

Social Aggression and Resource Conflict Across the Female Life-Course in the Bolivian Amazon

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This work explores sources of conflict among forager-horticulturalist women in Amazonian Bolivia, and applies life history theory as a tool for understanding competitive and cooperative social networking behaviors among women. In this study, 121 Tsimane women and girls were interviewed regarding current and past disagreements with others in their community to identify categories of contested resources that instigate interpersonal conflicts, often resulting in incidences of social aggression. Analysis of frequency data on quarrels ($N = 334$) reveals that women target several diverse categories of resources, with social types appearing as frequently as food and mates. It was also found that the focus of women's competition changes throughout the life-course, consistent with the notion that current vs. future reproduction and quantity-quality trade-offs might have different influences on competition and social conflict over resources within women's social networks across different age groups. *Aggr. Behav.* 38:194–207, 2012. © 2012 Wiley Periodicals, Inc.

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INTRODUCTION

The proposal that female reproductive success is limited more by competitive access to resources, while male reproductive success is limited more by competitive access to females, is a fundamental concept in the evolutionary biology of mammals. The sexes vary considerably in costs of reproduction and potential fitness benefits to additional matings [Parker, Baker and Smith, 1972; Trivers, 1972]. The substantial disparity in parental investment, with greater contributions by females, creates conflict between and within the sexes, contributing to debates surrounding optimal investment of resources in quantity vs. quality of offspring [Hagen, Barrett and Price, 2006], parenting decisions [Borgerhoff Mulder, 1992; Daly and Wilson, 1985], and sex differences in mating strategies and relationship conflicts (Clutton-Brock, 1994; Gangestad and Simpson, 2000; Schmitt, Shackelford and Buss, 2001]. Marital conflicts often reflect disparities in the optimal use of resources, where the “optimal” allocation may often differ among spouses [Gurven, Winking, Kaplan, von Rueden and McAlistler, 2009; Lundberg and Pollak, 1993; Manser and Brown, 1980; Stieglitz, Kaplan, Gurven, Winking and

Vie Tayo, 2011]. Within the evolutionary sciences, the resources that impact human female reproductive success, which are relevant to these debates, usually focus only on food *or* mates, with less attention being given to women's conflicts over social resources. And most work in the social sciences that has focused on women's social dynamics has not employed evolutionary theory to investigate the complex phenomena of resource competition, conflict, and cooperation among women. Additionally, research in small-scale societies on women's social networks and conflicts is rather sparse. This work seeks to identify the resources over which women and girls compete via social aggression and how the dynamics and sources of competition change over the life-course, and to

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use evolutionary logic to shed light on this complex subject. We test several hypotheses derived from evolutionary theory, as well as discuss the implications of the findings on a diverse range of theoretical areas.

The limited availability of resources instigates competition, fueling the evolution of social strategies designed to resolve conflicts over assets in one's favor. Social aggression by quarreling, gossiping or "informational warfare" [Hess, 2006] is a common forum for competition among women. Quarreling among women is costly in several ways; (1) It takes time away from other activities, (2) Injured parties might retaliate, and (3) Participation could negatively influence one's social standing. Thus, women should only be willing to quarrel when they stand to gain something concrete (e.g., resources, information) or when it is reputationally advantageous. This current work addresses gaps in evolutionary analysis of the combined resources that women target for competition and explores the trade-offs of focus on each throughout the life-course. A woman's reproductive value, need for a long-term partner, and the number of child dependents she has are expected to vary over a woman's life-course, and hence the type and quantity of resources needed throughout her life should vary accordingly. Thus, we first expect that age-mates will be frequent competitors for similar resources. Second, we expect that women will focus attention on quality long-term mate acquisition when young, because the benefits of a provisioning long-term partner are cumulative. We also expect that conflict over social resources (informal social contracts and friendships) will increase with age and dependency load due to the increasing demands of children, which cause women to increasingly seek resources outside of the pair bond in order to satisfy greater reproductive demands. We expect to see a similar food competition trajectory for similar reasons. And finally, we expect mate-retention conflicts to be generally focused at younger ages, because previous work in less acculturated Tsimane villages indicates that men tend to target extramarital relationships when they are younger with fewer dependents to risk [Winking, Kaplan, Gurven and Rucas, 2007a], and because women's reproductive value decreases with age, indicating that younger women will attract more male attention, which in other work has been shown to correlate with significant spousal conflict and violence [Stieglitz, Gurven and Kaplan, in press; Stieglitz, Kaplan, et al., 2011].

Resource: Food and Food-Sharing Contracts

Food sharing, a core feature present in all hunting and gathering groups, contributes to the uniqueness

of human social systems and is an essential component in the evolution of our species [Gurven, Allen-Arave, Hill and Hurtado, 2000; Gurven, Hill and Kaplan, 2002; Kaplan and Hill, 1985; Lancaster, 1978]. Food sharing lowers the probability of daily food shortfalls when success varies within and among individuals; however, due to the potential benefits of withholding shares (i.e., cheating) or under-producing (i.e., slacking), individuals may not reciprocate in the expected culturally appropriate manner, resulting in social aggression via gossiping and quarreling [Gurven, 2006]. The unenforceable nature of informal social contracts creates a demand for honest, trustworthy cooperators. Because of this, we expect that a significant percentage of female-female quarrels will concern accusations of food theft, stinginess, and other indications of a failure to meet expectations governing social exchange. The study of quarrels over food-sharing contract defections can shed light on the relevance of different foods that people acquire and share. And indeed, were such quarrels to be discovered, support would be found for models of reciprocal altruism; whereas, a lack of such quarrels would be more consistent with tolerated scrounging or signaling [Bliege Bird and Bird, 1997; Blurton Jones, 1987; Gurven, 2004]. Tolerated scrounging predicts sharing when the costs of resource defense outweigh the benefits of hoarding, while signaling predicts sharing to others to advertise information about cooperative intent or phenotypic quality. These two models do not require contingency between giving and receiving, and therefore are not consistent with complaints or resentments over failed expectations to receive return shares by specific parties. While it may be interpreted that a lack of food sharing quarrels could indicate perfect reciprocity, we believe this is unlikely since food resources are often scarce, information about others' motives and abilities to produce food is imperfect, and conflicts of interest are likely given the large range of options for sharing resources.

