Original Research Article

Spousal Violence and Paternal Disinvestment Among Tsimane' Forager-Horticulturalists

JONATHAN STIEGLITZ,[1] * HILLARD KAPLAN,[1] MICHAEL GURVEN,[2] JEFFREY WINKING,[3] AND BASILIO VIE TAYO[4]
[1]*Department of Anthropology, University of New Mexico, Albuquerque, New Mexico 87131*
[2]*Integrative Anthropological Sciences, Department of Anthropology, University of California at Santa Barbara, Santa Barbara, California 93106*
[3]*Department of Anthropology, Texas A&M University, College Station, Texas 77843*
[4]*Proyecto Tsimane' de Salud y Antropología, San Borja, Bolivia*

Objectives: We develop and test a conceptual model of factors influencing the likelihood of physical wife abuse. The paternal disinvestment model emphasizes that spousal conflict over resource use results from men's attempts to increase individual fitness at a cost to the family (e.g., through pursuit of extramarital affairs). We propose that men use violence to control women's responses to the diversion of resources away from the family: to quell women's objections to male disinvestment, maintain women's parental investment, and to dissuade women from pursuing relationships with other men.

Methods: Interviews were conducted among men and women to determine rates of violence and demographic and behavioral covariates. Structural equation modeling and generalized estimating equations analyses were used to test predictions derived from the model. We also collected data on frequent complaints in marriage and women's perceptions of arguments precipitating violence.

Results: Over 85% of women experienced physical wife abuse ($n = 49$). Indicators of paternal disinvestment positively covary with indicators of marital strife and with rates of wife abuse. The wife's age, matrilocal residence, and presence of joint dependent offspring decrease the likelihood of violence through direct and indirect routes.

Conclusions: Wife abuse is linked to the importance of paternal investment in human families, and is a means by which men control women's responses to a dual reproductive strategy of familial investment and pursuit of extramarital sexual relationships. This framework is more general than traditional sociological and evolutionary perspectives emphasizing patriarchy and men's sexual jealousy, respectively. Am. J. Hum. Biol. 23:445–457, 2011.   © 2011 Wiley-Liss, Inc.

Spousal violence is the most common form of family violence (Levinson, 1989), yet its frequency varies substantially within and across populations. Among selected non-Western countries, lifetime prevalence of physical violence by an intimate partner varies from 13 to 61% of ever-partnered women, with an annual prevalence varying between 3 and 29% (Garcia-Moreno et al., 2006). In the United States, 22% of women are physically assaulted by current or former partners at some point in their lives (Tjaden and Thoennes, 2000). For the majority (78%) of victimized American women, violence occurs primarily before the relationship ends, with 28% of injured women seeking medical treatment following the most recent assault (ibid).

In addition to acute trauma, long-term health consequences for physically abused women include chronic pain, gastrointestinal and gynecological problems, unwanted pregnancy, fetal loss, post-traumatic stress disorder, and depression (for references see Alio et al., 2009; Campbell, 2002; Heise et al., 1994a,b). Children of abused women also exhibit higher early mortality and low birth weight (Jejeebhoy, 1998, Murphy et al., 2001), suggesting that children are indirect victims of spousal abuse.

Spousal violence raises public health and human rights concerns worldwide, yet most theoretical models of spousal conflict are developed and tested among an unrepresentative sample of the world's population: industrialized, formally educated, and relatively wealthy Westerners. A general theory that both explains why husbands engage in physical violence against their wives, and that predicts the conditions under which violence is more likely to occur would be useful in the design of public health interventions to lower its occurrence and mitigate its harmful effects.

This article makes two contributions. First, we develop a general conceptual model of factors influencing the likelihood that women experience physical violence in marital/cohabiting unions. The model considers the importance of paternal investment in human families. It argues that violence is used by husbands to control wives' responses to men's diversion of resources away from the family, often in pursuit of extramarital affairs. Second, we evaluate this theoretical approach using data on spousal conflict and wife abuse, and their correlates among Tsimane' forager-horticulturalists of Bolivia. There are several reasons why the Tsimane' provide an interesting test of our model linking household demography and resource allocation strategies to spousal conflict and wife abuse. They are traditionally matrilocal early in marriage, have limited residential privacy and exposure to violence in media, they do not own land and exhibit relatively low variance in socioeconomic status within and across sexes,

they produce most of their own food, and they lack formal patriarchal institutions. In addition, Tsimane' society is gradually undergoing integration into the market economy. Sporadic wage labor opportunities exist for men, but usually not for women, and men exercise considerable control over the use of the small amounts of money they acquire. The data show that in spite of the fact that potential aggressors face significant social costs, physical wife abuse is extremely common.

The article is organized as follows. The first section reviews existing literature on male physical violence against spouses. It shows that there are clear patterns in the data, but that no single framework integrates the disparate results. The next section develops our conceptual model. Part I discuss how parental investment theory informs our understanding of male–female aggression and introduces why consideration of paternal investment is crucial to understanding human intersexual relationships. Part II focuses on the nature of marital conflict and the conditions under which spousal violence is more likely to occur. Part III presents a path model for predicting the frequency of violence against women. We then introduce the study population and our methodology. The next section presents the results. To conclude, we discuss the empirical and theoretical contributions of the analysis to the study of intimate partner violence and human sexual relations, and their implications for public health.

Factors increasing the likelihood of violence against women: Existing literature and explanatory approaches

Early studies report positive correlations between violence frequency and either level of marital restrictions imposed upon women or men's control of wealth (Lester, 1980; Levinson, 1989). Other studies highlight historical relationships between patriarchal dimensions (e.g., economic, legal, political) and violence against women (cf. Yllö, 1984). Rigidly defined gender roles and norms linking masculinity to physical dominance over women are also a risk factor for wife abuse (e.g., Ellsberg et al., 2000). In societies lacking rigid gender stratification, formal patriarchal institutions, and defensible wealth, cultural norms provide justification for men's use of force to control women. For example, among Lusi-Kaliai horticulturalists of Papua New Guinea, husbands are expected to discipline wives through beatings if wives fail to perform domestic tasks (Counts, 1999). Positive relationships between adherence to norms condoning men's use of force and frequency of violence against women have been found elsewhere [e.g., China (Hollander, 2005), India (Koenig et al., 2006)]. Implicit in such norms is the idea that violence (or the threat of violence) is an effective way for husbands to maintain marital contributions of their wives. This begs a counterintuitive question: Why do husbands resort to physical violence in order to attain cooperation from a sexual partner?

Other studies report individual or relational risk factors for wife abuse, including the wife's young age or relative youth (Holland and Ferguson, 2009; Naved and Persson, 2005; Wang et al., 2009; but see Alio et al., 2009; Dude, 2009), and the husband's sexual infidelity (Djikanovic et al., 2009; Dunkle et al., 2006; Hollander, 2005; Koenig et al., 2006; McCloskey et al., 2005), alcohol consumption (Dude, 2009; Hoffman et al., 1994; Kantor and Straus,

1990; Rao, 1997), and attempts to control a partner's social behavior (Ellsberg et al., 2000; Gage, 2005; Garcia-Moreno et al., 2006; Shackelford et al., 2005; Tjaden and Thoennes, 2000). Frequency of marital arguments over the use of time and resources is also positively associated with rates of violence (Hoffman et al., 1994; Suitor et al., 1990). Many studies, however, only report empirical associations and lack a cogent conceptual framework specifying direct and indirect pathways through which these effects operate. In this article we attempt to integrate these previous findings by adopting a perspective emphasizing demographic and behavioral factors expected to influence the costs and motivations to husbands of engaging in physical violence against wives.

