

Shared interests or sexual conflict? Spousal age gap, women's wellbeing and fertility in rural Tanzania

HIGHLIGHTS

We explore whether husband-older spousal age gaps are costly or beneficial to women

Women frequently married older men than their stated ideal spousal age gaps

Spousal age gap was unrelated to the risk of divorce or to women's fertility

Overall, women's wellbeing was highest in husband-older marriages

However, among women married to older men, spousal age gap was unrelated to wellbeing

Shared interests or sexual conflict? Spousal age gap, women's wellbeing and fertility in rural Tanzania

David W. Lawson^{a*}, Susan B. Schaffnit^a, Anushé Hassan^b, Mark Urassa^c

a. University of California Santa Barbara, Department of Anthropology, Santa Barbara, CA 93106, United States

b. London School of Hygiene & Tropical Medicine, Keppel Street, London WC1E 7HT, United Kingdom

c. National Institute of Medical Research, Isamilo Street, Mwanza, Tanzania

*Corresponding author; dlawson@ucsb.edu

WORD COUNT: 7414, including abstract.

Shared interests or sexual conflict? Spousal age gap, women's wellbeing and fertility in rural Tanzania

ABSTRACT

The marriage of older men to younger women is common across cultures. On one hand, husband-older marriage may serve the interests of both sexes, a conclusion broadly consistent with reported gender differences in mate preferences. On the other hand, men alone may benefit from such marriages at a cost to women if seniority enables men to exert dominance in conflicts of interest. Indeed, in public health large spousal age gaps are generally deemed “pathological”, both a cause and consequence of gender inequalities harmful to women. We investigate these alternative models of spousal age gap using data from a cross-sectional survey of women in Mwanza, northwestern Tanzania (n=993). Consistent with the notion that spousal age gaps are a product of sexual conflict, women typically married with a larger age gap than stated ideals. However, adjusting for potential confounds, spousal age gap was not associated with fertility or the risk of divorce. Furthermore, women's mental health and autonomy in household decision-making was higher in husband-older marriages compared to rare cases of same-age or wife-older marriage. Beyond this comparison, the magnitude of spousal age gaps was unrelated to either measure of women's wellbeing among the overwhelming majority of marriages where the husband was older. Together these findings suggest husband-older marriage does not influence marital stability, relatively large spousal age gaps are neither especially costly nor beneficial to women, and that alternative sociodemographic factors are more important in driving variation in women's wellbeing and reproductive success in this context. Our results support neither a model of mutual benefits, nor a “pathological” conceptualization of spousal age gaps. We conclude by both encouraging evolutionary human scientists to engage more fully with models of sexual conflict in future studies of marriage and mating, and suggesting that public health scholars consider more neutral interpretations of spousal age differences.

1
2
3
4 **KEYWORDS**
5
6

7 Spousal age difference; empowerment; mental health; marriage; Tanzania; sexual
8 conflict
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65

1. Introduction

One of the most stable aspects of human marriage across cultures is the tendency of older men to marry younger women. The magnitude of spousal age gaps is variable, but it is normative everywhere for husbands to be older than their wives (Carmichael, 2011; Casterlinet, Williamst, & Mcdonald, 1986; Conroy-Beam & Buss, 2019). Within the evolutionary behavioral sciences, and to some extent economic perspectives on marriage more generally (Bergstrom & Bagnoli, 1993; Gustafson & Fransson, 2015), this pattern has long been interpreted as serving the interests of both sexes. Men prefer young women because female youth is closely associated with reproductive value, while women prefer older men because male wealth and social status tend to increase with age. Supporting evidence for this interpretation comes from numerous mate choice studies where men state a preference for younger women, while women state preferences for older men (Buss, 1989; Conroy-Beam & Buss, 2019; Kenrick & Keefe, 1992). Although less commonly studied, there is also some evidence that the reproductive success of a marriage is higher when the husband is older than the wife (Fieder & Huber, 2007; Helle, Lummaa, & Jokela, 2007; Kuna, Galbarczyk, Magdalena, Nenko, & Jasienska, 2018; but see Stoeckel & Chowdhury, 1984, Rotering & Bras, 2019).

While cross-culturally common, mating preferences for relatively older males and younger females may be derived rather than ancestral traits for our species, evolving in tandem with our distinct tendency among apes for paternal care and the truncation of female fecundity by menopause. Wild chimpanzee males, for example, prefer older females as mates, most likely due to their higher social rank, and experience as mothers (Muller, Thompson, & Wrangham, 2006). There is also evidence for context-dependency in human spousal age gaps and in age preferences. Among the richest and most gender equal societies the mean spousal age gap approaches zero (Carmichael, 2011). Furthermore, Eagly and Wood's (1999) reanalysis of Buss's (1989) landmark cross-cultural mate choice study demonstrates that women's preferences for older men are weaker among societies with greater gender equality. Within populations, there is also evidence that individual socioeconomic status influences women's age

1
2
3
4 preferences, although the direction of reported effects is mixed (Moore, Cassidy, &
5 Perrett, 2010; Moore, Cassidy, Smith, & Perrett, 2006). This demonstration of
6 variability has sometimes been taken as a challenge to the idea of universal evolved
7 sex differences in ideal partner age. However, evolutionary perspectives anticipate
8 context-dependency in behavioral strategies and preferences (Nettle, Gibson,
9 Lawson, & Sear, 2013; Smith, Borgerhoff Mulder & Hill 2001). Women with
10 independent wealth, for example, may benefit relatively little from partnering with
11 older men, and where local reproductive strategies prioritize offspring quality over
12 quantity (Lawson & Mace, 2011, Mace 1998), female youth as a proxy for reproductive
13 value will logically be a lower priority for men.
14
15
16
17
18
19
20
21
22

23 A more relevant challenge to the view that observed spousal age gaps serve the
24 mutual interests of men and women is raised by considering scope for sexual conflict
25 over ideal partner characteristics (Borgerhoff Mulder & Rauch, 2009). Indeed,
26 although rarely approached from an evolutionary perspective, a large public health
27 and applied social science literature is premised on the view that husband-older age
28 gaps reinforce power inequalities between the sexes, enabling men to dominate
29 younger women and restrict women's autonomy (Barbieri, Hertrich, & Grieve, 2005;
30 Girls Not Brides, 2019; Carmichael, 2011; Clark, Bruce, & Dude, 2006; UNFPA, 2012)
31 with potentially harmful consequences. Here, women are viewed as effectively forced
32 or manipulated into husband-older marriages by patriarchal systems that restrict their
33 marital options, and it is assumed that if given free choice women would not opt to
34 marry significantly older men (UNFPA, 2012). A link between large spousal age gaps
35 and divorce could support such a view (e.g. Francis-Tan & Mialon, 2015), but evidence
36 linking age gaps to wellbeing is inconsistent (Adebowale, 2018; Kim, Park, & Lee,
37 2015; Kishor & Johnson, 2005; Otieno, 2017), a point we return to below when
38 discussing results of the present study (Section 4.3). Confusing matters further, many
39 public health studies of spousal age gaps also rely on national datasets (such as the
40 Demographic and Health Surveys) which prioritize the generation of representative
41 statistics at aggregated levels (i.e. country, sub-region), rather than within-
42 community comparisons. Consequently, they are particularly vulnerable to
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65

1
2
3
4 confounding marriage patterns with alternative sociodemographic determinants of
5 wellbeing at the individual and ecological level (for discussion see: Lawson et al.,
6 2015, Lawson & Gibson 2018). More studies comparing outcomes for women (and men)
7 with different spousal age gaps from within the same local cultural context are
8 needed.
9

10
11
12
13
14 In this study, we explore evidence for sexual conflict over spousal age gap using data
15 from a cross-sectional survey of women's marital history and wellbeing in Mwanza
16 Region, northwestern Tanzania. Our analyses are designed to test the hypothesis that
17 relatively large husband-older age gaps are undesirable and costly to women. First,
18 we predict that women will not realize their ideal age gap preferences and
19 consequently frequently marry with a larger age gap than their stated ideals. Second,
20 we predict that marriages where the husband is relatively older will be especially
21 prone to marital conflict and thus greater husband-older age gaps will increase risk of
22 separation or divorce. This prediction notably rests on the assumption that women are
23 able to leave unhappy marriages, which may not be true in all contexts. Third, we
24 predict that, all else equal, women with relatively older husbands will suffer from
25 poorer wellbeing. Here, we focus on two outcomes: presence of depressive symptoms,
26 as a measure of mental health, and household decision-making authority, a commonly
27 used indicator of women's empowerment. Finally, we consider the relationship
28 between spousal age gap and age-adjusted fertility as an indicator of female
29 reproductive success. Here, our analysis is best considered exploratory rather than
30 predictive. Lower fertility might be disadvantageous for female fitness, but past
31 research has also suggested that men can benefit more from higher fertility than
32 women given that women pay the biggest physiological costs of reproduction
33 (Borgerhoff Mulder & Rauch, 2009; but see Moya, Snopkowski, & Sear, 2016).
34 Moreover, since the study population is urbanizing we anticipate that reproductive
35 strategies are in flux for both sexes, with ideals of relatively lower fertility and higher
36 parental investment increasingly adopted (Hedges, Sear, Todd, Urassa, & Lawson,
37 2018). Nevertheless, differences in women's fertility by spousal age gaps may inform
38 our understanding of the scope for and consequences of sexual conflict.
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65

We caution from the outset that marriage and gender norms demonstrate considerable cultural variation. Consequently, we explicitly do not claim that the results from this study will be generalizable to alternative settings, even within Tanzania which encapsulates considerable cultural, demographic and socioeconomic diversity. As described below, in this population divorce and remarriage are commonplace and women report autonomy in partner choice. As such men's ability to dominate women may be limited compared to contexts where marriages are commonly arranged and divorce is not an option. On the other hand, bridewealth is practiced, suggesting that women's wellbeing may be traded for financial gain of wider kin. Finally, and perhaps of particular importance, the population is vulnerable to food insecurity and economic precarity which may, in contrast to wealthier settings, ultimately render marital relations a relatively trivial determinant of both perceived and objective wellbeing.

