status. For example, socio-economic position and resource access can lead to influence over others, but leveraging influence can also result in increased socio-economic position (von Rueden & Jaeggi, 2016). Likewise, personality traits, individual expertise in relevant domains, and other performance characteristics can either lead to or magnify status. In this study, we don't intend to disentangle this complexity, but instead we seek to better understand the role of status in women in this community. First, we use these data to ascertain predictors of both men's and women's status, and look for sex differences in the predictive value of various traits. We then look at how status affect's desirability as a romantic partner for both men and women, as well as the degree to which status is correlated among spouses. Finally, we investigate the impacts of mother's and father's status on the health of their children.

2. Methods

2.1. Study site

Himba are an ethnic minority living in northern Namibia, closely related to the larger and more market integrated Herero. The focal study community includes 40–45 households residing about 150 km outside of the regional capital of Opuwo. As agro-pastoralists, Himba continue to maintain a largely subsistence-based diet of milk and meat from their herds, subsidized with store-bought or garden-grown maize and other staples like rice, sugar and tea. Households are multigenerational and consist of between 5 and 25 individuals, with some members residing seasonally in cattle and goat posts in the surrounding hillsides.

Himba have a number of cultural traits that make them an interesting case study for exploring the causes and consequences of women's status. First, Himba are one of the few societies that practice double descent, a system where men and women trace their descent through both patrilines and matrilines (Gibson, 1956; Murdock, 1940). Like most double descent systems, where inheritance is typically biased in favor of one descent group, Himba men inherit the vast majority of cattle wealth through the matriline. In contrast, the patriline only passes a few sacred livestock, ritual rites, and land use rights from father to son (Bollig, 2006; Scelza et al., 2019). Although Himba are patrilocal, the matrilineal bias in inheritance of wealth may imbue women with more autonomy than similar patrilineal-patrilocal groups (Low, 1992). This is exemplified by several reproductive practices that signify a high level of female autonomy and decision making. The majority of men and women, married and unmarried, have concurrent partnerships (Scelza & Prall, 2018, 2023). This practice is maintained by sets of norms that moderate conflict between men and maintain equality in investments to women and children regardless of paternity (Prall & Scelza, 2020b; Scelza et al., 2019; Scelza et al., 2021; Scelza, Prall, & Starkweather, 2020). Women also have a great degree of freedom of movement, despite patrilocal residence, indicating a high degree of autonomy in personal decisions (Scelza, 2011). Together, these factors suggest that Himba women may have higher relative status compared to women in other pastoralist groups.

2.2. Data collection

Data used as part of this study comes from a 10+ year demographic project with Himba pastoralists living in northwest Namibia, including marriage and birth records and informal relationship histories. Age was calculated based on the local year-name system (Scelza, 2011). Residuals for age specific fertility were calculated for men and women separately, using a simple gaussian regression with polynomials for age (squared and cubic). Residuals were standardized and used as predictors in the models described below. Self-reports of livestock numbers were collected for all individuals. Although only men own large numbers of cows, the main form of wealth in the community, women may own small numbers of cows as well as other livestock (sheep and goats). Several women in the study community are known to be fairly wealthy, with very large goat herds. Livestock counts were converted into tropical livestock units using standard conversion metrics (Bollig, 2006). Additionally, we collected opportunistic longitudinal anthropometrics on adults and children, including weight via a standard scale, and height via a stadiometer. Demographic and anthropometric data was collected as far back as 2010, with the majority of data, including all trait data described below, collected between 2016 and 2019. Oral consent was obtained from all participants in accordance with approved study procedures by the UCLA institutional review board (IRB-10-000238).