An explanatory framework for male violence against spouses

Part I: Parental investment theory, sexual conflict, and cooperation. Among sexually reproducing species, males and females have conflicting reproductive interests and usually exhibit asymmetries in parental investment (Emlen and Oring, 1977; Maynard, 1977; Parker et al., 1972; Trivers, 1972). Females produce larger, more energetically expensive gametes and almost always invest greater amounts of time and energy in offspring than males. Female reproductive success is therefore limited by access to resources critical for reproduction whereas male reproductive success is constrained by access to fertile females. Among most mammals, male investment in reproduction is limited to courtship and copulation (i.e., mating effort), rather than provisioning and care (i.e., parenting effort), (Clutton-Brock, 1991). Mating opportunities may be obtained by successful courtship or through coercive means involving aggression toward other males or unreceptive females. Sexual coercion may increase the likelihood that a female will mate with an aggressive male, or lower the likelihood that a female will mate with rival males (Smuts, 1992). Among chimpanzees, sexual coercion appears to be the primary motivation underlying male aggression towards females (Muller et al., 2009).

Unlike most primates humans form long-term pair bonds characterized by high levels of paternal investment (Gray and Anderson 2010). Human infants require almost constant care early in life, and this lowers the efficiency of foraging mothers (Hurtado et al., 1992). Because offspring remain nutritionally dependent until their mid- to late-teens among hunter-gatherers and agriculturalists (Kaplan, 1994; Kramer, 2005), adults into their 50s must simultaneously provide for several dependents of different ages (Gurven and Walker, 2006; Lancaster and Lancaster, 1983). Prolonged multiple dependencies of different-aged offspring increases costs of mate desertion because a change in partners entails reduced investment in children with a former partner. This need to support multiple dependent offspring increases the opportunity cost to fathers of diverting resources away from the family for individual fitness gain.

Given relatively high levels of human paternal investment, male sexual jealousy has been proposed as an important factor motivating violence or hostility against women (e.g., Burch and Gallup, 2000; Daly and Wilson, 1988; Figueredo and McCloskey, 1993; Goetz, 2008). Although men and women report a similar frequency and intensity of jealous emotions during recalls of potential

infidelity (Shackelford et al., 2000), men are more consistently concerned with sexual infidelity by their partners while women are more concerned with emotional infidelity (e.g., Buss, 2000; Buunk et al., 1996; Pietrzak et al., 2002). This sex difference is consistent with an evolved male psychology attuned to the cost of cuckoldry, and an evolved female psychology attuned to cues of husbands diverting investment from offspring.

Both husbands' and wives' experience of jealous emotions are linked to threats and consequences of partner infidelity and conflicts over the allocation of family resources. While traditional evolutionary approaches emphasize the role of male jealousy, the extent of female jealousy and its role in prompting spousal conflict and violence has received little attention. As a result, the underlying causal pathways between male infidelity and diversion of resources away from the family, female jealousy, female infidelity, male jealousy, and spousal violence remain unclear.

Part II: Marital conflict and the strategic use of violence. Despite the generally collaborative nature of pair bonds, interests of husbands and wives do not always coincide and within marriage there is substantial room for conflict of interest (Bird, 1999; Borgerhoff Mulder and Rauch, 2009; Gurven et al., 2009). The anthropological literature is replete with descriptions of conflicts resulting from failure of one partner to meet the expectations of the other, differences in perceptions of what those expectations should be, and conflicts over suspected infidelities (e.g., Shostak, 1981).

Given that interests of spouses do not always perfectly overlap, the use of violence can be viewed as a "strategy" employed by some men to control women's behaviors. Coercive control need not be limited to the reproductive domain, as in preventing or punishing sexual infidelity; violence may be used to influence behavioral outcomes in any domain, so that a wife is more likely to defer to her husband's immediate goals, while setting a precedent for future deference.

Circumstances where spousal interests diverge resulting in different opinions over the proper use of family resources may invite coercive tactics. Borgerhoff Mulder and Rauch (2009) identify a series of interrelated marital "conflict traits" that include relative work effort, pursuit of extramarital affairs, and degree of tolerance following a partner's misconduct. Since men are more likely than women to commit infidelity (Atkins et al. 2001), and since the husband's infidelity per se does not risk marital dissolution to the same extent as the wife's infidelity (Betzig, 1989), we might expect male diversion of resources away from the family for individual fitness gain to be a major source of the conflicts that occur in marriage.

Among the study population, access to and reliance on market goods is increasing, and women rarely earn wages. Money represents a scarce yet fungible and liquid resource that is seldom saved and can easily be squandered by men on other sexual relationships, luxury goods, and recreation at a cost to the family. Although men's wage labor can be considered a form of parental investment if wages are used to make family purchases, wives frequently complain about insufficient knowledge of husbands' wage earnings, and about having relatively little control over how wages are spent. We refer to the suite of men's behaviors that divert resources away from the family for individual fitness gain as *paternal disinvestment*, a construct jointly operationalized as: (1) the husband's village absenteeism due to wage labor, (2) store-bought alcohol consumption, and (3) extramarital affair involvement.

Despite the use of violence as a potentially effective means of coercion, there are costs to engaging in abuse that should restrict its occurrence among a social species engaging in long-term unions. This includes injury to the aggressor if violence provokes retaliation by the wife or the wife's natal kin. Spousal abuse could also result in divorce and loss of future reproductive opportunities with a wife. Even if women remain in abusive relationships, violence contributes to marital strife. Such strife could lead women to withdraw romantically, pursue relationships with other men, and/or reduce work effort as a means of protest, even if doing so results in more violence. Finally, in societies where behavioral visibility is high due to large extended families residing in closely-spaced open houses, perpetrators of violence may experience reputational damage, which could negatively impact the aggressor's involvement in sharing networks, coalitions, or future prospects in the mating market.

Part III: A path model of hypotheses and predictions. Figure 1 displays a path model of factors hypothesized to have direct and indirect effects on the frequency of physical wife abuse. Squares and circles denote measured and latent variables, respectively. Solid lines denote hypothesized positive effects and dashed lines denote negative effects.

The double-sided arrow on the left indicates that spousal ages covary within a marriage. Spousal ages are expected to be positively associated with degree of joint offspring dependency during the couple's reproductive years, where dependents are defined as co-resident children under age 10 (P1). Because of the nature of Tsimane' post-marital residence patterns (see Methods), the husband's age is expected to have a negative effect on the likelihood of residing in close proximity to the wife's natal kin (i.e., biological parents and full siblings) (P2).