2. Materials and methods

2.1 Study population

Our data come from a larger project on marriage and wellbeing in northwestern Tanzania (Schaffnit, Hassan, Urassa, & Lawson, 2019; Schaffnit, Urassa, & Lawson, 2019). Data collection was carried out within the infrastructure of the ongoing Magu Health and Demographic Surveillance System (HDSS) managed by the Tanzanian National Institute for Medical Research (NIMR). The study area (Kisesa Ward) is predominantly rural, located approximately 20 kilometers east of Mwanza city, and home to over 35,000 people (Kishamawe et al., 2015). The population are primarily Sukuma, combining agropastoralist livelihoods with varying degrees of wage labor, especially in more urban communities. Education levels are rising, and girls' education is increasingly prioritized among families (Hedges et al., 2018).

Marriage is an important social institution, widely viewed as instrumental in acquiring social status within one's local community and practiced near universally (Schaffnit, Urassa, et al., 2019). Marriages are marked by cohabitation, but not necessarily a

ceremony or clear marriage event. In formal marriages (those with a legal, religious and/or traditional ceremony), bridewealth is generally exchanged at marriage, while informal marriages (those with no ceremony) are often followed by a “compensation” transferred from a husband to his parents-in-law, effectively serving as a late bridewealth (see also Kudo, 2015). Although we did not collect data on the reasons behind differences in the formality of marriage, our general understanding is that informal marriages are more common when bridewealth cannot be afforded and/or the couple marry without parental approval. Both forms of relationship are fully accepted as marriage in the community. Divorce is commonplace, and usually followed quickly by remarriage, at least for relatively young women (Boerma et al., 2002). Polygyny is practiced with approximately 10-20% of adult men married to more than one woman (Hedges, Sear, Todd, Urassa, & Lawson, 2019). It is common for women to have children prior to and outside of marriage (Schaffnit, Urassa, et al., 2019) and childcare arrangements often involve extended kin, with high rates of fostering, especially with grandparents (Hedges, Sear, Todd, Urassa, & Lawson, 2019). Female autonomy in the marriage process appears high; almost all married women sampled reported having chosen their own spouse, while unmarried women reported that they expected to choose who and when to marry (Schaffnit, Urassa, et al., 2019). Young women however are rarely economically-independent and usually remain living with their kin prior to marriage and following divorce.

2.2 Survey design

Cross-sectional surveys were conducted in two communities within the HDSS from July through October of 2017. These communities were chosen to represent the extremes of the rural-urban gradient within Kisesa Ward, facilitating comparisons between the more agricultural and market-integrated ecologies within the study site. The more urban area is hereafter referred to as the town, and the more rural area as the village. As a mixed, urbanizing economy it is particularly challenging to identify singular dimensions of wealth or social status. Land or cattle ownership, for example, poorly captures wealth variation because many households rely primarily on wage-labor rather than farming. Conversely, material asset scores favor ‘urban’ wealth over

1
2
3
4 wealth more common amongst farmers (i.e. livestock and land) (see Lawson et al.
5 2015). However, food security is a concern for all families, and is measured here using
6 the Household Food Insecurity Access Scale which assesses food insecurity during the
7 last month (Coates, Swindale, & Bilinsky, 2007).
8
9

10
11
12 Households containing at least one 15 through 35-year-old girl/women were selected
13 for interview, by simple random sampling, using the 2016 HDSS census as a sampling
14 frame. This age range was chosen based on our wider project aims of sampling both
15 married and unmarried women/girls, with approximately 35% marrying before age 18
16 years in this population (Schaffnit et al 2019). Note, for simplicity, throughout we use
17 the collective term “women” to refer to participants between these ages while
18 acknowledging that many may be considered girls or adolescents, and that boundaries
19 between childhood and adulthood are culturally variable (Dixon-Mueller 2008,
20 Schaffnit, Urassa et al. 2019). Originally, we aimed to sample approximately 900
21 women, based on budget and time constraints, along with sample size calculations
22 concerning our original variable of primary interest (age at marriage). Ultimately, we
23 approached 1,254 households, and successfully conducted surveys at 743 households
24 and with 993 women. Due to high-levels of movement, many households drawn from
25 the HDSS were ineligible, typically due to outmigration of the woman herself, or less
26 commonly, full household migration. However, once contacted, participation was
27 near universal, with less than 1% of women refusing to participate. Participation was
28 voluntary and no payment was made. However, broader NIMR activities support local
29 health care services in the study area, leading to a good relationship between NIMR
30 and community members.
31
32

33
34
35 Parental/guardian consent and participant assent was obtained for minors, and
36 participant consent was obtained from adult participants prior to interview.
37 Participants were read a consent statement which outlined the study’s goals and risks
38 and benefits of participation. Following this, participants were allowed time to ask
39 questions (or decline participation) and were given a hard copy of this statement
40 along with contact information for representatives of NIMR should they have questions
41 or concerns arising at a later time. Interviews were first conducted with household
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65

heads (n=743; 78% male) to gather information on household membership, socioeconomic status and livelihoods; this interview lasted approximately 30 minutes. Interviews were then conducted privately with all appropriately-aged, resident women, lasting up to our hour. Women's surveys (n=993) included questions on their marital and birth histories, and our measures of wellbeing (see below). We asked about marriages in chronological order, starting with their first. For ever-married women, information was collected for up to 3 current/past husbands - including both formal and informal marriages. This was sufficient to gather complete relationship histories in most cases; only 4 women had had 3 husbands, and of those only 2 had since separated from their 3rd husband. Of the 502 ever married women, 69.7% (n=350) were still married to that original partner, 11.1% (n=56) were married to someone else and the remainder were currently unmarried. Ethical approval for this research was granted by the University of California, Santa Barbara (Human Subjects Committee #1-17-0405) and NIMR (Lake Zone IRB #MR/53/100/463).

2.3 Ideal and actual spousal age gap

Ideal spousal age gap was calculated from two variables. All women were asked "What is the ideal age for a man to marry for the first time (in years)?" and "What is the ideal age for a woman to marry for the first time (in years)?" We refer to the difference between these two responses as the "ideal spousal age gap". This is different from previous studies which have asked more directly what the age differences of spouses should be, or about women's preferences for the age of a potential spouse for themselves. As such, we interpret this variable as representing women's 'societal ideal' for age gaps as opposed to an individual preference for their own potential mate. Three outlying responses were dropped due to unrealistically large age gaps, likely the result of recording errors during data collection, leaving 990 valid responses.

Actual spousal age gaps were calculated for each previous or current partner and can be sub-divided into first (n=502 women had ever married), and current marriages

(n=417 women currently married). Spousal age gaps were calculated from two variables. Women were asked “How old were you when you married this man?” and “How old was your husband at the time of the marriage?” Women who did not know their own or their husband’s actual age, were asked to make their best estimate. The difference between these two variables is used as their actual spousal age gap. Some women did not know their partner’s age at marriage and were unable to confidently guess; this resulted in a sample of 495 ever married and 412 currently married women with information on their actual spousal age gaps. For both ideal and actual spousal age gaps, negative numbers represent wife-older marriages, while positive numbers represent husband-older marriages.

2.4 Women’s wellbeing and fertility

Women’s current wellbeing was captured by two composite measures assessing mental health and autonomy in household decision-making (see **Supplementary Materials** for individual questions making up each summary score). Mental health was evaluated using a modified version of the Hopkins Symptoms Checklist (Hadley & Patil, 2006), which specifically focuses on depressive symptoms. Women were asked to specify whether they had experienced various symptoms. They could respond “not at all”, “a little”, “some” or “a lot”; scores were reverse coded such that low values represent poorer mental health. Autonomy in household decision making was captured through a series of questions about who made decisions in various spheres within the household (CARE, 2008). Women could respond that the decisions were made by themselves, their husband, their parents, their parents-in-law, or together with their husband. Women with higher “empowerment scores” made more decisions on their own or with their husband and are considered to have high empowerment. Each of these outcomes are standardized for the full sample of women (i.e. including unmarried women) so that 0 is equal to the sample mean, and 1 unit is equal to 1 standard deviation. Finally, age-adjusted fertility was calculated from the residuals of a linear regression predicting number of living children with current age. The resultant value can then be interpreted as how many more (positive values) or fewer

(negative values) living children each woman has, compared to what would be predicted for her age.

