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A Review of Sex Differences in Sexual Jealousy, Including Self-Report Data, Psychophysiological Responses, Interpersonal Violence, and Morbid Jealousy

Christine R. Harris

Center for Brain & Cognition
University of California, San Diego

The specific innate modular theory of jealousy hypothesizes that natural selection shaped sexual jealousy as a mechanism to prevent cuckoldry, and emotional jealousy as a mechanism to prevent resource loss. Therefore, men should be primarily jealous over a mate's sexual infidelity and women over a mate's emotional infidelity. Five lines of evidence have been offered as support: self-report responses, psychophysiological data, domestic violence (including spousal abuse and homicide), and morbid jealousy cases. This article reviews each line of evidence and finds only one hypothetical measure consistent with the hypothesis. This, however, is contradicted by a variety of other measures (including reported reactions to real infidelity). A meta-analysis of jealousy-inspired homicides, taking into account base rates for murder, found no evidence that jealousy disproportionately motivates men to kill. The findings are discussed from a social-cognitive theoretical perspective.

Several evolutionary psychologists have proposed an intriguing theory about sex differences in jealousy over a mate's infidelity (Buss, 2000; Symons, 1979; Wilson & Daly, 1992). According to these theorists, jealousy in the two sexes is a fundamentally different phenomenon for reasons that can be understood only in light of the process of natural selection. Men are hypothesized to be innately predisposed to be upset over a mate's sexual infidelity, and women over a mate's emotional infidelity. This difference, it is argued, reflects different selective pressures that are assumed to have operated on the two sexes in the ancestral environment. For our male ancestors, the major threat to Darwinian fitness was cuckoldry. If a mate's infidelity resulted in pregnancy, a man lost a chance to reproduce and also risked spending resources on another man's progeny. Male sexual jealousy, according to this view, reflects the operation of a psychological module engineered to motivate behaviors that, in the ancestral environment, would have functioned to prevent cuckoldry. A woman, however, cannot be tricked into bringing up an offspring not her own. Hence, it is claimed, present-day women

should not be particularly concerned over a mate's sexual infidelity. As Daly and Wilson (1988) put it

A Darwinian perspective on sexual jealousy suggests the hypothesis that it will prove to be a sexually differentiated state in people ... because of the asymmetrical risk of cuckoldry. While women may be expected to be jealous of their mate's allocation of attention and resources, for example, they do not have the same rationale as men for being concerned with specifically sexual fidelity. (p. 182)

For a woman, infidelity posed a different risk to Darwinian fitness: the loss of a mate's resources for her and her offspring. A mate's emotional involvement with another is hypothesized to have been a good indicator of this threat. Therefore, it is argued, present-day women should be particularly upset over a mate's emotional infidelity. Men, not having faced this adaptive problem, should be less concerned about emotional infidelity. Thus both men and women have a jealousy module, but the two sexes have different triggers that activate that module. In sum, "since men and women have evolved different sexual strategies, they should get jealous, angry, and upset about different events" (Buss, 2000, p. 52).

This view of jealousy as a sexually dimorphic adaptation has great intellectual appeal, seemingly linking an important aspect of human emotion to the ultimate force shaping living organisms: namely, Darwinian evolution. Not surprisingly, therefore, the account is widely discussed in current editions of social psychology text-

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Requests for reprints should be sent to Christine R. Harris, Department of Psychology-0109, University of California San Diego, La Jolla, CA 92093-0109. E-mail: charris@psy.ucsd.edu

books and has received enormous attention in books and articles written for the general public. For example, R. Wright (1994), in his critically acclaimed volume *The Moral Animal*, cited the jealousy theory as a particularly well-worked-out and compelling example of evolutionary psychology. Similarly, in his influential book *How the Mind Works*, Pinker (1997) described sex differences in sexual jealousy as an established fact. This theory also serves as the foundation for Buss's (2000) recent popular press book on jealousy.

This article offers an alternative perspective on this body of work. The various diverse strands of evidence taken to support sex differences in jealousy are critically examined. It is argued that although the theory of jealousy proposed by researchers such as Daly and Wilson (1988) deserves admiration for its boldness, the evidence supporting this theory is far less conclusive than is often maintained. It is suggested that, on balance, the data for this theory range from inconclusive to downright disconfirmatory. The article concludes with an examination of possible ultimate and proximate mechanisms that would not require that there be a marked sex difference in jealousy, and with a discussion of the social-cognitive theory of jealousy.

Before turning to the evidence, a comment on terminology is necessary. The theory under discussion here is often termed the *evolutionary theory of jealousy*. A number of contemporary evolutionary psychologists view the human mind as made up of many distinct modules, each designed by natural selection to solve a specific recurring adaptive problem in our ancestral past. Although this might be so, the theory of evolution does not entail such a conclusion. Natural selection might instead have shaped much more domain-general mechanisms, even mechanisms as general as those proposed by learning theorists. Alternatively, evolution may have shaped mechanisms intermediate in specificity or may have shaped less sexually dimorphic mechanisms (Eagly & Wood, 1999; Harris, 2000; Miller & Fishkin, 1997). Therefore, the account of jealousy under discussion is referred to as the *jealousy as a specific innate module* (JSIM) hypothesis. This term helps make clear that this debate is not about evolution but rather about the specificity of the mechanisms involved in jealousy.

