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Patterns of Paternal Investment Predict Cross-Cultural Variation in Jealous Response

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Article

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SUPPLEMENTARY INFORMATION

Supplementary Methods

All data were analyzed using Bayesian multilevel regression using the *map2stan* function as part of the *rethinking*¹ package to fit models in RStan. All models used three chains, with a total sequence of 4000 iterations (2000 warmup). Because different populations were expected to have relatively divergent attitudes and norms regarding jealousy and sexual infidelity, models contained varying slopes by culture, allowing for group level deviation from a mean. However, given differences in sample size, and goal to generalize population-independent responses, these models allow for partial pooling between populations. This approach is preferable in that it results in better estimates of true population parameters, and adaptively modulates small sample size, high-variance group predictions. McElreath provides more details on partial pooling with these types of models.¹

Ratings of severity were assessed via a five-point likert scale of very bad (1) to very good (5), and these ratings were analyzed using multilevel ordered logit model. Because each participant answered four severity questions for sexual/emotional infidelity for men/women, and these severity ratings were expected to covary within individuals, a model that combined all severity ratings was used. This model predicted severity for any outcome, with varying intercepts by individual to correct for multiple responses, and dummy variables and interaction expressions to allow for specific effects of varying intercepts and predictors to vary by question. This approach allows for all 4148 responses to be included in a single model, while controlling for individual severity and group level severity interpretations. Previous analyses that used individual statistical models for each question have similar results to those presented here. The forced choice assessment of whether sexual or emotional infidelity is more upsetting is assessed with multilevel binomial regression, where the sexual infidelity response = 1. Several populations had a small number of missing values (see Supplementary Table 2), which were imputed using *rethinking* functions in each model.

As described in the manuscript text, models were built by adding and modifying sex, culture, age and marital status as fixed or varying effects, and using model comparison approaches to assess out of sample deviance via the Widely Applicable Information Criterion (WAIC). The null model (model 1) only contained a universal intercept, while model 2 included a slope with a fixed effect for sex. Model three included a universal intercept, as well as varying intercepts by culture. Model 4 added varying slopes for sex by culture, onto model three. The full model added varying slopes for each population by age and marriage. While there are many different ways to model the effects of marriage and age in jealous responses because we expect that age and marital status effects to be under the control of local norms and as a result, highly population specific, the varying slopes approach allows for differential estimates of these effects. Models for severity always included a varying intercept by participant ID, to correct for repeated observations. Model comparisons were run using complete cases only in all instances.

Finally, to assess the population level effects of predictors (those assessed from ethnographer survey, not from data collection by participants in the populations) including paternal investment, frequency of sexual infidelity, adult-sex ratio, and others, these predictors were added as standardized fixed effects (the severity models include unique slopes for each predictor by question type), and results modeled independent of population specific adjustments. See below for full model details and posterior parameters. The relationship between these population-level variables is shown in Supplementary Figure 1.

The paternal investment variable was broken into two components; direct investment and provisioning. We used two separate components instead of a summed variable of overall investment since different cultural and ecological contexts may manifest paternal investment in different ways. Direct investment was calculated by adding four relevant variables (holding, grooming, feeding, play) to capture the direct level of paternal investment whereby fathers participate in day-to-day care and interaction with children. Provisioning was assessed by adopting a question from the Standard Cross-Cultural Sample, asking the percent contribution of males to diet, to assess a level of paternal investment related only to provisioning of offspring. Results of this variable were split into a high/low category (>6/<6), and then response of the resources transfer question (whether fathers engage in material resource transfers including, money, land, and livestock to their children) and the marriage question (whether fathers pay marriage costs, including bride price, dowry, wedding costs for their children) were added to a new summary variable of provisioning.

Frequency of sexual infidelity was measured via a Likert scale for both men and women. Because these two variables are expected to covary and be influenced by local norms, we added these two responses into a single predictor for sexual infidelity. Adult-sex ratio was reported by ethnographer survey, which was a result of local demographic survey, or otherwise used previously published values.

The full model for predicting severity is as follows:

$$\begin{aligned}
 &Severity_i \sim Ordered(p) \\
 &logit(p_k) = \alpha_k + \alpha_{ID} + \\
 &item1 * [\alpha_1 + \alpha_{Culture1} + (\beta_{female1} + \beta_{female1[Culture]}) * Female + (\beta_{age1} + \beta_{age1[Culture]}) * Age + \\
 &\quad (\beta_{married} + \beta_{married[Culture]}) * Married] + \\
 &item2 * [\alpha_2 + \alpha_{Culture2} + (\beta_{female2} + \beta_{female2[Culture]}) * Female + (\beta_{age2} + \beta_{age2[Culture]}) * Age + \\
 &\quad (\beta_{married2} + \beta_{married2[Culture]}) * Married] + \\
 &item3 * [\alpha_3 + \alpha_{Culture3} + (\beta_{female3} + \beta_{female3[Culture]}) * Female + (\beta_{age3} + \beta_{age3[Culture]}) * Age + \\
 &\quad (\beta_{married3} + \beta_{married3[Culture]}) * Married] + \\
 &item4 * [\alpha_4 + \alpha_{Culture4} + (\beta_{female4} + \beta_{female4[Culture]}) * Female + (\beta_{age4} + \beta_{age4[Culture]}) * Age + \\
 &\quad (\beta_{married4} + \beta_{married4[Culture]}) * Married] \\
 &\alpha_{ID} \sim Normal(0, \sigma_{ID}) \\
 &\sigma_{ID} \sim \lambda(1) \\
 &\alpha_k, \alpha_{1-4}, \beta_{female\ 1-4}, \beta_{age\ 1-4}, \beta_{married\ 1-4} \sim Normal(0, 2)
 \end{aligned}$$

$$\begin{bmatrix} \alpha_{\text{Culture } 1-4} \\ \beta_{\text{female } 1-4 [\text{Culture}]} \\ \beta_{\text{age } 1-4 [\text{Culture}]} \\ \beta_{\text{married } 1-4 [\text{Culture}]} \end{bmatrix} \sim \text{DMVNormal} \left(\begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \end{bmatrix}, S_{\text{culture } 1-4} \right)$$

$$\rho_{1-4} \sim \text{DLKJcorr} (2)$$

$$S_{\text{culture } 1-4} \sim \lambda (1)$$

$$\text{Age} \sim \text{Normal} (v_{\text{age}}, \sigma_{\text{age}})$$

$$v_{\text{age}} \sim \text{Normal} (0,1)$$

$$\sigma_{\text{age}} \sim \text{Half Cauchy} (0,1)$$

$$\text{Female} \sim \text{Bernoulli} (\varphi_{\text{Female}})$$

$$\text{Married} \sim \text{Bernoulli} (\varphi_{\text{Married}})$$

$$\varphi_{\text{Female}}, \varphi_{\text{Married}} \sim \text{Beta} (1)$$

The full model for predicting forced choice is as follows:

$$FC_i \sim \text{Binomial}(1, p_i)$$

$$\text{logit}(p) = \alpha + \alpha_{\text{Culture}} + (\beta_{\text{female}} + \beta_{\text{female}[\text{Culture}]}) * \text{Female} +$$

$$(\beta_{\text{age}} + \beta_{\text{age}[\text{Culture}]}) * \text{Age} + (\beta_{\text{married}} + \beta_{\text{married}[\text{Culture}]}) * \text{Married}$$

$$\alpha, \beta_{\text{female}}, \beta_{\text{age}}, \beta_{\text{married}} \sim \text{Normal} (0,2)$$

$$\begin{bmatrix} \alpha_{\text{Culture}} \\ \beta_{\text{female}[\text{Culture}]} \\ \beta_{\text{age}[\text{Culture}]} \\ \beta_{\text{married}[\text{Culture}]} \end{bmatrix} \sim \text{DMVNormal} \left(\begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \end{bmatrix}, S_{\text{culture}} \right)$$

$$\rho_{1-4} \sim \text{DLKJcorr} (2)$$

$$S_{\text{culture } 1-4} \sim \lambda (1)$$

$$\text{Age} \sim \text{Normal} (v_{\text{age}}, \sigma_{\text{age}})$$

$$v_{\text{age}} \sim \text{Normal} (0,1)$$

$$\sigma_{\text{age}} \sim \text{Half Cauchy} (0,1)$$

$$\text{Female} \sim \text{Bernoulli} (\varphi_{\text{Female}})$$

$$\text{Married} \sim \text{Bernoulli} (\varphi_{\text{Married}})$$

$$\varphi_{\text{Female}}, \varphi_{\text{Married}} \sim \text{Beta} (1)$$

Sample Questionnaire

Jealousy Datasheet
Order # _____

Part A: Background Demographic Info

Name: _____

Sex: M F

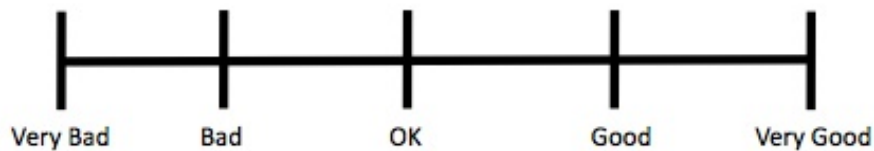
Year Born: _____

Number of current husbands/wives: _____ Number times ever married:

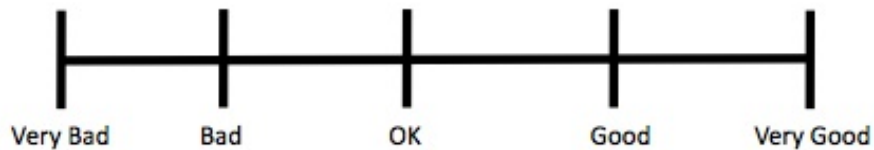
If unmarried: current girlfriend/boyfriend? Y N Number Children:

Part B: Relative Severity Scales

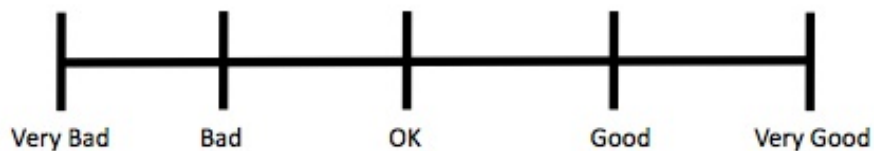
1) If a Himba man has sex with someone other than his wife/wives, is this....?



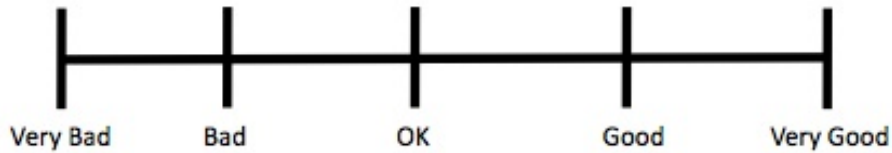
2) If a Himba woman has sex with someone other than her husband is this....?



3) If a Himba man falls in love with someone other than his wife/wives is this....?



4) If a Himba woman falls in love with someone other than her husband, is this...?



Part C: Forced Choice Vignette

Imagine that your partner both fell in love with another person and had sexual intercourse with that person. Which aspect of your partner's involvement would upset you more?

- A. Sexual intercourse
- B. Falling in love

Response: _____

Part D. Free Listing

1) If a Himba man has sex with someone other than his wife (but is not in love with her), will he be punished? If yes, in what ways?

Yes No

2) If a Himba woman has sex with someone other than her husband (but is not in love with him), will she be punished? If yes, in what ways?

Yes No

3) If a Himba man falls in love with someone other than his wife (but does not have sex with that woman), will he be punished? If yes, in what ways?

Yes No

4) If a Himba woman falls in love with someone other than her husband (but does not have sex with that man), will she be punished? If yes, in what ways?

Yes No

Supplementary Results

Supplementary Results for Severity Model

Posterior results from the full models were constructed (Supplementary Tables 4 and 5). We also plotted posterior predictions of severity by the sex of the respondent (Supplementary Figure 2), and by population-level predictors (Supplementary Figures 4-7). For each plot, 50 samples from the posterior representing boundaries between severity ratings, where red lines indicate estimates of the cut off between “very bad” and “bad” ratings. Changes in the probability space across the x-axis represent predicted differences in probability associated with respondent sex. To evaluate the effects of combinations of population-level variables on severity using the full model (M5), posterior distributions of combinations are plotted in Supplementary Figure 3. Additional model comparison results, using combinations of predictors on the full model, with and without varying intercepts by culture, and using fixed effect predictors are shown in Supplementary Table 6-8. Variance estimates of the best fit model are plotted in Supplementary Figure 8. Covariance between varying intercepts and slopes by severity type are plotted in Supplementary Figure 9 and 10.

Supplementary Results for Forced Choice Model

Posterior means and intervals from the full model of the forced choice vignette are presented in Supplementary Tables 9 and 10. Posterior means for the probability of being more upset by sexual infidelity by sex are plotted by culture and by average in Supplementary Figure 11. The covariance between varying intercepts and slopes in the best fit forced choice model are shown in Supplementary Figure 12, indicating a negative correlation between posterior means for varying intercepts and slopes, indicating a linkage between cultural level variation in severity and the effect of sex within each culture. Boxplots depicting the variance in forced choice responses by sex is presented in Supplementary Figure 13. Finally, we examined the relationship between the paternal investment variables (direct investment and provisioning) with the raw results of the sex difference of being more upset by sexual vs emotional infidelity (Supplementary Figure 14).

Relationship between severity and forced choice responses

To investigate the relationship between individual and cultural level responses to forced choice and severity questions, we compare these parameters three ways. First we plot mean severity scores by culture to mean forced choice scores by culture (Supplementary Figure 15). Next, we run additional models to predict forced choice outcomes from severity scores (models run individually, predictors centered) to understand which severity type best predicts forced choice. Density distributions for the posterior of the predictor for severity are plotted (Supplementary Figure 16). Finally, we calculate mean posteriors of the varying intercepts for culture from the best-fit models predicting both forced choice and severity, as described previously. Posterior means for severity (by severity type) are then compared to posterior means for forced choice, individually by severity type

(Supplementary Figure 17), and together with trend lines illustrating relationship differences in by severity type (Supplementary Figure 18).

Comparing Likert scale responses across domains

The use and interpretability of Likert scales in small-scale societies was raised as an issue by reviewers of this manuscript. In particular, reviewers questioned whether the use of Likert scales resulted in “floor” effects, indicating that individuals from small-scale societies could not effectively differentiate between “bad” and “very bad” responses. To address this issue, we compared Likert responses collected for other types of responses with our data. We did not include questions on other topics in our study, but seven of our 11 populations participated in the Culture and the Mind project where Likert scales were used in response to short vignettes on other kinds of infractions. To determine whether there were culture-level effects that caused different populations to treat Likert scales with differing degrees of severity (i.e. some cultures will just generally rate things more harshly than others) we compared the mean scores from our study with the mean scores in response to questions about theft, poisoning, physical harm and food taboos.² We did not find evidence that any of the cultures treated Likert scales aberrantly (e.g. being consistently very negative for all kinds of infractions) (Supplementary Figure 19). For example, the three cultures who viewed sexual infidelity most harshly in our study (Main text Figure 2: Karo Batak, Tsimane and Yasawa) were quite middle of road compared to other cultures when rating indiscretions ranging from theft to poisoning to breaking food taboos (Barrett et al. 2016 Fig 3). Therefore, we don't have reason to believe that the variation we see is being driven by some cultures who just rate all kinds of indiscretion more harshly than others.

Supplementary Notes

Information on each of the populations in our study is presented below. Notes about data collection at each site, including information about inclusion and exclusion criteria, is also provided. Descriptive statistics describing the results of the severity questions and the forced choice are provided for each population in Supplementary Figures 20-30.

Hadza

Description: The Hadza are a group of egalitarian hunters and gatherers residing in a 4000km² area around the shores of Lake Eyasi in Northern Tanzania, East Africa. Of the total population of approximately 1000 individuals, only around 150 individuals currently practice a predominantly hunting and gathering way of life where the majority of their diet is derived from wild plant foods and game animals. Individuals who reside in bush camps consume few domesticated cultigens, although the percentage contribution of agricultural products to the overall diet is increasing rapidly. Degree of market integration is also increasing, largely as a consequence of pressure from increased tourism, international research, and government and missionary aid. Those under study here, who continue to practice a foraging lifestyle, live in small semi-nomadic camps with fluid residency and composition. Residence patterns are bilocal and flexible, with a slight bias to living with the wife's

family. They practice bilateral descent, do not recognize clans, and are largely serially monogamous, although a small percentage of polygynous relationships has been reported in the ethnographic literature over the past sixty years. Marriages, which are described by the Hadza as love matches, are not arranged by kin, however parental approval is often sought for first marriages in particular. Divorce is common, particularly in the first ten years of union, with infidelity often cited as the primary grounds for separation.