Resource: Material Goods

Human developmental needs are not limited to calories but include protection, language instruction, good health, mating opportunities, and a variety of significant social, behavioral, psychological, and physical skills that require years of teaching and learning accomplished only through instruction, example, exposure, and practice. Food alone cannot supply sufficient "resources" in order to maximize female reproductive success or quality of life and family. Complex cultural technologies have been utilized by humans for hundreds of thousands of years to solve problems of food acquisition, for protection from the elements,

predators and microorganisms, and have infiltrated nearly every aspect of daily life. Thus, we expect that material resources, which may greatly enhance condition and reputation, will also be under competition among women and result in quarrels. For instance, it may not be obvious that a spoon could increase survivorship, but in communal food-eating households, we observed that cooked meals were often-times rapidly consumed from a single pot while still very hot. Spoons might assist in getting more food without the risk of getting burned. Additionally, such implements are very helpful with food processing and cooking, and have great longevity, saving individuals the time it would have taken to repeatedly make a less durable utensil.

Resource: Men

Male friends, short-term mates, and spouses can provide numerous resources and protection as well as serve as long-term cooperative partners. Men are particularly inclined to such commitment when they are attempting to win favor or when they share reproductive interests with a woman. Typically, women attempt to secure several positive traits in male social and romantic partners, including good genes, ability, and willingness to invest, status, prestige, intelligence, and fidelity—traits that tend to increase the magnitude, quality, and reliability of investment in current and future offspring. Courting male friends and romantic partners, assisting in male-male coalitional conflicts, and harassing other females for their male companions are complex social behaviors, intended to increase the probability of winning high-quality partners, thus imparting fitness benefits to self and offspring [Hooks and Green, 1993; Hrdy, 1999; Mesnick, 1997]. Men vary in what they can and are willing to offer partners, and competing to secure a higher quality partner can often have long-term payoffs, particularly if it influences a man's marital choice. For these reasons, we predict the acquisition of mates and mate retention to cause considerable conflict among women, fueling intense intrasexual arguments. We expect conflict over mate acquisition to peak in frequency and intensity during a woman's teenage years, since this is when unmarried women in most natural fertility societies first marry. However, marriages of young girls are often arranged or at least influenced by relatives [Gurven et al., 2009], and courtship periods may be brief. In the Tsimane context, women may have less time to evaluate, select, and contend with competitors in the game of mate acquisition due to an earlier age of marriage and first-birth marriage compared to Western populations. We also expect quarrels concerning mate retention to occur early in women's marriages,

due to previous work demonstrating that most of Tsimane men's extramarital affairs (a primary, cross-cultural cause of relationship discord) occurred in the first five years of marriage, when offspring dependency is low [Winking et al., 2007a].

Resource: Social

Parenting assistance may be offered in the form of allocaregivers who reduce the time and effort required by the mother to protect, feed, and socialize dependent young, resulting in low interbirth intervals and higher total fertility [Hrdy, 2005]. Friends may also offer help in the form of cooperative tasks, productive activities, and cultural or social information. Evidence among baboons indicates that social bonds, measured by grooming and frequency bouts, positively impact offspring survivorship [Silk, Alberts and Altmann, 2003]. Therefore, understanding the importance of friendships among women is of great consequence, due to the fact that helpers may significantly increase the health and reproductive success of oneself and one's allies through a wide variety of pathways.

Humans pay enormous time costs to developing and maintaining relationships with others and securing positions within social communities. Social grouping provides benefits, however, such as protection from conspecifics and predators, increased food sharing, and benefits from economies of scale for various productive activities, that must outweigh these costs. The complexity involved with optimizing these benefits among equally matched competitors and allies has frequently been cited as a major evolutionary pressure for increases in brain size, language acquisition, and social intelligence [Barton and Dunbar, 1997; Dunbar, 1992, 1993, 1997]. For example, economic production of lactating women is seriously compromised among hunter-gatherers [Hurtado, Hill, Kaplan and Hurtado, 1992; Marlowe, 2003], and so women must rely on spouses, kin support, friends, social ties, and reputation in order to obtain enough food. While men reproductively benefit from investment in offspring independent of the need for maternal persuasion, social skills, and influence by socially intelligent women may also influence the distribution of male-acquired resources. Social intelligence assists women in their reproductive struggle by increasing access to food and other necessities via extended social networks and by decreasing mortality risk through protection from predators and other conspecifics. For these reasons, we hypothesize that social network size and quality, coalitional allies, and associated social contracts with sharing partners (otherwise combined generally into "social resources") will instigate competition and quarreling due to their strong fitness

potential. Contextual examples of such a quarrel might involve situations that revolve around distilling information about how one's friend might be withholding returns of shared foods, or instances where women quarrel with others with whom they share no obvious conflict except in the support of an injured friend. And because reproductive resource needs increase with the number of dependent children, it was also predicted that the number of quarrels over these social resources would increase with dependency load and age.

General Predictions

We predict that women at similar life stages will be competing over comparable resources because such women face similar trade-offs, and share analogous dependency loads and relationship statuses. Thus, smaller age differences between women should predict greater intensity of resource competition, resulting in an overall greater number of within-pair quarrels, and be represented by a higher probability of engaging in any within-pair resource quarrel.

Previous work indicates that kinship and proximity between residences affect friendship, levels of competitiveness, and cooperative coalition formation. Women are often inclined to take resources from close kin and helpers, and they often derogate their female kin on varying measures [Rucas, Gurven, Kaplan and Winking, 2010; Rucas et al., 2006]. Tsimane women also prefer, when possible, to live near helpful female kin. Therefore, we expect that the probability of quarreling over resources increases with kinship (proxied by the coefficient of genetic relatedness) and closer residential proximity. These two variables together impact the frequency of daily interaction, and all else equal, quarrels should rise in proportion to interaction frequency. Because of this, kinship and distance between houses will be used as control variables so that resource competition can be measured independently of these other influences.

To our knowledge, no work among women in traditional populations has yet explored the relative reproductive importance of various resource types as measured by their potential to cause conflict among women of different ages. However, we recognize that several untested assumptions may be drawn from this perspective, since many other detailed factors affect the degree of competition, other than reproductive fitness, such as cultural values or effectiveness of competition. Still this work seeks to introduce an evolutionary lens to examine resource conflict among women and explore how resource focus may fluctuate in order to better optimize lifetime fertility.