Five types of evidence have been adduced in support of the JSIM model of sex differences in jealousy: self-report data, psychophysiological data, murder statistics, spousal abuse and pathological jealousy. This article critically reviews each in turn.

Self-Report Data Primarily From College-Age Populations

A few early studies hinted at a sex difference in jealousy over infidelity. In interviews with 15 couples,

Francis (1977) suggested sexual infidelity is more often associated with jealousy for men than for women. Unfortunately, no statistics were given, and the sample size was small. In a Dutch sample of people whose mates had engaged in infidelity, Buunk (1984) found that for men, but not for women, scores on a jealousy index were correlated with the attribution that the affair was motivated partly by a need for sexual variety. Teismann and Mosher (1978) found that when asked to role-play a jealous situation, more men than women picked a sexual topic. However, this finding would be consistent with men having a greater tendency to focus on or discuss sexual matters in general.

The largest set of evidence taken to support the JSIM hypothesis comes from self-report studies that employ forced-choice questions originally designed by Buss, Larsen, Westen, and Semmelroth (1992). The majority of these studies have recruited college students as participants. Men and women are asked to imagine a committed sexual relationship that they have had, presently have, or would like to have. Participants are then asked to choose which they would find more upsetting: a mate falling in love with someone else or a mate having sexual intercourse with someone else. A significant sex difference in which form of infidelity is chosen as most upsetting has been found in most studies employing this forced-choice method, with more men than women predicting that sexual infidelity would be worse (see Table 1).

Meta-Analysis of Forced-Choice Responses

Given the widespread use of the forced-choice method in the literature and the variations emerging from different studies, I conducted a meta-analysis on this measure to synthesize these results. The effect size for sex in responses to the forced-choice question was quantified using log-odds ratio (LOR), as recommended by most authors (Fleiss, 1994; Haddock, Rindskopf, & Shadish, 1998). With this measure, the odds of picking sex for male participants are divided by the odds of picking sex for female participants, and the natural log of this quantity is used to represent effect size (see last column in Table 1). If there were no sex difference, one would expect a LOR of zero. The results of the 32 independent samples were combined using a random-effects model as described by Rosenberg, Adams, and Gurevitch (1997), yielding an estimated overall effect size of 1.00 (95% confidence interval $0.81 < \text{LOR} < 1.19$), which is typically described as a moderate effect size (Rosenthal, 1996).¹

¹Buss et al. (1992) originally designed two versions of the forced-choice question. When a study included both questions, results from Question 1 were used in the meta-analyses reported here. None of the findings are changed by the substitution of results from Question 2 (although some analyses produced slightly smaller effects).

Table 1. Studies Used in the Meta-Analysis of the Forced-Choice Hypothetical Infidelity Data, Including Sample Characteristics and Effect Size for the Sex Difference in Each Sample

Study	Country	Age Group	Sexual Orientation	Sample Size		Question ^a	Percentage Choosing Sex as Worse		Sex Difference	Effect Size ^b
				Men	Women		Men	Women		
Buss et al. (1992)	U.S.	S	Heterosexual	133	176	1	49	19	30	.139
Buss et al. (1999)	U.S.	S	Heterosexual	115	117	1	76	32	44	.173
				115	116	2	43	11	32	.162
Buss et al. (1999)	Korea	S	Heterosexual	98	89	1	59	18	41	.171
				97	86	2	53	22	31	.128
Buss et al. (1999)	Japan	S	Heterosexual	213	100	1	38	13	25	.119
				211	99	2	33	14	19	.94
Buunk et al. (1996)	U.S.	S	Heterosexual	115	109	1	60	17	43	.178
				115	109	2	44	12	32	.158
Buunk et al. (1996)	Germany	O	Heterosexual	100	100	1	27	15	12	.72
				100	100	2	30	8	22	.42
Buunk et al. (1996)	Holland	S	Heterosexual	102	105	1	51	30	21	.85
				102	105	2	24	14	10	.60
DeSteno & Salovey (1996)	U.S.	S	Heterosexual	53	61	1	51	25	26	.112
DeSteno & Salovey (1996)	U.S.	O	Heterosexual	73	68	1	58	38	20	.77
DeSteno et al. (2002)	U.S.	S	Heterosexual	50	61	1	54	34	20	.79
DeSteno (2001)	Internet	O	Heterosexual	5726	17,009	1	63	45	18	.71
Dijkstra, et al. (2001)	Holland	O	Gay or Lesbian	138	99	1	32	51	19	-.77
				138	99	2	23	26	3	-.17
Gaulin et al. (1997)	U.S.	S	Heterosexual	84	116	1*	42	26	16	.72
Geary et al. (2001)	U.S.	S	Heterosexual	133	159	1	73	37	36	1.43
Geary et al. (1995)	U.S.	S	Heterosexual	141	244	1	53	23	30	1.37
Geary et al. (1995)	China	S	Heterosexual	54	41	1	20	5	15	1.30
Geary et al. (1995)	U.S.	S	Heterosexual	89	184	1*	54	19	35	1.64
Geary et al. (1995)	China	S	Heterosexual	62	75	1*	23	9	14	1.01
Goldenberg et al. (in press)	U.S.	S	Heterosexual	22	29	1	55	34	21	.80
				22	29	2	41	7	34	1.97
Goldenberg et al. (in press)	U.S.	S	Heterosexual	24	27	1	46	22	24	1.04
				25	28	2	24	14	10	.62
Harris & Christenfeld (1996a)	U.S.	S	Heterosexual	55	81	2	47	22	25	1.14
Harris (2002)	U.S.	O	Heterosexual	47	47	2	26	11	15	.99
Harris (2002)	U.S.	O	Gay or Lesbian	49	44	2	12	5	7	.97
Harris (2003)	U.S.	S	Heterosexual	136	217	1	61	24	37	1.59
				138	217	2	56	18	38	1.74
Hupka & Bank (1996)	U.S.	S	Heterosexual	84	162	1*	37	27	10	.46
Hupka & Bank (1996)	U.S.	S	Heterosexual	163	336	1	48	26	22	1.01
Sheets & Wolfe (2001)	U.S.	S	Heterosexual	42	73	1	55	30	25	1.02
				42	73	2	29	11	18	1.22
Sheets & Wolfe (2001)	U.S.	O	Gay or Lesbian	55	27	1	24	22	2	.08
				55	27	2	5	4	1	.37
Voracek (2001)	Austria	O	Heterosexual	158	177	U	33	25	8	.36
Voracek et al. (2001)	Austria	S	Heterosexual	134	105	1	26	12	14	.85
				134	105	2	18	7	11	.99
Wiederman & Allgeier (1993)	U.S.	S	Heterosexual	103	120	3	64	41	23	.90
Wiederman & Kendall (1999)	Sweden	S	Heterosexual	173	203	3	62	37	25	.99