DOWNSTREAM VARIABLES

Marital residence. Matrilocal residence is hypothesized to have a direct negative effect on rates of violence (H1:P1) due to the greater costs to husbands of engaging in wife abuse when surrounded by the wife's kin (Counts et al., 1999; Erchak, 1984; Figueredo et al., 2001). Using similar logic we hypothesize that husbands will be less likely to disinvest due to greater social pressure from interested affinal kin (H1:P2). Matrilocal residence is also hypothesized to lower levels of marital strife over work effort (H1:P3). While close proximity of the wife's natal kin per se does not increase the extent to which spousal interests converge, residential arrangements can influence whose interests prevail during conflicts of interest. This leads to the prediction that husbands will be more accommodating when residing near affines, rendering both wives and husbands less likely to express verbal complaints to a spouse. Here marital strife is operationalized as the frequency of one spouse's complaints over another's production. We
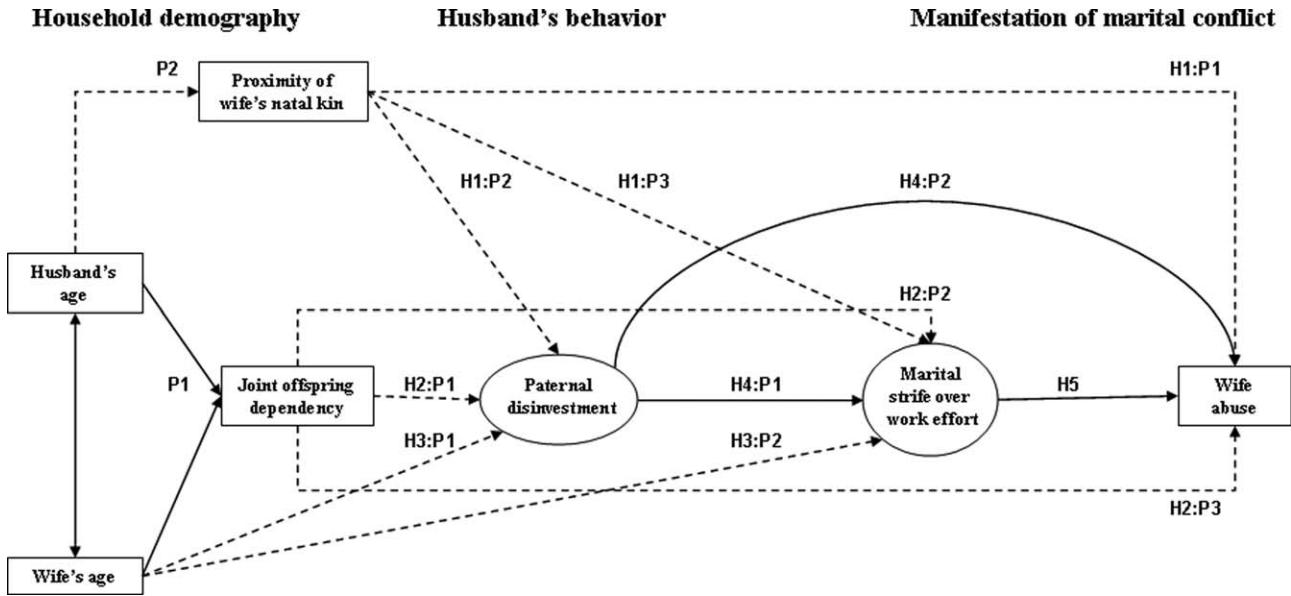
Fig. 1. A path model of physical wife abuse.

focus on complaints over work effort because, such complaints are overrepresented in both men's and women's reports of frequent spousal conflicts (see Results).

Joint offspring dependency. The presence of children stabilizes marriage in traditional and industrialized societies by decreasing the likelihood of marital dissolution and male infidelity (e.g., Hill and Hurtado, 1996; Kaplan et al., 1998; Winking et al., 2007). We hypothesize that degree of offspring dependency will have a direct negative effect on paternal disinvestment (H2:P1) and marital strife over work effort (H2:P2). Since there is evidence that presence of co-resident children decreases the frequency of physical violence against wives (Koenig et al., 2006; Tauchen et al., 1991; but see Wang et al., 2009), we also include a direct effect of offspring dependency on rates of wife abuse (H2:P3). Because sex-biased parental investment is not salient among the Tsimane' [Gurven et al., (2007) report no significant sex differences in mortality rates prior to adulthood], we do not consider in the present analysis how variation in gender composition of offspring influences levels of paternal disinvestment, marital strife, or wife abuse.

Wife's age. Investigation of the conditions under which paternal disinvestment occurs can shed light not only on determinants of spousal conflict and violence, but also on two competing models addressing men's involvement in marriage (reviewed in Gurven and Hill, 2009). The "show-off hypothesis" proposes that men marry to gain access to women's fertility, and that husbands' work effort is primarily motivated by desires to gain social and mating benefits rather than investing in the family (Hawkes, 1991). The "provisioning hypothesis" proposes that men marry because marriage facilitates a sexual division of labor and biparental care, in addition to greater paternity certainty from exclusive sexual relations (Isaac, 1978; Washburn and Lancaster, 1968). The show-off hypothesis predicts that paternal disinvestment will be positively associated with the

wife's age given the wife's declining reproductive value. No such prediction follows from the provisioning hypothesis. To test this prediction we include an effect of the wife's age on paternal disinvestment. In light of possible evidence (Winking et al., 2007) of a negative relationship between the wife's age and one indicator of paternal disinvestment (Tsimane' husbands' affair involvement), the direction of the effect in the model is negative (H3:P1).

The wife's age is also hypothesized to have a direct negative effect on marital strife over work effort (H3:P2). All else equal, women's mate value declines more rapidly with age than men's mate value and younger wives will have greater extrapair mate choice compared to older wives. Because husbands married to younger wives exhibit greater mate guarding behavior independent of the husband's age and relationship duration (Buss and Shackelford, 1997), we expect more frequent male-initiated verbal disputes over the wife's activities when she is younger (using the husband's complaints over the wife's work effort as a proxy). In addition, younger wives are predicted to initiate verbal disputes over the husband's work effort more frequently than older wives due to the inverse relationship between the wife's age and the husband's affair involvement among the Tsimane' (Winking et al., 2007). This prediction is suggested by the paternal disinvestment model but does not follow from the logic of the male sexual jealousy model. It is important to note, however, that because the degree of offspring dependency is reduced for younger wives, the intensity of female-initiated disputes might be lower at younger ages.

Paternal disinvestment and marital strife over work effort. Paternal disinvestment is hypothesized to have a direct positive effect on marital strife over work effort by increasing the frequency of female-initiated verbal disputes over the husband's use of family resources (H4:P1). Paternal disinvestment is also hypothesized to have a direct positive effect on rates of wife abuse (H4:P2). We propose that men use violence as a means of controlling

women's responses to the diversion of resources away from the family for the husband's fitness gain: to quell her objections to his disinvestment, maintain her parental investment and her other marital contributions, and to dissuade her from pursuing relationships with other men.

Finally, marital strife over work effort is hypothesized to have a direct positive effect on rates of wife abuse (H5). Despite folk psychological wisdom that projecting aggression verbally might actually improve marital relations and lower the risk of marital violence, empirical evidence suggests otherwise (e.g., Hoffman et al., 1994; Straus, 1974; Suitor et al., 1990).

METHODS
Study population

The Tsimane' are a natural fertility population inhabiting the rainforests and savannas in the Beni department of lowland Bolivia. The majority of their diet comes from foraging and slash-and-burn horticulture, which is supplemented by varying amounts of market goods. A recent census, as part of the Tsimane' Life History and Health Project, estimates roughly 9,500 Tsimane'. Considerable variation exists across nearly 100 villages in frequency of town visits and degree of interaction with loggers, ranchers, and merchants.

Villages are composed of household clusters, each of which typically contains three or four residences of consanguineal or affinal kin. Spouses engage in extensive cooperation and sex roles are well-defined. Women are responsible for providing childcare and preparing food and *chicha* (homemade beer). Men acquire game and fish and engage in wage labor. Both sexes collect forest fruits, fetch firewood and water, and work in horticultural gardens.