METHODS

The Tsimane

The Tsimane are an indigenous group of roughly 10,000 forager-horticulturalists inhabiting the tropical areas of lowland Bolivia along the Maniqui River [Winking, Kaplan, Gurven and Rucas, 2007b]. They live in approximately 90 semi-sedentary villages ranging in size from 30–550 persons. They engage in a combination of horticulture, hunting, fishing, and gathering subsistence strategies [Godoy et al., 2004]. Horticultural products include plantains, rice, sweet manioc, and corn. Women spend much of their day engaged in childcare, cooking, food preparation, and garden labor. Extended family units typically live in household clusters, with women and girls of varying ages represented at each residential unit, which typically includes a mixture of consanguineous and affinal kinswomen. Whereas some females have many close-blood kin present, others live in clusters as in-laws with no blood relatives residing in close proximity.

Men typically supply the bulk of meat and fish consumed within the household; however, women may provide some of these resources themselves when their husbands are absent engaging in wage-labor outside of the community. High-producing women are typically married to high-producing males [Gurven et al., 2009]. Good mothering skills are highly valued, and this includes attending to children's needs, keeping a clean house, and providing supplementary foods such as fish or other staples. Women socialize during work activities, childcare duties, and in social gatherings such as chicha drinking parties and household visits. They share food, friendship, household duties, garden plots, and sometimes spouses through sororal polygyny. Women tend to form coalitions of cooperative (and sometimes competitive) partners among kin and friends within their villages and engage in varying amounts of intragroup social aggression. Gossip is common and women tend to generally feel that it can have a negative effect on one's health and happiness.

Tsimane women tend to have their first child by about age nineteen and give birth to approximately nine children over their lifetimes. Marriages, signified by a mating pair sharing the same house, are fairly stable, monogamous unions, although polygynous marriages are not uncommon (<10%). [Winking et al., 2007a]. Postmarital residence rules are often matrilocal in the first years of marriage, after which partners routinely choose residence opportunistically to maximize social or food resources, sometimes moving back and forth over the years as conditions and opportunities shift. Parents and other kin often play a role in the acquisition of marital

partners, and are typically asked for courting permission by interested males. Cross-cousins are preferred marriage partners and can be close or distantly related.

The Interview

Participants were 121 females, ages 8–70, living in four communities situated along the Maniqui River. The four communities chosen for the study varied in the extent of their acculturation, proximity, and contact with national Bolivian society and local markets. Twenty-nine women from one of the more acculturated, 70 from medium acculturated villages, and 22 women from a village of very low acculturation (121 total females) were asked to participate in a semi-structured interview regarding the state of current and very recent conflicts or disagreements (quarrels) they were having with other females in their community, either social or physical, during any time within the last two months. It should be noted that *no* physical fights were reported, thus all data to be discussed only concerns instances of social aggression such as rumors, gossip, silent treatment, verbal arguments, or angry disputes. Within the scope of this research, quarrels are therefore defined as disagreement or disputes between people.

We coded the contested resource identified to cause the disagreement, participants involved, duration of conflict, and whether or not the conflict had been resolved (most had not). Interviewees were queried about potential conflicts with all other women in the community one-by-one using Polaroid photos of other women as cues to describe current or recent events concerning those women within the last two months in open-ended discussion. It was not required that both parties, during separate interviews, describe or confirm the same quarrel in order to be considered. Evidence of a quarrel having occurred was deemed valid for coding if at least one woman reported and described the disagreement, and quarrels were not double coded when both women reported the same incidence, which was very frequent, indicating that disagreements are often mutually acknowledged. Participants were allowed to have open interpretation about what constituted a quarrel worth mentioning and researchers did not prompt women with examples of hypothetical or real quarrels in order that the data not result in biases toward particular types of disagreements. While there exists the possibility that some women may not have felt comfortable discussing conflicts openly with an outsider, measures were taken to help insure comfort level and interview reliability. Emphasis was placed on informed consent, privacy of interviews, and the voluntary nature of participation.

Additionally, it was explained that most data would be aggregate and when not, personal identities would be obscured. Interviews were conducted in a private location by SLR and a bilingual Tsimane woman. SLR had spent over six months in two of the three villages, and one month in the third, and had developed trusting relationships with many of the interviewees.

Resource Categorization

The relative influence of different resources was evaluated based on quarrel frequency. Quarrels generally fell into eight common themes driven by familiar trends in the topics of women's complaints: (1) reciprocal social contracts; (2) non-meat food thefts; (3) adultery; (4) competition for non-attached males; (5) material goods thefts; (6) friendships; (7) meat thefts, and (8) children's quarrels. Six of the eight categories could be further condensed into three broader categories (and are displayed as hatched bars in Fig. 1); *all social* (contracts + friendships), *all men* (adultery + unattached men), and *all food theft* (meat + non-meat); note these cross-hatched bars exclude material goods and children's quarrels. No quarrels were cross-coded.

The "reciprocal social contract" category comprised all quarrels in which a woman was accused of cheating, defecting, or refusing to return her side of a tacit reciprocal exchange arrangement with another woman where the currency of exchange involved food, goods, helping with household chores, and other services, or social grooming (such as visitations and conversations). The "friendship" category included conflicts resulting from one's joining a friend's quarrel with a third party. For example, one woman decided to join her friend against another person who was accused of stealing her friend's pig, even though the pig was not her own. Quarrels concerning food theft were coded separately for meat (including fish) and non-meat (such as rice, plantains, or manioc) to explore differences between the two categories. Non-meat nearly always involved accusations of theft of staples from family garden plots when no one was around. Quarrels over unattached males resulted from competition to gain the attentions of a potential husband. "Adultery" quarrels were the result of married women who felt that another woman was attempting to gain attention, services, or investment from her husband. "Material goods" resource quarrels resulted from theft of a wide variety of items such as spoons, knives, clothes, etc. "Children's" quarrels occurred when mothers conflicted as an extension of their respective offspring's arguments. It is important to note that resource labels were largely driven by women's reports, who are quick to identify the source