Note: S = college-age samples; O = samples that include participants older than 25 years of age; U = Unknown.

^aDifferent versions of the forced-choice infidelity question were used in different studies: 1 = imagining your partner enjoying passionate sexual intercourse vs. imagining your partner forming a deep emotional attachment with that other person. (1* means slight wording change from original version); 2 = imagining your partner trying different sexual positions vs. imagining your partner falling in love with that other person; 3 = other similar forced-choice scenario created for that particular study.

^bEffect Size expressed as log-odds ratio.

The exclusion of samples that were made up of individuals with a gay and lesbian orientation raised this value very slightly to 1.09 (95% confidence interval 0.92 < LOR < 1.27).

Next, hierarchical meta-analyses were conducted to examine whether the LOR of the effect of sex was modulated by three study variables. The first study variable was sexual orientation, which compared the sex effect in the three gay and lesbian populations to the other populations.² This revealed a significant effect of orientation, $Q(1)=15.3, p<.0001$, reflecting a stronger sex effect for heterosexual participants (1.09) than for gay and lesbian participants (-0.26). The three gay and lesbian populations were excluded from the remaining analyses. The second analysis examined age, categorized as samples that primarily included college-age students (sample with a mean age less than 26) versus samples that included older individuals. There was a significant effect of age with a stronger sex effect for college students (mean LOR = 1.20) as compared to older samples (mean LOR = 0.67), $Q(1)=12.3, p<.001$. Ideally, we would have liked to test the effect of country on the forced-choice responses in a meta-analysis. Unfortunately, other than the United States, most countries only had one sample. An analysis using the less optimal grouping by region (United States vs. Asia vs. Europe), did not reveal a significant modulation of region on the sex effect, $Q(2)=3.9, p=.14$, although the relative paucity of non-U.S. samples leaves that issue open. In sum, across samples there does appear to be a sex difference when the forced-choice hypothetical method is used with heterosexual samples. This effect, however, is greatly reduced in samples that are older than the typical college age. These results are further interpreted later in this article.

Self-Report Data That are Inconsistent With JSIM

Some aspects of the forced-choice data are consistent with JSIM. However, there are several findings (or lack thereof) that raise serious doubts about the validity of the forced-choice self-report items to assess actual jealousy. In order for the self-report data to offer support for JSIM, at least two conditions must be met. First, there should be convincing evidence that these measures do indeed measure jealousy. Second, the evidence should favor the view that the differences arise from innate sexually dimorphic specific mechanisms (e.g., rather than noninnate mechanisms or more general innate sex differences). One of the tests of whether a measure is valid is to find converging evidence across

many studies and multiple operationalizations. As we shall see, attempts to find converging evidence for the validity of the self-report forced-choice measures have not supported the JSIM model or the use of the forced-choice measure.