Status and other individual measures were assessed using a peer rating task on a tablet computer. Participants were shown a series of randomized headshots of community members. For each trait, participants were ask to respond to the set of photos and rate whether or not the person was [trait], with a binary response of "yes" (for the presence of the perceived trait) or "no" (response for absence of perceived trait, coded as 1/0 respectively, see Fig. S1 in Prall & Scelza, 2020a). These traits included the ratee being interpreted as physically attractive, generous, respectful, hardworking, intelligent, and influential. For status we use the most proximate and locally relevant term for leadership and influence (*omunene omua*). This term is used to describe people in the community who have the qualities of a good leader and who garners influence and respect. It is not limited to people in formal leadership positions, but rather can be used to describe anyone in the community, making it most relevant for our task. Participants rated a selection of all community members on all traits except attractiveness, where they only rated opposite sex individuals. Participants completed 10–20 ratings for each of the 5 traits, resulting in a dataset with >10,000 ratings of 365 individuals. Additionally, to assess the desirability of community members, participants rated a set of up to 100 opposite sex individuals using a Likert scale of how much they wanted to be in a romantic relationship with that person, with the option to skip close kin and unknown individuals. These peer ratings ($n = 12{,}362$ of 304 individuals) were then modeled to estimate a single score for desirability (Prall and Scelza, 2022).

2.3. Analysis

2.3.1. Estimating predictors of status

We examine the effects of a number of individual level traits in predicting influence ratings. As many of these other traits were collected at the same time as the influence rating, and therefore have their own multilevel structure, we independently predicted ratee traits using a multilevel Bernoulli model, with varying intercepts for rater and ratee. To get a point estimate for ratee trait values, we calculate a posterior median for each individual ratee. These estimates are then used as predictors in models estimating influence ratings. We include a varying intercept for ratee sex, and varying slope for the ratee trait estimate and ratee age (M1).

$$Influential \sim Bernoulli\ (p)$$

$$logit(p) = \alpha + \alpha_{rater} + \alpha_{ratee} + \alpha_{sex} + \left(\beta_{age} + \beta_{sex[age]}\right)^{*}age + \left(\beta_{trait} + \beta_{sex[trait]}\right)^{*}trait$$

2.3.2. Status and desirability

To estimate the influence of women's status on their desirability as a partner, the posterior median for each ratee as described above was used to estimate of influence. We use a similar approach to calculate mate value from a large dataset of desirability ratings, calculating the posterior median from a multilevel cumulative ordered logit model (see Prall & Scelza, 2022). This allows us to generate a single zero-centered estimate that doesn't rely on the cumulative ordered distribution from ordinal data. We predict these desirability coefficients in a Gaussian model with standardized age and age corrected influence estimates (ς below, M2). Since we have no prior expectation about the influence of these predictors on desirability, and suspect that effects may be non-linear, we use the *s()* function to estimate thin plate regression splines for each, defined as $\Sigma W_k A_k$ below. A distributional component is also included, as age or status may influence the variation in desirability outcomes.

$$Desirability \sim Normal(\mu, \sigma)$$

$$\mu = \alpha + \Sigma W_{k_{age}} A_{k_{age}} + \Sigma W_{k_\varsigma} A_{k_\varsigma}$$

$$\sigma = \alpha + \beta_{age}{}^{*}age + \beta_\varsigma{}^{*}\varsigma$$

To assess correlations between status estimates in men and women within marital and nonmarital relationships, we estimated residual correlations between these two variables in a multivariate framework (M3). Residual correlations were estimated for all dyads, and for spouses and informal partnerships separately. Results of these Bayesian residual correlation estimates largely conform to simple Pearson's correlations.

2.3.3. Status and child anthropometrics

To evaluate the impact of status estimates on child anthropometrics, age and sex specific standardized residuals for height and weight measurements on all children were calculated using Gaussian models with sex specific splines for age, allowing us to leverage the full sample from the database ($N > 600$) to estimate standardized residuals. We excluded any measurement >/< 2.5 standardized residuals assuming measurement or recording error. Anthropometric residuals were then estimated using a Gaussian model (M4), correcting for individual child and parent as varying intercepts, and including parent influence estimates (ς below), and interactions with influence on child age and sex. Child age and sex are not included as individual predictors since these variables were already corrected for when calculating anthropometric residuals. Parents' average anthropometric parameter (PV below) was added to correct for heritability. To avoid the multicollinearity associated with using both mother and father's status estimate and to maximize sample sizes, parents' influence on children's anthropometrics was estimated separately, and parameters compared.