2.5 Analysis strategy

We first describe and compare the distributions of ideal and actual spousal age gaps. We then contextualize our understanding of marriage patterns by testing for bivariate relationships between actual spousal age gap and a range of potential correlates, as measured by our surveys. Here we divide between two broad categories of variables. First, '*structural and demographic variables*' include village or town residence, a household-level measure of socioeconomic status (household food insecurity, described above), women's current age and education (level completed), and household religion. Because structural and demographic data are relevant only to the time of interview (i.e. we do not have retrospective data on these measures) bivariate relationships were only considered for current marriages. Second, among ever-married women (i.e. currently and previously married women), we also consider relationships between spousal age gap and other '*union-level variables*' for first and current relationships; note that 70% of ever-married women were still married to their first partner, so there is overlap between these two groups. Union-level variables include wife number (comparing monogamously married women, first wives of polygynous men, and later wives of polygynous men), age at marriage, who the woman reports chose her husband, whether or not the marriage included an exchange of bridewealth, and the husband's relative wealth and education at the time of their marriage. Relative wealth here is a woman's own subjective comparison of the wealth of the woman's household prior to marriage, compared to her husband. We highlight that both wife number and receipt of bridewealth variables are based only on current status; currently monogamous marriages may later become polygynous (and vice versa), and bridewealth transfers can be delayed. Both variables were also recorded for formal marriages only. As such, informal marriages are excluded from bivariate analyses with these two variables, while multivariate models include a binary variable for formal vs informal marriage. For union-level variables, bivariate relationships between participant characteristics and spousal age gaps are presented for both first

1
2
3
4 and current marriages. We use linear regression with spousal age gap as the outcome
5
6 to test each bivariate relationship, running a likelihood ratio test based on model fit
7
8 to obtain an overall p-value for each categorical predictor. We do not run hierarchical
9
10 models with women clustered within households because the mean number of women
11
12 surveyed per household was only 1.3 and Clarke (2008) has demonstrated that when
13
14 clusters are unbalanced and sparsely populated both fixed and random effects may be
15
16 overestimated.

17
18 Next, we consider relationships between all union-level characteristics (including
19
20 spousal age gaps) and marital stability for first marriages. Women who had been
21
22 widowed (n=13) were excluded from these analyses. Bivariate relationships are
23
24 considered using a chi-squared test, followed by a multivariate logistic regression
25
26 predicting staying married, with spousal age gap as the primary predictor controlling
27
28 for potential confounders (i.e. union-level characteristics that are correlated with
29
30 both spousal age gap and staying married to a first husband). This is followed by an
31
32 examination of relationships between spousal age gap, women's wellbeing measures
33
34 and age-adjusted fertility. Here, information on only current partners was used
35
36 because the wellbeing data are relevant to time of interview only. After considering
37
38 bivariate relationships between wellbeing/fertility and structural, demographic and
39
40 union-level variables, multiple linear regression models were run predicting each
41
42 wellbeing/fertility outcome. Variables identified as possible confounders (i.e.
43
44 correlated with the wellbeing/fertility outcome and current spousal age gap) were
45
46 included in these models. A control for village was included in each model a priori, as
47
48 was participants' current age in the two wellbeing models.

49 3. Results

50 3.1 Ideal versus actual spousal age gaps

51
52 The majority of respondents felt that the ideal age at first marriage for men was
53
54 older than for women (76.6%), with 69.4% of women suggesting that a man should be
55
56 2-7 years older than a woman at first marriage (mean ideal age for women = 18.6
57
58
59
60
61
62
63
64
65

years, standard deviation(sd) = 2.5; mean ideal age for men = 22.0 years, sd = 4.1). About a fifth of women said that the ideal age of marriage was the same for men and women (21.8%), while a small percentage of women suggested that either women should be older than men (1.6%) or men should be 8+ years older than women (7.2%) at the time of first marriage. Never-married women (n=488) preferred smaller age gaps than women who had ever married (n=502); with a mean ideal age gap of 3 years (sd = 3) versus 3.8 years (sd = 2.9) respectively ($t(985)=-3.7$, $p<0.001$). Among women who had ever married, actual spousal age gaps with first husbands were larger (mean = 7.0, sd = 5.1) than their ideal age gaps (mean = 3.9, sd = 3.1; $t(462)=-11.6$, $p<0.001$; **Figure 1; Supplementary Table 1**). These data support our first prediction, that women frequently marry relatively older men than stated ideals, with ideal age gaps about half the size of actual age gaps.

3.2 Variation in spousal age gaps

For currently married women, we considered the relationship between age gaps and several structural and demographic variables: place of residence, household food insecurity (a measure of socioeconomic status), women's education, women's current age, and religion. These analyses were restricted to information using women's current relationships only (n=412) because the structural and demographic variables were applicable only to the time of interview. None of these variables were significantly related to women's current spousal age gap (**Table 1**).

Next, we considered bivariate relationships between spousal age gaps and union-level characteristics (**Table 2**). For first, but not current marriages, an earlier age at marriage was associated with larger spousal age gaps. For all marriages, age gaps were largest for later wives of polygynously married men, and smallest for first wives of polygynous men. For first marriages only, spousal age gaps are largest if the woman rated her husband as relatively poor compared to her family background. Otherwise husband's relative socioeconomic status was not associated with spousal age gaps. Spousal age gaps were larger for women who received bridewealth for current, although not first marriages. and for women whose husbands were chosen by someone

other than herself and/or her parent for all marriages. Whether a marriage was formal or informal was not associated with spousal age gap for either first or current marriages.

3.3 Marital stability

If large husband-older age gaps are costly for women, then we anticipate higher levels of marital discord and ultimately a greater chance of separation or divorce with increasingly large spousal age gaps. Bivariate relationships between separation/divorce and union-level characteristics for first marriages indicate no relationship between probability of remaining married and spousal age gaps (**Table 3**). However, other union-level characteristics were correlated to remaining married to a first husband. Women who were married monogamously had lower rates of separation than women married to polygynous men, as did women who had received bridewealth compared to those that had not, and those in formal compared to informal marriages. Finally, marriages were more stable when women were married to men who had higher education than themselves.

Based on these bivariate relationships, we built multivariate logistic regression models with staying married as the outcome (**Supplementary Table 2**). Once controlling for current age and probable confounders (i.e. union-level characteristics correlated with both staying married and spousal age gaps), spousal age gap remained uncorrelated with the odds of staying married (**Figure 2**). Consistent with bivariate trends, women had lower odds of staying married when they were in polygynous marriages compared to monogamous marriages (first wives vs. only wives: odds ratio = 0.23, $p < 0.001$; later wives vs. only wives odds ratio = 0.46, $p = 0.03$), and when marriage was informal compared to formal (odds ratio = 0.30, $p < 0.01$). Overall, these results indicate that while some characteristics of a marriage are important predictors of marital stability, spousal age gap itself is not.

3.4 Women's wellbeing and fertility

We consider two aspects of wellbeing - empowerment in household decision making, and a measure of depressive symptoms as an indicator of mental health - with a sexual conflict model predicting lower wellbeing in marriages with relatively older husbands. Bivariate relationships between wellbeing and structural/demographic variables are presented in **Table 1**, and union-level characteristics in **Table 3**; these statistics are limited to current marriages as wellbeing is measured only at time of survey. There is no bivariate relationship between spousal age gap and the wellbeing outcomes, but wellbeing is correlated to other union-level characteristics. Women who are married at younger ages have lower empowerment than women married later (but see Schaffnit, et al. 2019 for dedicated multivariate analysis of age at marriage and women's wellbeing). Women who reported marrying relatively wealthier men also had higher empowerment scores. Mental health was better for women married to men with similar education levels and for women whose parents chose their husbands. Finally, formal marriage was associated with higher empowerment and better mental health than informal marriage.

Figure 3 shows the raw relationships between spousal age gaps and both wellbeing measures, and adjusted coefficients for union-level variables from linear regressions controlling for age, village, and other potential confounders (i.e. union-level characteristics correlated with spousal age gap and outcome). Among the large majority of women married to older men, having an incrementally older husband did not predict empowerment (**Figure 3D**; **Supplementary Table 3**) or mental health (**Figure 3E**; **Supplementary Table 4**), but in the rare cases where a woman was older than her husband, she tended to have lower empowerment ($\beta=-0.7$, $p=0.02$) and worse mental health ($\beta=-1.0$, $p=0.01$) compared to women married to men 5-7 years older. Women married to similarly aged men also had lower mental health than women married to men 5-7 years older ($\beta=-0.3$, $p=0.04$). Independently of spousal age gap, we also observe that, while the overwhelming majority of women chose their own husband, those who stated that their parents chose their husband tended to have better mental health compared to women who chose their own partners ($\beta=0.7$, $p=0.02$).

Finally, we tested for a relationship between spousal age gap and reproductive success, as measured by age-adjusted fertility, but found no relationship. Bivariate relationships are shown in **Table 3**. Age-adjusted fertility was higher for women who married at younger ages, were the first wife of a polygynous man, and were married to men chosen by their parents. **Figure 3** shows raw relationships between spousal age gaps and age-adjusted fertility, and adjusted coefficients for union-level variables from linear regressions controlling for village and other potential confounders (**Supplementary Table 5**). There is some suggestion that having a younger husband is linked to lower fertility, but this relationship is not significant to the 0.05 level. Mirroring bivariate findings, first wives in polygynous marriages tended to have higher fertility than monogamously married women ($\beta=1.0$, $p=0.001$), and women whose parents had chosen their husbands had higher fertility than women who chose their own husbands alone or with help ($\beta=1.1$, $p=0.006$).