First, data are steadily accumulating that suggest that the sex differences predicted by the JSIM model are rarely found when measures other than the forced-choice items are used to assess jealousy over hypothetical infidelity. DeSteno and Salovey (1996) found no evidence of a sex-by-type-of-infidelity interaction when participants used continuous rating scales to estimate their upset over the two forms of infidelity. In another study, the two sexes did not differ in their ratings of the acceptability of different types of infidelity—for example, sex without emotional betrayal and vice versa (Sheppard, Nelson, & Andreoli-Mathie, 1995). Sheets and Wolfe (2001) had participant's pick which of the two forms of infidelity would be worse, but then also asked them to rate how much worse. Analysis of this later question revealed that on average both men and women rated emotional infidelity as more distressing than sexual infidelity (although women did so to a greater degree). DeSteno, Bartlett, Braverman, and Salovey (2002) found no sex differences on a continuous measure. When participants from seven nations were asked how jealous they would feel over a mate having "satisfying sexual relations with someone else," men did not have higher ratings than women (Buunk & Hupka, 1987). These data are hard to explain if men and women have sexually dimorphic jealousy triggers. One might suppose that these effects simply reflect a ceiling effect, with participants reporting maximum distress in response to both forms of infidelity. However, this is not the case.

Contrary to the JSIM view, several studies have reported results that show both sexes are more bothered by sexual infidelity. For example, Harris (2002b) found that women as well as men estimated that their upset over a mate's one-night sexual fling during vacation would be greater than their upset over a comparable emotional betrayal. Based on the JSIM perspective, this is the very type of situation that men, but not women, should find particularly upsetting because it poses grave Darwinian risk to men (potential cuckoldry) but scarcely any Darwinian risk to women. In another study that used similar scenarios, men and women also had greater mean ratings of upset over sexual infidelity as compared to emotional infidelity, although statistics for this comparison were not provided (Wiederman & Allgeier, 1993). DeSteno et al. (2002) similarly found that both sexes reported greater distress to sexual infidelity. Shackelford, LeBlanc, and Drass (2000) reported that although men and women did not differ in the amount of jealousy they anticipated having over a mate's sexual infidelity, women did report greater anger and hurt than

²Some of the studies specifically stated that gay and lesbian participants were excluded. However, many studies do not mention sexual orientation; for this analysis, we assumed that these samples were made up primarily of heterosexual individuals.

men.³ Another study found that compared to men, women anticipated reacting more violently to a mate's sexual infidelity (Paul & Galloway, 1994). One exception to these findings comes from work by Geary, Rumsey, Bow-Thomas, and Hoard (1995). Chinese men had higher jealousy intensity ratings over sexual jealousy scenarios than Chinese women. However, Chinese men's ratings were lower than those of American women, whose ratings were slightly higher than their male counterparts (although not significantly so). When Geary et al. (2001) used these same measures in another study of American college students, the infidelity type by sex interaction predicted by JSIM was not found. Instead, women reported greater hurt and anger over sexual infidelity than did men.⁴

Second, even the forced-choice hypothetical results do not unequivocally support JSIM. Although sex differences are found in the studies conducted in countries other than the United States, the majority of men in these studies do not choose sexual infidelity as more upsetting than emotional infidelity. Instead, their response patterns are often very similar to those of American women. For example, an inspection of Table 1 reveals that on one hypothetical forced-choice question, between 70% and 80% of Chinese, Austrian, Dutch, and German men reported that they would find emotional infidelity more upsetting than sexual infidelity. To assess the variability of responses among men in a more quantitative fashion, we compared the propensity of U.S. as compared to European men to pick sexual infidelity on the forced-choice question using the LOR scale. The effect size for this cultural effect on men was 0.90 (standard error [SE] = ± 0.16), which is quite similar in magnitude to the effect of sex in the overall meta-analysis reported previously. The comparison of U.S. to Chinese men yields an even larger effect size (LOR = 1.73, with $SE \pm 0.19$). In other words, European men differ from U.S. men in their responses to the questionnaire to about the same extent (and in the same direction) as U.S. women, and Chinese men differ even more. This finding seems quite problematic to the JSIM theory. Proponents of JSIM have argued that the differences in men's and women's responses to the forced-choice question reflect the operation of different sexually dimorphic innate jealousy mechanisms. The fact that one finds almost identical differences when European men are compared to U.S. men is puzzling if one assumes that forced-choice questions are tapping into innate sex-specific jealousy mechanisms. One would wish to have

strong supporting evidence before taking effect sizes of comparable magnitude to represent innate factors in one case and cultural factors in another.

A third problem is that the few studies that have compared the forced-choice responses to responses on other measures designed to examine sexual and emotional jealousy have failed to find convergent validity. Forced-choice responses were uncorrelated with responses to questions regarding a mate's actual infidelity in two studies (Harris, 2002, 2003) and to psychophysiological responses in a third study, discussed later in this article (Harris, 2000).

Finally, and perhaps most troubling, self-report studies that have examined people's reports of their actual experiences with infidelity, rather than responses to hypothetical infidelity, have not revealed evidence for sex differences. For example, male and female college students did not differ in their assessment of how damaging a mate's actual sexual infidelity was to their primary relationship (Hansen, 1987). Nor did coeds differ in their ratings of how much they focused on the sexual versus emotional aspects of a mate's affair (Harris, 2003). Moreover, a study with adults who were older than the typical college age found that, on average, both men and women, regardless of sexual orientation, focused more on the emotional rather than sexual aspects of a mate's actual infidelity (Harris, 2002).⁵ In a sample of sexually open marriages, wives, more than husbands, generally had greater negative perceptions of their spouses' affairs and were specifically more bothered by thinking about their mate having sexual intercourse with another person (Buunk, 1981).