Notes about data collection Data for this project were collected in 2015. A Tanzanian research assistant worked with A. Crittenden to conduct all of the interviews of male participants; A. Crittenden conducted all of the interviews of female participants. All of the interviews were conducted in Swahili, the second language of the Hadza. Exclusion criteria included elderly individuals who were unable to understand the questions and vignette in Swahili. Average age was 40.7 (range 18-76) and 84.4% of participants were currently married.

Himba

Description: The Himba are a group of traditional pastoralists living in the northwest corner of Namibia in a part of the Kunene region referred to as the *Kaokoveld*. The Himba are closely related to the Herero, a Bantu group who arrived in Namibia in the middle of the 16th century. The two groups share a language (*Otjiherero*) and many cultural institutions, including a double descent system of inheritance, patrilocal residence, polygyny and levirate marriage. Marriages are arranged by kin, and parents exert choice in their children's partners for first marriages, while love matches are more common in later marriages. Divorce and infidelity are both common for men and women. The Himba continue to rely mainly on pastoral production for majority of their calories. They herd cattle, goats and sheep. During the rainy season women also have gardens where they grow maize, sorghum and melons. Market integration is still limited, although elders are eligible for pension payments and items like cell phones and vehicles are becoming increasingly common.

Notes about data collection: Data for this project were collected in 2013. A local research assistant worked with B. Scelza to conduct all of the interviews. Interviews were conducted in *Otjiherero*. Exclusion criteria included having responded to a similar (although more limited) survey on jealousy in 2012. Average age was 38.9 (range 18-84), and 54.8% of participants were currently married. Participants were given a small gift for participating in the study (maize, sugar, washing powder or petroleum jelly).

India

Description: India is quite culturally diverse yet many beliefs and practices are widely shared across the subcontinent. While matrilineal groups still exist in modern India, the cultural mainstream in both North and South India has been patrilineal and patrilocal for centuries and these traditions persist despite increasing neolocality in Indian cities. Levels of parental investment in children are

high among urban, educated families. Family size is small and investment in education is competitive and socially important. Parental investment takes the form of both provisioning (parents, generally fathers, support the family through wage work or business ownership) and also in terms of resource transfers at marriage (dowry) or at death (inheritance). Women are often housewives, or have less remunerative jobs than their husbands, and divorce rates are low, thus men are very important in provisioning despite the fact that some women do work. Social class and caste stratification are ubiquitous, and social class and caste endogamy are still common.

Marriage is generally monogamous, and while polygyny is legally allowed for Muslims, in practice is quite rare, especially in urban centers. Both men and women are expected to be faithful to their spouses both emotionally and sexually, though the social pressure on women to conform to this ideal is stronger than on men and the consequences of violating norms are likewise more severe for women. Social traditions of jealousy are common and widely understood. In fact, clear examples of both romantic and sexual jealousy are commonly represented in popular media, including Bollywood films and Hindi TV serials.

Notes about data collection: The research team explored the possibility of collecting the Indian data in person but decided against it. The topic of jealousy is a sensitive one, making in-person interviews quite challenging. Not only would it be difficult for an interviewer to ask such questions without social awkwardness (both during and after the interview), but there would be real concern about whether participants would be willing to say what they really thought in front of an interviewer, especially if their answer violated local social norms. To address these concerns, we decided to recruit participants through an online survey platform where anonymity could be ensured and (ideally) candid expression would be possible. While this decision necessarily limited our sample to a relatively well-educated, English-literate, and technologically-literate subsample of Indian society, in modern India with its burgeoning middle class this represents a large fraction of the population. In fact, the online format allowed recruitment of a large and quite diverse sample from larger cities and smaller towns in regions across the subcontinent. The sample is also fairly varied in terms of education, occupation, and other characteristics. While men were much more likely to participate than women, this is consistent with local gender norms and likely reflects greater access to computer technology and the internet among young men. It is also possible that the online format makes our sample a conservative test since such individuals may be less socially conservative than previous generations.

Data for this project were collected in 2016. Surveys were conducted in English and online using Amazon Mechanical Turk, therefore, participants were limited to those with reading proficiency in English and with Internet access. Average age was 33.4 (range 19-71) and 96.5% of participants were currently married. Participants were paid \$1.00 for participating in the study.

Karo Batak

Description: The Karo people of North Sumatra, Indonesia, who are often referred to as Karo Batak in the anthropological literature, are a group of patrilineal agriculturalists whose traditional homeland is a tropical highland plateau in the Bukit Barisan mountains. They speak Bahasa Karo and Bahasa Indonesia, both Austronesian languages. Over the past 150 years or so, under missionary and colonial pressure, many aspects of their lifestyle have undergone drastic change. For instance, their religion has changed from animistic beliefs to majority Christian (both Catholic and Protestant). Marriage is clan exogamous with a stated preference for marriage between *impal* (i.e., matrilineal cross-cousin marriage) though these cousin marriages have become less common over the past 80 years. Parents sometimes try to arrange marriages for their children, but the children almost always have a say in the end. Polygyny is allowed in Karo culture, but not Indonesian, thus it is rarely practiced. Divorce is uncommon. Fertility is moderately high compared to the Indonesian average. The majority of village Karo have junior or senior high school education, but some lie in the extremes of the distribution with no education or university degrees. Inheritance of farmland is divided amongst sons. The products of Karo rice and vegetable gardens, and fruit and coffee groves, are used for subsistence and to sell to agents who distribute the produce to local, regional, and international markets.

Notes about data collection: Data for this project were collected in 2014. Average age was 42.2 (range 23-84), and 90.8% of participants were married. The fieldwork was supported by a Fulbright Scholars Grant to G. Kushnick and was approved by the University of Washington Human Subjects Committee. Local permission was granted by the Ministry of Research and Technology of the Republic of Indonesia. A local research assistant worked with G. Kushnick to conduct all the interviews. Interviews were conducted in Bahasa Indonesia.

Los Angeles

Description: The greater Los Angeles area is the second largest urban center in the United States, with a population of 18.7 million people. It is located along the southern coast of California, with a Mediterranean climate. Wage labor dominates the economy. Los Angeles, and is the largest manufacturing center in the U.S. Other major industries in the area include aerospace, entertainment, fashion and healthcare. Monogamous marriage is normative, but out-of-wedlock births and divorce are both common. Men are legally obligated to contribute to their children's well-being even after a divorce.

Notes about data collection: Participants from this population all resided in the greater Los Angeles area. Average age was 30.6 (range 17-71), and 23.6% of participants were currently married. An undergraduate research assistant and a postdoctoral scholar administered the surveys. Data collection took place at three sites in 2016. The first was a student population at UCLA. Data was collected through the Communication Studies Subject Pool. Students received credit toward a

course requirement in exchange for participating in the study. LA residents were also surveyed at the Third Street Promenade in Santa Monica and at Union Station in downtown LA. These participants were paid \$5.

Mayangna

Description: The Mayangna are indigenous horticulturalists who inhabit the tropical rain forest in the Bosawas Biosphere Reserve, Nicaragua. The Mayangna share territories with the Miskito, another indigenous group with whom they commonly inter-marry. In addition to staple crops, such as rice and beans, the Mayangna cultivate bananas, plantains, and manioc while supplementing their diet via hunting, fishing, and products of domestic animals. The majority of adults earn money by panning for gold. In terms of social organization, the Mayangna are characterized by bilateral descent, prescriptively monogamous marriages, and an uxori-local residence bias (particularly for women's first marriages). Arranged marriages do not occur, and although family members may express approval or opposition, both males and females exhibit autonomy in terms of choosing spouses. Divorce is not uncommon and carries few stigmas. Infidelity is denounced in general, but there are few formal sanctions for adulterous relations.

Notes about data collection: Data for this project were collected in 2013 at a time when contraceptive methods at the study site were largely non-existent. A local research assistant worked with J. Koster to conduct all of the interviews. Interviews were conducted in the indigenous languages. Average age was 34.6 (range 18-75), and 70.9% of participants were currently married. Participants were provided with modest monetary compensation for the interview, which included questions unrelated to this study.

Mosuo

Description: The Mosuo (aka Na, Naze, Yongning Mos(u)o) are a population of approximately 40,000 Tibeto-Burman people residing in the southeastern foothills of the Himalayas, in contiguous regions of northwest Yunnan and southwest Sichuan Provinces, China. Mosuo populations residing around Lugu Lake (an alpine lake at an altitude of 2650 meters) and on the nearby Yongning plain are known for matrilineal descent and inheritance and natal local residence. Many Mosuo practice "walking marriage" (*(ti)sese* in the local Nuru language): women and men reside in their natal households and conduct conjugal visits at night; children belong to their maternal lineages, from whom they also inherit. Even though institutional marriage has become more popular in recent generations, walking marriage continues to play an important role in shaping Mosuo identity today. Mosuo men are said to take on relatively peripheral roles, perhaps explained originally by their participation in historical trading caravans that led to long-term absences from their natal communities.

Mosuo subsistence historically has been based on relatively non-intensive agriculture (i.e., limited irrigation and no use of plows). Mosuo families traditionally grew potatoes, buckwheat, millet, maize, and beans and raised pigs, chickens, oxen,

and water buffalos. Cultivation of rice and vegetables began more recently and is increasingly important to farming enterprises. While Mosuo villages had been relatively difficult to access prior to the 1980s, ethnic tourism in the 1990s and the 2000s has propelled market integration and economic development in the region. Some Mosuo villages, especially those located by the lake, are slowly abandoning agriculture to engage in the prosperous tourist-driven economy. In addition, increased educational and employment opportunities in nearby cities have led to significant depopulation in many villages.

Notes about data collection: Data for this project were collected by T. Blumenfield, S. Mattison, and C. Sum in 2013 and 2015 (N=24) and 2017 (N=19) in various primarily matrilineal villages in Yunnan and Sichuan Provinces. Interviews were conducted primarily in Mandarin Chinese, but a local research assistant translated to Naru when necessary. Average age was 35.3 (range 16-78), and 51.2% of participants were married. Participants in the first phase of the research were not compensated for participating in the study. Later participants were given small gifts of cash or lip balm at the end of the interview.

Okinawa

Description: The survey for this project targeted Okinawan (or Ryukyuan) living in Okinawa island, Okinawa prefecture, located in the southernmost part of Japan. They have a different cultural, historical and genetic background from the rest of Japan. Monogamous marriage is the norm but the divorce rate is higher than any other prefecture in Japan. They also have the highest fertility rate in the country. Men have no legal obligation to provide resource to their children after divorce although it is commonly practiced. Wage work is the most common mode of subsistence. The minimum wage and mean annual income are among the lowest in the country. Therefore, dual income of a couple is common. Okinawan society is traditionally patrilineal and patrilocal. They worship their ancestors in a different way than Buddhism and Shintoism that are two major religions of Japan. The first son inherits “ie (household)” that includes the family’s altar. However, daughters often help their own parents more than sons. The strong connections of females to their birth parents, combined with high female employment rate, are considered to be supporting factors for high fertility rate and high divorce rate in Okinawa.

Notes about data collection: Data for this project were collected in 2015. K Yamaguchi conducted all of the interviews in *Japanese* at two sites. The first was in Okinawa city. The second was at Makishi Market in Naha city, the capital of Okinawa. Average age was 48.2 (range 19-77), and 42.2% of participants were currently married. Participants were given a book voucher that is worth 500JPY (approximately 4.00USD).

Shuar

Description: The Shuar are the second largest indigenous population in Ecuador, with current population estimates ranging from 40,000 to 100,000. The Shuar live in the upper Amazon region of Ecuador and extend into Peru. They are part of the

Jivaroan ethno-linguistic group, which also includes the Achua, Shiwiar, and others. Until the middle of the 20th century, the Shuar and other Jivaroan groups effectively resisted domination and influence of outside forces, from the Inca to the European colonizers and missionaries. Traditional life was fiercely independent, with households comprised of a male head-of-household, an average of two wives and their children. Households were sparsely spaced throughout the rainforest. Since the 1960s, the Shuar have largely consolidated into villages comprised of 5-40 households, and many today live in cities that are majority European descent. There is currently a wide range of variation in subsistence patterns between Shuar communities. Most still rely on swidden horticulture, with staple crops of sweet manioc, plantain, and eddoe, for their primary source of calories, but there is large variation in the sources of protein as population density and infrastructure development have dramatically impacted wildlife populations in some areas. Likewise, market integration varies widely between communities, with more remote communities experiencing very little, and communities along the main roads being fully integrated. Traditional marriage among the Shuar was polygynous, with a high rate of homicide and warfare allowing for the majority of Shuar men to have multiple wives. Today, polygyny is practiced by only a few individuals. As with subsistence, there is wide variation between villages in adherence to traditional marriage practices, in which a marriage is typically negotiated between a young man and the father of the girl, with temporary matrilocality and informal bride service usually persisting until the birth of the first child. In those communities with greater integration into the market economy, this pattern is shifting to one in which young men and women often meet and decide for themselves to marry, either with or without permission from their parents. Despite these changes, the average age of marriage among Shuar women is 17, and among men is 21. The Shuar have a high fertility rate and relatively low infant-mortality rate, with an average of seven living children living in a household. The primary language continues to be the Shuar language, but as a result of government initiated bilingual primary schooling in most villages, the majority of Shuar also speak, read, and write in Spanish.

Notes about data collection: Data for this project was collected in 2013. Average age was 36.0 (range 16-63), and 90.5% of participants were married. Individual participants received no payment for participation, but the host village received support for multiple infrastructure projects, including the building of a covered communal space used for assemblies, sporting events, and village meetings.

Tsimane

Description: The Tsimane are forager-horticulturalists (population \approx 16,000) living in the Beni Department of the Bolivian Amazon, dispersed in 90+ villages ranging in size from 40–550 inhabitants. Fertility among Tsimane is high, with little evidence of any sustained decline in recent years. The average Tsimane woman has 9 births over her reproductive lifetime, and effective contraceptive use is rare and inconsistent. Average \pm SD age at first birth is 18.1 \pm 2.7 yrs, with average \pm SD interbirth interval of 30.7 \pm 10.6 months. Women commonly report breastfeeding up

to and often after the onset of pregnancy. Marriages tend to be stable, with divorce increasingly uncommon after the birth of children. The period of courtship tends to last no more than a couple of weeks, though up to one-third of women report being pressured to marry against their wishes. If successful, the couple customarily resides near the wife's family for two or three years, after which time they can move to wherever they desire. Cross-cousin marriage is preferred, as is sororal polygyny, though this is relatively rare (<5% marriages). Diet remains largely traditional, with over 90% of calories coming from horticulture (plantains, manioc, rice), fishing, hunting, and gathering. There is no running water, plumbing or public sanitation, though electricity is now available in several villages. Market integration, however, has been increasing over the last decade, due in part to improved travel along the Maniqui River using affordable *pequi* motors.

Notes about data collection: Data for this project were collected by Stieglitz with assistance from a local Tsimane research assistant in July 2013. Interviews were conducted either in the Tsimane language or Spanish. Average age was 40.4 (range 18-77), and 94.7% of participants were married at the time of the interview (of those who ever married, 77.8% were married once, 16.7% twice, and 5.6% three times). Participants were given a small gift for participating in the study (e.g. pasta, fishing equipment, soap).

Yasawa

Description: Data were collected in Yasawa-i-rara village, on Yasawa Island in the Western Division of the Fijian Islands in July-August, 2015. Residents of this village subsist mainly through fishing, collecting, and horticulture. Sugar, flour, and tea are common staples when families can afford them. They supplement their subsistence lifestyle with wage labor on occasion, but wage labor is rarely available, poorly paid, and often of short duration for village residents. Market integration is partial but requires much effort. Yasawan men can often sell fish and lobster to the single resort on the island, and some families receive money from relatives abroad in New Zealand and Australia. Women can sell their woven mats on the main island of Viti Levu, but this requires a lengthy trip away from the village and potentially hundreds of dollars in travel costs. Most households have cell phones and many have smartphones. Connectivity is limited by poor network reception, inability to purchase additional minutes since there are no stores on the island and most village residents do not have bank accounts let alone credit cards, as well as difficulty maintaining a reliable source of electricity.

Yasawan society is traditionally patrilineal and patrilocal, with inheritance of fishing rights as well as garden land structured by patrilines. Arranged marriages were typical throughout Yasawan history and were often used as a way of forging alliances within and across regions. More recently, arranged marriages have not been practiced in this village in the strict sense for the last twenty years. Still, patrilines and kinship status do structure who the eligible marriage partners are, and nearly all families choose to observe patrilocal patterns of residence. Christianity is important to Yasawan views on marriage and reinforces traditional

Yasawan patriarchal views of women's sexual and romantic behavior: premarital sex (though not rare, and often leading to childbirth) is frowned upon, as are extra-marital affairs. Boys born out of wedlock and who are not recognized by their fathers must be "adopted" by a male relative, or risk being disenfranchised, without land for gardening or fishing rights, in their own villages. While extra-marital affairs are therefore a serious risk and a source of much gossip, they are not punished equally for men and women; some men are known to have frequent affairs but are typically only punished by expulsion from the village if they have had an affair with a married woman, or with a woman whose family otherwise objects. Legal divorce is possible, but very rare. Men are expected to "discipline" their wives through physical abuse, for sexual or other misbehavior. Marriages may sometimes split without official divorce if a woman returns to her own family, in another village.