$$Residuals \sim Normal(\mu, \sigma)$$

$$\mu = \alpha + \alpha_{id} + \alpha_{parent} + \varsigma^{*}\beta_\varsigma + age^{*}\varsigma^{*}\beta_{age.\varsigma} + sex^{*}\varsigma^{*}\beta_{sex.\varsigma} + PV^{*}\beta_{PV}$$

2.3.4. Analysis details

All analyses were run in R, with all models fitted to RStan via the package *brms* (Bürkner, 2017; R Core Team, 2020; Stan Development Team, 2019). All models used three chains with 6000 iterations per chain, half warmup, and $\widehat{R}$ values were used to assess convergence. All models included regularizing priors for standardized predictors ($\beta \sim Normal[0, 2]$) and variance parameters ($\sigma \sim Exponential[1]$), except for thin-plate regression splines, which relied on the default student-t priors. Other packages used for data cleaning and visualization include *tidyverse*, *janitor*, *modelr*, *tidybayes*, *cowplot*, and *ggridges* (Firke, 2021; Kay, 2020; Wickham, 2017, 2020; Wilke, 2017, 2021). Below we report posterior medians (β) and 95% credible intervals (CI). Sample sizes and model descriptions are reported in Table 1.

3. Results

3.1. Predictors of status

To assess the differential impact of various traits on men and women's status, we compare varying slopes of these predictors by ratee sex (Fig. 1). Comparison of varying slopes estimates for women indicates that generosity, respectfulness, and intelligence are the strongest predictors of influence, while fertility is the weakest, and wealth has no predictive power on whether a woman is assessed as influential. In men, attractiveness, generosity, intelligence, and respectfulness are the strongest predictors of influence. Attractiveness, wealth, and fertility have a larger effect on status in men than women. None of the traits used here more strongly predict status in women than men, but attractiveness, wealth and fertility predict status in men better than in women. Fig. 1B illustrates the model predictions of these eight traits by sex.

3.2. Status on desirability

Model results indicate that, when correcting for the non-linear impact of age, residuals for status positively predict desirability (Fig. 2A). Age has a substantial non-linear impact on the outcome, where desirability peaks in the early 20s before a decline (Fig. 2B). In the distributional component of the model, influence predicts reduced variance in desirability estimates ($\beta = -0.25$, CI $= -0.41$ to -0.09), while age has no impact.

3.3. Homogamy in status

Correlation estimates show that, when all dyads are considered, men and women have positively correlated estimates of status ($r = 0.29$, CI $=$ 0.08 to 0.45). When estimates are separated into marital and non-

Table 1
Sample sizes and model descriptions. Model numbers correspond with formulas listed in the methods section.

Model #	Outcome	Goal	Sample size	Model type
M1	Status assessments	Predicting the impact of various predictors by sex	$N = 1373$–2523 ratings $N = 113$–114 raters $N = 194$–353 ratees	Multilevel Bernoulli model
M2	Desirability estimate	Predicting the influence of status on women's desirability scores	$N = 172$	Gaussian distributional regression model
M3	Status estimates	Examining status correlations in partnerships	$N = 127$ for all dyads $N = 70$ for marital dyads $N = 57$ for non-marital dyads	Multivariate Gaussian for residual correlations
M4	Anthropometric residuals	Predicting the influence of status on children's anthropometrics	$N = 136$–323 residuals $N = 92$–215 children $N = 29$–89 parents	Gaussian multilevel model