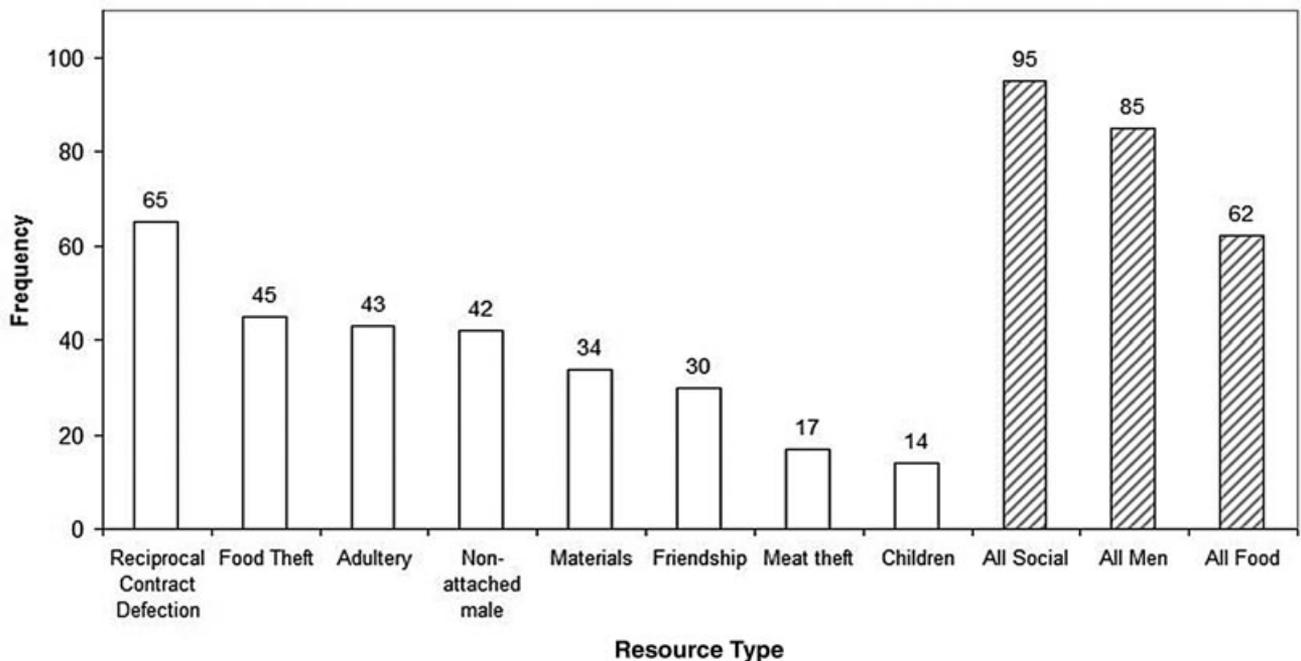


Fig. 1. Number of quarrels by resource type. Cross-hatched bars: all social = reciprocal contract defections + friendships; all men = adultery + nonattached males; all food = food theft (nonmeat) + meat thefts.

outright by making such statements as; “she stole rice from my garden,” “. . . our daughters are fighting . . .,” “. . . my friend is mad at her so I am too,” “she stopped sharing food with me,” “she won’t visit me anymore,” etc.

RESULTS

The frequencies of the different types of quarrels ($N = 334$) are shown in Figure 1. In descending order, reciprocal social contracts were the most common (19.5%), followed by non-meat food thefts (13.5%), adultery (12.9%), competition for non-attached males (12.6%), material goods thefts (10.2%), friendships (9.0%), meat thefts (5.1%), and extensions of children’s quarrels (4.2%). A significant number, 44 quarrels (13.2%) could not be assigned to any resource category. These involved cases in which women identified a persistent aggressive state with a longstanding “enemy,” but were unable to remember the original causes of the disagreement or subsequent deterioration of the relationship. Such fights were typically between older women who had more or less permanent social aversion to each other. It cannot be discounted though that at least some of these women perhaps did not want to provide details about the origin of their disagreement. The other remaining unassigned cases involved very young girls who were unable to articu-

late exactly why they were upset with each other and what exactly had instigated the disruption.

The frequency data displayed in Figure 1 indicate that of the eight resource categories, *reciprocal social contracts* account for the greatest number of conflicts. Even when the eight categories are collapsed into the three cross-hatched bars (all social, all males, and all food), the greatest number of conflicts still revolve around the *social* resources of friendship loyalties and social contract infringements. Such arguments are often more about the fidelity of the sharing relationship than about the individual disputed items themselves.

Figure 2 provides a further breakdown of the *reciprocal social contract* category ($N = 65$). Of these, quarrels over food (including both meat and non-meat) account for 38% of the total, with meat-related quarrels contributing the majority, two-thirds. Comparatively, as illustrated in Figure 1, meat *theft* quarrels, where there existed no social contract of expected exchange, were only half as frequent as non-meat theft quarrels. Socializing exclusions were also very common (28%), which are characterized by situations such as, for example, when one woman invites a friend to a beer drinking party, but the friend does not later reciprocate with an invitation. Defections on household duty sharing accounted for 18% of the quarrels, and finally, disputes over money-goods exchanges, such as when one woman receives some good and fails to provide a promised payment, accounted for 15%.

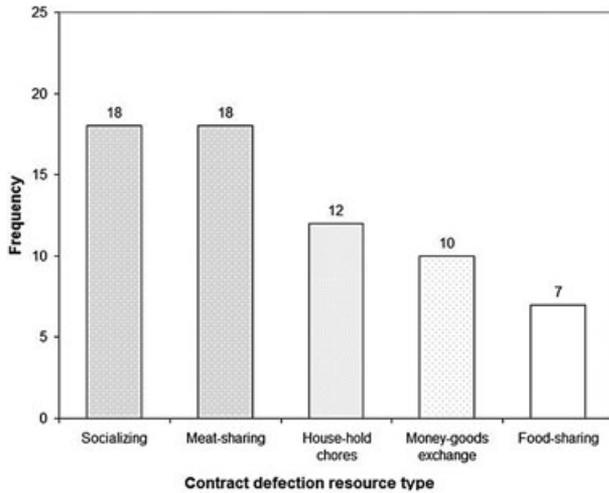


Fig. 2. Frequency of reciprocal contract-defections by type.

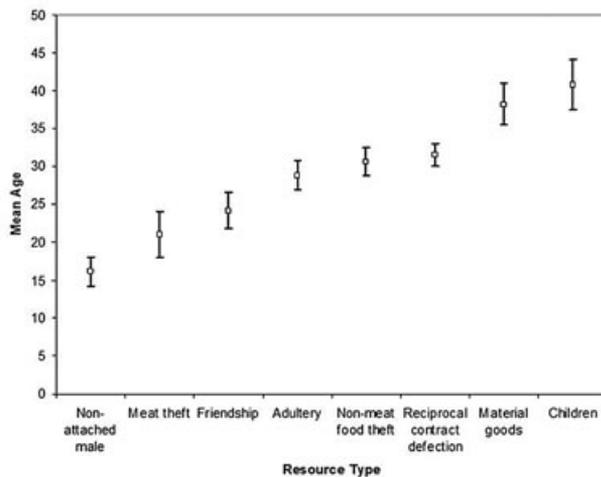


Fig. 3. Mean age by quarrel category (standard error bars).