Notes about data collection: Average age was 46.5 (range 19-76), and 78.1% of participants were currently married. Trained and supervised Indigenous Fijian Research Assistants collected the data in cooperation with the primary researcher at the site, Michelle Kline. All study scripts were translated and back-translated into Standard Fijian prior to administering the study.

Supplementary Tables

Supplementary Table 1 | Population level descriptors. These variables were contributed by ethnographers and provide a picture of the variation in the cultures included in our sample. Numbers in parentheses refer to the code for that variable in the Standard Cross-Cultural Sample.

Population	Country	Mode of Subsistence*	Marital System (68)	Inheritance System (278/279)	Religiosity (% regularly attending services)	Market Integration (1734)	Contraceptive Use
Himba	Namibia	Pastoralism Horticulture	Polygynous (>20%)	Double Descent	None	Local	Rare
Mayanga Mosuo	Nicaragua China	Mixed	Monogamous	Matrilineal	10-50%	Local Local, regional, supraregional	Often
Hadza	Tanzania	Foraging Wage Work	Monogamous (<20% polygyny)	Absence of individual property rights	None	Local	Rare
Karo Batak	Indonesia	Mixed	Monogamous (<20% polygyny)	Patrilineal	>80%*	Local, regional, supraregional	Sometimes
Okinawa	Japan	Wage Work	Monogamous	Equal to sons and daughters	<10%	Local, regional, supraregional	Often
Shuar	Ecuador	Mixed	Monogamous (<20% polygyny)	Patrilineal*	<10%	Local, regional	Rare
India	--	Agriculture Wage Work	Monogamous	Patrilineal	>80%	Local, regional, supraregional	Often
Yasawa	Fiji	Mixed	Monogamous	Patrilineal	>80%	Local, regional, supraregional	Rare
Tsimane	Bolivia	Mixed	Monogamous (<20% polygyny)	Absence of individual property rights		Local, regional	Rare
Los Angeles	United States	Wage Work Students	Monogamous	Equal to sons and daughters	10-50%	Local, regional, supraregional	Often

Supplementary Table 2 | Missing Data. Data were missing from the following predictor variables. When these predictors were used, data was imputed in the model. See sections below for details on imputed data priors.

Culture	n	Missing Sex	Missing Age	Missing Marital Status
Hadza	32	0	0	0
Himba	45	0	2	3
India	401	1	1	4
Japan	64	0	0	0
Karo Batak	87	0	0	0
Los Angeles	161	0	1	4
Mayangna	103	0	0	0
Mosuo	43	0	0	0
Shuar	42	0	1	0
Tsimane	38	0	0	0
Yasawa	32	0	0	0

Supplementary Table 3 | Results of Ethnographer Survey. Variables were constructed wherever possible by using existing codes from the standard cross-cultural sample (SCCS). SCCS variable codes are shown in parentheses in Supplementary Table 1. Where the SCCS lacked detailed coding of direct paternal investment, we created a series of scaled responses for different types of direct care, following the breakdown established by Michael Lamb and colleagues into three areas: interaction, availability and responsibility.³ Holding, grooming, feeding and play fall under Lamb et al.'s interaction category and marriage costs and material resource transfers fall under the category of responsibility. We chose to use SCCS code 890 for a more fine-grained measure of provisioning than the question in Lamb et al. Most of our cultures fell into Lamb et al.'s category of "Often" but within that, we found substantial variation.

Culture	Freq of Extramarital Sex - Men	Freq of Extramarital Sex - Women	Holding	Grooming	Feeding	Play
Himba	Universal	Universal	Rarely	Rarely	Rarely	Sometimes
Mayangna	Moderate	Occasional	Rarely	Never	Rarely	Rarely
Mosuo	Moderate	Occasional	Sometimes	Sometimes	Sometimes	Often
Hadza	Moderate	Occasional	Often	Rarely	Sometimes	Rarely
Karo Batak	Occasional	Uncommon	Often	Sometimes	Sometimes	Rarely
Japan	Occasional	Occasional	Sometimes	Rarely	Rarely	Sometimes
Shuar	Universal	Moderate	Sometimes	Rarely	Rarely	Sometimes
India	Occasional	Uncommon	Sometimes	Rarely	Rarely	Often
Yasawa	Moderate	Occasional	Often	Sometimes	Rarely	Sometimes
Tsimane	Moderate	Occasional	Sometimes	Rarely	Sometimes	Sometimes
LA	Occasional	Occasional	Often	Sometimes	Often	Often

Culture	Co-reside	Co-Sleep	Co-Work	Provisioning Category	Tasks	Resources	Marriage costs	ASR
Himba	Often	Often	Rarely	5	Some	No	Yes	0.714
Mayangna	Often	Sometimes	Sometimes	8	Some	Yes	No	1.17
Mosuo	Sometimes	Sometimes	Rarely	2	Some	No	No	1.01
Hadza	Often	Often	Rarely	5	None	No	No	0.96
Karo Batak	Often	Often	Rarely	7	Many	Yes	Yes	0.985
Japan	Often	Often	Never	7	Some	Yes	Yes	0.946
Shuar	Often	Often	Sometimes	4	None	Yes	No	0.923
India	Often	Sometimes	Sometimes	7	Some	Yes	Yes	1.06
Yasawa	Often	Often	Sometimes	8	Few	Yes	Yes	1.098
Tsimane	Often	Often	Sometimes	6.5	Some	No	No	1.01
LA	Often	Rarely	Never	6	Many	Yes	Yes	0.974

Supplementary Table 4 | Posterior means and 89% intervals from the full severity model

Outcome	α	β_{female}	β_{age}	$\beta_{married}$
Male Sexual Infidelity	-0.7 [-2.28,0.88]	-0.61 [-1.14,-0.07]	-0.03 [-0.4,0.33]	-0.87 [-1.6,-0.11]
Female Sexual Infidelity	-2.02 [-3.59,-0.43]	-0.27 [-0.74,0.19]	0.03 [-0.29,0.34]	-0.55 [-1.15,0.06]
Male Emotional Infidelity	0.52 [-1,2.06]	-0.7 [-1.11,-0.28]	-0.11 [-0.34,0.11]	-0.22 [-0.76,0.33]
Female Emotional Infidelity	0.3 [-1.22,1.83]	-0.29 [-0.7,0.12]	-0.03 [-0.25,0.19]	-0.78 [-1.28,-0.27]

Supplementary Table 5 | Posterior means and 89% intervals for varying intercepts and slopes from the full severity model

Culture	$\alpha_{Culture}$	$\beta_{female Culture}$	$\beta_{age Culture}$	$\beta_{married Culture}$	
Male Sexual Infidelity	1. Himba	0.72 [-0.16,1.76]	0.46 [-0.2,1.52]	-0.44 [-0.99,0.08]	1.09 [-0.03,2.42]
	2. Mayangna	0.09 [-0.71,0.9]	0.03 [-0.6,0.67]	-0.03 [-0.49,0.42]	0.54 [-0.26,1.45]
	3. Mosuo	0.18 [-0.7,1.07]	0.18 [-0.53,1.07]	0.13 [-0.48,0.78]	0.78 [-0.23,1.99]
	4. Hadza	0.42 [-0.55,1.55]	-0.01 [-0.88,0.84]	-0.22 [-0.88,0.41]	0.71 [-0.35,1.99]
	5. Karo Batak	-1.48 [-3.02,-0.12]	-0.42 [-1.49,0.31]	0.5 [-0.05,1.1]	-0.94 [-2.36,0.3]
	6. Japan	-0.08 [-0.96,0.73]	-0.03 [-0.72,0.66]	0.12 [-0.4,0.66]	-0.32 [-1.34,0.6]
	7. Shuar	0.86 [-0.14,2.1]	-0.43 [-1.51,0.28]	-0.49 [-1.16,0.11]	0.35 [-0.77,1.54]
	8. India	0.62 [-0.19,1.59]	-0.23 [-0.88,0.26]	-0.34 [-0.8,0.1]	-0.06 [-1,0.85]
	9. Yasawa	-0.71 [-1.98,0.33]	-0.48 [-1.71,0.28]	-0.27 [-0.91,0.36]	-0.37 [-1.59,0.73]
	10. Tsimane	-0.08 [-1.3,1.24]	0.8 [-0.11,2.34]	-0.02 [-0.62,0.58]	-1.19 [-2.81,0.07]
	11. LA	-0.85 [-1.7,-0.06]	0.05 [-0.59,0.75]	1.17 [0.59,1.76]	-1.03 [-2.36,0.09]
Female Sexual Infidelity	1. Himba	0.96 [0.07,1.89]	0.18 [-0.25,0.92]	-0.08 [-0.52,0.33]	0.13 [-0.38,0.88]
	2. Mayangna	0.5 [-0.25,1.28]	0.03 [-0.38,0.49]	-0.02 [-0.41,0.36]	0.14 [-0.27,0.79]
	3. Mosuo	0.71 [-0.16,1.63]	0.13 [-0.33,0.77]	0.35 [-0.16,1]	0.21 [-0.28,1.04]
	4. Hadza	-0.06 [-1.07,0.9]	0.09 [-0.38,0.76]	-0.18 [-0.74,0.33]	-0.08 [-0.74,0.46]
	5. Karo Batak	-1.55 [-2.73,-0.39]	0.02 [-0.54,0.61]	0.3 [-0.15,0.85]	-0.27 [-1.25,0.28]
	6. Japan	0.63 [-0.18,1.53]	0.04 [-0.42,0.57]	0.02 [-0.41,0.45]	0 [-0.52,0.54]
	7. Shuar	0.06 [-0.88,1]	0.02 [-0.51,0.6]	-0.09 [-0.63,0.43]	0.12 [-0.38,0.83]
	8. India	0.52 [-0.25,1.28]	-0.14 [-0.67,0.21]	-0.37 [-0.82,0.01]	0.1 [-0.36,0.73]
	9. Yasawa	-1.03 [-2.22,0]	0 [-0.54,0.56]	-0.19 [-0.76,0.32]	-0.04 [-0.7,0.55]
	10. Tsimane	-1.18 [-2.42,-0.01]	-0.39 [-1.58,0.17]	-0.21 [-0.83,0.33]	-0.18 [-1.1,0.41]
	11. LA	-0.34 [-1.1,0.39]	0 [-0.5,0.49]	0.51 [0.05,1.01]	-0.19 [-0.95,0.3]
Male Emotional Infidelity	1. Himba	0.17 [-0.26,0.74]	-0.02 [-0.49,0.4]	0.06 [-0.16,0.37]	0.18 [-0.33,0.89]
	2. Mayangna	0.09 [-0.28,0.55]	0.14 [-0.17,0.64]	0.02 [-0.19,0.26]	0.09 [-0.33,0.6]
	3. Mosuo	0.06 [-0.41,0.57]	-0.02 [-0.48,0.43]	-0.1 [-0.52,0.12]	-0.2 [-0.91,0.32]
	4. Hadza	0.02 [-0.52,0.55]	0.02 [-0.41,0.5]	0.07 [-0.16,0.42]	0.16 [-0.35,0.84]
	5. Karo Batak	-0.16 [-0.76,0.28]	-0.17 [-0.77,0.21]	-0.07 [-0.39,0.15]	-0.17 [-0.82,0.32]
	6. Japan	0.06 [-0.36,0.55]	0.01 [-0.38,0.43]	0.05 [-0.15,0.33]	-0.05 [-0.6,0.43]
	7. Shuar	-0.02 [-0.54,0.48]	-0.11 [-0.69,0.28]	0.1 [-0.13,0.48]	-0.19 [-0.89,0.29]
	8. India	-0.34 [-0.97,0.07]	0 [-0.37,0.35]	-0.03 [-0.28,0.18]	-0.17 [-0.74,0.29]
	9. Yasawa	-0.1 [-0.69,0.37]	0.02 [-0.43,0.48]	0.04 [-0.19,0.35]	-0.19 [-0.93,0.33]
	10. Tsimane	0.35 [-0.18,1.2]	0.24 [-0.18,1.04]	-0.04 [-0.36,0.21]	0.5 [-0.09,1.49]
	11. LA	-0.09 [-0.56,0.3]	-0.13 [-0.62,0.22]	-0.11 [-0.45,0.1]	-0.02 [-0.6,0.53]
Female Emotional Infidelity	1. Himba	-0.06 [-0.49,0.27]	0.07 [-0.31,0.52]	0.06 [-0.14,0.33]	-0.01 [-0.45,0.43]
	2. Mayangna	0.11 [-0.16,0.52]	0.06 [-0.26,0.46]	-0.02 [-0.24,0.17]	0.05 [-0.28,0.45]
	3. Mosuo	-0.05 [-0.47,0.29]	-0.07 [-0.57,0.3]	-0.02 [-0.29,0.23]	-0.16 [-0.77,0.19]
	4. Hadza	-0.01 [-0.39,0.37]	0.02 [-0.4,0.46]	0 [-0.25,0.26]	-0.04 [-0.51,0.38]
	5. Karo Batak	-0.04 [-0.46,0.32]	-0.16 [-0.72,0.19]	0 [-0.24,0.26]	-0.08 [-0.58,0.29]
	6. Japan	0.15 [-0.13,0.65]	0.06 [-0.27,0.5]	0.02 [-0.18,0.25]	0.09 [-0.27,0.57]
	7. Shuar	-0.09 [-0.57,0.25]	0.2 [-0.16,0.86]	0.04 [-0.18,0.35]	-0.01 [-0.45,0.42]
	8. India	-0.15 [-0.6,0.13]	0.05 [-0.27,0.42]	-0.07 [-0.34,0.11]	-0.14 [-0.6,0.16]
	9. Yasawa	0.06 [-0.3,0.48]	0 [-0.43,0.43]	0.05 [-0.15,0.34]	-0.04 [-0.51,0.37]
	10. Tsimane	0.08 [-0.31,0.58]	-0.08 [-0.61,0.32]	0.04 [-0.19,0.34]	0.16 [-0.24,0.77]
	11. LA	0.03 [-0.3,0.38]	-0.18 [-0.73,0.14]	-0.12 [-0.47,0.09]	0.14 [-0.23,0.72]

Supplementary Table 6 | Model comparison of best fit model predicting severity with the addition of predictors. Model number corresponds with notation in the R file. Note the standard errors of the estimates for these models are 120-121.

Model Number	Description	WAIC	Weight
5	Model 5	6591.15	0.04
6	M5 + Paternal Investment	6587.56	0.26
7	M5 + Freq Sex Infidelity	6588.04	0.20
8	M5 + ASR	6589.09	0.12
9	M5 + Paternal Investment + ASR	6591.72	0.03
10	M5 + Paternal Investment + Freq Sex Infidelity	6591.85	0.03
11	M5 + Freq Sex Infidelity + ASR	6587.38	0.28
12	M5 + Paternal Investment + Freq Sex Infidelity + ASR	6591.74	0.03

Supplementary Table 7 | Model comparison between severity models without varying intercepts by culture, to examine the impact of fixed effect predictors. Model number corresponds with notation in the R file. Note standard errors of the estimates for these models are 115 to 117.

Model Number	Description	WAIC	Weight
1	Null (intercept only)	6804.51	0
2	Null + Sex	6801.92	0
13	Null + Paternal Investment	6744.73	1
14	Null + Freq Sex Infidelity	6798.29	0
15	Null + ASR	6812.63	0

Supplementary Table 8 | Model comparison between severity models with varying intercepts by culture, to examine the impact of fixed effect predictors. Model number corresponds with notation in the R file. Note standard errors of the estimate for these models are 120.