4. Discussion

4.1 Are older husbands beneficial or costly to women?

We document a widespread preference among Sukuma women for husband-older marriages. This finding is in line with focus group data from our qualitative work in the same population wherein participants described ideal ages of marriage as younger for women than men (Schaffnit, Urassa, et al. 2019; see also Nnko & Pool, 1997), along with age preferences recorded more generally across a diverse range of human populations (Conroy-Beam & Buss, 2019). However, actual age gaps are on average almost twice as large as ideal spousal age gaps, indicating that women frequently marry older men than stated ideals. It is unclear to what extent this finding is remarkable; despite a large literature on age preferences (Conroy-Beam & Buss, 2019), we are not aware of prior studies considering (a)synchrony between ideal and actualized spousal age gaps. Supporting the notion of conflicting age gap preferences, we find that particularly large spousal age gaps are most common when women's marriage partners were chosen by neither the woman or her parents. Such marriages are likely arranged by extended kin, who are likely to be relatively less concerned

1
2
3
4 with the woman's wellbeing. Age gaps are also larger when bridewealth transfers are
5 made, suggesting that financial compensation may be required to make marriage to
6 much older men desirable or at least tolerable to women. However, a lack of clear
7 relationships of spousal age gap with food security, or husband's relative wealth and
8 education, suggests socioeconomic patterns of mate choice are more nuanced than
9 men simply trading wealth for female youth. This may be because, in this urbanizing
10 context, higher socioeconomic status may also alter women's earning potential and
11 educational attainment, rendering youth less fundamental to their perceived 'value'
12 on the mating market. Male education may also shift gender norms away from
13 traditional values that prioritize female youth in marriage partners.
14
15
16
17
18
19
20
21
22

23 A discrepancy between ideals and actual age differences is consistent with sexual
24 conflict over spousal age gap, but is itself not diagnostic evidence. Further evidence
25 of sexual conflict over spousal age gaps could come from a link between large gaps
26 and divorce indicating acrimony between spouses, or a demonstration that women
27 with relatively larger husband-older age gaps suffer from poor wellbeing and/or lower
28 reproductive success. We find that spousal age gaps were unrelated to marital
29 stability, suggesting it has no discernable negative or positive impact on happiness
30 with a marriage. Arguably marital stability may present a weak test of sexual conflict
31 if controlling men prevent women from leaving unhappy marriages. Yet prior studies
32 of this population indicate lack of affection and undesirable male behaviors are
33 common grounds for divorce, suggesting women are active agents in the termination
34 of marriages. In a 1996/7 survey of 314 divorced women from Kisesa, Boerma et al.
35 (2002) report that alcoholism of the husband (38%), lack of love (31%), unfaithfulness
36 (27%), and violence (24%) were the most common reasons for divorce, followed by
37 non-payment of bridewealth (7%) and infertility (3%). Our findings here also indicate
38 that divorce is more common among informal marriages and where bridewealth is
39 unpaid, consistent with the notion that such marriages are relatively weaker unions to
40 begin with. Bridewealth payments may also act to increase economic incentives and
41 social obligations to remain married.
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65

We also observe husband-older relationships have no discernable costs to women's wellbeing and reproductive success. In fact, compared to women who are the same age or older than their husband, those married to older men had higher empowerment, and compared to women married to younger men, those with older husbands had better mental health. This finding could be taken as evidence of husband older marriages in general benefiting women, and is consistent with a study in South Africa, where women reported a preference for older males as mates because they are perceived to be more respectful and less violent than men closer in age (Beauclair & Delva, 2013). However, among the overwhelming majority of women with an older husband, incremental increases in spousal age gap are not related to either measure of wellbeing or to fertility, suggesting that this reflects a qualitative distinction between women who do and do not follow strong social norms of husband-older marriage. There is no evidence that relatively larger husband-older age gaps benefit women among those that do marry older men. On the basis of our available data we therefore conclude that relatively large husband-older spousal age gaps are generally neither costly nor particularly beneficial in this population in terms of empowerment, mental health or fertility. Intriguingly, the minority of women whose parents choose their partner had relatively high wellbeing. We are hesitant to interpret this pattern without further supporting data, but future research should consider potentially differing expectations of married life, and consider how kin involvement in the marriage process relates to wider patterns of emotional and economic support from kin which may impact women's wellbeing.

The interpretation of our results comes with several important caveats. First, while we document differences in ideal spousal age gap, our analyses do not enable us to measure the strength of such preferences in comparison to other traits. Stated ideals may also reflect latent assumptions about ideal circumstances of marriage, rather than individual preferences per se. It is possible therefore that discrepancies between ideal and actual gaps are not especially meaningful. Second, our study can only tell us about the observed range of age gaps, and so we cannot make conclusions about more extreme husband-older marriages (e.g. of 15+ years), which are relatively unusual in

1
2
3
4 this population. Third, our cross-sectional analysis cannot definitively establish
5 causality in observed relationships. It would be ideal for future studies to revisit the
6 relationships discussed here utilizing longitudinal analysis to investigate the possibility
7 of selection bias. This could occur, for example, if a woman's pre-marital
8 characteristics influence her choice of marriage partners, as has been demonstrated
9 in studies of polygyny (Lawson & Gibson 2018). Finally, our conclusions rest on a
10 limited number of wellbeing indicators. For example, our measure of mental health is
11 notably limited to depressive symptoms. Future research is thus required to fully
12 access evidence for potential wellbeing (or fitness) consequences of marriage to older
13 men for women, and the hypothesized benefits of husband-older marriages for men.
14 Sexually transmitted infections, including HIV, may be particularly relevant in this
15 context, since sex with older men (who have had more pre-marital sexual partners) is
16 a key transmission risk for young women (Boerma et al. 2002).

29 4.2 Why are women in same-age/wife-older marriages disadvantaged?

32 Women primarily reported ideals for husband-older marriages, a view reinforced in
33 focus group discussions (Schaffnit, Urassa, et al. 2019), indicating that husband-older
34 marriage represents a strong social convention in this population. We found that
35 women in wife-older marriages had relatively poorer mental health and lower
36 empowerment than those in husband-older marriages. This result rests on a small
37 sample of women who married similar aged or younger men in this population, yet is
38 complimented by several studies from other cultural contexts which come to similar
39 conclusions albeit considering different wellbeing outcomes. This includes studies
40 wherein women in wife-older marriages have been found to be more likely to suffer
41 from depression (Kim et al., 2015) and experience intimate partner violence
42 (Adebowale, 2018; Hindin, Kishor, & Ansara, 2008; Jewkes, Levin, & Penn-Kekana,
43 2002; Kishor & Johnson, 2005; Otieno, 2017).

55 During data collection in 2017, we observed that female Tanzanian research assistants
56 remarked on wife-older pairings as embarrassing or shameful, suggesting costs of
57 norm violation may contribute to disadvantages for women in wife-older marriages.
58
59
60
61
62
63
64
65

Men in wife-older marriages were seen as ‘push-overs’ and their wives stereotyped as forceful or controlling. Our ongoing research on marriage in this population also reinforces this interpretation. In a focus group discussion with women aged 19-24 conducted in 2019, one participant reflected on the undesirability of having a younger husband: *“Maybe you find a man is older than a woman and there would be respect present, but if a woman is older than a man then the marriage is difficult. For example, a woman who is 22 years old - she is supposed to be married to a man who is five years older, 28 or 30 years. They will settle. But if you say a woman is to be older than a man, respect will not be there. The woman will be seeing the man is very young and respect [of the husband] will decrease”*. Similarly, an unmarried 18-year old woman said during an in-depth interview: *“Say maybe I am 25 years old. It doesn’t mean I will get married to a man who is either 26 or 27 because it means we will always be fighting. So, looking at my age, I will take a man who is at least 30.”*

These observations suggest that women who marry younger men face judgement from their peers, and may experience more conflict within a marriage, which could in turn adversely impact mental health. Lower empowerment among women in wife-older marriages could come about, for example, if their husbands behave in more violent or controlling ways in order to counteract stereotypes of weakness or passivity. Alternatively, causal relationships between poor wellbeing and wife-older marriages may go in the opposite direction. For example, women with pre-existing mental health vulnerabilities may have low success on the marriage market, and consequently will be more likely to accept undesirable marriage arrangements, including marriage to a relatively young man who may himself also be relatively disadvantaged. These possibilities are not easy to disentangle without data on women and men’s wellbeing both prior to and following marriage.

4.3 Making sense of wider trends

Our findings contrast with widespread assumptions in global health and applied social science where relatively large age discrepancies are frequently conceptualized as harmful for women (Girls Not Brides, 2019; Pyke & Adams, 2010; UNFPA, 2012). Here,

male-older spousal age gaps are viewed as both a symptom and a cause of unequal power dynamics ultimately favoring men at a cost to women's wellbeing (Carmichael, 2011; Kishor & Johnson, 2004). Supporting this account, there is some evidence that women in relationships with large spousal age gaps experience higher mortality than women paired with a similarly aged spouse (Klinger-vartabedian & Wispe, 1989, Drefahl 2010). However, in addition to our findings, a sizeable number of studies indicate that, despite common assumptions, husband-older marriages are not predictive of harm in other domains, most notably intimate partner violence (Adebowale, 2018; Hindin et al., 2008; Jewkes et al., 2002; Kishor & Johnson, 2005; Otieno, 2017).

An alternative possibility is that the "pathological view" (Pyke & Adams 2010) of husband-older marriages may exaggerate or misidentify underlying trends. Supporting this conclusion, our own review of the literature indicates mixed findings. As mentioned, intimate partner violence, an outcome not assessed in this study, is often noted to be *less* common in relationships where males are older than females compared to in age-similar or wife-older relationships (Adebowale, 2018; Hindin, Kishor, & Ansara, 2008; Jewkes, Levin, & Penn-Kekana, 2002; Kishor & Johnson, 2004; Otieno, 2017). Qualitative work on power dynamics in age disparate relationships also calls into question whether greater age gaps in male-older relationships are invariably indicative of a male-favored power balance (Pyke & Adams, 2010). False support for sexual conflict over spousal age gap may also occur as large spousal age gaps tend to be confounded by alternative risk factors for poor wellbeing. Indeed, isolating spousal age gap as a driver of women's wellbeing is complicated by the tendency for large husband-older spousal age gaps to covary with other relationship-level characteristics that may not always serve women's interests, including early and polygynous marriages (Barbieri et al., 2005), and simply by virtue of the exaggerated distribution of male-older marriages in relatively low-income and less gender equalitarian contexts (Carmichael, 2011).