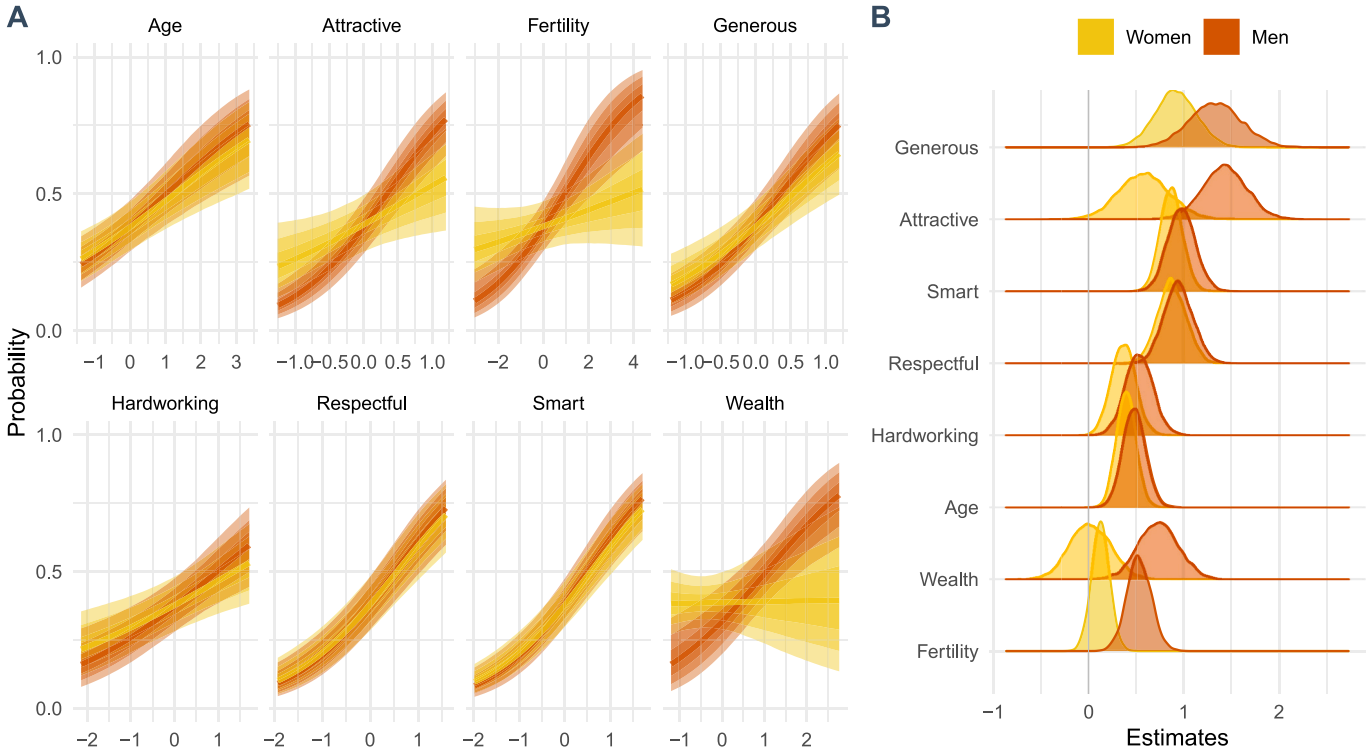

Fig. 1. Sex differences in predictors of status. A. Posterior predictions of the influence of eight standardized traits on status ratings in men and women (interval shading represents 50%, 80%, and 95% credible intervals). B. Posterior of varying slopes of these same traits by sex, illustrating that attractiveness, wealth, and fertility are the only traits that seem to have differential associations with status by sex.