Model Number	Description	WAIC	Weight
3	Culture	6611.86	0.09
17	Culture + Sex	6607.52	0.78
18	Culture + Paternal Investment	6613.85	0.03
19	Culture + Freq Sex Infidelity	6612.28	0.07
20	Culture + ASR	6614.34	0.03

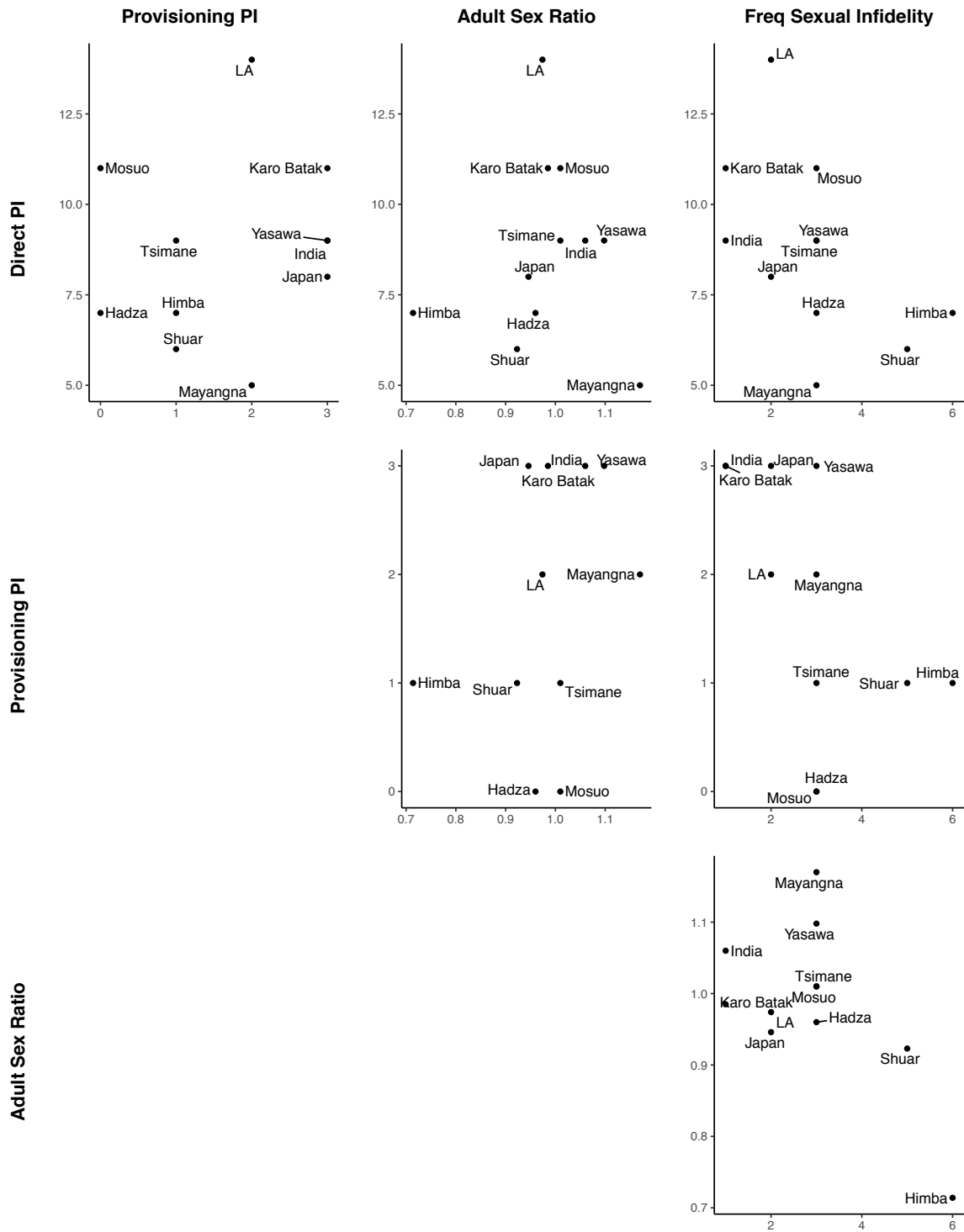
Supplementary Table 9 | Posterior means and 89% intervals from the full model for forced choice

	Mean	89% Interval
α	1.09	0.26, 1.97
β_{female}	-0.89	-1.44, -0.39
β_{age}	0.08	-0.09, 0.25
$\beta_{married}$	0.46	-0.01, 0.97

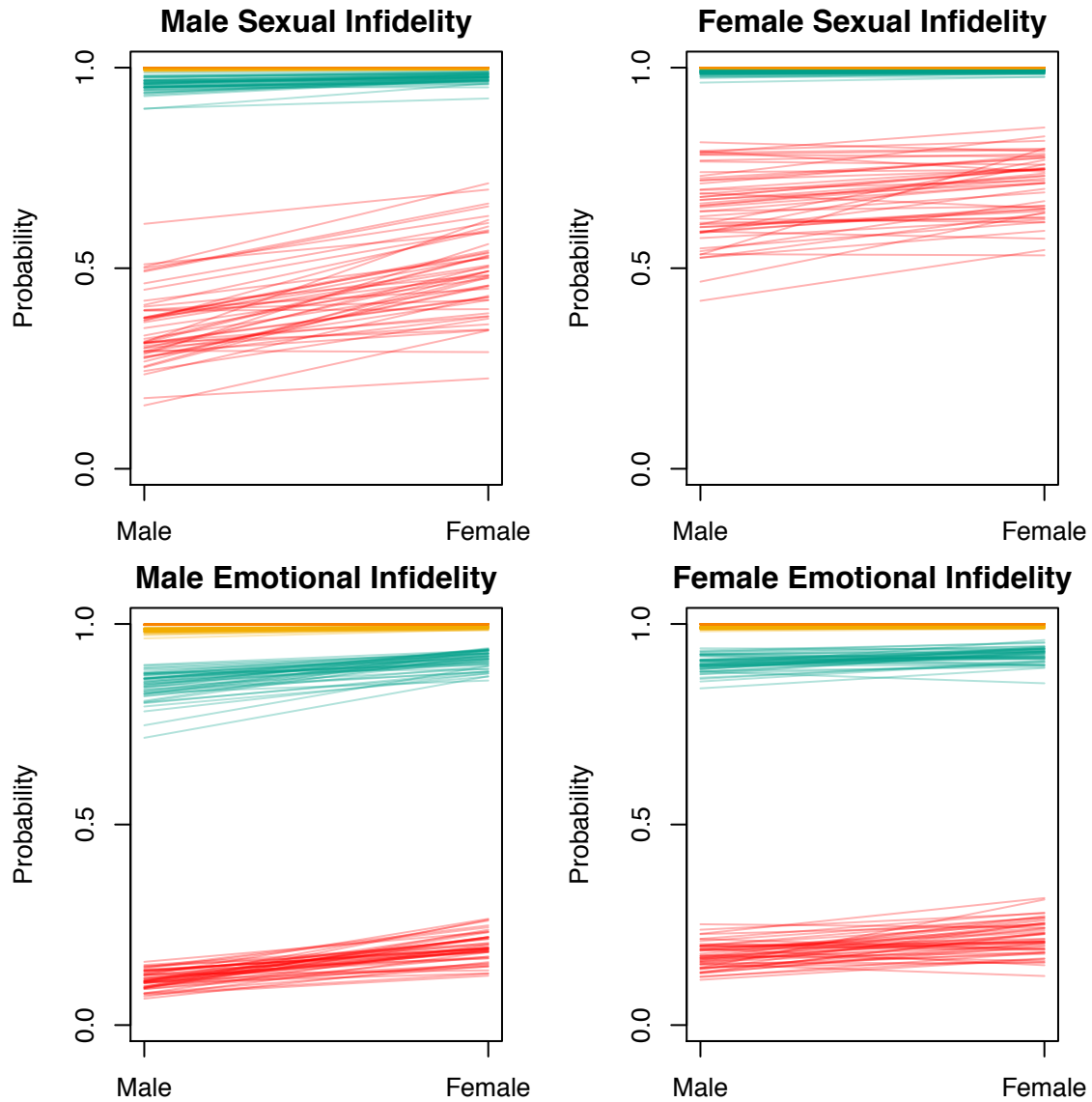
Supplementary Table 10 | Posterior means and 89% intervals for varying intercepts and slopes from the full model for forced choice

Culture	$\alpha_{Culture}$	$\beta_{female[Culture]}$	$\beta_{age[Culture]}$	$\beta_{married[Culture]}$
1. Himba	-0.03 [-1.09,1.02]	-0.28 [-1.18,0.53]	-0.03 [-0.29,0.17]	0.17 [-0.42,0.97]
2. Mayangna	1.37 [0.22,2.7]	-1.04 [-2.21,-0.11]	0.13 [-0.07,0.5]	-0.1 [-0.83,0.53]
3. Mosuo	-1.46 [-2.57,-0.42]	0.14 [-0.75,1.04]	-0.02 [-0.32,0.25]	0.21 [-0.42,1.06]
4. Hadza	0.43 [-0.85,1.8]	-0.38 [-1.5,0.55]	-0.02 [-0.29,0.21]	0.22 [-0.44,1.18]
5. KaroBatak	1.95 [0.54,3.53]	-0.38 [-1.62,0.65]	-0.07 [-0.41,0.15]	0.28 [-0.41,1.29]
6. Japan	-0.7 [-1.7,0.28]	0.03 [-0.73,0.8]	0.03 [-0.18,0.29]	-0.29 [-1.1,0.23]
7. Shuar	-0.99 [-2.18,0.15]	0.23 [-0.59,1.11]	0.03 [-0.19,0.29]	-0.2 [-1.09,0.43]
8. India	-0.79 [-1.78,0.14]	0.61 [0.03,1.25]	0 [-0.19,0.2]	0.02 [-0.58,0.62]
9. Yasawa	-0.59 [-1.75,0.56]	0.59 [-0.25,1.62]	-0.05 [-0.32,0.16]	-0.24 [-1.15,0.36]
10. Tsimane	2.52 [0.69,4.8]	-0.06 [-1.49,1.33]	-0.01 [-0.36,0.32]	0.41 [-0.49,1.92]
11. LA	-1.1 [-2.03,-0.21]	0.22 [-0.4,0.91]	0.01 [-0.19,0.22]	-0.34 [-1.16,0.19]

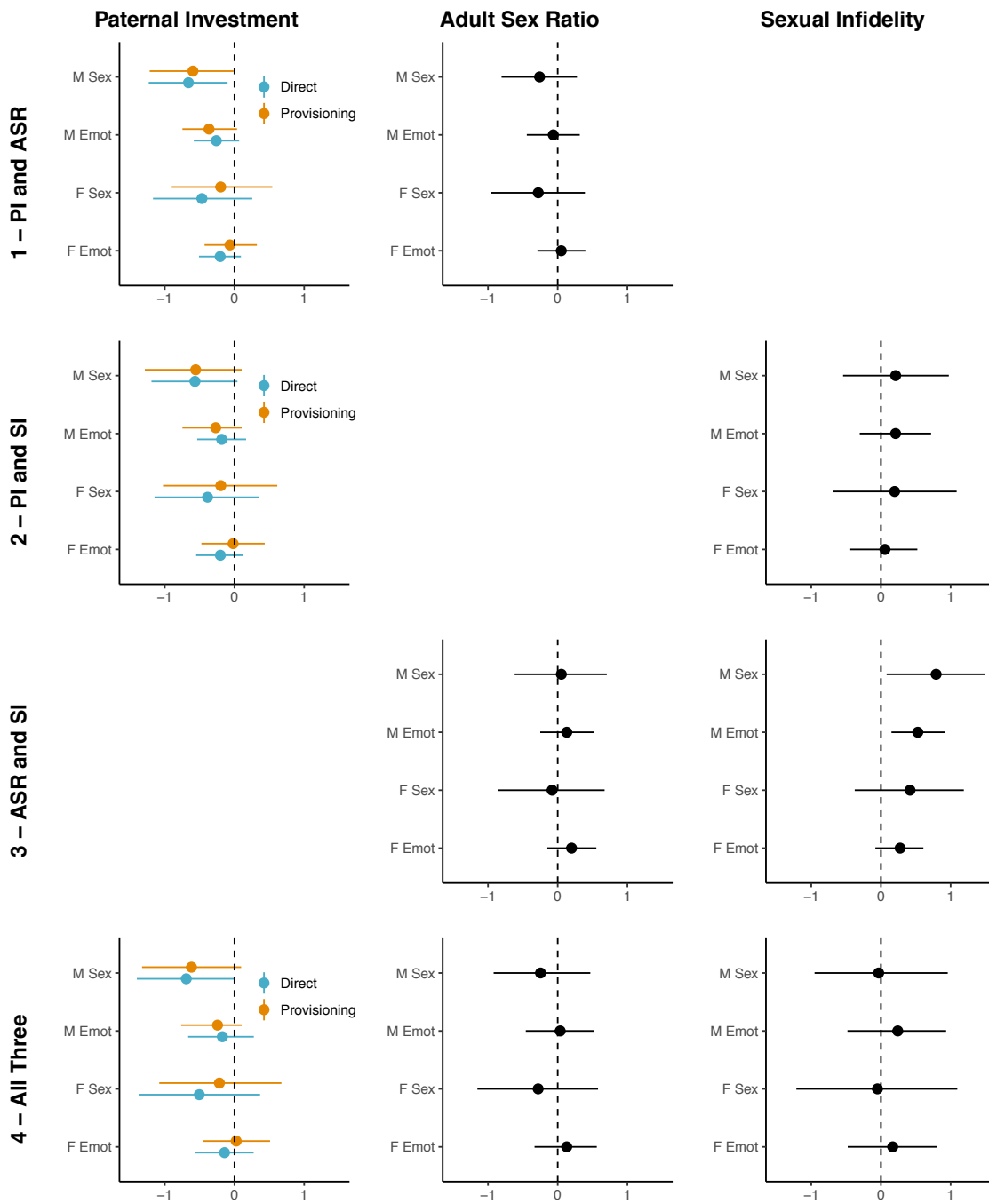
Supplementary Figures



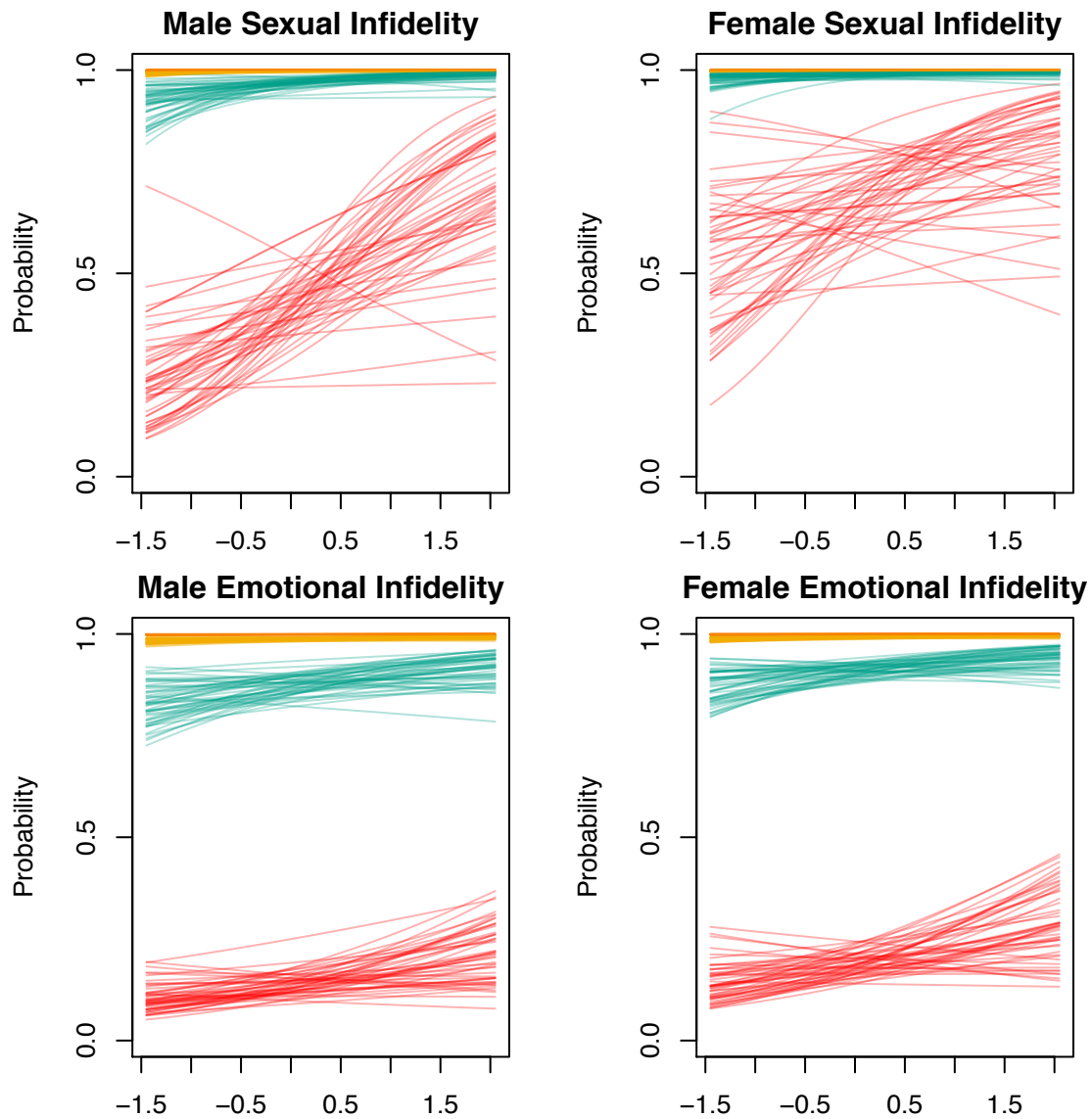
Supplementary Figure 1 | Relationships between population-level variables utilized in the severity analysis