Nonetheless, while we do not find strong evidence for sexual conflict over size of spousal age gap in this population, we also do not find particularly strong evidence

that larger husband-older marriages are beneficial for women. This is relevant to the evolutionary social sciences, as many evolutionary studies of mate choice have largely failed to look beyond the apparent mutual compatibility of older men and younger women, underestimating the possibility of sexual conflict. Rather, evolutionarily-grounded research on age gaps is dominated by documentation of preferences, at the exclusion of considering how preferences are actualized, and/or measuring the proximate and ultimate consequences of age disparate relationships. Furthermore, while the topic of sexual conflict is well developed in animal studies, its application to human mating and marriage behavior has lagged (for review see Borgerhoff Mulder & Rauch, 2009). Illustrating this point, Conroy-Beam & Buss's (2019) recent and exhaustive review of age preferences in human mating pulls together an impressive compendium of findings demonstrating that women on average prefer older men, but does not raise the possibility that female fitness may nevertheless be better served by smaller age gaps than are optimal for men. Yet, even preference data alone points to potential for sexual conflict over partner age; it has long been recognized that while women generally state ideals for only modestly older men, men more typically desire considerably younger women, especially as they reach older ages themselves (Kenrick & Keefe, 1992). Such distinct preferences are logically incompatible and suggest sexual conflict is unavoidable.

4.4 Conclusions

Our study suggests that Sukuma women in northwestern Tanzania typically prefer to marry slightly older husbands, but frequently marry men older than their stated ideals. However, beyond this indicator of sexual conflict, there are neither obvious costs nor benefits associated with greater age gaps between a wife and her husband. In contrast, other aspects of the marriage - such as cowife status, the payment of bridewealth, the formality of marriage, and absolute age at marriage - are associated with, and are likely more important determinants of a woman's marital stability, mental health, empowerment and reproductive success. Thus, other than adhering to social conventions by avoiding younger husbands, we tentatively conclude that spousal age gap itself is largely of little consequence to the women we studied. While

1
2
3
4 seemingly neutral to women, husband-older marriages may nevertheless serve male
5 fitness interests, with prior research demonstrating that early female marriage -
6 linked to larger spousal age gaps - is predictive of higher reproductive success
7 (Schaffnit et al. 2019). Observed spousal age gaps may also be a, at least partial,
8 byproduct of mating market availability. Globally, the largest spousal gaps are found
9 where polygynous marriage is common (United Nations, 2000). Polygyny leads to a
10 relative shortage of unmarried women, which may in turn motivate men to look for
11 relatively younger women as marriage partners. Whatever the case, the findings of
12 this study are unlikely to be universally generalizable and we caution that a wider
13 global and public health literature routinely emphasizes potential for sexual conflict
14 over spousal age gap in other cultural contexts. We conclude by recommending that,
15 often implicit, assumptions about the mutual compatibility of male and female age
16 preferences in the evolutionary human sciences on the one hand, and assumptions
17 about the harms of husband-older marriage in public health on the other, are further
18 examined at both the theoretical and empirical level. As highlighted by Borgerhoff
19 Mulder & Rauch (2009) a decade ago, we still know surprisingly little about the extent
20 of sexual conflict in human mating and marriage.
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36

37 Author contributions

38
39 D.W.L. and S.B.S. conceptualized and designed the study. S.B.S., A.H., D.W.L. and
40 M.U. collected the data. S.B.S. conducted the data analysis. D.W.L. & S.B.S. wrote the
41 manuscript. A.H. and M.U. contributed to editing the manuscript.
42
43
44
45

46 Acknowledgements

47
48
49 We thank the directors of the National Institute for Medical Research, Mwanza, our
50 study participants and our fieldwork team: M. Malyawere, J. Mbata, P. Muyanja, R.
51 Dotto, H. Dick, C. John, I. Sengerema, S. Kituku and C. Joseph. Thank you also to S.
52 Hedges, J. Todd and R. Sear for practical assistance and constructive criticism on our
53 research design, and three anonymous reviewers for helpful comments. This study
54 was funded by the National Science Foundation (Award Number: 1851317) and the
55
56
57
58
59
60
61
62
63
64
65

University of California, Santa Barbara.

Data Availability

The data associated with this research are available upon request to the authors, provided the planned analysis is first approved by NIMR, Mwanza, satisfies their concerns regarding subject anonymity, and due credit is given to NIMR in the co-production of the data. The authors can facilitate this approval process on request or NIMR can be approached directly.

Funding

This research was supported by the University of California, Santa Barbara and the National Science Foundation (Award number: 1851317).

Figure Captions

Figure 1: Histograms showing (A) actual (median = 6) and ideal (median = 3) spousal age gaps among ever married women, and (B) ideal spousal age gaps among ever (median = 3) and never married (median = 2) women; vertical, dotted lines indicate median ideal/actual spousal age gaps.

Figure 2: Odds ratios from logistic regression predicting still being married to first husband (n=491). Model controls for all variables plotted, current age, and whether the marriage was formal or informal (see Supplementary Material). 95% confidence intervals are illustrated.

Figure 3: Relationships between empowerment score (A, D), mental health score (B, E), and age-adjusted fertility (C, F) and spousal age gap for currently married women showing raw data (A-C) and coefficients for spousal age gap and other union level

characteristics from regression models (D-F). Model output (D-F) controls for women's current age, place of residence, and shown union-level variables (see Supplementary Material). 95% confidence intervals are illustrated. Note "Woman+" refers to women who choose their partner alone or with another person.

References

- Adebowale, A. S. (2018). Spousal age difference and associated predictors of intimate partner violence in Nigeria. *BMC Public Health*, 18(1), 1-15.
<https://doi.org/10.1186/s12889-018-5118-1>
- Barbieri, M., Hertrich, V., & Grieve, M. (2005). Age Difference between Spouses and Contraceptive Practice in Sub-Saharan Africa. *Population (English Edition, 2002-)*, 60(5/6), 617. <https://doi.org/10.2307/4148187>
- Beauclair, R., & Delva, W. (2013). Is younger really safer? A qualitative study of perceived risks and benefits of age-disparate relationships among women in Cape Town, South Africa. *PLoS ONE*, 8(11), 1-8.
<https://doi.org/10.1371/journal.pone.0081748>
- Bergstrom, T. C., & Bagnoli, M. (1993). Courtship as a waiting game. *The Journal of Political Economy*, 101(1), 185-202. <https://doi.org/10.1002/2013TC003394>
- Boerma, J. T., Urassa, M., Nnko, S., Ng'weshemi, J., Isingo, R., Zaba, B., & Mwaluko, G. (2002). Sociodemographic context of the AIDS epidemic in a rural area in Tanzania with a focus on people's mobility and marriage. *Sexually Transmitted Infections*, 78 Suppl 1, i97-105. https://doi.org/10.1136/sti.78.suppl_1.i97
- Borgerhoff Mulder, M., & Rauch, K. L. (2009a). Sexual conflict in humans: Variations and solutions. *Evolutionary Anthropology: Issues, News, and Reviews*, 18(5), 201-214. <https://doi.org/10.1002/evan.20226>
- Borgerhoff Mulder, M., & Rauch, K. L. (2009b). Sexual conflict in humans: Variations and solutions. *Evolutionary Anthropology: Issues, News, and Reviews*, 18(5), 201-214. <https://doi.org/10.1002/evan.20226>
- Buss, D. M. (1989). Sex differences in human mate preferences: Evolutionary hypotheses tested in 37 cultures. *Behavioral and Brain Sciences*, 12, 1-14.
- CARE. (2008). *Women's Empowerment - Multidimensional Evaluation of Agency*,

1
2
3
4 *Social Capital & Relations (WE- MEASR): A tool to measure women's*
5 *empowerment in sexual, reproductive and maternal health programs (Vol. 42).*
6
7 Atlanta, GA.
8
9

10 Carmichael, S. (2011). Marriage and power: Age at first marriage and spousal age gap
11 in lesser developed countries. *History of the Family*, 16(4), 416-436.
12
13 <https://doi.org/10.1016/j.hisfam.2011.08.002>
14
15

16
17 Casterlinet, J. B., Williamst, L., & Mcdonald, P. (1986). Population Investigation
18 Committee The Age Difference Between Spouses : Variations among Developing
19 Countries Author (s): John B . Casterline , Lindy Williams and Peter McDonald
20
21 Published by : Taylor & Francis , Ltd . on behalf of the Population Investi.
22
23 *Population Studies*, 40(3), 353-374.
24
25

26
27 Clark, B., Bruce, J., & Dude, A. (2006). Protecting Young Women from HIV / AIDS: The
28 Case Against Child and Adolescent Marriage. *International Family Planning*
29 *Perspectives*, 32(2), 79-88.
30
31

32
33 Clarke, P. (2008). When can group level clustering be ignored? Multilevel models
34 versus single-level models with sparse data. *Journal of Epidemiology &*
35 *Community Health*, 62(8), 752-758.
36
37

38
39 Coates, J., Swindale, A., & Bilinsky, P. (2007) Household Food Insecurity Access Scale
40 (HFAS) for measurement of food access: Indicator guide (v.3). Washington, DC:
41 Food and Nutrition Technical Assistance Project, Academy for Educational
42 Development.
43
44

45
46 Conroy-Beam, D., & Buss, D. M. (2019). Why is age so important in human mating?
47 Evolved age preferences and their influences on multiple mating behaviors.
48 *Evolutionary Behavioral Sciences*, 13(2), 127-157.
49
50