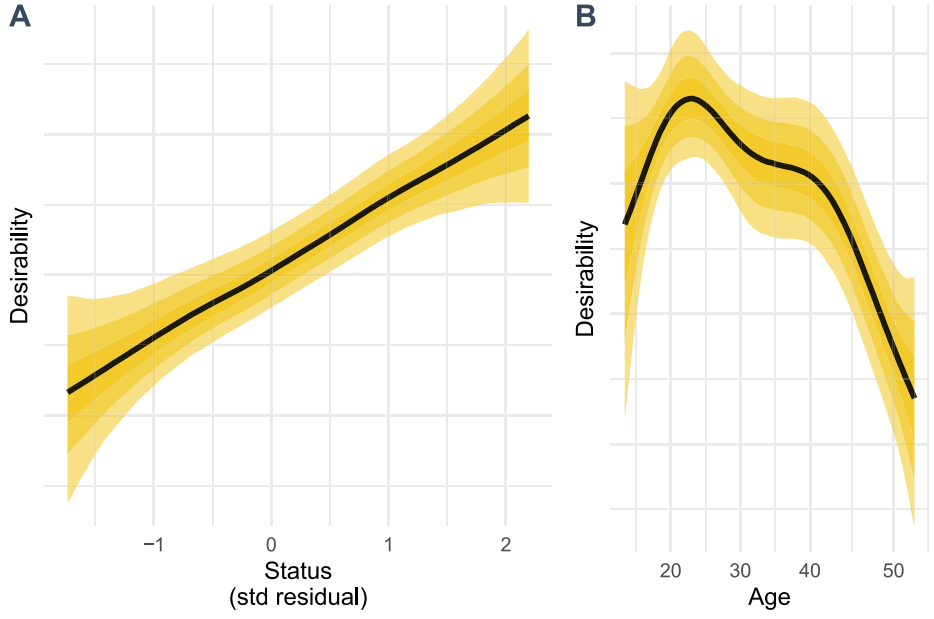

Fig. 2. Influence estimates on women's desirability. A. Posterior predictions of the influence of age-corrected standardized residuals for status estimates on coefficients of desirability. B. The independent posterior prediction of age on women's desirability in the same model.

marital relationships, spouses tend to have stronger associations in status ($r = 0.33$, CI = 0.08 to 0.53) than do boyfriends and girlfriends ($r = 0.17$, CI = −0.14 to 0.44, Fig. 3). For comparative purposes, we calculate this same correlation in Tsimane data collected by Alami et al. (2020a) Although different methods are used in this study, results indicate that married Tsimane men and women's status is similarly positively correlated ($r = 0.31$, CI = 0.07 to 0.52). This estimate is slightly lower than a previously reported correlation in leadership scores of Tsimane spouses ($r = 0.523$ in von Rueden et al., 2018).

3.4. Status and children's anthropometrics

To assess the influence of mother's and father's status estimates on child anthropometrics, separate sets of models were run for mothers and