Age Effects

Figure 3 illustrates the average age of participants for each type of quarrel. Average ages vary from 16–40, illustrating the changing foci of competition across the life-course. Discriminant analysis indicates a significant effect of conflict type on average ages ($P < .001$ and $F = 10.02$, $N = 290$). Figures 4 and 5 show the average number of quarrels per person across the life-course for each decade of age, whereby Figure 4 collapses the groups into three major categories (Male, Social and Food), and Figure 5 illustrates the same data expanded in to finer categories. These data indicate that conflicts over men occur relatively more frequently at younger ages, and those over social resources peak in the thirties, while conflicts over food resources increase only very slightly with age. A significant amount of variation in conflict

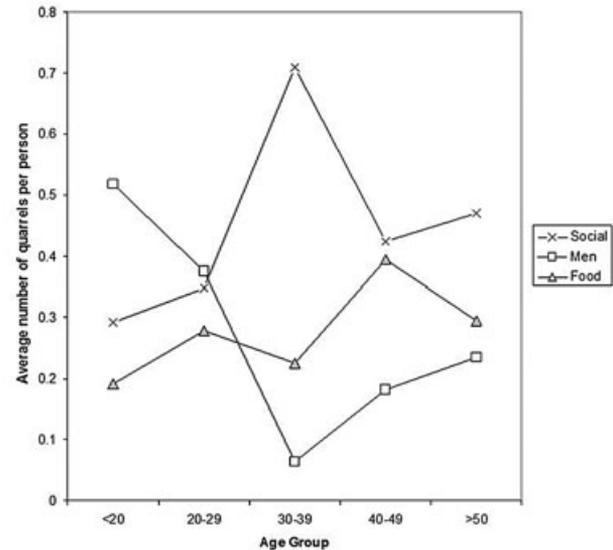


Fig. 4. Average number of resource quarrels per person across the life-course.

over resources may be due to age and its corollary increases in dependent young. Further contextual and qualitative description is provided in a section below illustrating what is perhaps a common life history trajectory for Tsimane women with respect to resource competition at different ages.

Figure 6 illustrates the age difference averages for each resource and provides average absolute age difference between women who are vs. those who are not quarreling over different resources. Multiple linear regression indicates that women closer in age are statistically significantly more likely to be quarreling about men, food, and friends ($P < .01$ for all three), but not for children, materials, or social contract defections. Women quarreling over unattached males were the closest in age, on average being only approximately 1.6 years apart. There was very little variation in the absolute age difference of women *not* quarreling over any of the resource types. Indeed, it appears that women not quarreling over the different resource categories exhibited the exact same age difference, but this is not the case, it is simply that the observable variation is negligible.

Using multiple linear regression, the number of concurrent quarrels reported between pairs of women was modeled as a function of their absolute age difference after controlling for other potential predictors of quarreling, such as the coefficient of genetic relatedness between women and the geographical distance between houses. A greater absolute age difference between women predicts fewer concurrent quarrels ($P < .001$) (Table I). The mean age differences for

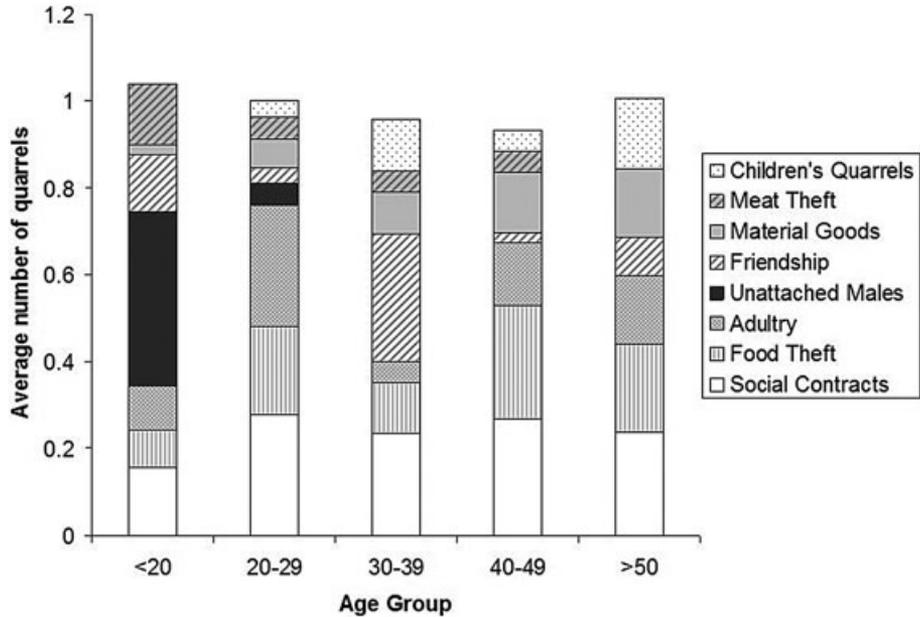


Fig. 5. Average number of resource quarrels per person within each age group for each type of resource.

pairs of women engaged in varying numbers of concurrent quarrels, with the maximum reported being three between any one dyad, were calculated. Pairs of women experiencing three quarrels were on average 6.92 years apart; women with two quarrels were on average 8.13 years apart; women with one quarrel were on average 9.69 years apart, and the average age difference for those reporting no quarrels was approximately 15.02 years. The differences were con-

siderable when comparing intense competitors with noncompetitors, whereby women not quarreling were more than twice the age difference of women experiencing three concurrent quarrels.