51
52 Dixon-Mueller, R. (2008). How young is “too young”? Comparative perspectives on
53 adolescent sexual, marital, and reproductive transitions. *Studies in family*
54 *planning*, 39(4), 247-262.
55
56

1
2
3
4 Drefahl, S. (2010). How does the age gap between partners affect their survival?
5
6 *Demography*, 47(2), 313-326. <https://doi.org/10.1353/dem.0.0106>
7

8
9 Eagly, A., & Wood, W. (1999). The origins of sex differences in human behavior:
10 Evolved dispositions versus social roles. *American Psychologist*, 54, 408-423.
11
12

13
14 Fieder, M., & Huber, S. (2007). Parental age difference and offspring count in
15 humans. *Biology Letters* 2, 3, 689-691.
16
17

18
19 Francis-Tan, A., & Mialon, H. M. (2015). A diamond is forever” and other fairy tales:
20 The relationship between wedding expenses and marriage duration. *Economic*
21 *Inquiry*, 53(4), 1919-1930.
22
23

24
25 Girls Not Brides. (2019). *Child Marriage: A form of violence against children*. Girls Not
26 Brides. Available at: [https://www.girlsnotbrides.org/wp-](https://www.girlsnotbrides.org/wp-content/uploads/2019/10/Girls-Not-Brides-Child-Marriage-Violence-Against-Children-LR.pdf)
27 [content/uploads/2019/10/Girls-Not-Brides-Child-Marriage-Violence-Against-](https://www.girlsnotbrides.org/wp-content/uploads/2019/10/Girls-Not-Brides-Child-Marriage-Violence-Against-Children-LR.pdf)
28 [Children-LR.pdf](https://www.girlsnotbrides.org/wp-content/uploads/2019/10/Girls-Not-Brides-Child-Marriage-Violence-Against-Children-LR.pdf)
29
30
31

32
33 Gustafson, P., & Fransson, U. (2015). Age Differences Between Spouses:
34 Sociodemographic Variation and Selection. *Marriage and Family Review*, 51, 610-
35 632.
36
37
38

39
40 Hadley, C., & Patil, C. L. (2006). Food insecurity in rural Tanzania is associated with
41 maternal anxiety and depression. *American Journal of Human Biology*, 18(3),
42 359-368. <https://doi.org/10.1002/ajhb.20505>
43
44
45

46
47 Hedges, S, Sear, R., Todd, J., Urassa, M., & Lawson, D. W. (2019). Earning their keep?
48 Fostering, children’s education and work in north-western Tanzania. *Demographic*
49 *Research*, 41, 263-292.
50
51
52

53
54 Hedges, Sophie, Sear, R., Todd, J., Urassa, M., & Lawson, D. W. (2018). Trade-Offs in
55 Children’s Time Allocation: Mixed Support for Embodied Capital Models of the
56 Demographic Transition in Tanzania. *Current Anthropology*, 59(5), 644-654.
57 <https://doi.org/10.1086/699880>
58
59
60
61
62
63
64
65

- 1
2
3
4 Helle, S., Lummaa, V., & Jokela, J. (2007). Marrying women 15 years younger
5 maximized men's evolutionary fitness in historical Sami. *Biology Letters*, 4, 75-
6 78.
7
8
9
10 Hindin, M. J., Kishor, S., & Ansara, D. L. (2008). *Intimate partner violence among*
11 *couples in 10 DHS countries: Predictors and health outcomes. DHS Analytical*
12 *Studies No 18.*
13
14
15
16
17 Jewkes, R., Levin, J., & Penn-Kekana, L. (2002). Risk factors for domestic
18 violence: findings from a South African cross-sectional study. *Soc Sci Med*, 55,
19 1603-1617.
20
21
22
23
24 Kenrick, D., & Keefe, R. (1992). Age preferences in mates reflect sex differences in
25 human reproductive strategies. *Behavioral and Brain Sciences*, 15(75-91).
26
27
28
29 Kim, J.-H., Park, E.-C., & Lee, S. G. (2015). The impact of age differences in couples
30 on depressive symptoms: evidence from the Korean longitudinal study of aging
31 (2006-2012). *BMC Psychiatry*, 15, 10. <https://doi.org/10.1186/s12888-015-0388-y>
32
33
34
35 Kishamawe, C., Isingo, R., Mtenga, B., Zaba, B., Todd, J., Clark, B., ... Urassa, M.
36 (2015). Health & Demographic Surveillance System Profile: The Magu Health and
37 Demographic Surveillance System (Magu HDSS). *International Journal of*
38 *Epidemiology*, 44(6), 1851-1861. <https://doi.org/10.1093/ije/dyv188>
39
40
41
42
43 Kishor, S., & Johnson, K. (2004). *Profiling Domestic Violence: A Multi-Country Study.*
44 Calverton, Maryland. <https://doi.org/10.1017/CBO9781107415324.004>
45
46
47
48 Kishor, S., & Johnson, K. (2005). Profiling Domestic Violence: A Multi-Country Study.
49 *Studies in Family Planning*, 36(3), 259-261.
50
51
52
53 Klinger-vartabedian, A. L., & Wispe, L. (1989). Age Differences in Marriage and
54 Female Longevity. 51(1), 195-202.
55
56
57
58 Kudo, Y. (2015). Female migration for marriage: Implications from the land reform in
59 rural Tanzania. *World Development*, 65, 41-61.
60
61
62
63
64
65

- 1
2
3
4 Kuna, B., Galbarczyk, A., Magdalena, K., Nenko, I., & Jasienska, G. (2018). Age
5 difference between parents influences parity and number of sons. *American*
6 *Journal of Human Biology*, 30(3), e23095.
7
8
9
10
11 Lawson, D. W., & Gibson, M. A. (2018). Polygynous marriage and child health in sub-
12 Saharan Africa: What is the evidence for harm?. *Demographic Research*, 39, 177-
13 208
14
15
16
17 Lawson, D. W., James, S., Ngadaya, E., Ngowi, B., Mfinanga, S. G. M., & Mulder, M. B.
18 (2015). No evidence that polygynous marriage is a harmful cultural practice in
19 northern Tanzania. *Proceedings of the National Academy of Sciences of the*
20 *United States of America*, 112(45). [https://doi.org/10.1073/pnas.1507151112/-](https://doi.org/10.1073/pnas.1507151112/-/DCSupplemental)
21 [/DCSupplemental](https://doi.org/10.1073/pnas.1507151112/-/DCSupplemental)
22
23
24
25
26
27
28 Lawson, D. W., & Mace, R. (2011). Parental investment and the optimization of
29 human family size. *Philosophical Transactions of the Royal Society B: Biological*
30 *Sciences*, 366(1563). <https://doi.org/10.1098/rstb.2010.0297>
31
32
33
34
35 Mace, R. (1998). The co-evolution of human fertility and wealth inheritance
36 strategies. *Philosophical Transactions of the Royal Society of London. Series B:*
37 *Biological Sciences*, 353(1367), 389-397.
38
39
40
41 Moore, F., Cassidy, C., & Perrett, D. (2010). The effects of control of resources on
42 magnitudes of sex differences in human mate preferences. *Evolutionary*
43 *Psychology*, 8, 720-735.
44
45
46
47 Moore, F., Cassidy, C., Smith, Mj., & Perrett, D. (2006). The effects of female control
48 of resources on sex-differentiated mate preferences. *Evolution and Human*
49 *Behavior*, 27, 193-205.
50
51
52
53
54 Moya, C., Snopkowski, K., & Sear, R. (2016). What do men want? Re-examining
55 whether men benefit from higher fertility than is optimal for women.
56 *Philosophical Transactions of the Royal Society of London. Series B, Biological*
57 *Sciences*, 371, 20150149.
58
59
60
61
62
63
64
65

- 1
2
3
4 Muller, M. N., Thompson, M. E., & Wrangham, R. W. (2006). Male chimpanzees prefer
5 mating with old females. *Current Biology*, 16, 2234-2238.
6
7
8
9 Nettle, D., Gibson, M. a., Lawson, D. W., & Sear, R. (2013). Human behavioral
10 ecology: current research and future prospects. *Behavioral Ecology*, (Grafen
11 2006). <https://doi.org/10.1093/beheco/ars222>
12
13
14
15 Nnko, S., & Pool, R. (1997). Sexual discourse in the context of AIDS: dominant themes
16 on adolescent sexuality among primary school pupils in Magu district, Tanzania.
17 *Health Transition Review*, 7, 85-90.
18
19
20
21
22 Otieno, F. O. (2017). *A Meta-analysis of the Association between Intimate Partner*
23 *Violence and Age Disparity in sub-Saharan Africa*. Doctoral dissertation.
24 Stellenbosch: Stellenbosch University
25
26
27
28
29 Pyke, K., & Adams, M. (2010). What's age got to do with it? A case study analysis of
30 power and gender in husband-older marriages. *Journal of Family Issues*, 31(6),
31 748-777. <https://doi.org/10.1177/0192513X09357897>
32
33
34
35 Rotering, P., & Bras, H. (2019). The age difference between spouses and reproduction
36 in 19th century Sweden. *Demographic Research*, 41, 1059-1090.
37
38
39
40 Schaffnit, S. B., Hassan, A., Urassa, M., & Lawson, D. W. (2019). Parent-offspring
41 conflict unlikely to explain 'child marriage' in northwestern Tanzania. *Nature*
42 *Human Behaviour*. <https://doi.org/10.1038/s41562-019-0535-4>
43
44
45
46 Schaffnit, S. B., Urassa, M., & Lawson, D. W. (2019). "Child marriage" in context:
47 exploring local attitudes towards early marriage in rural Tanzania. *Sexual and*
48 *Reproductive Health Matters*, 27(1), 1571304.
49
50
51 <https://doi.org/10.1080/09688080.2019.1571304>
52
53
54
55 Smith, E. A., Borgerhoff Mulder, M., & Hill, K. (2001). Controversies in the
56 evolutionary social sciences: A guide for the perplexed. *Trends in ecology &*
57 *evolution*, 16(3), 128-135.
58
59
60
61
62
63
64
65

Stoeckel, J., & Chowdhury, A. (1984). Spouse age difference and fertility in rural Bangladesh: implications for raising the age at marriage of females. *Biology and Society*, 1, 139-143.