Women's age at first marriage in the present sample ranged from 13 to 22 with a mean of 17 ($n = 49$). Marriages are generally facilitated by kin. Although there are no strict rules of post-marital residence, newlyweds often reside near the wife's natal kin for a few years. During this time the husband works with affines, but bride service is not formally recognized. After several years the couple and any children may relocate to live near the husband's kin. Marriages are stable, with less than 20% resulting in divorce (Winking et al., 2009). Since for men divorce and remarriage often entails migrating to another village, the probability of conflict occurring with a current wife over directing resources toward the husband's children from a previous marriage is low. There are no restrictions against polygyny but it is rare (5–10% of men). Important characteristics of long-term mates for both sexes include industriousness and a good character (Gurven et al., 2009).

Data were collected in 2007 in two villages located along the Maniqui River, which serves as the main thoroughfare for over 40 villages to the market town of San Borja (population ~20,000). Study villages are located in the Beni Biosphere Reserve, which encompasses 1,350 km^2 and is home to roughly 1,200 Tsimane' (Miranda, 1995). Use of the Reserve's resources is restricted to residents for subsistence purposes. Wage labor opportunities exist outside of the Reserve as either laborers for ranchers or itinerant river merchants, or through commercial logging. Men are usually not accompanied by wives and children during multi-day wage labor stints and subsequent town visits to make purchases.

The spousal conflict interview

JS obtained institutional (UNM) IRB approval as well as village- and individual-level informed consent. Interviews were translated into Tsimane' from Spanish, and then back-translated into Spanish from Tsimane' with the help of two bilingual research assistants. Inconsistencies were resolved and the interview was piloted for 3 months as additional revisions were made. Interviews were privately conducted in the researcher's field house to ensure confidentiality.

A retrospective interview design was utilized to test predictions derived from the path model. This was done to balance the gains in statistical power from repeated measures on the same individual over time and the logistical constraints on increasing the sample of couples. We first elicited women's complete reproductive histories to construct temporal intervals (e.g., pregnancies, inter-birth intervals) to which we could assign chronological years based on demographic data (see next section). Additional intervals included the period of spousal co-residence prior to the first pregnancy in marriage, and the year prior to data collection for married post-menopausal women. Demographic and behavioral data were assigned to each interval (see Table 1 for variable definitions). Abusive events were defined as any physical contact initiated by the husband with intent to harm the wife (e.g., punch, kick, slap).

The sample consisted of 735 temporal intervals (or risk periods assigned a year of occurrence) pertaining to monogamous marriages of 49 women. Intervals of participants who remarried due to divorce or the husband's death were included ($n = 89$ intervals or 12%). The presence of children under age 10 from a woman's previous marriage did not significantly affect paternal disinvestment, marital strife over work effort, or frequency of wife abuse.

In another part of the interview, male and female informants listed frequent complaints with a spouse (without prompts). In addition, for a subset of physically abusive episodes with unambiguous causes, wives described their perceptions of arguments precipitating wife abuse.

Age estimation and household composition

Demographic interviews were conducted by JS and another graduate student from 2006 to 2007 among 148 adults. Birth years and genealogies were assigned based on a combination of methods used elsewhere (for a detailed description see Gurven et al., 2007). These include using known ages from written accounts, relative age lists, dated events, and cross-validation of information from independent interviews of kin.

Data analysis

Multivariate analysis by structural equation modeling (SEM) was conducted using maximum likelihood estimation (EQS software version 6.1). SEM is an extension of multiple regression that incorporates modeling of latent variables (or constructs) measured by multiple indicator variables, and permits estimation of direct and indirect effects of covariates (Kline, 1998). A model was specified in which a number of indicators are represented by a smaller number of constructs hypothesized to cause correlations between indicators. Two constructs predicted to directly and/or indirectly affect variation in the frequency of physical wife abuse were created: (1) paternal disinvestment

TABLE 1. Coding of path model variables

Variable	Operationalization
Husband's age	
Wife's age	
Proximity of wife's natal kin (wife's report)	0 = wife's nuclear family member(s) not resident in cluster 1 = wife's nuclear family member(s) resident in cluster
Joint offspring dependency	0 = no co-resident joint children < age 10 1 = at least one co-resident joint child < age 10
Husband's village absenteeism from wage labor (wife's report)	0 = never leaves community overnight 1 = rarely leaves community (<2 weeks) 2 = sometimes leaves community (>2 weeks and <1 month) 3 = frequently leaves community (>1 month)
Husband's store-bought alcohol consumption (wife's report)	0 = never/rarely uses wage on alcohol 1 = sometimes uses wage on alcohol 2 = frequently uses wage on alcohol
Husband's extramarital affair involvement (wife's report)	0 = husband has no affair 1 = husband has affair
Husband's complaints over wife's production (includes childcare, sex-specific domestic work [e.g., cooking, making *chicha*, washing clothes], and garden labor; wife's report)[a]	0 = never complains; 1 = rarely complains; 2 = sometimes complains; 3 = frequently complains
Wife's complaints over husband's production (includes hunting/fishing, garden labor, and sex-specific domestic work [e.g., house maintenance]; husband's report)[a]	
Frequency of wife abuse (wife's report)	Number of physically abusive events

[a]Task-specific complaint ratings were summed to create one measure.

(on which the husband's village absenteeism due to wage labor, store-bought alcohol consumption, and affair involvement were loaded) and (2) marital strife over work effort (on which the husband's complaints over the wife's production and the wife's complaints over the husband's production were loaded). Missing values of the wife's complaints over the husband's production were nonsystematic and imputed using sample means.

Because SEM does not account for correlation of within-subject measurements resulting from a retrospective design, we conducted generalized estimating equations (GEE) analyses (SPSS version 16) to determine whether the correlated structure of variables due to repeated measures on the same individual affects results (Liang and Zeger, 1986). For analyses where the response was dichotomous, a binomial distribution was specified with a logit link and regression coefficients are presented as log odds. For analyses where the response was continuous, a normal distribution was specified with an identity link.

RESULTS
Descriptives

Two regressions were conducted to assess reliability of informant recall of rates of violence. There was no effect of the number of years since the first year of the first marriage on the number of abusive events in the first year (B = −0.024, t = −0.705, P = 0.484), nor was any effect found including all years of marriage (B = 0.005, t = 0.696, P = 0.487).

Over 85% of sampled women (42 of 49) experienced physical violence in marriage. More than a third of married women (38%) were beaten in the year preceding interviews alone. Younger wives are at the greatest risk of experiencing violence (Fig. 2; also see Table 2); women under the age of 20 report abuse at over twice the rate (mean = 2.3 times/year, SD = 4.09) of their older counterparts (mean = 1.02 times/year, SD = 1.82).
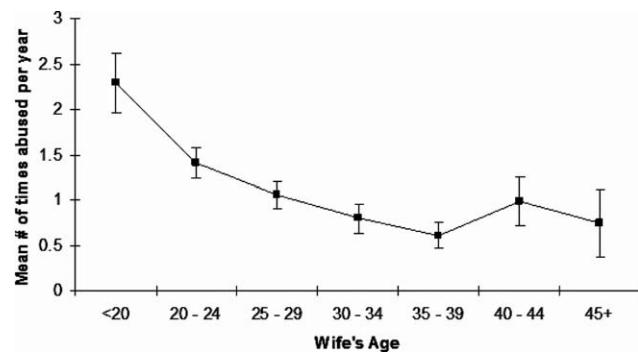

Fig. 2. Rates of physical wife abuse by the wife's age (±SE).