DISCUSSION

Data on social aggression, social networking, and resource competition among women in small-scale

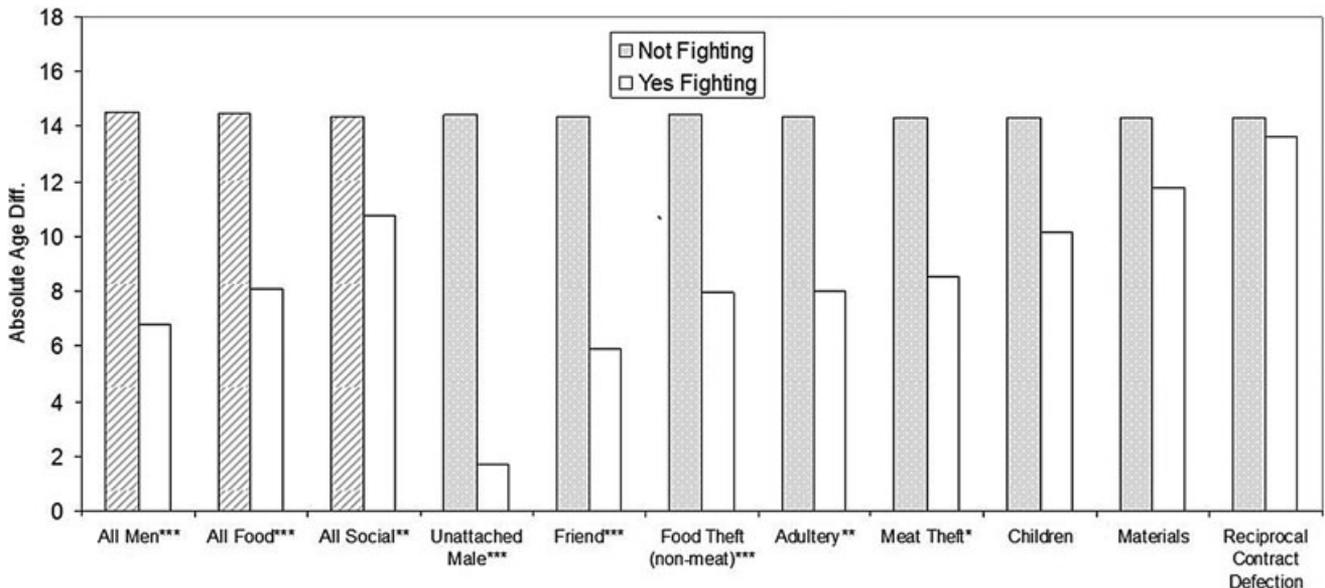


Fig. 6. Absolute age differences between pairs of women quarreling and not quarreling over different resource types. *sig. < .1; **sig. < .05; ***sig. < .01. Controls: coefficient of relatedness and distance between residences.

TABLE I. Multiple Regression Analysis of Absolute Age Difference Effects on the Number of Concurrent Quarrels Reported Between Pairs of Women Controlling for Kinship and the Distance Between Their Residence Locations

Predictor variables	Unstandard coefficient		Standard Coefficient		Sig.
	Beta	Standard error	Beta	<i>T</i>	
(Constant)	0.321	0.037		8.688	0.000
Absolute age difference	-0.003	0.001	-0.116	-5.644	0.000
Coefficient of relatedness	0.136	0.062	0.054	2.203	0.028
Distance between houses	-0.058	0.010	-0.143	-5.870	0.000

traditional societies are very limited. Because networking and social aggression are costly, it should be expected that women are more willing to pay the cost when the potential gains are high. It was also predicted that women compete over different resources at different times throughout their lives in accordance with fitness-maximizing goals, making women of similar ages more likely to be resource and social aggression competitors. Our data generally support these ideas. We would caution, however, that other measures of intensity of conflict, beyond frequency data, were insufficient in our dataset for use in analysis. That being said, it is important to note that some quarrels may have far greater intensity than others and reporting of a disagreement may reflect some level of salience to the participant. Indeed, while women were asked to report recent or current disagreements, it was found that women sometimes reported long-standing quarrels with another woman that had lasted for several years, to the point that their relationship had evolved into a general state of constant discord characterized by continuous dissatisfactions with one another. Beyond quarrel frequency, we did not collect data to provide a suitable proximate measure of intensity, other than the duration of conflict, which was not usable in this circumstance since many quarrels were still occurring. But we do believe that issues such as the duration of the conflict or perhaps the exact nature of the aggressive medium might be important indicators of relative resource importance and future studies should attempt to parcel such factors.

Based on the fact that social conflict is costly, it was assumed that women would actively quarrel more frequently over those resources that have a greater impact on reproductive success. Our results indicate that food, men, and social resources are the most important fitness-related factors that women discern are worth the cost of female-female competition via social aggression, and are most effectively dealt with via quarreling. Indeed, these three broad categories encompassed 87% of all quarrels. It is also worth noting that *all* recorded quarrels were social in nature; no physical fights were reported. When women were

asked about occurrences of physical fighting, the general consensus was that such events do happen, but only rarely and more typically only among younger girls.

Social resources (34% of quarrels), made up of social exchange networks, friendships, and social contracts, are clearly vital to women and appear frequently in events of social aggression. Many quarrels in this category involved failed expectations concerning food or money exchanges; however, 48 of them (51%) were specific to friendship loyalties, situations in which women supported the social conflicts of others, and breakdowns in social contracts about visitation and conversation exchange. Given the heavy research focus on mate competition in evolutionary psychology, and on feeding competition in primatology, it was illuminating and instructive to find that social resources in this population are at least as important as both food and men. Fighting over a single piece of stolen fruit may not be as profitable as quarreling over a friend or social contract fidelity because the latter two may provide long-term benefits such as insurance against future food shortages, coalitional support, or household task assistance. Also, it could free one from free-loader or “fair weather” friends and advertise to others the unlikelihood that anyone could take advantage of you.

Since additional caretakers should improve offspring quality, we expected significant conflict over allocaretaking to occur, but, there were *no* reported quarrels specifically related to allocaretaking either in circumstances of shared babysitting duties or of women reporting that others commonly saddled them with unattended offspring. However, in one interview, a married woman admitted to persuading a younger sister who was vying to become a second wife to her husband to help babysit her children. This did not actually cause conflict, however, because the younger sister was eagerly taking on the duties in an attempt to persuade her sister concerning the courtship attentions of the husband; this suggests that there is bargaining going on with respect to allocaretaking, but not so much fighting or social aggression. This

example should not be taken to mean that co-wives do not quarrel, because indeed they do, and such quarrels may be frequent and intense; however, it is simply that the nature of co-wife quarreling very rarely involves allocaretaking.