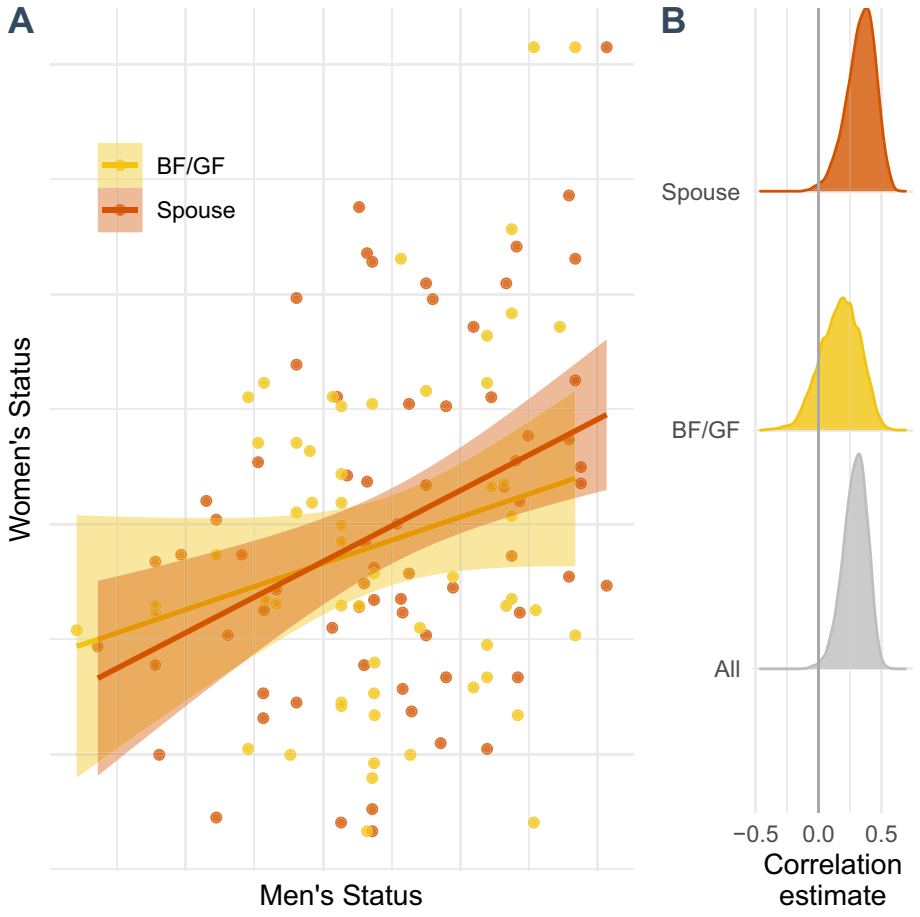

Fig. 3. Status correlation estimates. A. Scatterplot of status estimates in men and women by relationship type. B. Posterior distributions of correlation estimates for dyads by relationship type.

fathers (Fig. 4). Overall the impacts of parental status on child outcomes are specific to anthropometric type. Maternal status has a small but consistent positive effect on standardized residuals for child height ($\beta =$ 0.13, CI = 0.08 to 0.24), particularly for younger children ($\beta = -0.08$, CI = −0.17 to 0.00). However maternal status has no impact on standardized residuals for child weight, and interaction effects indicate positive effects of BMI are specific to older children ($\beta = 0.16$, CI = 0.00 to 0.31). Sample sizes are much smaller for fathers (see Table 1), but