The paternal disinvestment factor score is negatively correlated with the wife's age (r = −0.23, P < 0.001 [two-tailed]) but not the husband's age (r = 0.05, P = 0.14 [two-tailed]). Older wives are less likely to experience indicators of paternal disinvestment, particularly the husband's village absenteeism and affair involvement (Table 2; also see Table 3). Rate of violence increase with all indicators of paternal disinvestment (Table 3), and the paternal disinvestment factor score significantly increases rates of violence controlling for the wife's age (GEE B = 0.623, P < 0.001). Rate of violence is more strongly correlated with the paternal disinvestment factor score (r = 0.49, P < 0.001 [two-tailed]) than with the marital strife factor score (r = 0.15, P < 0.001 [two-tailed]) or any other variable.

Spousal complaints

Women's most frequent complaints reflect the perception that husbands are not working hard enough to support the family (Table 4). Husbands' alcohol consumption is another frequent complaint of wives. Wives also complain about husbands' affairs, wage labor involvement, and poor spending habits. Although wages are used to

TABLE 2. Selected descriptives by the wife's age: Rates of physical wife abuse and indicators of paternal disinvestment

Wife's age	N wives (% abused)	N intervals (% with abuse)	Mean village absenteeism from wage labor (SD)	Mean store-bought alcohol consumption (SD)	Mean affair involvement (SD)
<20	45 (64)	150 (56)	1.34 (1.21)	1.23 (0.7)	0.45 (0.49)
20–24	41 (68)	167 (47)	1.1 (1.21)	1.25 (0.72)	0.29 (0.45)
25–29	35 (63)	141 (40)	1.11 (1.18)	1.24 (0.7)	0.25 (0.42)
30–34	29 (48)	115 (27)	0.86 (1.11)	1.17 (0.73)	0.17 (0.39)
35–39	24 (33)	96 (20)	0.9 (1.05)	1.18 (0.78)	0.08 (0.28)
40–44	18 (39)	47 (32)	0.83 (1.15)	1.26 (0.74)	0.04 (0.22)
45+	12 (17)	19 (21)	0.79 (1.08)	0.84 (0.77)	0.05 (0.25)

TABLE 3. Pearson correlation coefficients among path model variables (n = 735)

	Husband's age (1)	Wife's age (2)	Proximity of wife's kin (3)	Offspring dependency (4)	Village absenteeism (5)	Alcohol consumption (6)	Affair involvement (7)	Husband's complaints (8)	Wife's complaints (9)	Wife abuse frequency (10)
(1)	1									
(2)	0.72*	1								
(3)	−0.19*	−0.07	1							
(4)	0.25*	0.27*	−0.11	1						
(5)	0.05	−0.14*	−0.14*	−0.02	1					
(6)	0.21*	−0.06	−0.13*	0.05	0.37*	1				
(7)	−0.1	−0.29*	−0.19*	−0.13*	0.39*	0.25*	1			
(8)	0.14*	−0.04	−0.13*	−0.06	0.23*	0.06	0.16*	1		
(9)	−0.03	−0.1	−0.21*	−0.03	0.1	0.09	0.14*	0.53*	1	
(10)	−0.05	−0.2*	−0.24*	−0.17*	0.4*	0.31*	0.39*	0.16*	0.11	1

Columns (5), (6), (7) grouped under "Indicator of paternal disinvestment"; columns (8), (9) grouped under "Indicator of strife over work".

*$P < 0.001$ (two-tailed).

make purchases benefitting the family, wives are unable to exert much control over the use of such earnings. Husbands' self-reports of daily wages and wives' estimates of their husbands' wages are not strongly correlated ($r = 0.27$, $P = 0.11$, $n = 36$ couples). Husbands report a wage that is 8% higher than what their wives report (paired $t = 1.337$, one-tailed $P = 0.095$).

Men's most frequent complaints similarly reflect the perception that a partner is not working hard enough. Husbands complain that wives are often visiting kin instead of working at home. Husbands also complain about the quality of care provided to children (e.g., "allowing" children to get injured or dirty while playing). While work effort is the most frequent complaint by both husbands and wives, husbands do not list women's affairs or drunkenness as common complaints.

Tests of predictions derived from the model

Figure 3 displays results of the SEM analysis. The correlated structure of variables due to repeated measures on the same individual over time does not affect results [We found no differences between SEM and GEE analyses in the uncertainty surrounding regression effect estimates (there were also no changes in the direction of effects)] (See Table A1). Standard goodness of fit measures approach acceptable levels ($\chi^2 = 248.55$, $P < 0.001$, RMSEA = 0.1, CFI = 0.87) [For the RMSEA (root mean square error of approximation) and CFI (comparative fit index), values greater than 0.08 and lower than 0.9, respectively, indicate that the model might not adequately represent the data (Browne and Cudeck, 1992)]. Lack of model fit is driven by unexplained covariance between the husband's age, and his alcohol consumption and

TABLE 4. What are your most frequent complaints to your spouse?

Wives' reports		Husbands' reports	
Complaint	% Listing complaint	Complaint	% Listing complaint
No meat	64	Does not cook	94
Does not work in field	64	Does not wash clothes	56
Too often drunk	32	Does not bring water	31
Has an affair	27	Does not bring firewood	25
Too often wage laboring	14	Does not make *chicha*	25
Poor spending habits	14	Too often visiting family	25
Does not bring firewood	14	Does not work in field	13
Does not bring water	9	Does not clean house	13
Gossiping in-laws	9	Does not properly care for children	13
Does not fix house	5		
Too often sick and cannot work	5		

Free list; $n = 16$ wives and 16 husbands.

complaints over the wife's production (this covariance results from a few men contributing many intervals to the dataset). Removing the man's age from the analysis altogether (by substituting an effect of the wife's age on the probability of residing near the wife's natal kin) improves model fit ($\chi^2 = 90.11$, $P < 0.001$, RMSEA = 0.07, CFI = 0.93).

The couple is less likely to live near the wife's natal kin over the course of marriage. This indicates an early bias toward matrilocality with residential fluidity following bride service (this effect remains significant after accounting for repeated measures and controlling for the wife's age). As might be expected, younger and older adults are least likely to reside with joint dependents; the effect of age on the likelihood of residing with at least one dependent is quadratic in separate regression models for each sex.