In sum, although hypothetical forced-choice self-report formats suggest sex differences, alternative methods, including the most fundamental data, namely, reports of actual experiences with infidelity, reveal evidence that runs counter to JSIM. Moreover, even the forced-choice format fails to document any universal tendency for men to focus on sexual infidelity more than emotional infidelity. A variety of factors are likely to contribute to sex differences observed with the forced-choice hypothetical questions. In one intriguing recent study, DeSteno et al. (2002) examined the effect of cognitive load (retaining a string of 7 digits in short-term memory) on response patterns to the forced-choice infidelity question. They reasoned that if sex differences reflect wired-in and sexually dimorphic emotional tendencies as hypothesized by JSIM, then

³Women also reported greater reactions to emotional infidelity than men. However, difference scores (degree of emotion in response to sexual infidelity – degree of emotion in response to emotional infidelity) were virtually identical for the two sexes.

⁴This effect was not significant when women taking birth control pills were excluded from the analysis.

⁵An anonymous reviewer suggested that the wording "How much did you focus on the emotional aspects of your mate's infidelity?" is ambiguous. However, even if this were the case, there is no ambiguity in the question "How much did you focus on the sexual aspects of your mate's affair?" Yet, there was no sex difference on this measure either, and if there was any trend at all, it was for women to have slightly higher ratings than men.

reducing the opportunity for reflective processing or self-presentation strategies by means of cognitive load should increase the effect, thereby polarizing the two sexes' responses. In fact, it had little effect on men's responses, but it caused women's responses to shift toward picking sexual infidelity. The results suggest that inferences or self-presentation strategies may play a particularly strong role in women's responses to the forced-choice questions.

Some of the variance between the sexes might also reflect on men, particularly young men, being more willing to endorse items that reflect the importance of sex to them. This in turn may be fueled by their arguably stronger sex drive (Baumeister, Catanese, & Vohs, 2001), rather than by an innate trigger that is specific only to the emotion of jealousy. Responses may also reflect cultural expectations. Still another factor that appears to contribute to sex differences in at least some samples is that men and women make different assumptions about the implications of hypothetical sexual and emotional infidelity. For example, several studies have found that people choose as worse the form of infidelity that is likely to imply the co-occurrence of the other form, labeled the *double-shot* (DeSteno & Salovey, 1996) or *two-for-one* (Harris & Christenfeld, 1996a, 1996b) hypothesis (see also Dijkstra et al., 2001, for data from a gay and lesbian sample).⁶ This interpretation fits with the fact that sex, culture, sexual orientation, and age all impact forced-choice responses. Although some of the factors described previously may also contribute to actual jealousy reactions, others probably do not (see Harris, 2003, for data on this). This highlights the need for future work to move beyond the forced-choice and other hypothetical measures and to assess cognitions and appraisals that occur over real infidelity.

Psychophysiological Studies

One study using psychophysiological measures with college students has been taken to provide particularly compelling support for the JSIM hypothesis (Buss et al., 1992). When asked to imagine either sexual or emotional infidelity on the part of a mate, men

⁶It should be noted that this variable, when assessed with different questions or scales, does not always mediate jealousy responses to a significant degree (Sheets & Wolfe, 2001; Voracek, Stieger, & Gindl, 2001; Wiederman & Kendall, 1999). Buss et al. (1999) explored this issue, using questions that explicitly state that emotional or sexual infidelity has occurred in the absence of the other form, and still found a sex effect. However, the sex effect was frequently weaker in these cases, suggesting that the implications of the co-occurrence of the two forms of infidelity plays some role but cannot completely account for the sex difference. It should also be noted that one potential confound with this approach is that a woman having sex without being in love is likely to evoke different moral judgments and inferences than a man having sex without being in love, possibly affecting choice responses.

showed greater heart rate and electrodermal activity (EDA) to imagined sexual infidelity, whereas, as the study is sometimes described, women showed the opposite pattern (e.g., see Buss, 2000; Pinker, 1997). However, a close examination of this study reveals that, for women, only one out of three measures (EDA) actually revealed significantly greater reactivity in response to emotional versus sexual infidelity.

Recent attempts to replicate and extend the Buss et al. (1992) results seriously question the robustness and meaning of their findings. With additional measures, Harris (2000) reported that men do indeed show greater signs of autonomic arousal when imagining sexual infidelity relative to emotional infidelity. However, men also show comparably greater reactivity to sexual than to emotional imagery that is devoid of infidelity, raising doubts about whether the greater reactivity is really indicative of greater distress. Moreover, as mentioned previously, the physiological measures during infidelity imagery were uncorrelated with self-report measures. Perhaps more damaging to the JSIM theory is the fact that Harris (2000), in two separate studies with significantly more statistical power than the original Buss et al. (1992) study, found no indication that women in general show greater autonomic arousal to emotional infidelity imagery than to sexual infidelity imagery. Further, and contrary to predictions by Buss et al. (1992), female participants who had experienced a sexually committed relationship showed greater reactivity not to emotional infidelity but rather to sexual infidelity imagery (a pattern of arousal that resembled that of male participants). Another recent psychophysiological study also failed to replicate the original Buss et al. findings (Grice & Seely, 2000). In this study, results from only one of the three physiological measures were in the direction predicted by JSIM; men showed greater heart rate increases to sexual relative to emotional infidelity imagery, and women showed greater heart rate increases to emotional relative to sexual infidelity imagery. However, the opposite effect was found for EDA, with women showing greater reactivity to sexual infidelity imagery, and men to emotional infidelity imagery. Electromyography (EMG) failed to show sex differences.⁷