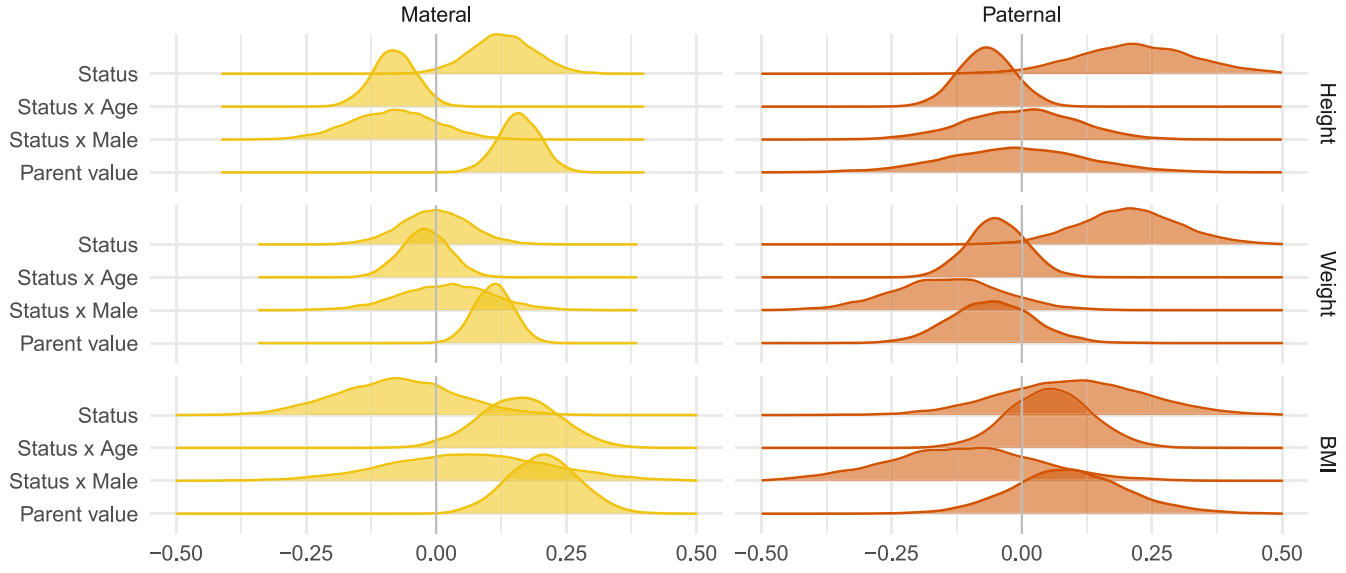

Fig. 4. Effects of status on children's anthropometrics. Posterior distributions of the predictors of standardized residuals for children's height, weight, and BMI are shown. Parent value refers to average anthropometric measurement used as a predictor, to correct for heritability of those measures.

paternal status positively predicts both height ($\beta = 0.22$, CI = 0.01 to 0.45) and weight ($\beta = 0.21$, CI = 0.02 to 0.40), has no effect on BMI, and little impact in interactions with child sex or age.

Average parent anthropometric values were included in these models to correct for the influence of heritability on anthropometrics. Notably, while maternal averages positively predict child residuals, none of the paternal values have any impact on child anthropometrics. This discrepancy is likely due to the high non-paternity rate in this population, diluting the impact of heritability in these estimates (Scelza, Prall, Swinford, et al., 2020). One potential confounding issue with inclusion of these parental averages is that they may also independently correlate with status. For example, maternal status estimates and average maternal weight are positively correlated ($r = 0.35$, CI = 0.12 to 0.54), but when maternal average value is removed from this model, maternal status still has little impact on child weight or BMI ($\beta = 0.05$, CI = −0.07 to 0.17; $\beta = 0.03$, CI = −0.17 to 0.24 respectively).

4. Discussion

In line with the few previous empirical studies on women's status in small-scale societies (Alami et al., 2020; Bowser & Patton, 2010; von Rueden et al., 2018), results of this project suggest that women's status is an important driver of fitness related outcomes, and needs to be considered in tangent with men's status. This is the first such result from a pastoralist population, which is notable given that in this context men hold the majority of livestock wealth and almost all formal leadership positions. When asked to name individuals who make up an informal "council of elders" used in dispute resolution, Himba tend to name men, although not exclusively. Similarly, all formal and informal political offices and chiefly hierarchies, as well as heads of matrilineal lineages are all filled by men (Bollig, 2006). However, Himba women can be heads-of-household, and several female-headed households exist in the study area, with ownership over large goat herds. The practice of double descent with matrilateral inheritance may imbue Himba women with more autonomy, decision-making powers, and status, even though men still dominate formal, political roles. This is similar to the ways that gender roles relate to status in other matrilineal societies (Low, 1992).

Our findings reveal few sex differences in the traits that predict status. Women's status is best predicted by generosity, respectfulness, and intelligence, but we identify no trait that better predicts women's status over men's status. Our results are similar to those from Chabu foragers, which show many similarities in social and cognitive traits between male and female leaders versus non-leaders, with the exception of aggression (Garfield & Hagen, 2020), but contrasts with some broader cross-cultural studies of sex differences in status. For example, Buss et al. (2020), in a cross-cultural study examining perceived importance of traits on status ratings, find that men's status is more closely associated with "protection ability," athleticism, and "hunting ability", while status in women was more closely associated with physical attractiveness and domestic skills such as cooking ability and child-care. However, cross-cultural results like these measure opinions about the importance of different traits, rather than rating known people who vary on the proposed traits. Participants were asked about a wide array of traits, including many that would not have been relevant to them (e.g. university students being asked about witchcraft and hunting ability). Details about the populations being studied were not included in the paper, beyond age and country of origin, making it difficult to parse whether the traits being asked about were relevant to the individuals in the study. Peer ratings and ranking methodologies like we use here have been broadly applied in the evolutionary social sciences (Pillsworth, 2008; Prall and Scelza, 2022; Redhead, Dalla Ragione, & Ross, 2023; Smith & Apicella, 2020), and have much greater explanatory potential to understand determinants and differences in status and other traits.