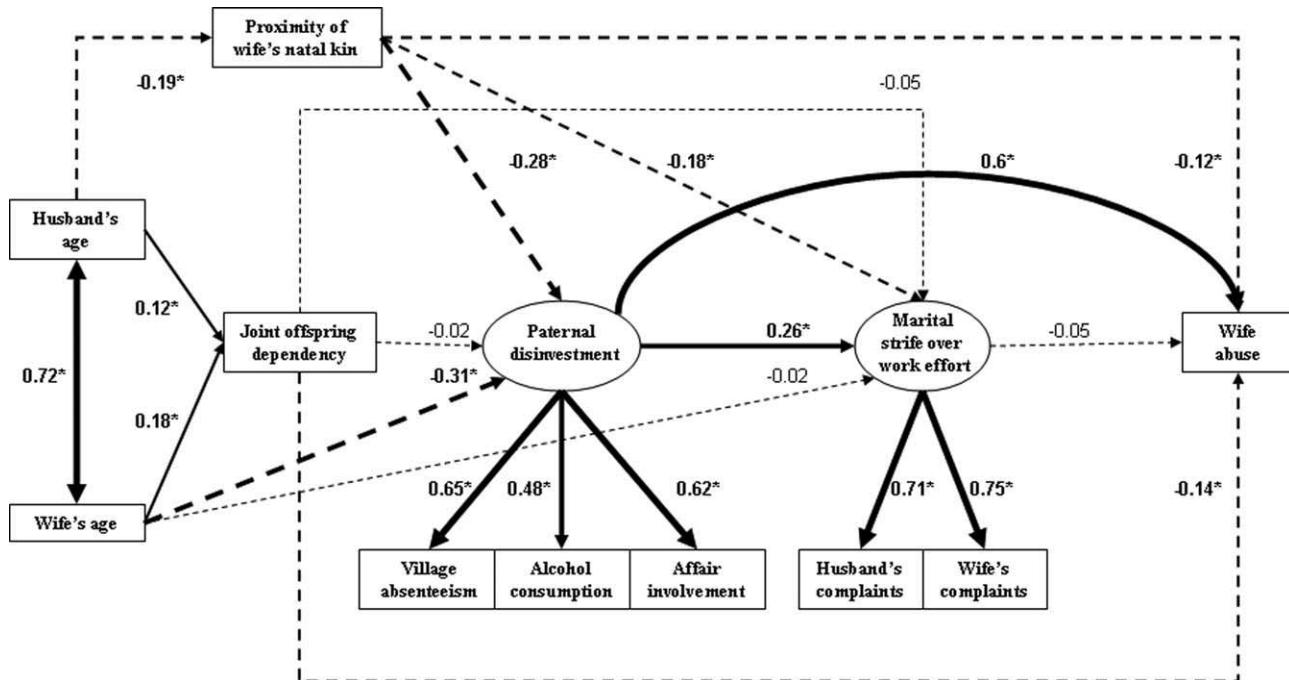*American Journal of Human Biology*

Fig. 3. Results of SEM analysis (standardized path coefficients inserted; line thickness determined by absolute value of path coefficient; asterisks indicate significance at the 5% level).

Determinants of paternal disinvestment

Matrilocal residence has a significant negative effect on paternal disinvestment controlling for the wife's age and presence of joint dependents. Matrilocal residence significantly decreases the husband's village absenteeism (GEE B = −0.397, P = 0.037, wife's natal kin = present), store-bought alcohol consumption (GEE B = −0.235, P = 0.007, wife's natal kin = present), and affair involvement (GEE B = −0.737, P = 0.042, wife's natal kin = present) controlling for the wife's age.

The presence of joint dependents decreases paternal disinvestment but the effect is not significant. Offspring dependency does not significantly decrease any indicator of paternal disinvestment in univariate GEE models (but see Winking et al., 2007 and Discussion).

Paternal disinvestment significantly decreases with the wife's age, which exerts the strongest negative effect and significantly predicts the husband's village absenteeism (GEE B = −0.021, P < 0.001), alcohol consumption (GEE B = −0.011, P = 0.022), and affair involvement (GEE B = −0.107, P < 0.001), controlling for proximity of the wife's natal kin. We examined the possibility that marital duration is driving this relationship since during the early years of marriage, men might be less committed as they evaluate the relationship's potential (Blurton Jones et al., 2000). We regressed the paternal disinvestment factor score on the wife's age and the wife's age at marriage. The latter, after controlling for the wife's age, serves as a measure of the number of years within marriage. We found no effect of the number of years in marriage on paternal disinvestment, or any indicator of disinvestment.

Determinants of marital strife over work effort

Matrilocal residence significantly decreases marital strife and has a negative effect on both the husband's complaints over the wife's work effort (GEE B = −0.209, P < 0.001, wife's natal kin = present, controlling for paternal disinvestment and the presence of joint dependents) and the wife's complaints over the husband's work effort (GEE B = −0.488, P < 0.001, wife's natal kin = present, controlling for paternal disinvestment and the wife's age).

The presence of joint dependents decreases marital strife over work effort but the effect is not significant. While having joint offspring significantly decreases the husband's complaints (GEE B = −0.631, P < 0.001, joint dependents = present, controlling for paternal disinvestment and proximity of the wife's natal kin), there is no significant effect on the wife's complaints (GEE B = −0.14, P = 0.143, joint dependents = present, controlling for paternal disinvestment, proximity of the wife's natal kin, and the wife's age).

The wife's age has a negative effect on marital strife over work effort but the effect is not significant. The wife's age negatively predicts the wife's complaints (GEE B = −0.025, P < 0.001, controlling for paternal disinvestment and proximity of the wife's natal kin) but does not predict the husband's complaints (GEE B = 0.005, P = 0.254, controlling for paternal disinvestment, proximity of the wife's natal kin, and presence of joint dependents).

Paternal disinvestment significantly increases marital strife and has a positive effect on both the husband's complaints (GEE B = 0.673, P < 0.001, controlling for the presence of joint dependents and proximity of the wife's natal kin) and the wife's complaints (GEE B = 0.176, P <

TABLE 5. *Effects of predictors on rates of physical wife abuse*

Predictor	Direct effect		Indirect effect		Total effect	
	Unstd. B	Std. β	Unstd. B	Std. β	Unstd. B	Std. β
Husband's age	–	–	0.009	0.035	0.009	0.035
Wife's age	–	–	−0.06[*]	−0.205[*]	−0.06[*]	−0.205[*]
Wife's natal kin = present	−0.674[*]	−0.118[*]	−0.874[*]	−0.153[*]	−1.548[*]	−0.271[*]
Joint dependents = present	−0.86[*]	−0.138[*]	−0.068	−0.011	−0.928[*]	−0.149[*]
Paternal disinvestment	1.972[*]	0.596[*]	−0.044	−0.013	1.928[*]	0.583[*]
Marital strife over work effort	−0.039	−0.051	–	–	−0.039	−0.051

[*]$P < 0.05$.

0.001, controlling for the wife's age and proximity of the wife's natal kin). Each indicator of paternal disinvestment has a significant positive effect on both the husband's and wife's complaints controlling for other factors (GEE analyses not shown).

Determinants of wife abuse

Direct effects of three of four variables hypothesized to influence rates of wife abuse are significant and in the predicted direction, accounting for 42% of the variance. Paternal disinvestment has the strongest direct and total effect on rates of wife abuse (Table 5), uniquely explaining 36% of the variance. Each indicator of paternal disinvestment has a significant positive effect on rates of wife abuse controlling for the presence of joint dependents, proximity of the wife's natal kin, and the two other indicators of paternal disinvestment (GEE analyses not shown).

Marital strife over work effort does not have a direct positive effect on rates of wife abuse. Neither the husband's complaints nor the wife's complaints predict rates of violence controlling for the presence of joint dependents, proximity of the wife's natal kin, and paternal disinvestment (GEE analyses not shown).

Direct negative effects of the presence of joint dependents and the wife's natal kin on rates of wife abuse are of similar magnitude. However, the total effect of matrilocal residence is nearly twice as great as that of offspring dependency due to differential mediating effects on paternal disinvestment and marital strife over work effort. The wife's age also yields an indirect negative effect on rates of wife abuse through a direct positive effect on degree of offspring dependency and a direct negative effect on paternal disinvestment.