UNFPA. (2012). Marrying Too Young - End Child Marriage. Retrieved from <https://www.unfpa.org/webdav/site/global/shared/documents/publications/2012/MarryingTooYoung.pdf>

United Nations. (2000). World marriage patterns. Available at: <https://www.un.org/en/development/desa/population/publications/family/marriage-patterns.asp>

Volpe, E. M., Hardie, T. L., Cerulli, C., Sommers, M. S., & Morrison-Beedy, D. (2013). What's Age Got to Do With It? Partner Age Difference, Power, Intimate Partner Violence, and Sexual Risk in Urban Adolescents. *Journal of Interpersonal Violence*, 28(10), 2068-2087. <https://doi.org/10.1177/0886260512471082>

Table 1: Mean spousal age gap for current relationships, current wellbeing and age-adjusted fertility by structural and demographic variables for currently married women (n=412).

			Spousal age gap		Empowerment score		Mental health score		Age-adjusted fertility	
		n (%)	Mean (sd)	p-value*	Mean (sd)	p-value*	Mean (sd)	p-value*	Mean (sd)	p-value*
Residence	Town	223 (54.13)	7.11 (4.99)	0.58	0.68 (0.84)	<0.001	-0.13 (1.02)	0.41	0.02 (1.45)	<0.001
	Village	189 (45.87)	6.81 (6.04)		0.20 (0.85)		-0.04 (1.00)		0.93 (1.37)	
Food insecurity	Secure & mildly insecure	89 (21.65)	8.14 (6.12)	0.08	0.97 (0.75)	<0.001	0.33 (0.71)	<0.001	-0.04 (1.53)	<0.001
	Moderately insecure	102 (24.82)	6.62 (4.85)		0.58 (0.81)		-0.10 (0.96)		0.30 (1.45)	
	Severely insecure	220 (53.53)	6.67 (5.47)		0.20 (0.85)		-0.26 (1.09)		0.71 (1.42)	
Woman's Education level	None	78 (18.93)	7.33 (6.79)	0.73	0.24 (0.84)	0.003	-0.30 (1.08)	0.11	1.07 (1.54)	<0.001
	Primary school	285 (69.17)	6.96 (5.31)		0.46 (0.86)		-0.04 (0.98)		0.43 (1.45)	
	Secondary school or higher	49 (11.89)	6.53 (4.33)		0.78 (0.92)		-0.03 (1.04)		-0.51 (1.05)	
Current age	15-19 years	35 (8.50)	6.88 (4.54)	0.73	-0.43 (0.60)	<0.001	-0.18 (1.24)	0.84	-	-
	20-24 years	87 (21.12)	7.26 (5.76)		0.29 (0.84)		-0.02 (0.96)		-	
	25-29 years	126 (30.58)	7.27 (5.21)		0.53 (0.88)		-0.07 (0.93)		-	
	30-35 years	164 (39.81)	6.60 (5.76)		0.68 (0.80)		-0.12 (1.04)		-	
Religion	Roman Catholic	139 (33.74)	7.41 (6.30)	0.47	0.63 (0.83)	0.04	-0.09 (1.03)	0.24	0.09 (1.39)	<0.001
	Other established Christian	150 (36.41)	6.56 (4.61)		0.42 (0.90)		-0.14 (0.97)		0.31 (1.60)	
	No religion	115 (27.91)	7.13 (5.62)		0.32 (0.87)		-0.08 (1.05)		1.07 (1.24)	
	Other	8 (1.94)	5.25 (4.50)		0.36 (0.87)		0.61 (0.56)		-0.17 (1.10)	

Table 2: Mean spousal age gaps by union-level variables for first marriages (n=495) and current marriages (n=412).

		Spousal age gap					
		First marriage			Current Marriage		
		n (%)	Mean (sd)	p-value*	n (%)	Mean (sd)	p-value*
Spousal age gap	Woman older	7 (1.41)	-	-	7 (1.7)	-	-
	Same age	37 (7.47)	-		34 (8.25)	-	
	Man 2-4 years older	122 (24.65)	-		105 (25.49)	-	
	Man 5-7 years older	154 (31.11)	-		119 (28.88)	-	
	Man 8-10 years older	77 (15.56)	-		61 (14.81)	-	
	Man 11+ years older	98 (19.80)	-		86 (20.87)	-	
Age at marriage	<18 years	156 (33.77)	7.97 (5.42)	0.01	110 (26.76)	7.97 (5.32)	0.06
	18-19 years	164 (35.50)	6.45 (4.54)		140 (34.06)	6.36 (4.42)	
	20+ years	142 (30.74)	6.38 (5.03)		161 (39.17)	6.75 (6.27)	
Wife number^	Only wife	237 (69.10)	6.46 (4.25)	<0.001	236 (74.21)	6.69 (5.03)	<0.001
	First wife	50 (14.58)	4.96 (4.23)		30 (9.43)	4.73 (4.43)	
	Later wife	56 (16.33)	11.41 (6.83)		52 (16.35)	10.88 (7.32)	
Husband's relative wealth†	Husband less wealthy	109 (23.70)	8.06 (5.75)	0.02	96 (23.41)	7.86 (5.84)	0.17
	About the same	199 (43.26)	6.31 (4.74)		184 (44.88)	6.54 (5.54)	
	Husband wealthier	152 (33.04)	7.02 (4.86)		130 (31.71)	6.87 (5.11)	
Husband's relative education†	Husband has less education	67 (14.86)	6.57 (5.84)	0.75	59 (14.60)	6.15 (6.15)	0.39
	About the same	230 (51.00)	6.79 (4.66)		212 (52.48)	6.88 (4.72)	
	Husband has more education	154 (34.15)	7.08 (5.13)		133 (32.92)	7.32 (6.16)	
Received bridewealth^	Yes	238 (69.19)	7.35 (5.36)	0.10	226 (70.85)	7.62 (5.97)	0.03
	No	106 (30.81)	6.37 (4.58)		93 (29.15)	6.07 (4.62)	
Informal marriage	No	343 (74.24)	7.05 (5.15)	0.55	318 (77.37)	7.17 (5.65)	0.20
	Yes	119 (25.76)	6.73 (4.86)		93 (22.63)	6.33 (4.89)	
Who chose husband	Father and/or mother	20 (4.32)	8.20 (5.52)	0.004	12 (2.91)	6.50 (3.29)	0.02
	Woman only or woman and another person	429 (92.66)	6.77 (4.94)		390 (94.66)	6.86 (5.50)	
	Someone else	14 (3.02)	11.07 (6.64)		10 (2.43)	11.90 (5.17)	

*p-value from likelihood ratio test; ^Formally married women only; †Excluding 'don't know' responses

Table 3: Proportion of ever-married women still married to their first husband (n=412) and mean empowerment score, mental health score, and age specific fertility for currently married women (n=412) by union-level characteristics.

		Still married		Empowerment score		Mental health score		Age-adjusted fertility	
		%	p-value*	Mean (sd)	p-value**	Mean (sd)	p-value**	Mean (sd)	p-value**
Spousal age gap (current marriage)	Woman older	57.14	0.73	-0.19 (0.76)	0.19	-1.04 (2.02)	0.12	-0.19 (1.40)	0.15
	Same age	72.22		0.26 (0.92)		0.02 (0.97)		0.35 (1.57)	
	Man 2-4 years older	72.50		0.42 (0.91)		-0.04 (1.01)		0.60 (1.43)	
	Man 5-7 years older	68.42		0.52 (0.91)		-0.02 (0.87)		0.37 (1.36)	
	Man 8-10 years older	77.33		0.56 (0.87)		-0.22 (1.22)		0.76 (1.67)	
	Man 11+ years older	72.83		0.48 (0.75)		-0.11 (0.91)		0.20 (1.51)	
Age at marriage	<18 years	65.06	0.06	0.30 (0.82)	0.01	-0.01 (0.96)	0.23	1.04 (1.45)	<0.001
	18-19 years	76.33		0.43 (0.88)		-0.02 (0.96)		0.64 (1.26)	
	20+ years	73.47		0.61 (0.88)		-0.19 (1.08)		-0.14 (1.48)	
Wife number^	Only wife	83.06	<0.001	0.55 (0.89)	0.43	-0.00 (0.98)	0.32	0.43 (1.44)	0.004
	First wife	53.70		0.36 (0.94)		0.19 (0.75)		1.40 (1.40)	
	Later wife	70.69		0.44 (0.80)		-0.14 (0.95)		0.49 (1.74)	
Husband's relative wealth†	Husband less wealthy	69.49	0.80	0.65 (0.92)	0.01	-0.26 (0.95)	0.15	0.43 (1.49)	0.30
	About the same	72.64		0.47 (0.85)		-0.06 (1.07)		0.34 (1.45)	
	Husband wealthier	72.73		0.30 (0.85)		-0.00 (0.96)		0.60 (1.49)	
Husband's relative education†	Husband has less education	73.53	0.03	0.47 (0.97)	0.22	-0.28 (1.21)	0.04	0.31 (1.29)	0.26
	About the same	77.73		0.53 (0.84)		0.02 (0.98)		0.35 (1.51)	
	Husband has more education	65.85		0.36 (0.89)		-0.20 (0.95)		0.60 (1.54)	
Received bridewealth^	Yes	82.93	<0.001	0.56 (0.86)	0.12	0.01 (0.98)	0.49	0.49 (1.52)	0.46
	No	61.82		0.40 (0.90)		-0.07 (0.92)		0.63 (1.51)	
Informal marriage	No	76.55	<0.001	0.51 (0.88)	0.02	-0.01 (0.96)	0.002	0.53 (1.51)	0.018
	Yes	59.09		0.27 (0.85)		-0.36 (1.13)		0.12 (1.34)	
Who chose husband	Father and/or mother	60.00	0.34	-0.11 (0.65)	0.06	0.58 (0.45)	0.05	1.78 (1.25)	0.01
	Woman only or woman and another person	72.57		0.48 (0.87)		-0.10 (1.02)		0.40 (1.48)	
	Someone else	62.50		0.34 (1.00)		-0.36 (0.90)		0.31 (1.32)	