In brief, the results from three articles, which have included a total of five psychophysiological experiments, fail to show clear evidence for men experiencing greater reactivity to sexual infidelity, and for

⁷Virtually identical results were obtained when physiological scores were calculated as changes from an emotional imagery baseline and a sexual imagery baseline. However, when analyzed in this manner, the sex effect on heart rate was stronger. One might wonder how this relates to the issue of whether the reactivity being measured reflects distress or sexual interest. Grice and Seely (2000) asked participants to imagine "two people having sexual intercourse" as the sexual baseline. Greater baseline reactivity might have been elicited had participants been asked to imagine "themselves having sex with their mate" as was done in Harris (2000).

women to emotional infidelity. Not only is there a lack of support, but also at least three of the results from these studies provide evidence incompatible with JSIM (i.e., evidence that could be interpreted as indicating an emotional jealousy trigger in men and a sexual jealousy trigger in women).

Homicide Statistics

As we have seen, evidence from self-report surveys and psychophysiological responses fail to provide support for sex differences in jealousy elicited by infidelity. However, it could be argued that one should not conclude too much either way from self-reports because they are potentially subject to various biases, particularly when respondents have little or no experience with actual infidelity. This point is made by the evolutionary psychologists Margo Wilson and Martin Daly (Wilson & Daly, 1992) in describing the research reviewed in the previous section:

The bulk of the data are paper-and-pencil responses of captive undergraduates to questionnaire items which may or may not have anything to do with anything they have ever experienced. ... In contrast with the inconclusive results of self-report studies, there is little ambiguity about sex differences in jealousy when one looks at such real-world phenomena as homicide, wife beating, initiation of divorce, and psychiatric cases of "morbid jealousy." (p. 304)

I will turn now to a discussion of these frequently cited real-world phenomena.

Daly, Wilson, and Weghorst (1982) were among the first to claim that sexual jealousy on the part of men is a principal instigator of violence in all known human societies. This account is echoed by Pinker (1997), who stated, "The largest cause of spousal abuse and spousal homicide is sexual jealousy, almost always the man's" (p. 489). It should be noted that Buss (2000), a major proponent of JSIM, parted company with these other JSIM proponents on this particular point. He argued that such homicides are not due to the sexual jealousy mechanism but rather due to men having evolved "a mate-killing module...whose function is not threat or deterrence, but rather the literal death of a mate" (p. 122).

In evaluating this evidence, two kinds of issues need to be considered, both of which have been neglected in discussions of this topic. One issue is epistemological and the other empirical.

Epistemological Issues: Deviancy and Species-Typical Characteristics

Jealousy-inspired murder and assault, along with clinical states of pathological jealousy, certainly seem to reflect intense emotional passions that probably

have something in common with more "ordinary" forms of jealousy. For that reason, it may seem reasonable to consider these phenomena as a useful source of evidence about "garden-variety" jealousy. However, in evaluating Darwinian explanations that postulate innate sex differences encoded in the genome of the species, this strategy appears questionable.

Observations about population extremes are likely to offer a very unreliable guide to species-typical characteristics. Consider the case of height. On average, human females are shorter than human males, with a difference in the mode and the median as well as the mean. This shift in the population undoubtedly reflects natural selection; for example, one possibility is greater intrasexual competition for mates among ancestral males as compared to females (see Wood & Eagly, 2002, for other possibilities). Observations at one extreme, however, do not exhibit this species-typical sex difference in any clear-cut fashion, nor do they shed any light on the difference. Although the most common cause of dwarfism, achondroplasia, is as common in males as females, some types of dwarfism are actually more common among males. Further, the ultimate causes for the sex ratio at the lower tail of the height distribution are entirely different from the ultimate causes of the species-typical sex difference in the average values (Staheli, 1998).

It may sometimes happen, of course, that extrema faithfully represent the central tendency of the population. However, for a Darwinian account of alleged species-typical properties to find better support from observations regarding extrema than from data involving the "normal range" would seem peculiar, to say the least (see Archer, 2000b; Hupka, 1991, for related points). Furthermore, such a view would be inconsistent with Symons's proposition that male sexual jealousy is "relatively invariant" (1979, p. 232). Before building a theory on outliers, one would need a good explanation for why an allegedly wired-in disposition would be suppressed or disguised in most individuals, although showing up clearly in disordered or deviant individuals. One should be especially wary of such arguments as they relate to sex differences, because it has been observed that males show greater variability in many dimensions than do females (Geary, 1998; Hedges & Nowell, 1995).