As expected, there was a high frequency of quarrels regarding males, likely due to the fact that Tsimane men provide substantial caloric contribution to the diet, and other forms of support and protection [Winking, 2006]. A good mate can mean the difference between a lifetime of support vs. a lifetime of fending for one's self and one's children. Some women competed in order to get mates while others competed in order to retain them. We found that competition to obtain mates would be concentrated at younger ages, around 16 years. This is likely much younger than the average age of mate competition in modern cultures because the latter exhibit later ages of marriage and first birth resulting in extended years of stressful mate (and status) competition for quality marriage partners (for example, according to the Centers for Disease Control, the age of first marriage and first birth in the US is 25.6 and 25 respectively, and medians in some other developed nations are even higher). Our data support the suggestion that girls in a natural fertility population engage in short term, but highly concentrated competition for life-mate partners. So intense is this competition that groups of Tsimane girls were often observed to be competing over several boys simultaneously. Thus, it seems possible that high quality males may sometimes be able to choose among several spousal options; whereas, others may have difficulty attracting girls' attentions as some boys were rarely or never mentioned in the discourse of conflicts.

The Tsimane divorce rate is lower than that observed in other forager-farmer groups such as the Ache, particularly once a family has a child or two [Hill and Hurtado, 1996; Winking et al., 2007a]. Marriages more often end due to the death of a spouse as opposed to electing for alternative mating opportunities. The average age of women making adultery accusations was 29, with several accusers over 40 and a majority in the early-mid twenties (Fig. 3). The average age of the accused woman was 18, and she was nearly always unmarried. Younger, unattached girls are likely feared and distrusted more because they are highly desired by men because they exhibit greater reproductive value due to their age, and they lack the deterring presence of an existing spouse.

Previous data indicate a negative association between extramarital affairs and number of dependent offspring; thus, we expected to find that women suspecting husband infidelity in this dataset to be in their

early twenties; yet, the average reported age was 29 with several accusers over 40. Contrarily, men of our previous study were more likely to have affairs when they were younger with fewer children to support [Winking et al., 2007a]. There are a few explanations for the difference in these male vs. female reported findings. First, Winking's data only included two of the four villages used in this study, so perhaps cultural effects account for the difference. Second, these data, unlike the male reports are unsolicited accusations of affairs, as opposed to Winking et al., infidelity data, which was direct male incident report. By contrast, the women's data included only a few cases offered during interviews by the offending women; whereas, the majority of the cases were simply described as unconfirmed suspicions by women. Finally, there seems to be an age gap in charges whereby women in their twenties experience a high degree of conflict in this area, which drops strongly in the thirties and then increases slightly again in the forties. Perhaps, too, women become more vocal and competitive about suspicions of adultery as they become much older and perhaps more independent and socially powerful where they were less so in their thirties (though this does not explain the high frequency in the twenties). Finally, some of the adultery charges in this data set were "ancient history" that had fueled a general adversarial status between the women, negatively characterizing their interactions for several years. An event that may have occurred several years in the past is still credited sometimes as being the reason for later social conflicts. Whatever be the case, wives are forceful in competing with younger girls over accusations of affairs, and may play a part in the common Tsimane belief that philandering fathers may cause child illness.

Nearly 30% of all quarrels involved food, whether through theft or failed expectations concerning reciprocity. While it may appear that conflict over meat is less important given its lower frequency in theft quarrels, non-meat food items show up far more frequently in the daily course of life, allowing for more opportunity for conflict. Additionally, staples are easier to steal, since agricultural fields are often left unattended. Nonetheless, even though meat materializes more rarely in daily life, it was still involved in 17 theft quarrels and 18 reciprocity defections underscoring its extreme importance to the diet and women. And, non-meat quarrels due to sharing defections were less frequent than those involving meat. This is perhaps due to the fact that staples, fruits, or other vegetables may be less frequently shared through social contracting, or it could be that they are more likely to be reciprocated than meat items. While

non-meat quarrels were far more likely to result from theft than failed food-sharing contracts, meat quarrels were nearly equally represented by both thefts and reciprocal contract defections. These findings are more consistent with food-sharing models involving reciprocity than those emphasizing tolerated scrounging or signaling, particularly for meat items. If tolerated scrounging were responsible for food distributions, frequent quarreling over failed food-sharing contracts would not be prevalent at so high a rate.

We expected that items that can improve the quality of offspring, such as material goods, to be under competition, but compared to men, food, and social resources (which also improve offspring quality), few quarrels involved material goods. Additionally, their probability of appearing in quarrels was strongly influenced by increasing age, likely reflecting the accumulation of material items over the lifespan. Also, while goods are often used within a household by all women, ownership tends to be attributed to the oldest matriarch. Plus, such thefts are more difficult to hide from others because, unlike food, which is quickly consumed, items such as clothes are repeatedly worn in front of others, and knives, spoons, and plates are continually used at communal mealtimes. Nearly all of the material goods quarrels involved these items, with clothing appearing the most frequently.

Women quarreling as an extension of their “children quarreling” occurred less frequently than all other types of quarrels ($N = 14$). These extended fights typically concerned the marital success of their older children and more rarely about access to food or other resources. For example, two women were quarreling with each other because they both wanted their respective daughters to be the wife of the same high-status male. With such a low frequency of quarrels regarding children, it might be concluded that Tsimane women do not substantially micromanage the social lives of their younger children, but this cannot be known without further cross-cultural comparative studies. These data indicate though that Tsimane mothers actively become involved when they feel it necessary, they do not seem to concern themselves in every minor quarrel. Also, the mean age of conflict over children’s quarrels was greater than all other categories, a direct reflection of the fact that nearly 80% of these quarrels concern the marital success of their children; thus, one must be of an age to have a marriageable aged child in order to have such a quarrel about their competitiveness in the mating market.

Several different analyses provide support for the hypothesis that resource competition is age-specific. Intensity of social aggression (frequency of quarrel-

ing) is strongly predicted by closeness in age, even when controlling for features such as relatedness and residential location. Women closer in age are more likely to be competing for similar resources (mates, friends, food, etc.) and are thus more likely to engage in social aggression via quarreling.

The following integrates qualitative information from our interviews to complement the quantitative data (i.e., Fig. 5, which details the average number of quarrels per person at each decade of life for each resource type) in order to better characterize the life of a typical Tsimane woman. Identities have been obscured with substituted character names.