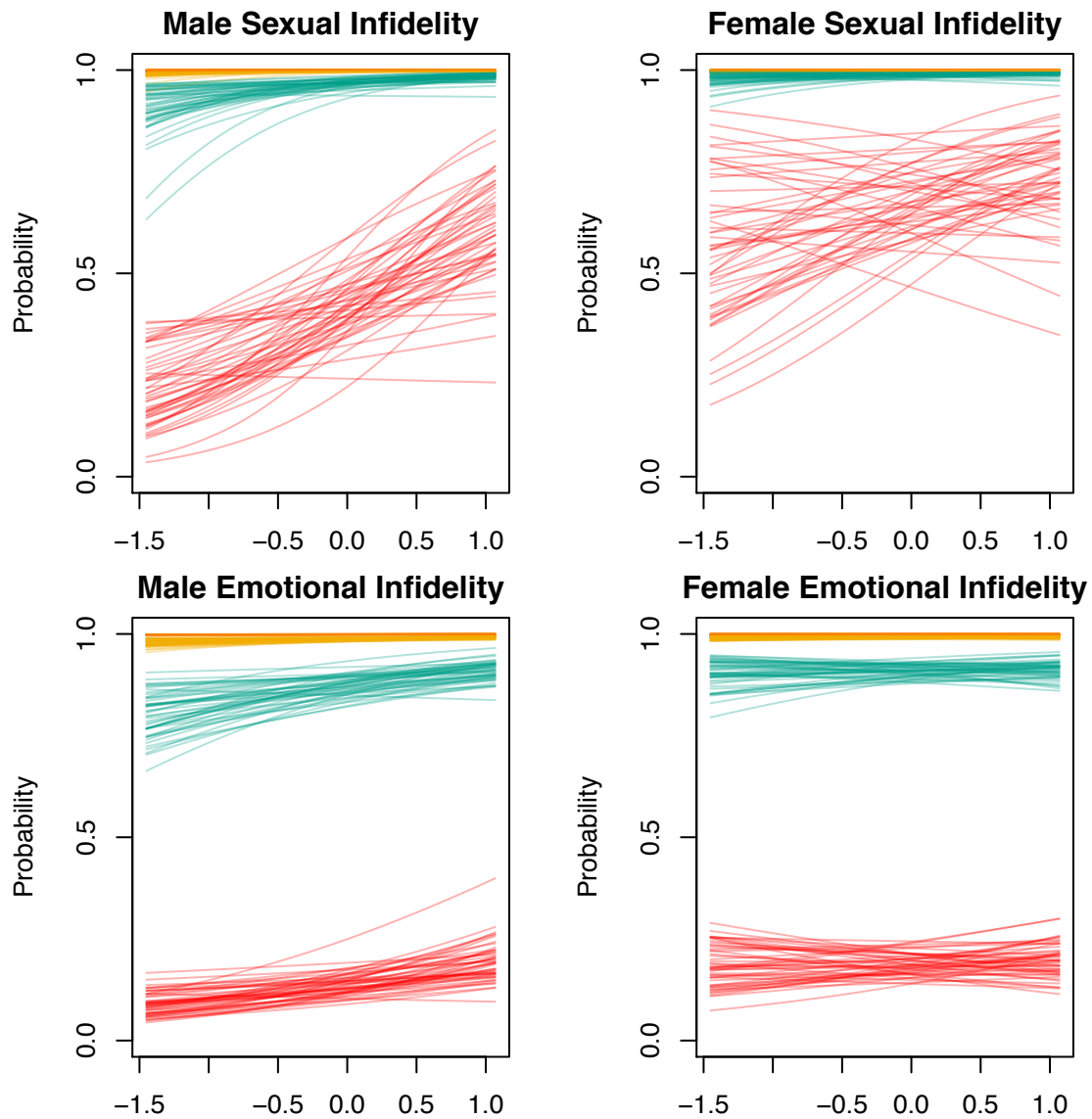
Supplementary Figure 2 | Posterior predictions of severity by sex of respondent. For each plot, 50 samples from the posterior representing boundaries between severity ratings, where red lines indicate estimates of the cut off between “very bad” and “bad” ratings. Changes in the probability space across the x axis represent predicted differences in probability associated with respondent sex



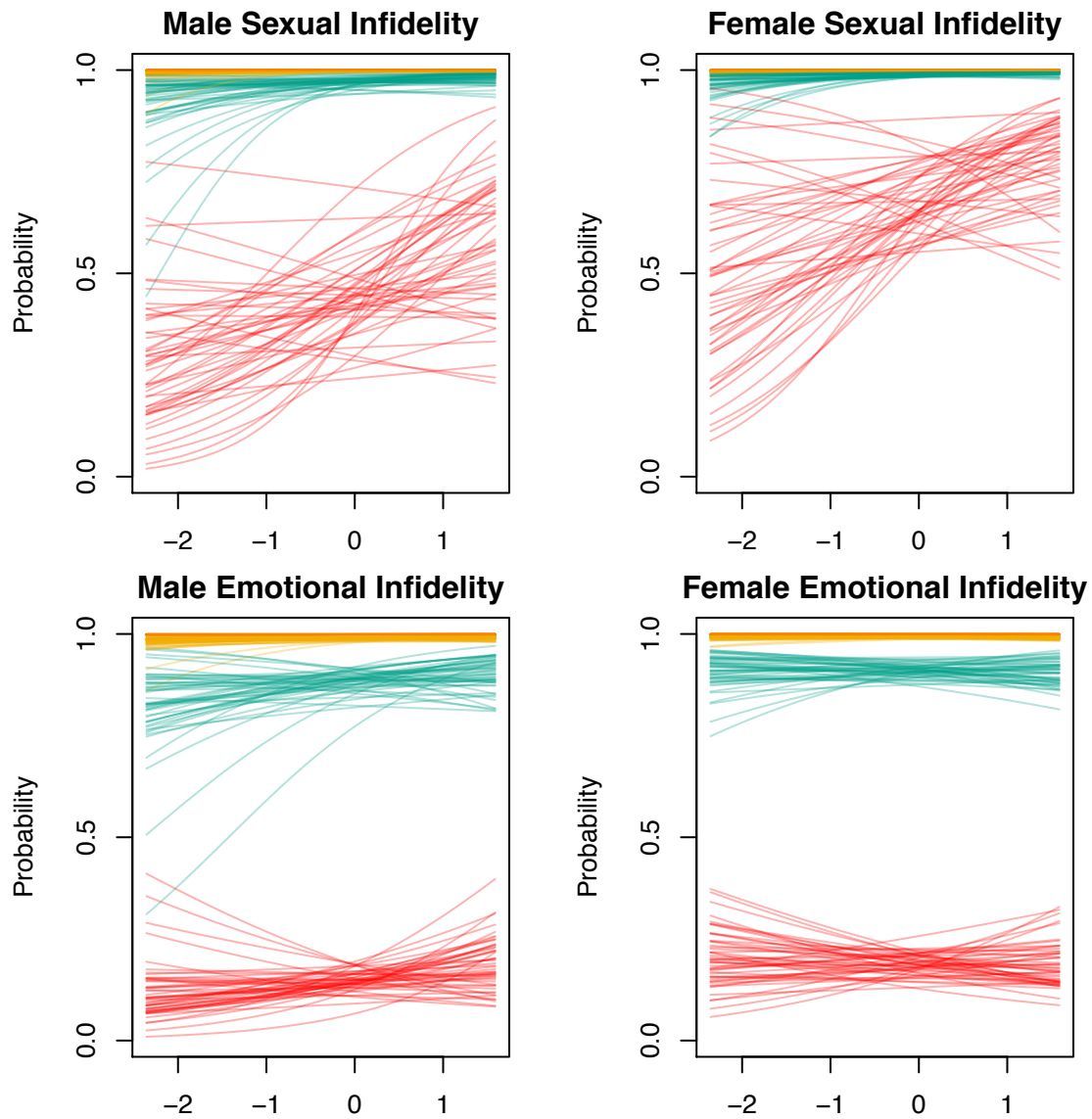
Supplementary Figure 3 | Effect of population-level predictors on severity. Posterior distributions of paternal investment, adult sex ratio, and frequency of sexual infidelity as predictors for severity, using the full model M5. In this case models were run with multiple predictors, listed by row below (e.g. row 1 displays the posteriors for the predictors including direct and provisioning PI, and ASR, ran in the same model). Models with predictors run individually are displayed in Figure 3. Posterior means and 89% prediction intervals displayed.



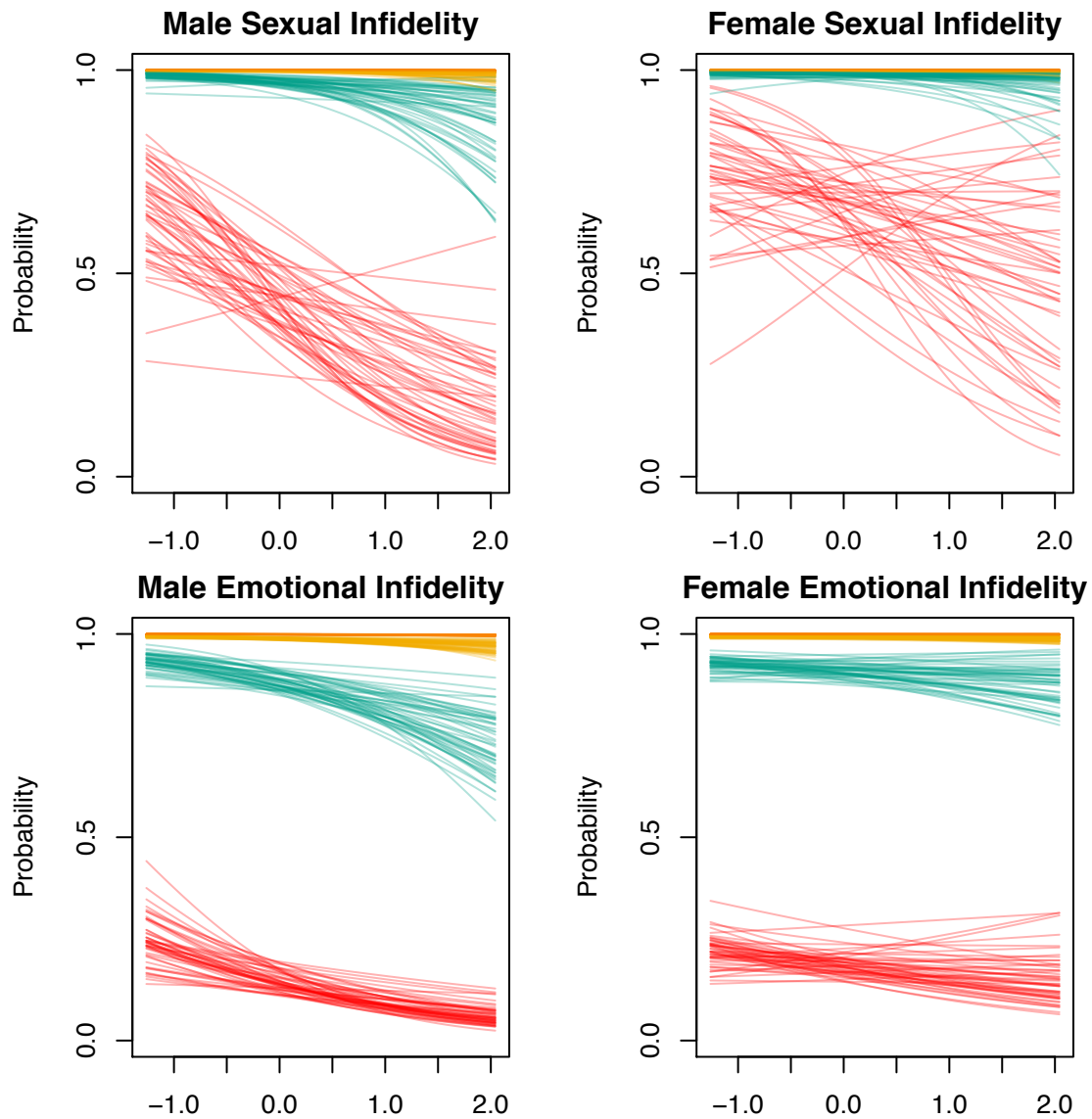
Supplementary Figure 4 | Posterior predictions of severity by direct paternal investment. Results are from the full model M5 including only predictors for paternal investment. For each plot, 50 samples from the posterior representing boundaries between severity ratings, where red lines indicate estimates of the cut off between “very bad” and “bad” ratings. Changes in the probability space across the x-axis represent predicted differences in probability associated with direct paternal investment score. Other predictors held at average.



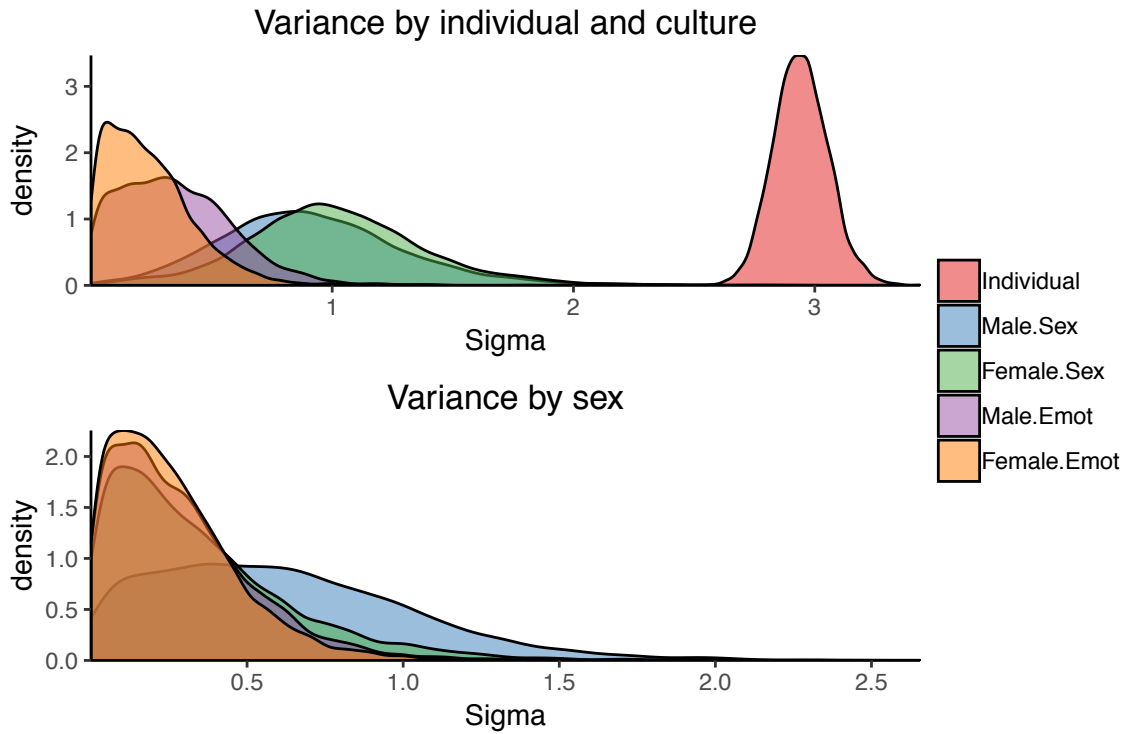
Supplementary Figure 5 | Posterior predictions of severity by paternal provisioning. Results are from the full model M5 including only predictors for paternal investment. For each plot, 50 samples from the posterior representing boundaries between severity ratings, where red lines indicate estimates of the cut off between “very bad” and “bad” ratings. Changes in the probability space across the x-axis represent predicted differences in probability associated with provisioning paternal investment score. Other predictors held at average.