Previous Research

In their review of jealousy and homicide, Daly et al. (1982) discussed several studies that attempted to determine the motivating factors behind a series of murder cases. These studies are taken to support the hypothesis that there is a sex difference in cases of upset over a mate's sexual infidelity, with male but not female sexual jealousy often leading to homicide. How-

ever, throughout their discussion of the literature, Daly et al. (1982) tended to blur three distinct contentions: (a) that jealousy is a common motive in homicide cases in many or all societies, (b) that male jealousy leads to homicide proportionally more often than does female jealousy, and (c) that male jealousy focuses on sexual betrayal and female jealousy focuses on emotional betrayal. Daly et al. made a persuasive case for the first contention—jealousy does appear to be a common precipitating factor in murder across many cultures. However, almost none of the homicide data presented by Daly et al. provide support for the second contention, that sexual jealousy is more frequently a motive for male murderers than it is for female murderers. Even less evidence exists for the third claim. As we shall see, the data fall short in several respects.

The Problem of Base Rates

The primary problem with the analyses provided by Daly et al. (1982) is that although they reported that men kill out of jealousy more often than women, they failed to consider sex differences in base rates for murder. For example, the study they discussed in greatest detail investigated 690 nonaccidental homicides committed in Detroit, Michigan, in 1972. This study was originally reported by Wilt (1974). Daly et al. coded additional homicides and added these to their analysis of this Detroit sample. Fifty-eight of these cases, according to Daly et al., stemmed from jealousy conflicts.⁸ Of these, 47 were coded as cases precipitated by male jealousy and 11 by female jealousy. Daly et al. interpreted these numbers as indicating that sexual jealousy is a stronger motive for men than it is for women.

However, as is widely known, male perpetrators outnumber female perpetrators for all forms of violent crime and many nonviolent ones as well. For example, the *National Crime Victimization Survey*, based on interviews of 83,000 U.S. residents, disclosed that, according to victim reports, more than 80% of criminal offenders were men (U.S. Bureau of Justice Statistics, 1992). This imbalance is also confirmed by surveys asking people about crimes they have perpetrated (Siegel, 1992). Given the dramatically lower tendency of women to commit crimes of violence compared to men, it is hard to see how the fact that women committed about 21% of jealous murders in the Wilt (1974) study can be taken to indicate that female sexual jealousy is a relatively weak source of anger and aggression. By analogous reasoning, one might conclude that because women commit just 8% of the robberies in the United States (U.S. Bureau of Justice Statistics, 1992), women have relatively weak acquisitive motivations.

⁸Daly et al. (1982) referred to all of these cases as "Sexual Jealousy Conflicts" (p. 14), whereas Wilt (1974) categorized these cases simply as "jealousy conflict."

Hence, given women's lower rate of violent crime, the Detroit findings clearly cannot rule out the possibility that infidelity causes roughly the same amount of rage in both sexes, with men simply having a lower threshold for intense violence (perhaps partly because they anticipate being more successful in carrying out a violent act, or perhaps partly for other biological or social reasons; see Siegel, 1992, for discussion).

Indeed, certain details of the Wilt (1974) data clearly reinforce this point. Only 40 of the 58 cases labeled as jealousy by Daly et al. (1982) in their Detroit sample involved real or suspected sexual infidelity or rivalry due to a "love triangle." In 30 (75%) of these cases, male jealousy led to the homicide, and in 10 (25%) female jealousy led to the homicide. However, the remaining 18 cases involved situations in which there is no indication that a third party was involved or even suspected (e.g., the homicide was motivated simply by a partner trying to terminate the relationship). Daly et al. pointed out that the sex difference is even greater in these types of situations (17 male perpetrators vs. 1 female perpetrator) and argued that in both types of situations jealousy arises as a response to a threat to reproductive capacity. However, a more parsimonious explanation for these findings is that regardless of the provocation, men, on average, respond more frequently with violence, or their aggression is of a greater intensity (support for this later contention can be found in meta-analysis of aggression by Archer, 2000a). As noted previously, across all known situations and places the vast majority of criminal violence is carried out by men.

In sum, simply taking the total number of homicides committed over jealousy and comparing the percentage of time the perpetrator was a man versus a woman provides no evidence, one way or the other, for whether men and women are differentially upset by a mate's sexual infidelity. At a minimum, what is needed is to take into account the differences in total number of crimes committed by the two sexes and then examine whether the proportion of homicides committed by men due to sexual jealousy is significantly different from the proportion of homicides committed by women due to sexual jealousy. Daly et al. (1982) acknowledged this at one point and admitted that their own Detroit data failed to show such a proportional difference. For example, men committed 82% of all the homicides and 81% of the jealousy murders, suggesting that in this sample jealousy was not disproportionately a motive for men. Daly et al. also cited three studies that they claimed do provide evidence that men and women commit murder out of sexual jealousy at proportionally different rates (Bohannan, 1960; Harlan, 1950; Mowat, 1966). Actual numbers are only provided for the Mowat study, which examines jealousy-inspired murder among insane inmates (jealousy was the motive in 57 of 473 [12.1%]

insane male murderers compared to 5 of 150 [3.3%] insane female murderers). However, it seems questionable whether the motivations of insane murderers reflect the psychological mechanisms of the typical sane person or even the typical murderer. This point will be returned to in the section on Morbid Jealousy.