Homogamy is a common feature of relationships across many populations (Blackwell & Lichter, 2004; Kalmijn, 1998), and it is no surprise that we find similarities in status among romantic partners in this population. Studies of other small-scale populations, including the Tsimane, Chabu, and Ecuadorian forager horticulturalists, all find similar positive associations between status in marital partners (Alami et al., 2020; Bowser & Patton, 2010; Garfield & Hagen, 2020; von Rueden et al., 2018). Less clear however, is whether homogamy on status is the result of assortative mating, or whether the status of one individual in the dyad is influenced by the other, resulting in a positive correlation. Women may prefer high status partners who are likely to be more wealthy, and as a result women with high status partners may see their own prestige rise. Conversely men may prefer to have high status partners, as women's status may be influenced by her membership in a wealthy or prestigious matriline. Himba livestock wealth is inherited matrilaterally, so marriage to the sister of a wealthy man in a high status matriline ultimately benefits a Himba man's children. Additionally, as status is associated with reproductive success and children's health (Alami et al., 2020; Bowser & Patton, 2010), marriage to a high status woman should be preferred. Results described here confirm that women who are high status are seen as more desirable relationship partners. This may suggest that one individual in the dyad positively benefits the status of the other, but it is impossible to rule out assortative mating on status. Confirming whether status homogamy is a feature of assortative mating or whether marital pairs influence their partner's traits will require longitudinal data on status during and after partnership formation.

In addition to making them more desirable partners, higher status women have children with better health outcomes, particularly younger children. This result is only true for child height, not weight or BMI. Height may be the more meaningful measure in this population, as it better reflects chronic conditions, whereas weight is typically more responsive to seasonal trends (Briend et al., 2015; De Onis & Branca, 2016). As our data were collected almost exclusively in the early dry season, they are not well suited to pick up seasonal changes. Our results are generally in line with other studies that find positive child health and reproductive outcomes for high status women (Alami et al., 2020; Bowser & Patton, 2010), and conform to the notion that women who have more household and decision-making power use it to the benefit of their children (Yaya et al., 2020). We also find that men's status positively predicts child outcomes. It is likely that, given the role of wealth in predicting men's status, the children of high status men benefit from greater household wealth. In a community with a matrilineal bias and high female autonomy and decision making, women may exert more power directing this wealth toward children's growth and nutrition (Lowes, 2022).

Given the multiplicity of within and between individual and household effects on child health and growth, it may be surprising that we can detect individual impacts in status. Children's health and growth trajectories can be responsive to a variety of insults, including the idiosyncratic effects of drought in different children at different ages. Household factors that influence energy balance are numerous, including household size, labor demands, sex ratios, and wealth. In this population, we have previously described how paternity, gender, and fosterage decisions have important implications on children's growth trajectories (Prall & Scelza, 2017, 2020b; Scelza & Silk, 2014), but other confounding factors are numerous. That we find meaningful effects of mothers' status speaks to the potential importance of women in leveraging cooperative labor and alloparenting, and accessing resources in times of scarcity to buffer the potential insults to children's energy balance.

Much of the work on understanding the importance of status has historically focused on the importance of men, with few studies focusing on women. This disparity speaks to a lack of nuanced appreciation for how women accrue and wield status, as well as to the historical bias of anthropological research favoring men's status endeavors. Equally problematic is the assumption that formal leadership positions equate to status, implying that where formal leadership is unavailable women, so too are the benefits of status. It is only more recently that women's status

has been better reflected in ethnographic research. Our study complements this body of work by adding peer measures of status and influence at the individual level, which reflects the numerous and idiosyncratic ways that individuals can attain prestige and influence over others to their advantage. Combining these with detailed demographic and health data, we find that the embodiment of women's status does not differ from men's as much as might be expected, and that women's status is critical to child health.

Declaration of Competing Interest

None.

Data availability

The data and code used for this study are available at the Open Science Framework at: https://osf.io/kaqzu/.

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