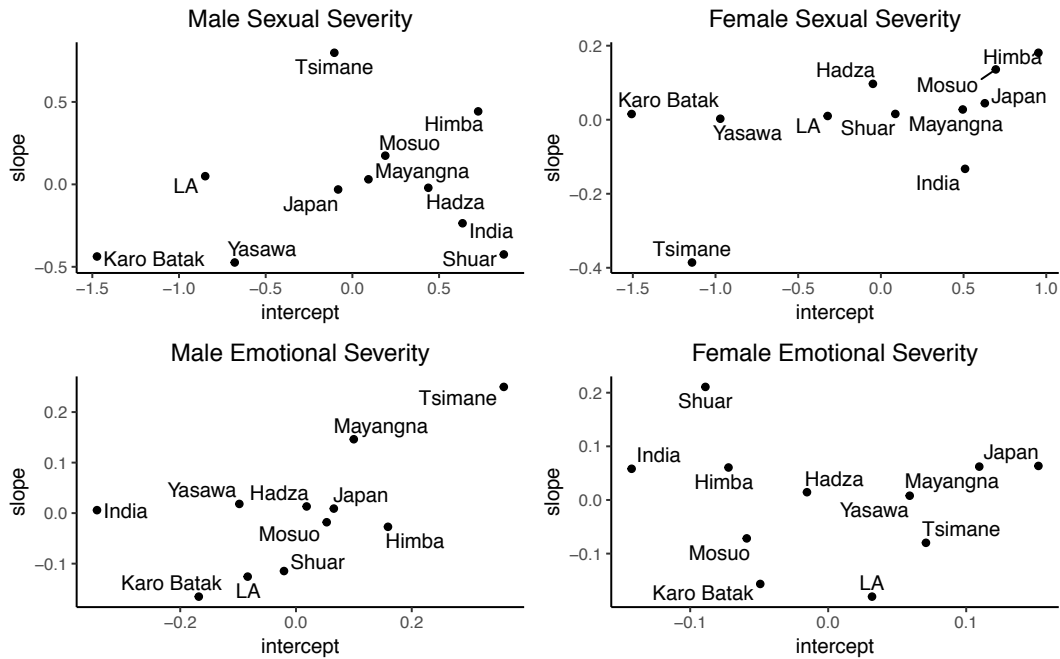
Supplementary Figure 6 | Posterior predictions of severity by adult sex ratio (ASR). Results are from the full model M5 including only ASR. For each plot, 50 samples from the posterior representing boundaries between severity ratings, where red lines indicate estimates of the cut off between “very bad” and “bad” ratings. Changes in the probability space across the x-axis represent predicted differences in probability associated with ASR. Other predictors held at average.



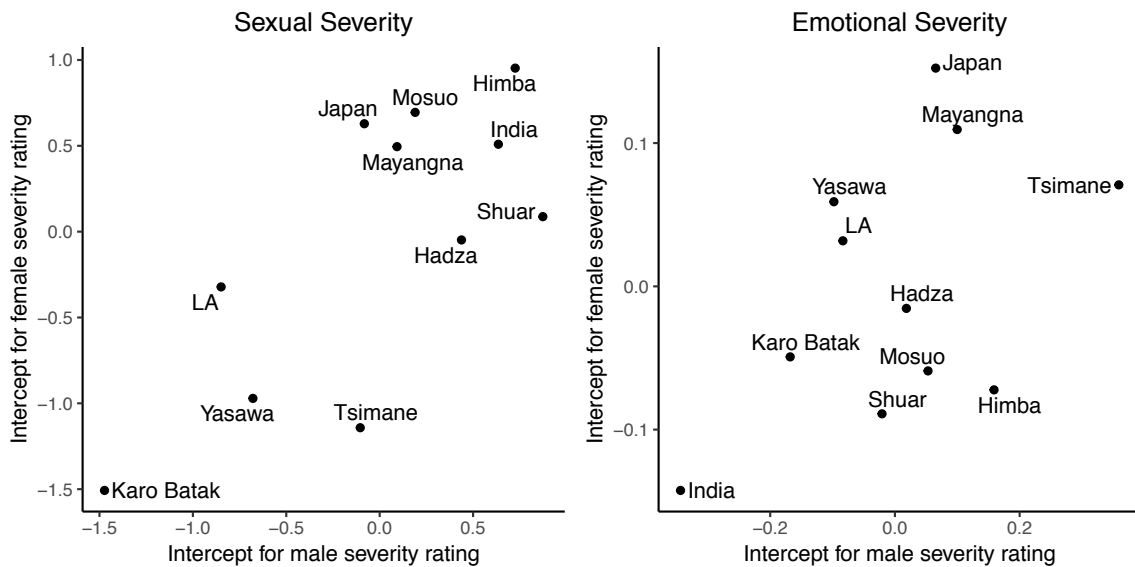
Supplementary Figure 7 | Posterior predictions of severity by frequency of extramarital sex. Results are from the full model M5 including only predictors for sexual infidelity. For each plot, 50 samples from the posterior representing boundaries between severity ratings, where red lines indicate estimates of the cut off between “very bad” and “bad” ratings. Changes in the probability space across the x-axis represent predicted differences in probability associated with frequency of sexual infidelity score. Other predictors held at average.



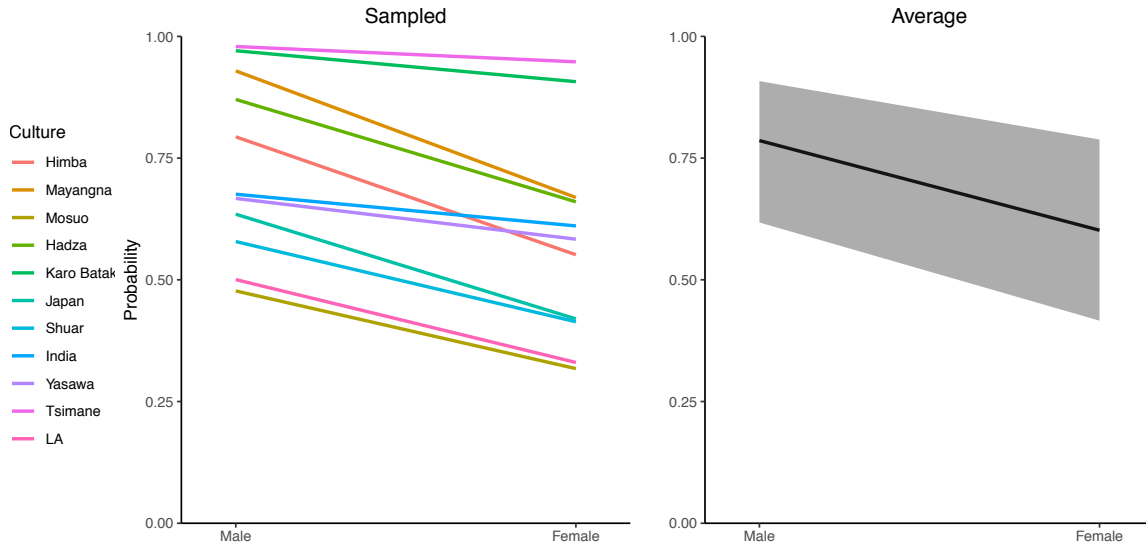
Supplementary Figure 8 | Variance estimates from the best fit model predicting severity. The top panel shows variance by individual and culture by severity category. The bottom panel shows variance in the slopes for sex by severity category.



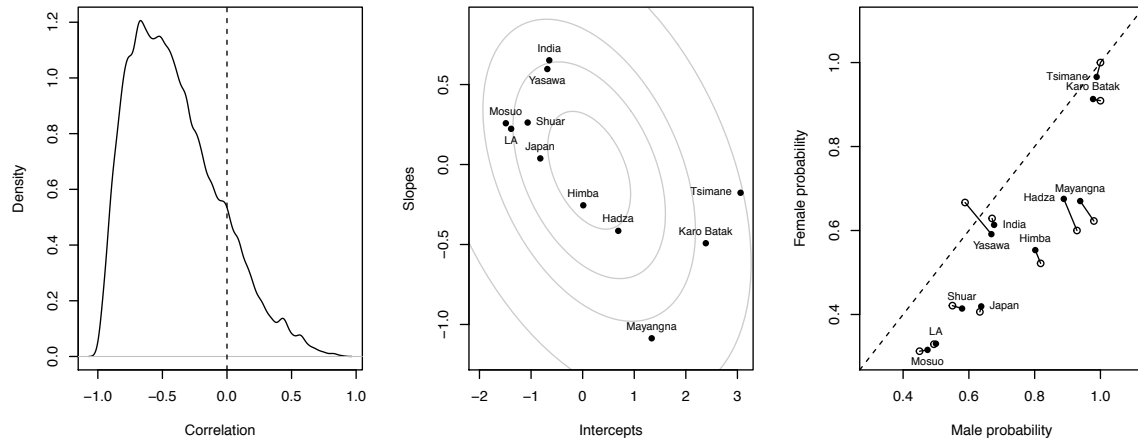
Supplementary Figure 9 | Covariance between varying slopes by sex and intercepts by culture from best fit model predicting severity. Posterior means plotted for each severity type as estimated from the best fit model (M5).



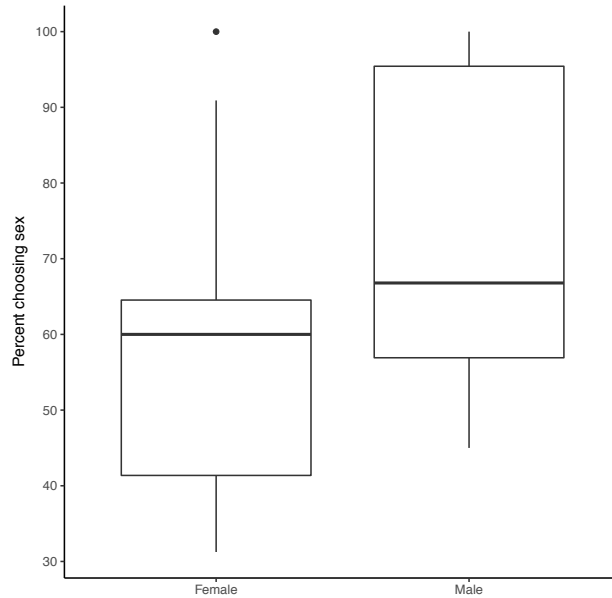
Supplementary Figure 10 | Covariance between intercepts for sexual and emotional jealousy ratings (posterior means) from the best fit model predicting severity.



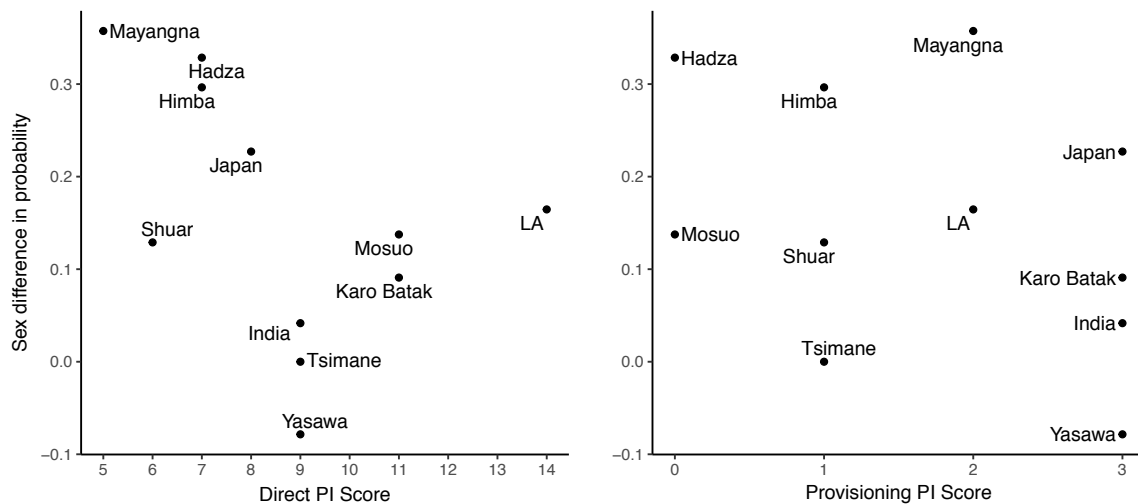
Supplementary Figure 11 | Model estimates of the probability of being more upset by sexual vs emotional infidelity from the best fit model predicting forced choice. The sampled plot illustrates sex differences in posterior means by culture sampled, while the average plot illustrates posterior mean (and 89% interval) of sex differences for an average culture (independent of varying intercepts and slopes).



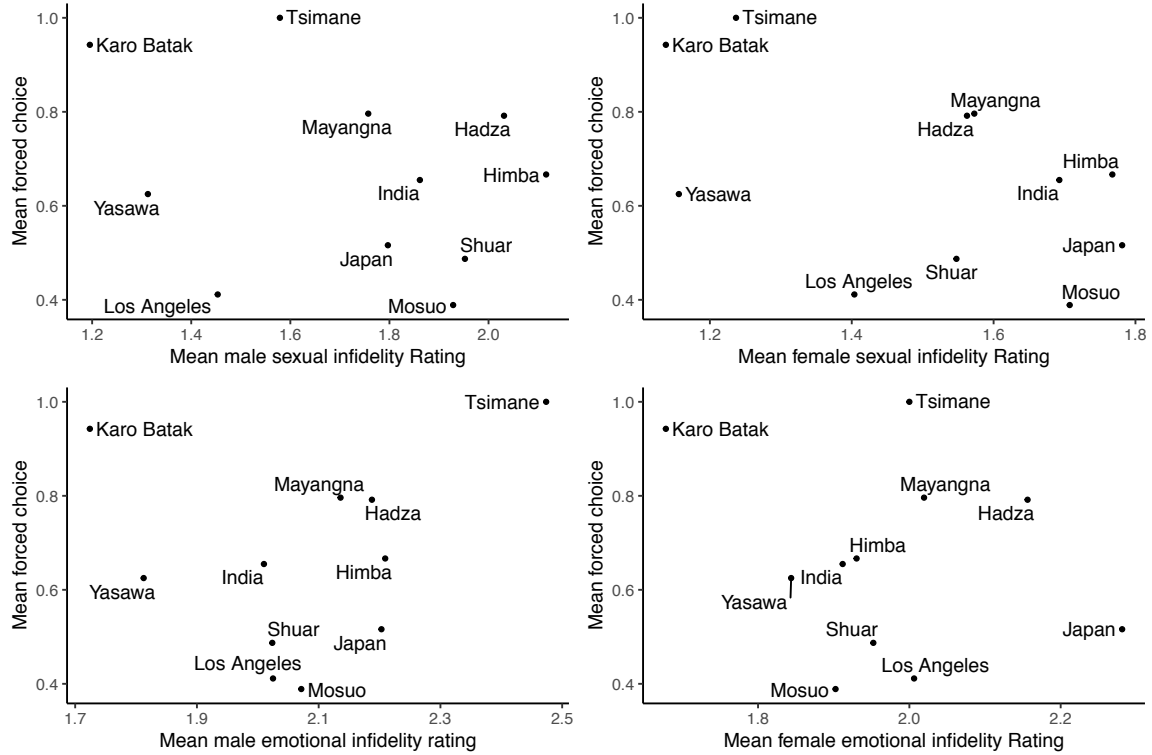
Supplementary Figure 12 | Covariance results from the best fit model predicting forced choice. Varying intercepts and slopes predicting the forced choice outcome are negatively correlated (left; density plot of correlation, center; scatterplot of slopes and intercepts), indicating linkage between cultural level variation in severity and the effect of sex within each culture. This relationship indicates that cultures tend to have similar sex differences relative to the overall magnitude of cultural level jealous responses, which are predicted to be universally male-skewed in favor of higher probability of sexual jealousy. The scatterplot (right) illustrates the sex difference in probability of being more upset by sexual infidelity, with open points representing raw un-pooled probabilities of being more upset by sexual infidelity, and filled points representing partially pooled probabilities as predicted by the model.



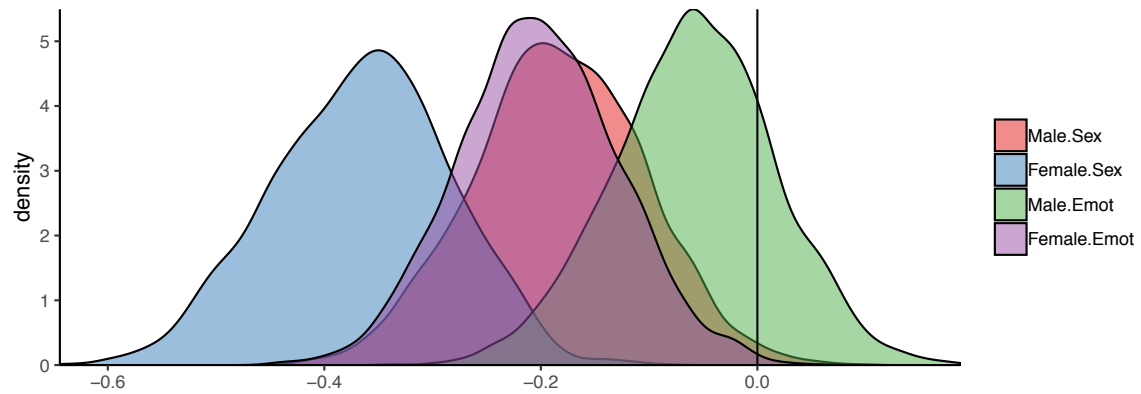
Supplementary Figure 13 | Boxplots depicting variance in forced choice responses, by sex. Plots depict population-level parameters ($n=11$) in order to show range of variation across cultures. Men's responses fall almost entirely above the 50% mark (i.e. the majority of men in most cultures are more upset by sexual infidelity) whereas women's responses are more variable.