We find no evidence that the negative relationship between the wife's age and rates of physical wife abuse is the result of a cohort effect. If this were the case, frequency of violence would not actually decrease as women age, but would instead be higher among younger women than among older women when they were younger. After stratifying the sample by decade, we find a robust negative relationship between the wife's age and the number of abusive events per year (GEE B = −0.041, $P = 0.004$, controlling for decade). We also find no evidence that the husband's age significantly influences rates of wife abuse through indirect effects that are independent of the wife's age.

Wives' perceptions of arguments precipitating physical wife abuse

Consistent with the strong positive correlation between paternal disinvestment and rates of wife abuse, the mari-

TABLE 6. *Wives' perceptions of marital arguments precipitating physical wife abuse*

Marital argument	% of total
Wife complains about husband's extramarital affair	36
Husband complains about wife's production[a]	29
Husband complains about wife's extramarital affair	17
Wife complains about husband's excessive drinking	5
Wife complains about living far from natal kin	4
Miscellaneous[b]	9

$n = 292$ abusive events.
[a]Refers to wife's inability to perform task due to involvement in other work, infirmity/rest, or kin visitation.
[b]Includes husband's complaints over reproduction unrelated to the wife's infidelity (e.g., wife is infertile), wife's attempts to prevent inebriated husband from fighting other man, wife's misplacement of tool, and wife's attempts to care for inebriated husband despite his requests otherwise.

tal argument most frequently associated with violence is the wife's complaints over the husband's infidelity (Table 6). Complaints over the wife's production represent another frequently reported argument triggering violence, and might reflect a reduction in women's work effort as a response to paternal disinvestment (i.e., to punish husbands). Consistent with this hypothesis, the paternal disinvestment factor score significantly increases the husband's complaints over the wife's production controlling for other factors (shown above). Accusations of the wife's sexual infidelity represent another frequently reported argument precipitating violence, but this cause is reported less than half as frequently as wives' complaints about male infidelity and was not reported by men as a common complaint (see Table 4).

DISCUSSION

Summary of results and theoretical extensions: Paternal disinvestment, male jealousy, and patriarchy

As hypothesized, indicators of paternal disinvestment, a construct representing the suite of men's behaviors that divert resources away from the family for individual fitness gain, positively covary with indicators of marital strife and with rates of physical wife abuse. Considering the role of paternal disinvestment and female jealousy over male infidelity therefore complements and helps integrate existing approaches to the study of both intimate partner violence and human sexual conflict. The paternal disinvestment model proposes that violence is a means by which men control women's responses to a dual reproductive strategy of familial investment and the pursuit of extramarital sexual relationships. This model, especially if supported by cross-cultural tests, integrates the consistent positive relationships reported earlier between rates of wife abuse and male control of wealth, male infidelity, and alcohol consumption.

As hypothesized, the wife's age is associated with a significant decrease in all indicators of paternal disinvestment, controlling for other factors. This finding is consistent with physiological, demographic, economic, and behavioral evidence that humans have a phylogenetic history of consistent male parental investment in pair bonds, where male and female fertility schedules are closely linked (Gray and Anderson, 2010; Kaplan et al., 2010). Despite a reduced dependency load for younger wives, we find that younger wives more frequently express verbal complaints over the husband's work effort. This is likely explained by the fact that paternal disinvestment is most common in marriages involving younger women, and suggests that the primary purpose of wives' complaints to husbands is to lower the likelihood of future resource diversions as costs of disinvestment increase with greater dependency loads. These findings are inconsistent with the logic of the show-off hypothesis, which predicts that men will withdraw investments as their wives' reproductive value declines with age.

The finding that risk of physical wife abuse is greater in marriages involving younger women is consistent with the logic of the male jealousy model of spousal violence (e.g., Counts et al., 1999; Daly and Wilson, 1988; Goetz, 2008). Indeed, male accusations of female infidelity play a noteworthy role in precipitating Tsimane' marital violence (Table 6). Yet our theoretical model and results suggest a reexamination of the relationship between the wife's age and rates of physical wife abuse that considers both the age-profile of male resource diversions and women's behavioral responses to such diversions. Female infidelity might represent a response to paternal disinvestment, to punish a husband and/or compensate for any loss of the husband's investment through extramarital sexual relationships with men offering resources. This hypothesis suggests a causal link between male infidelity, female jealousy, female infidelity, and male jealousy that requires further testing. If this link is supported empirically, then female reproductive value and risk of female infidelity are only a subset of individual- and household-level variables that require consideration in models of spousal conflict and violence. The fact that all indicators of paternal disinvestment are higher in marriages involving younger wives (including the husband's village absenteeism) is not well explained by the male jealousy model, which implies that men paired with younger women increase effort in maintaining partner relations. Rather, as marriages progress and as children are added to the family, demands of household production increase and spouses often resolve conflicts as their joint production requirements increase. We propose that an expanded evolutionary framework incorporating the importance of male parental investment and women's responses to the withdrawal of such investment might help explain why the predicted negative relationship between the woman's age and rates of physical wife abuse suggested by the male jealousy model is not always found (e.g., Alio et al., 2009; Dude, 2009).

Given the high prevalence of physical wife abuse in a traditionally matrilocal society with relatively low variance in socioeconomic status, our findings challenge the generalizability of conventional patriarchal explanations of men's use of force in sexual relationships. Sociological theories proposing that violence is the outcome of male attempts to control women must address why control is desired in the first place, and must explain why a strong empirical association may exist between male control of and violence against women in societies lacking formal patriarchal institutions, rigid gender stratification, and defensible/inheritable forms of wealth.

The model presented here also suggests a reexamination of the positive relationship between frequency of violence against women and men's adherence to norms linking masculinity to physical dominance over women's productive behavior. Relationship strife resulting from male resource diversions could lead women to reduce work effort as a means of punishing a partner. As a response to this reduction in work effort, male support of belief systems condoning the use of force might motivate abuse (or threats of abuse) in order to maintain female parental investment. This would imply that patriarchal attitudes are a result, rather than a cause, of men's behavior, and that such attitudes are context-dependent responses rather than stable personality attributes. Future research should therefore investigate causal pathways between paternal disinvestment, women's work effort, men's adherence to norms condoning use of force against women, and men's attempts to forcefully manipulate (verbally and physically) women's work effort.

Household demography, male parental investment, and spousal conflict

In addition to a direct negative effect of matrilocal residence on rates of physical wife abuse (also see Counts et al., 1999; Erchak, 1984; Figueredo et al., 2001), we find a slightly stronger indirect negative effect mediated by a decrease in paternal disinvestment. As might be expected, both wives and husbands express fewer verbal complaints over a partner's work effort when residing near the wife's natal kin.

The direct negative effect of the presence of dependent offspring on rates of wife abuse provides support for the hypothesis that joint children stabilize marriages (e.g., Kaplan et al., 1998; Winking et al., 2007). However, controlling for other factors the presence of dependents does not significantly decrease any indicator of paternal disinvestment (substituting a continuous measure of offspring number does not change this result). Response bias might explain the lack of a significant negative effect of offspring dependency on rates of male infidelity in the present sample. In contrast to the Winking et al. (2007) study (which uses Tsimane' men's reports), we use women's reports to determine rates of male infidelity. Comparing women's to men's reports across the two studies, it is evident that wives are more likely than husbands to report male infidelity at all ages, and that the greatest sex differences in reporting occur when wives are between 25 and 39 years of age. Since this age range corresponds to the time when foraging mothers have peak numbers of altricial offspring (Gurven and Walker, 2006), the tendency to over- or under-report male infidelity might reflect consensus between spouses that this is the time at which paternal disinvestment is most costly. Controlling for sex of respondent and spousal ages using the combined dataset of women's and men's reports, presence of joint dependents significantly decreases the likelihood of male infidelity (GEE B $= -0.399$, $P = 0.015$, joint dependents $=$ present, $n = 1,557$ risk years for 128 men).