Less than 20 age group. Compared to other women, this age group is not strongly characterized by food-sharing defections, but more so instead by food and meat *theft* accusations. While theft is still probably a minor way to get food, it may be that this age group is relying more upon theft as a food-getting strategy (beyond what is gifted to them by kin) over food sharing through reciprocal social contracts. By comparison, young girls are *overwhelmingly* concerned with getting mates and defending themselves from adultery accusations. In one example of this type of quarrel, Sofia explained to us that she was mad at another young girl, Dulce, who used to be a friend but is not any longer due to the fact that Dulce had started showing strong attentions to their mutual love interest, Domingo. Conflicts in this age group are also characterized by scenarios in which girls reported quarreling with a third party in support of a friend who was actively engaged in mate competition with the third party girl. In the mid-teens to early twenties, girls report strong levels of aggression from married women due to fears of adultery with their husbands. One girl in particular, Georgiana, was accused by no less than six married women of such a behavior, events that the girl denied. Still, this did not deter the accusations and Georgiana was continually plagued by the social aggression. Evidence also indicates that young girls are concerned with friendship making and loyalties. For example, Sylvania, explained that another girl, Juanita, had stolen her best friend Felicia away and supplanted her as Felicia’s seating companion during the occasional school lessons. Thus, girls of this age group appear to invest in acquiring two high payoff resources; a long-term mate and a social network of good loyal friends.

20s. Women in their twenties are usually married and have their first children. Men target extramarital relationships in this age range, and our conflict data supports that women in their 20’s make frequent accusations of adultery toward younger girls. In one prime example, Lolita, a 24-year old with two children and

a husband, informed us that she was upset with a 16-year-old girl of her community, Consuela, who flirted too much with her husband Jorge. Food thefts increase in the 20's probably because women need more food due to dependent offspring, but also because they begin to develop their own fields, which is the location of nearly all non-meat food thefts. In one example, Cynthia, a 28-year-old woman with three children accused Analuz, a 24-year-old woman with one child of sneaking into her field and stealing rice, which she proceeded to eat in secret with her kinswoman. Interestingly, *meat* thefts decline in the 20's and remain relatively low throughout the rest of the life-course until they ultimately disappear around age 50. However, meat-sharing conflicts begin to rise, reflecting that women develop sharing relationships that begin to take precedence over thieving activities at least for meat. Friendship loyalties have a relatively small influence on women in their twenties who seem to be more concerned with mate retention and struggling to acquire enough food to feed their newly growing families.

30s. The 30's are characterized by high investment by women in friendship loyalties and resource sharing between these friends. For example, Alejandra described quarreling with Gabriela, simply because Gabriela was the stated enemy of her best friend Maribel. The two women reported no other complaint aside from the state of their relationship with the third-party friend/enemy, Maribel. Another woman, Rosita, reported that she had invited Susana to a *chicha* (fermented manioc beverage) party at her house, but Susana subsequently later made *chicha* and did not invite Rosita back to drink. In another situation, Teresa said she had stopped talking to Ysabel, because the latter had not shared fish with her from the a group fishing event, even though Teresa had given her some *coati* meat the day before. It is during these ages that conflict over men seems to be at its lowest, partially reflecting that women have succeeded in finding a mate and their increasing dependency load combined with still present reproductive value improves the chances that their mate is diverting significant energy away from extramarital relationships and toward paternal investment. Thus, their competitive energy is instead taken up with creating and maintaining cooperative same-sex coalitions and improving social contract making skills and alliances. Extensions of their children's quarrels have begun to increase nearer the end of the decade and remain constant throughout their 40's before increasing significantly beyond their 50's. For example Vanessa, a 37-year-old woman reported arguing with Lola, a 68-year-old woman, because the elder woman's adult daughter

accused the younger woman's nearly-adult daughter of infidelity with her son-in-law.

40s. Adultery accusations (by wives of their husbands) which were very low in the 30's appear to rise slightly in the 40's, possibly as a result of the fact that women in their 40's exhibit rapidly diminishing reproductive value but still a relatively high dependency load of children of different ages (though we found in other interviews that women in their forties are sometimes given high attractiveness rankings as a result of their greater power and social status, Rucas et al. [2006]). Quarrels over informal social contracts are more numerous than those over friendship loyalties among women in this age group, as women are focused on maintaining equity within their specific cooperative relationships that they developed earlier in life. Women are less invested in outward displays of loyalty to friends and are more interested in social contract fidelities. Dalia, a 44-year-old woman, described a quarrel she was having with Antonia, because Dalia had given Antonia some fish when she was hungry one day, but Antonia had not given her any meat in return when her husband came home with deer a week later. Non-meat food theft accusations by women in their 40's also jump from the 30's and are likely a result of the cumulative investment husbands have been making with the increasing number of children in the size and variety of staple foods grown in their fields. The result of all of this labor is producing a surplus that might be attractive to others. Women's oldest children are getting mates and starting their own families, which are reflected in the slight increase in children's quarrels. Aside from some attempts to protect the mating future of their children, and keep husbands invested, they also find it necessary to protect material goods that have been skillfully acquired.

Greater than 50s. Paulina, a 52-year-old woman, reported to us that she was upset with her sister, Petrona (age 69), because their respective daughters wanted to marry the same boy and thus her sister had started rumors about Paulina's daughter's inability to cook and properly take care of children. Mating success of children becomes paramount as well as social strategizing to improve the social prospects of their children. The 50's also see a large jump in the number of quarrels over material goods. Modern consumer items such as spoons, mosquito nets, and pots are rare and more often claimed in ownership by older women (mothers) within households who have more power to control them. Thus, older women, beginning in their 40's and continuing throughout life, are more likely to report such conflicts and thefts. Social contract infringement and friendship quarrels are still

present but not greater than other resources quarrels, probably reflecting the fact that older women are relatively self-sufficient, powerful, and lack many dependent young. Adultery accusations, which increased in the 40's, begin to drop slightly, probably reflecting the decreasing mate value of their often even older spouse whose hunting productivity peaked in the previous decade and continues to decline.

In final conclusion, this study demonstrates the importance of social network resources to women and highlights the current lack of knowledge concerning women's social and resource competitive lives in small-scale societies. While no other such studies exist for comparison, we expect similar general results in other traditional societies where cooperation and food sharing are critical for survival and success. However, in wealthy modern societies, where food sharing is largely symbolic and cultural and where women have direct access to resources (through jobs as opposed to food-sharing, hunting husbands), we would expect quarrels to more frequently revolve around mate acquisition, social status, jobs, and resources directly. Questions for the future include: In what other ways might intensity of conflict be measured? How do women influence the size and composition of their social networks? To what extent does social capital and social aggression impact fitness and by what pathways, e.g., increased offspring survival, shorter birth intervals, etc? How does investment in social capital trade off against other kinds of resources, and is this different for men than women or across the life-course? Additional work among traditional populations is needed in order to better understand the costs, benefits, and trade-offs of women's social networks.

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