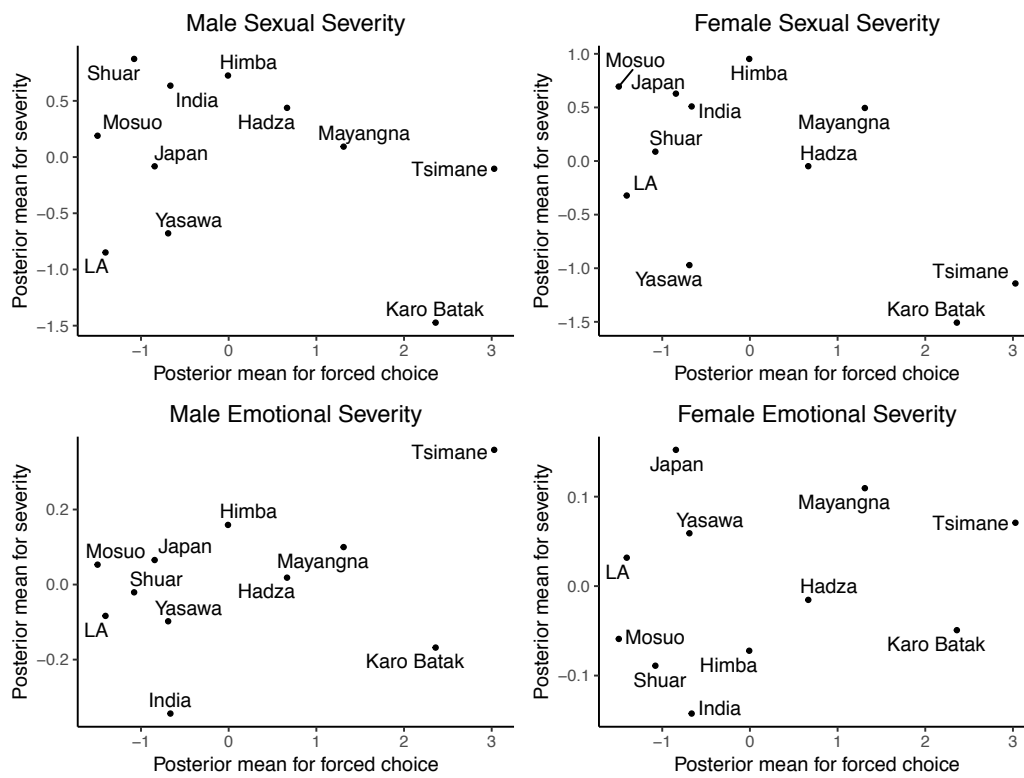
Supplementary Figure 14 | Correlations between paternal investment variables and raw results of sex difference in probability (Male - Female) of being more upset by sexual versus emotional infidelity. Pearson's correlations for these variables are -0.43 and -0.37 respectively.



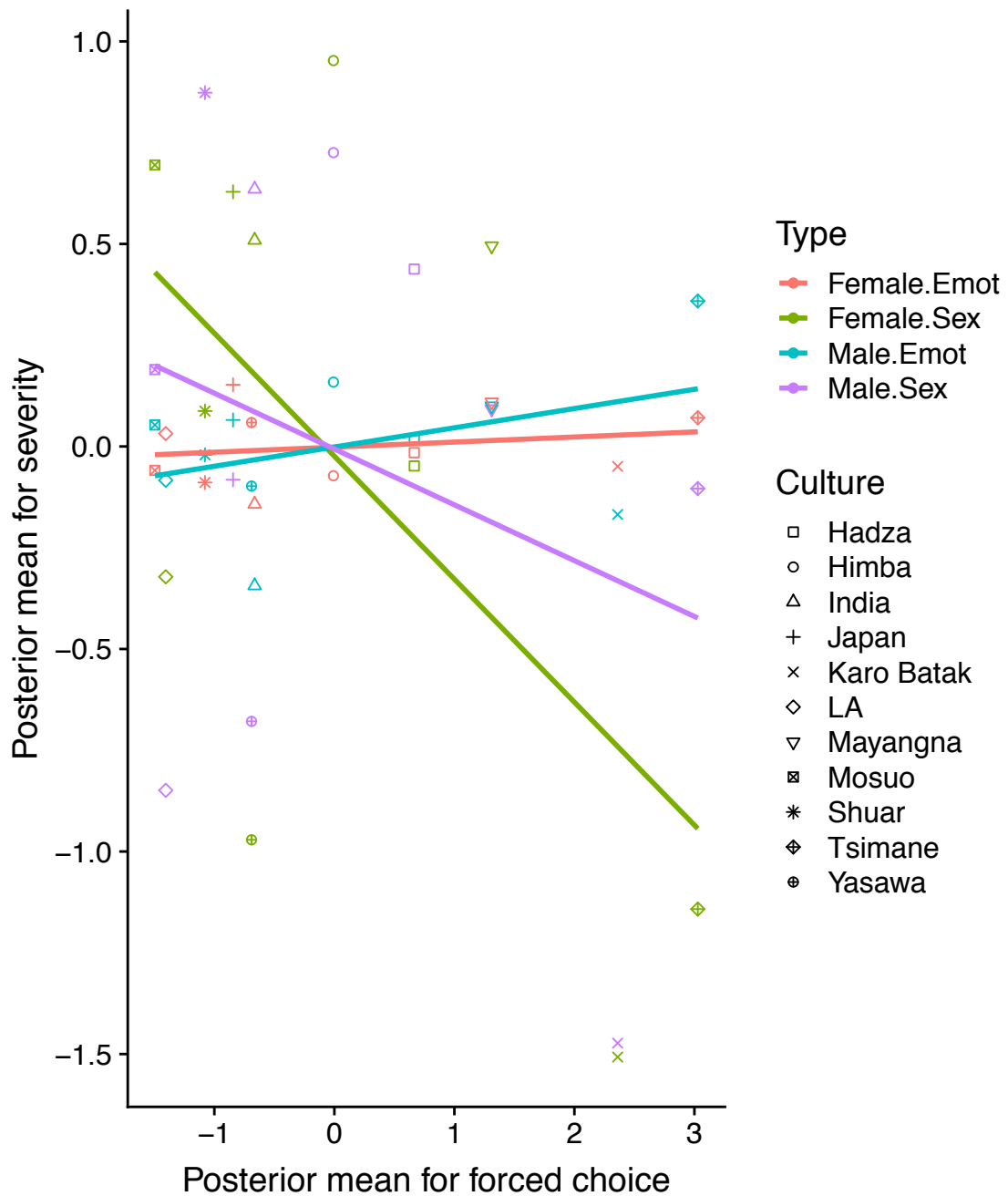
Supplementary Figure 15 | Mean severity scores and forced choice scores by culture



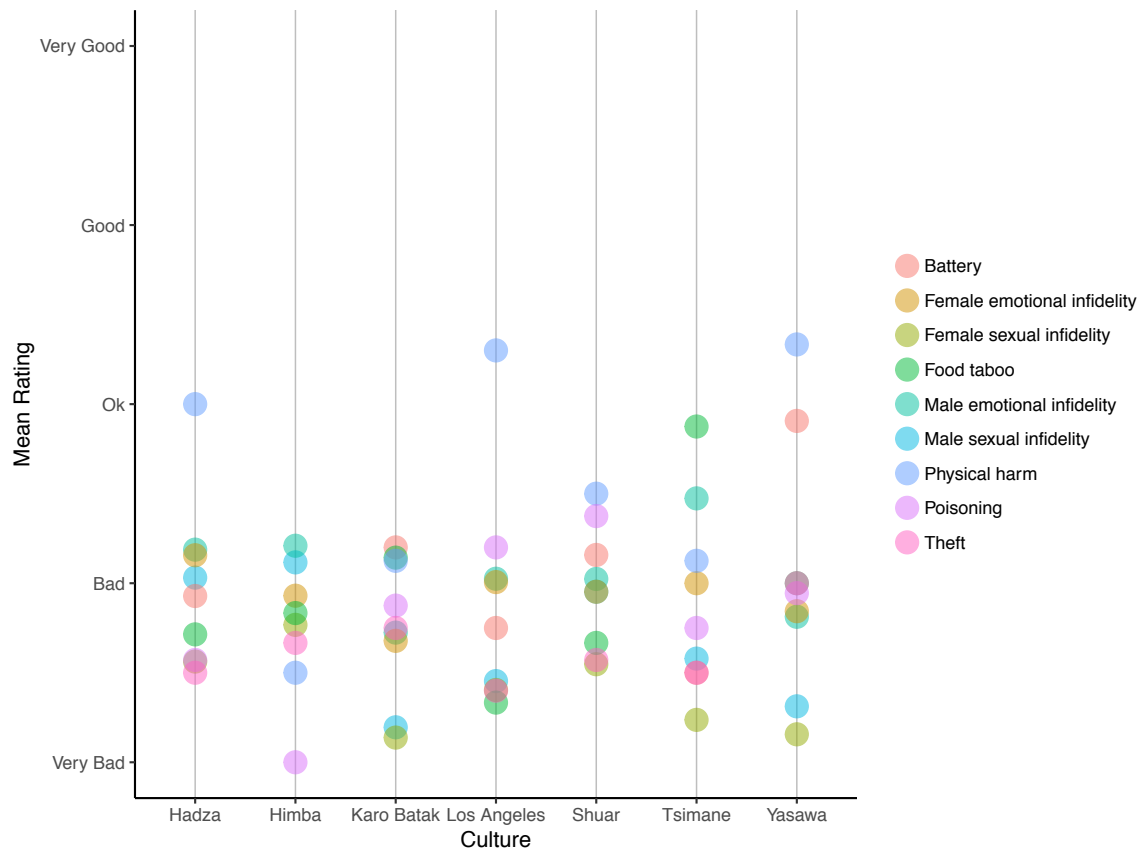
Supplementary Figure 16 | Results of logistic regression predicting forced choice responses from severity scores. Models were run individually including only one centered severity score as a fixed effect, and varying intercepts by culture. Severity scores for female sexual infidelity show the strongest effect in predicting individual forced choice outcomes.



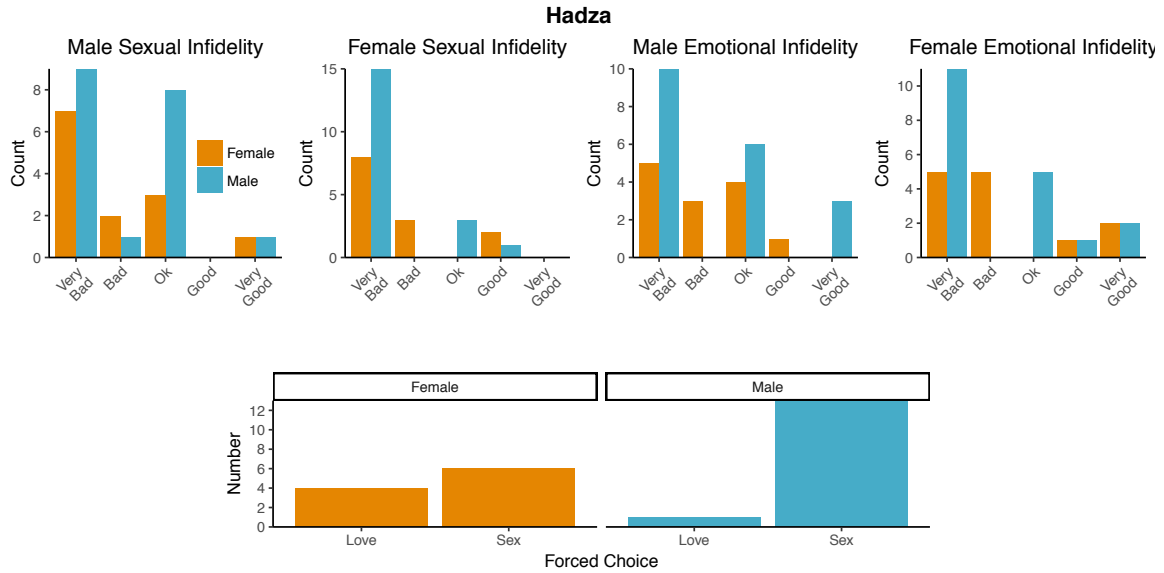
Supplementary Figure 17 | Posterior means of varying intercepts for severity (by type) and forced choice by culture, calculated from the best fit models.



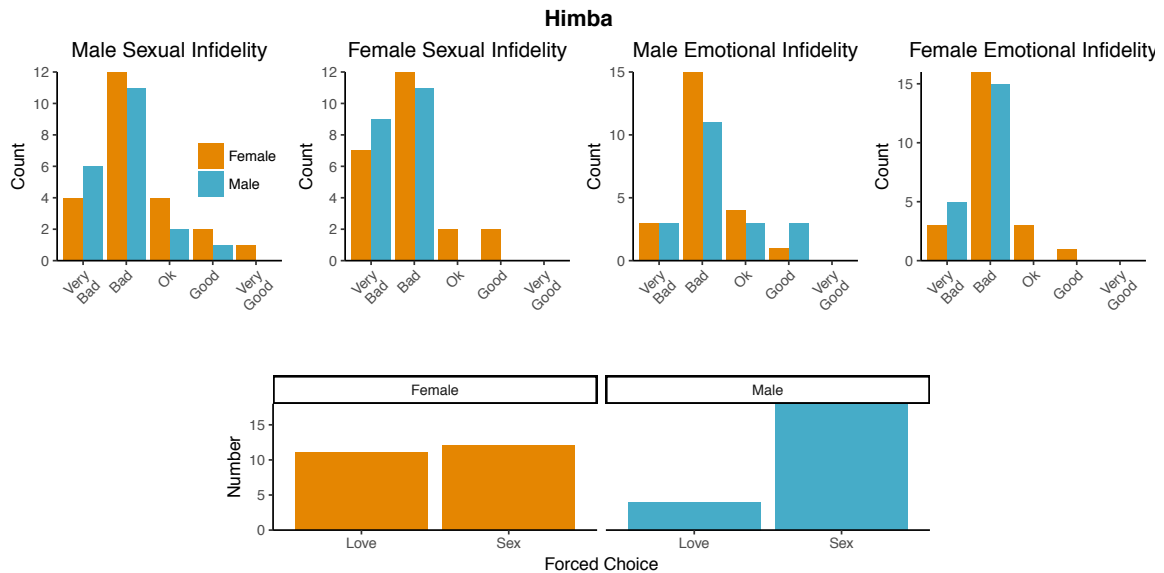
Supplementary Figure 18 | Posterior means of varying intercepts for severity (by type) and forced choice by culture. Calculations were from the best fit models plotted together, with trend lines depicting estimated relationship between severity and forced choice.



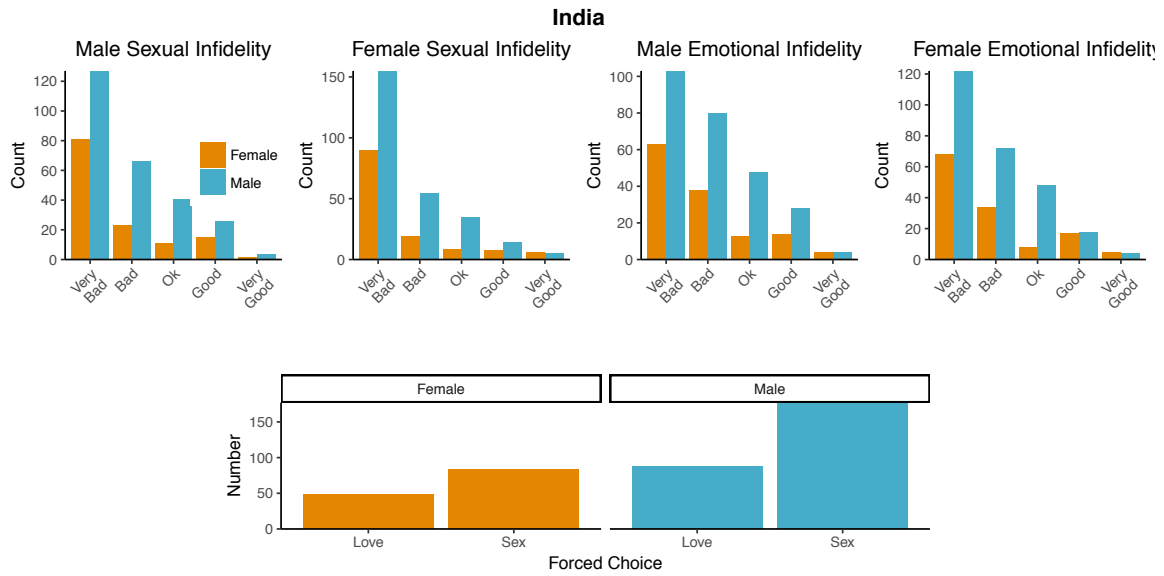
Supplementary Figure 19 | Comparison of mean Likert ratings by culture for various transgressions. Data for the infidelity questions come from our study. Data for the scenarios on food taboos infractions, physical harm, poisoning and theft come from Barrett et al. and only include responses to the “intentional” condition. The five-point outcome scale used by Barrett et al. has been converted to match the scale used for our assessments of jealousy.