* p-value from chi-squared test; **p-value from likelihood ratio test; ^Formally married women only; †Excluding 'don't know' responses

Figure 1

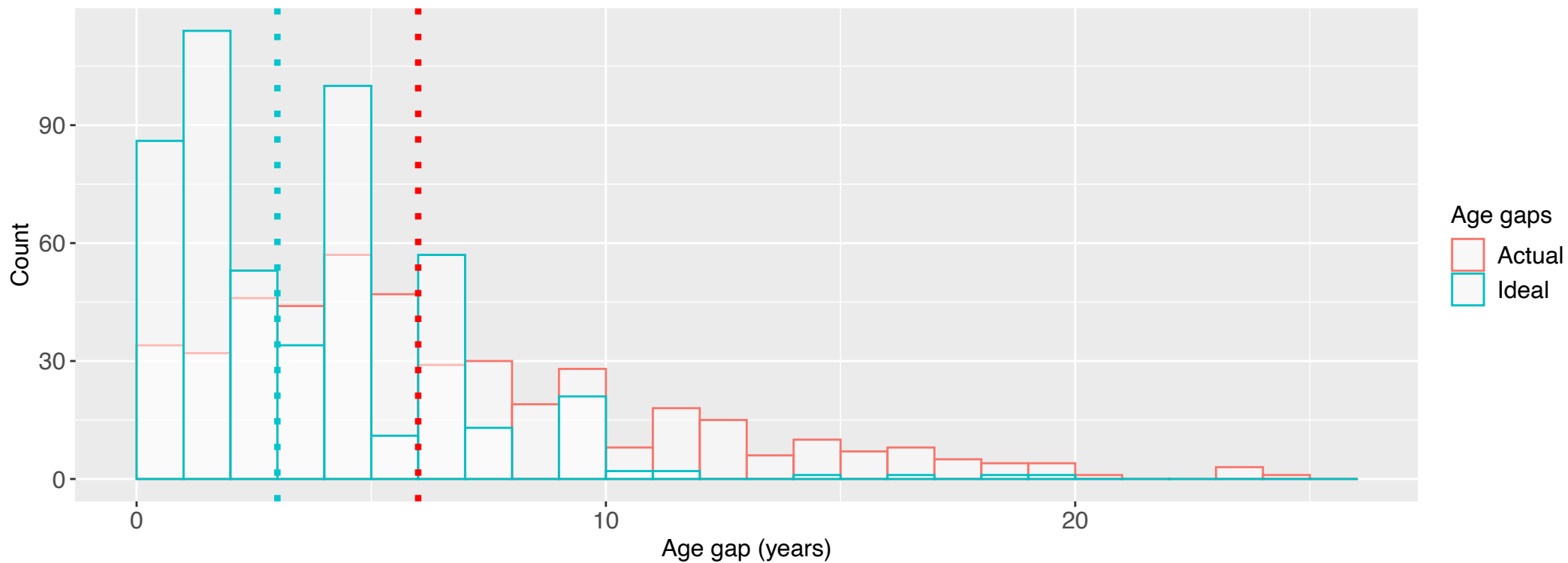
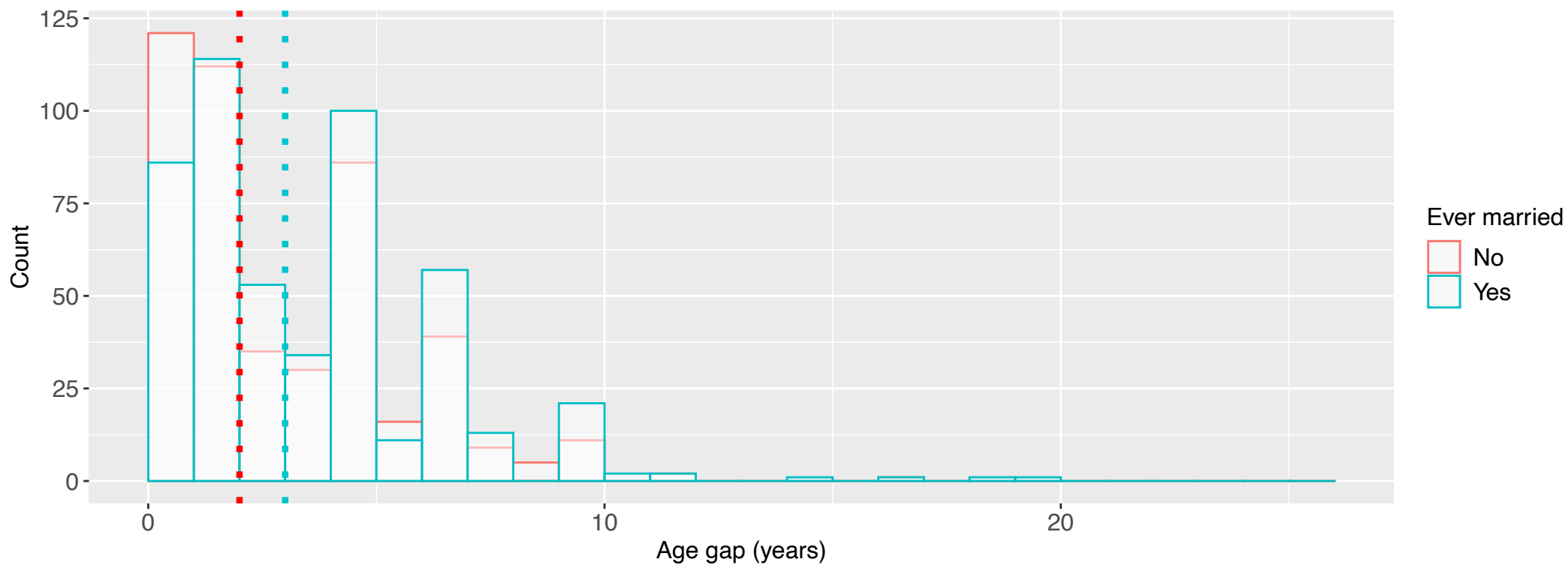
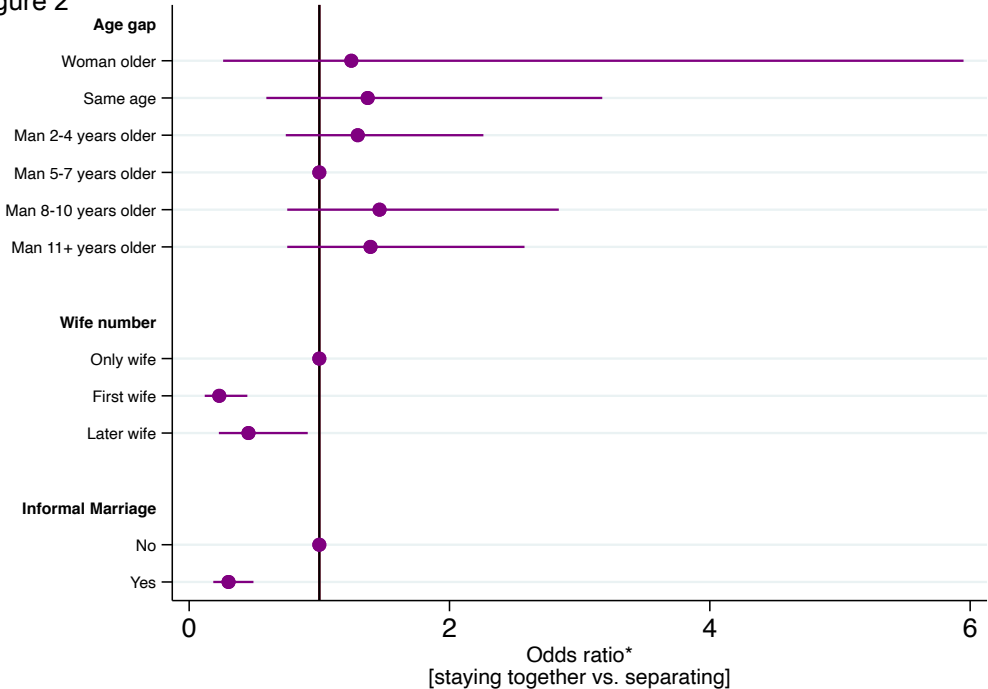
Married women's actual vs. ideal spousal age gaps**B****Ever vs. never married women's ideal spousal age gaps**

Figure 2



*for first marriages; controlling for variables shown and age and informal marriage

Figure 3