While presence of dependents may increase marital stability, resulting increases in labor demand can create

opportunities for spousal conflict over work effort, even if both partners increase time allocation to work and work efficiency. Our finding that presence of dependents significantly decreases the husband's but not the wife's complaints over a partner's production suggests an asymmetry in relative work effort, even as fitness interests of spouses converge. A recent meta-analysis supports the conclusion that wives absorb a greater share of the workload than husbands as joint offspring are added to the family. Twenge et al. (2003) found that transition to parenthood has a stronger negative effect on women's marital satisfaction than that of men, and that sex of parent and age of child interact such that mothers of infants are significantly more dissatisfied with marriages than mothers of older children or fathers of younger or older children. With these findings in mind, the lack of a strong negative effect of offspring dependency on overall marital strife might not be surprising.

Study limitations

Because causation cannot be inferred, we cannot rule out the possibility that paternal disinvestment is an outcome of violence. Spousal violence might signal imminent relationship termination, prompting men to shift investment in reproduction toward mating effort rather than investing in soon-to-be estranged biological offspring. Moreover, the strong correlation between paternal disinvestment and rates of violence might reflect the fact that disinvesting men are also more abusive or more likely to select partners tolerating abuse. In addition, even if paternal disinvestment triggers violence, the effect might not be direct. We have suggested, for example, that wives might punish disinvesting husbands by reducing work effort or pursuing relationships with other men, which then might result in husbands resorting to violence.

Another limitation is that indicators of marital strife only include complaints over work effort and are thus not representative of spousal complaints. Since we lack data on the frequency of complaints over a partner's social transgressions, which undoubtedly contribute to marital strife, it is premature to conclude that verbal aggression is not a necessary precondition for physical aggression (Stets, 1990). While the finding that marital strife does not directly increase rates of violence is tentative, it is plausible that frequency of complaints, particularly the wife's complaints, might not explain variation in rates of wife abuse. If part of the motivation for men to abuse is to increase the likelihood of the wife's compliance with the husband's future pursuit of extramarital affairs, then wives who know they are likely to be abused might be willing to defer to husbands in an effort to avoid violent reactions. This implies that women experiencing more frequent abuse might complain to husbands less frequently. Consistent with this explanation, rates of wife abuse have a significant negative effect on frequency of the wife's complaints (GEE B $= -0.064$, $P = 0.028$, controlling for proximity of the wife's natal kin, the wife's age, and paternal disinvestment).

Other limitations of this study are that sample size is relatively small, we only focus on physical forms of violence, and that interview data can produce socially desirable responses. Social desirability bias is suggested by the low degree of spousal concordance in reporting violence; whereas women report experiencing violence in 39% of risk years, men report perpetrating violence in only 13% of risk years. In addition, not one man expressed a complaint over a partner's sexual conduct, within or outside of marriage, despite reports by wives suggesting otherwise (see Table 6).

Public health relevance

It is now widely recognized that wife abuse is a significant public health concern. Our findings suggest that the extent of wife abuse (and spousal conflict in general) is explained in part by men's parental investment decisions. Whether paternal disinvestment influences women's and children's health in the short- and long-term, and how this relates to the expression of spousal conflict and violence, merits further investigation. There is evidence that women in abusive relationships are at greater risk of sexually transmitted infections (STIs), and that this effect is not mediated by women's sexual behavior (see Dude, 2009; Dunkle et al., 2006 and references therein). This result is consistent with the logic of the paternal disinvestment model, in that husbands that are more likely to engage in extramarital sexual relationships are more likely to contract STIs, and are also more abusive. There is also evidence that women in abusive relationships are more likely to be anemic and underweight, and that their children are more likely to experience stunting, wasting, and be severely underweight for age (Ackerson and Subramanian, 2008). These results are also consistent with our model in that they too suggest an association between wife abuse and reduced access to resources. While the hypothesis that paternal disinvestment negatively impacts women's physical, mental, and reproductive health, even in the absence of physical violence, has yet to be tested, our findings suggest that monitoring men's resource use in marriage might be a useful addition to public health research design.

CONCLUSION

An implication of this study, for research and intervention design in public health, is that the conditions that increase spousal conflict over family investments should be the target of explanatory models and attempts to lower violence frequency. One hypothesis is that when money is scarce, opportunities for men to earn money are sporadic, and monetary investments in offspring may not increase their future income (e.g., due to high mortality and a lack of formal educational institutions and a skills-based wage economy), men will be more likely to divert wages to extramarital relationships, when they do earn money. As urbanization is increasing throughout the developing world, and as people with low levels of formal education flock to cities in search of economic opportunities, unemployment rates are high and many men are only intermittently employed. This implies that there are also many cash-strapped women willing to engage in sexual relationships in return for resources. This may be a context which increases the likelihood of sexual conflict and violence. If so, rates of intimate partner violence should increase as people shift from complete reliance on subsistence production to wage-based economies, particularly when wage earnings are unstable and women cannot support children without assistance from men.

This study elucidates potential mechanisms underlying the relationship between men's control of wealth, alcoholism, infidelity, and use of violence against women often noted in the social sciences. In addition to the traditional focus on the effects of patriarchy and male sexual jealousy on rates of violence, spousal conflict over men's resource use has a salient impact on wife abuse.

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APPENDIX

TABLE A1. Comparison of estimates derived from structural equation model (SEM) and generalized estimating equation (GEE) analyses

Dependent variable	Independent variable	Standard error		P-value[a]		Change in significance?
		SEM	GEE	SEM	GEE	
(1) Proximity of wife's natal kin	Husband's age	0.002	0.012	<0.05	<0.001	No
(2) Joint offspring dependency	Husband's age[b]	0.002	0.015	<0.05	<0.001	No
	Wife's age	0.002	0.019	<0.05	0.003	No
(3) Paternal disinvestment[c]	Wife's age	0.004	0.003	<0.05	<0.001	No
	Proximity of wife's natal kin	0.08	0.079	<0.05	0.013	No
	Joint offspring dependency	0.087	0.062	>0.05	0.926	No
(4) Marital strife over work effort[c]	Wife's age	0.019	0.005	>0.05	0.173	No
	Proximity of wife's natal kin	0.365	0.087	<0.05	<0.001	No
	Joint offspring dependency	0.363	0.095	>0.05	0.133	No
	Paternal disinvestment[c]	0.29	0.03	<0.05	<0.001	No
(5) Frequency of wife abuse	Proximity of wife's natal kin	0.202	0.088	<0.05	<0.001	No
	Joint offspring dependency	0.208	0.093	<0.05	<0.001	No
	Paternal disinvestment[c]	0.194	0.029	<0.05	<0.001	No
	Marital strife over work effort[c]	0.034	0.03	>0.05	0.334	No

[a]EQS output indicates whether $P < 0.05$ but does not specify exact P-values.
[b]Because of the strong correlation between spousal ages, age difference (husband's age—wife's age) was used as a measure of the husband's age after controlling for the wife's age.
[c]Factor scores were obtained by summing the product of standardized values of indicators and factor loadings.