Supplementary Figure 20 | Hadza responses to severity and forced choice scenarios



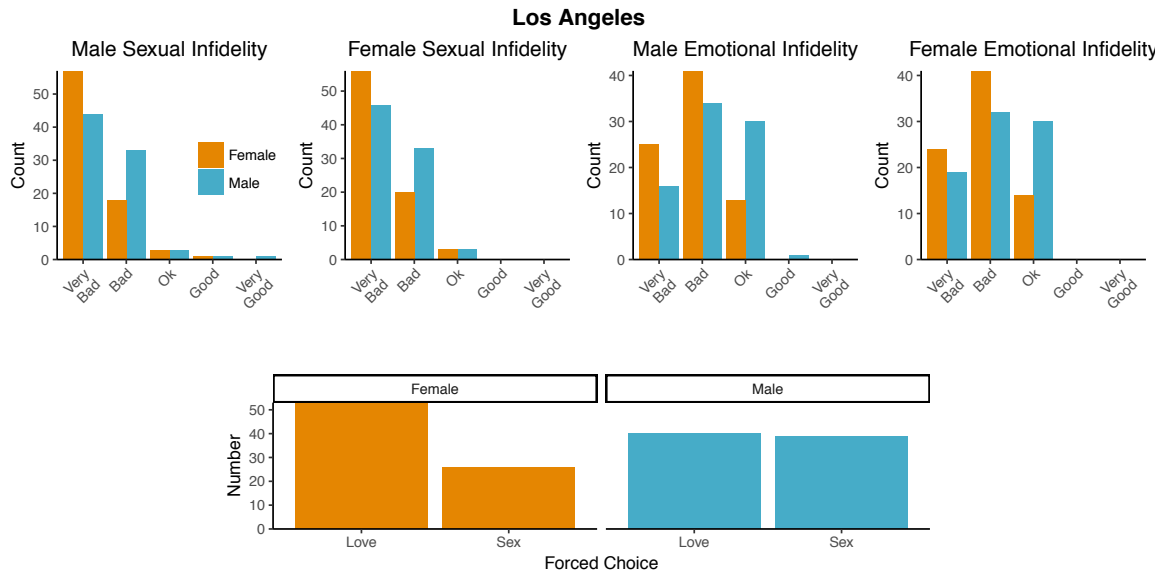
Supplementary Figure 21 | Himba responses to severity and forced choice scenarios



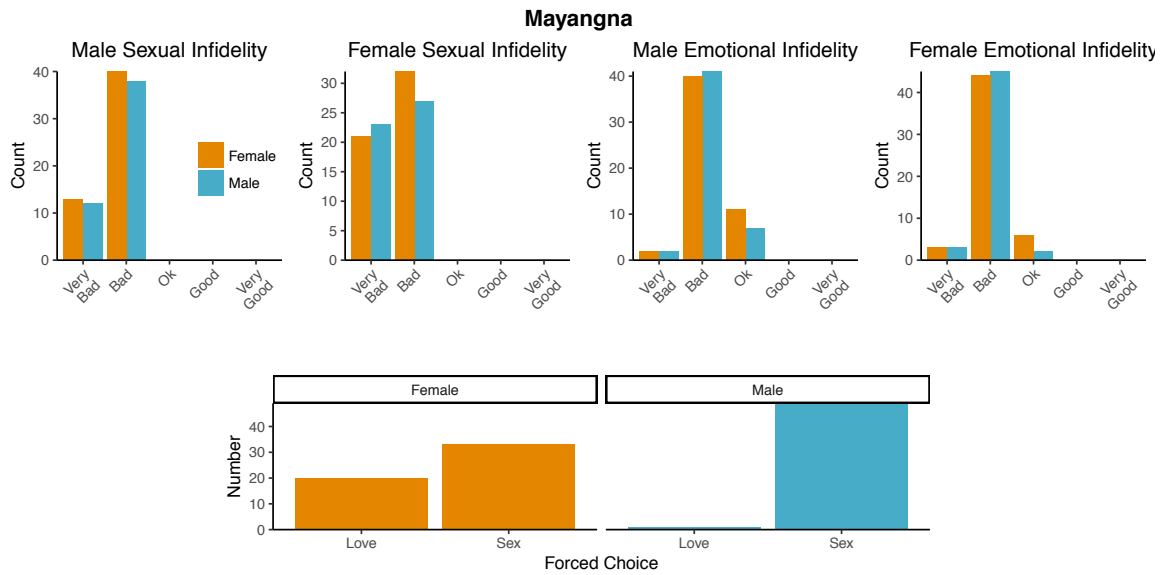
Supplementary Figure 22 | India responses to severity and forced choice scenarios



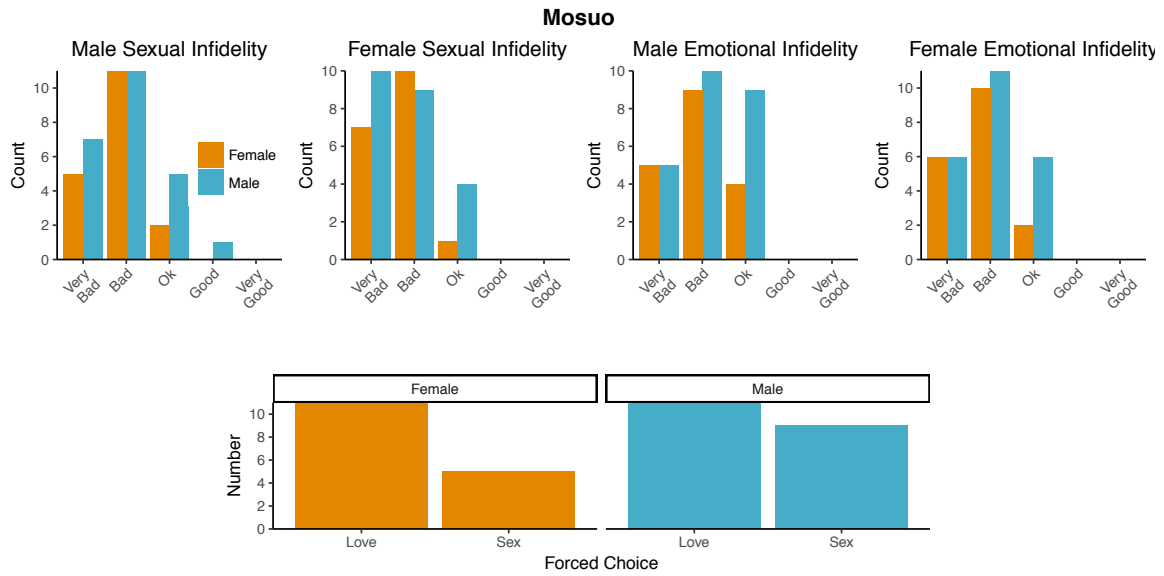
Supplementary Figure 23 | Karo Batak responses to severity and forced choice scenarios



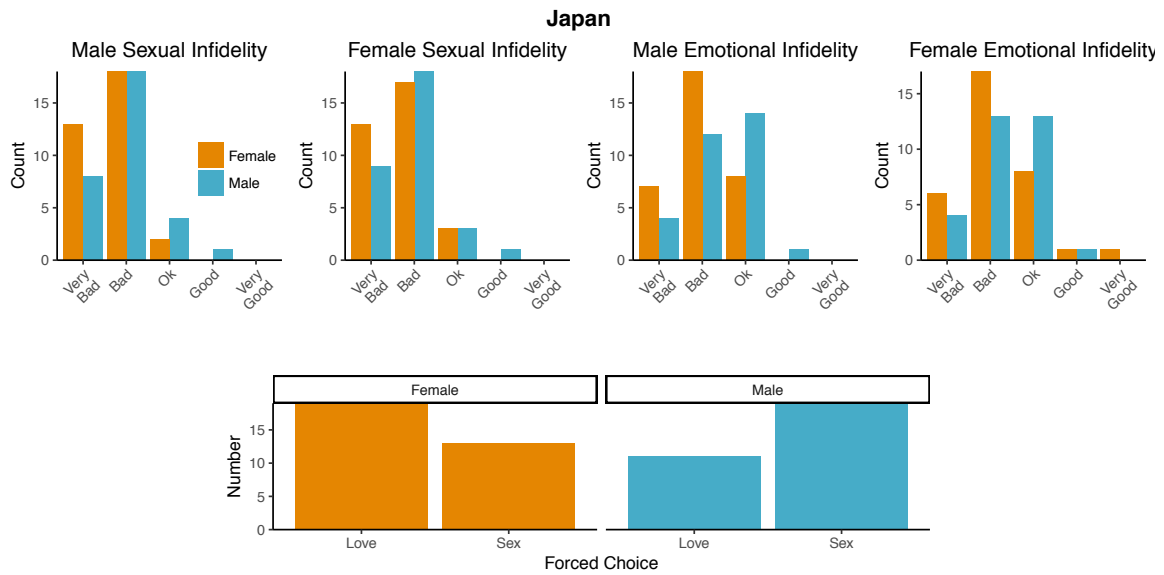
Supplementary Figure 24 | Los Angeles responses to severity and forced choice scenarios



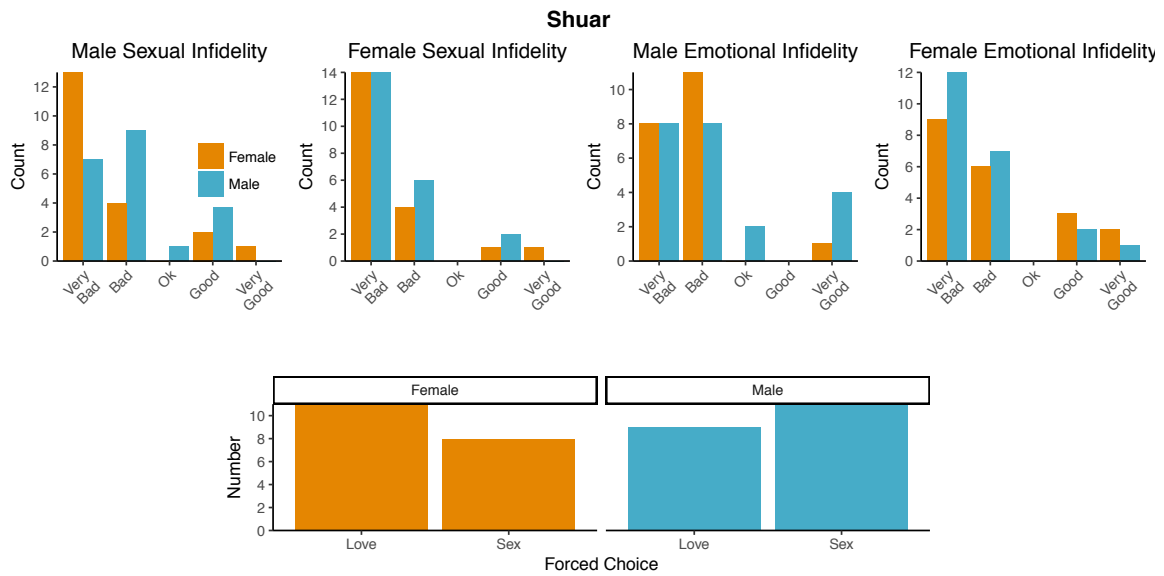
Supplementary Figure 25 | Mayangna responses to severity and forced choice scenarios



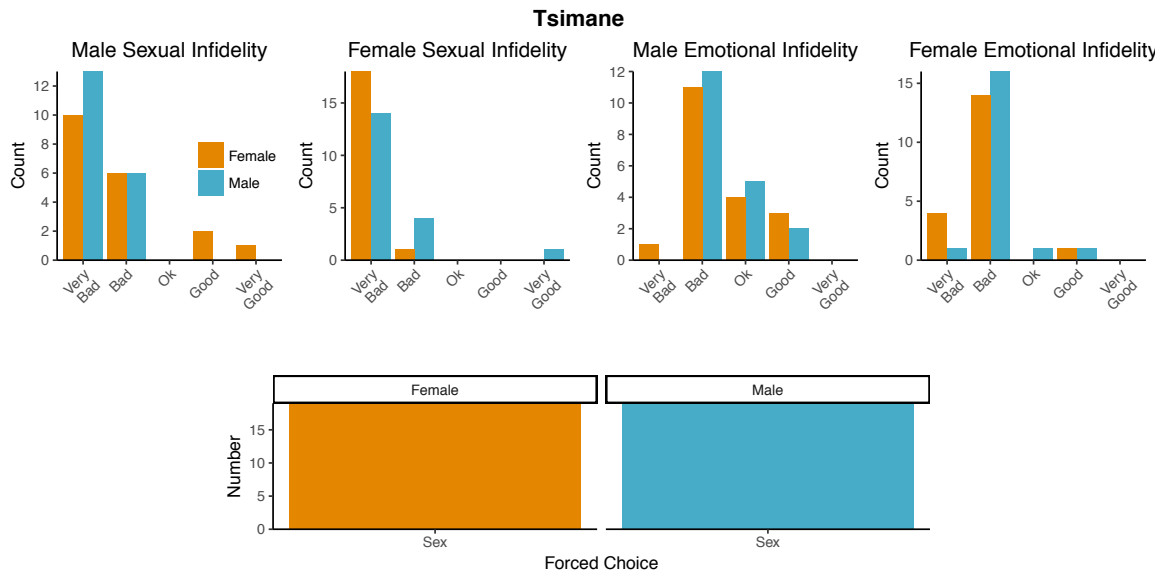
Supplementary Figure 26 | Mosuo responses to severity and forced choice scenarios



Supplementary Figure 27 | Okinawa responses to severity and forced choice scenarios

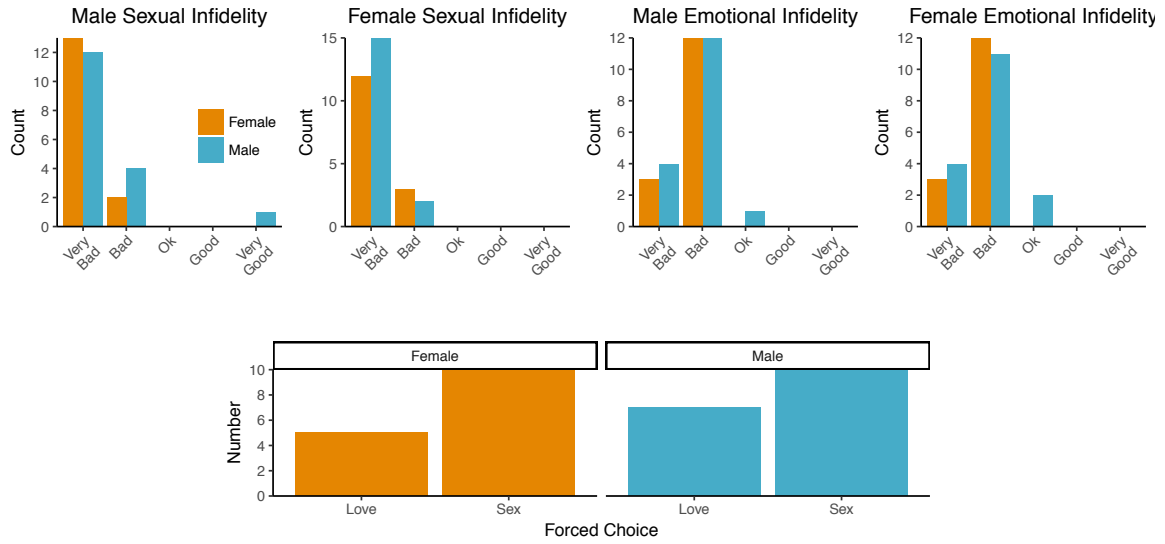


Supplementary Figure 28 | Shuar responses to severity and forced choice scenarios



Supplementary Figure 29 | Tsimane responses to severity and forced choice scenarios

Yasawa



Supplementary Figure 30 | Yasawa responses to severity and forced choice scenarios

Supplementary References

1. McElreath, R. *Statistical rethinking: A Bayesian course with examples in R and Stan*. **122**, (CRC Press, 2016).
2. Barrett, H. C. *et al.* Small-scale societies exhibit fundamental variation in the role of intentions in moral judgment. *Proc. Natl. Acad. Sci.* **113**, 4688–4693 (2016).
3. Lamb, M. E., Pleck, J. H., Charnov, E. L. & Levine, J. A. Paternal behavior in humans. *Am. Zool.* 883–894 (1985).