A Meta-Analysis of the Homicide Literature

To examine whether the homicide statistics provide support for JSIM, this review reexamined each of the studies mentioned by Daly et al. (1982) to determine whether, integrating across samples, men do indeed disproportionately kill out of jealousy relative to women. Daly et al. referenced 18 homicide articles in their work and discussed 2 additional studies relevant to jealousy-inspired homicides in their book (Daly & Wilson, 1988). Their review of these studies is primarily through prose; tables with actual statistics, particularly ones that take into account base rates of murders, were not provided for most of the studies. Therefore each of the original articles was obtained for this analysis. We then attempted to gather statistics from each of these articles on the total number of male and female murderers and the number of murders precipitated by male and female jealousy. In many of these studies, obtaining this information required coding individual case histories. Where possible an attempt was also made to determine if the jealousy was focused on sexual or emotional betrayal. A search of the literature since 1982 was also conducted but did not reveal any additional studies with pertinent data (jealousy-inspired murder presented by sex of murderer).

A summary of the homicide data from each sample is presented in Table 2. Wherever possible the count of total number of murderers excludes cases in which the motive or the sex of the perpetrator was unknown. Further information on sample characteristics of each of the studies is provided in the Appendix. Some authors included tables that listed jealousy as a motive in homicide. In these cases, the numbers were taken directly from their tables (and the text was used to confirm whether the jealousy arose from a mating context). In many studies the pertinent data were embedded in text or in descriptions of individual case histories, which were usually included in an appendix. In determining what constituted a jealousy-inspired crime, we drew on the generally accepted definition that jealousy is elicited when a rival threatens an important relationship. The requirement that there be a rival in jealousy is agreed on by virtually all researchers in this area (e.g., Mathes, 1991; Parrott, 1991; Salovey & Rothman, 1991; White & Mullen, 1989). For example, Sharpsteen (1991) stated, "It is clear that a virtually infinite number of situations may produce romantic jealousy, but only one intervening interpretation seems to

be required: that there is a rival for one's partner" (p. 37). The focus of this investigation was limited to jealousy-inspired homicide that occurred within romantic relationships. In the homicide literature, these types of jealousy-eliciting situations are frequently referred to as "sex or love triangles."⁹

A meta-analysis was performed to synthesize the results of all of the different homicide studies in which motives and base rates for murder could be obtained. This information was not found in 7 samples; therefore, these samples were excluded from the meta-analysis (see Table 3). One additional sample was also excluded because there were no female murderers. For the analysis, a LOR was computed by dividing the odds that a murder committed by a man was jealousy motivated by the odds that a murder committed by a woman was jealousy motivated, and taking the natural log of this quantity (effect sizes are shown in Column 7 of Table 2). When all 20 samples shown in Table 2 were combined using a random-effects model, the mean effect size across studies was -0.35, with a 95% confidence interval ranging from -1.05 to 0.34. (A negative effect size would mean that women conducted a proportionally greater number of jealousy-inspired homicides than men.) This indicates that, across these studies, there is no evidence for a systematic sex difference in the role of jealousy motivation in murders, with the trend running in the opposite prediction of JSIM. A test for heterogeneity indicated the likely presence of true differences between these studies, $Q(19) = 93.3, p < .0001$.

Four samples that were included in the first meta-analysis had features that made them questionable in terms of their ability to unequivocally test the veracity of JSIM. The Criminal Justice Commission of Baltimore study (1967), which included two samples, does not explicitly state that all cases coded as jealousy did indeed occur within a mating context. Therefore, we cannot rule out the possibility that jealousy between, say, friends or siblings may have been included in the jealousy counts. Harlan (1950) coded for sex triangles in cross-sex killings but did not distinguish whether the alleged infidelity was on the part of the man or the woman. Therefore, it is unclear whether it was the jealous party being killed or doing the killing; hence, we cannot determine whether the murder was precipitated by male or female jealousy. Furthermore,

⁹Some of the numbers presented in Table 2 are different from those reported by Daly and Wilson (1988). One factor that may contribute to the differences is that Daly et al. (1982) tended to include in their discussions cases that involved motivations other than jealousy, such as sexual refusals, and cases in which a mate simply left or rejected the mate, with no indication of the presence of a rival (see Parrott, 1991, for a discussion of the distinction between rejection and jealousy). This work focuses on jealousy in particular because that is the emotion that has been hypothesized to differ in men and women in the JSIM model.

Table 2. Cross-Cultural Studies Included in the Meta-Analysis of Jealousy-Precipitated Homicide, with Effect Sizes and Base Rates for Murder for Each Sex

Study	Population	Total Number of Murderers		Number of Murderers Motivated by Jealousy		Effect Size ^a	Can Emotional vs. Sexual Jealousy be Determined?	Comments
		Men	Women	Men	Women			
Bohannan (1960)	African groups Tiv	108	5	13	0	1.17	8 sexual 5 unknown	
	Basoga	86	2	14	1	-2.36	11 sexual 4 unknown	
Gisu		113	8	7	1	-1.29	3 sexual 5 unknown	
Banyoro		34	4	8	1	-0.08	2 sexual 7 unknown	
BaLuyia		137	9	10	0	1.14	5 sexual 5 unknown	
Uuo		54	3	6	0	1.16	6 unknown	
Total		532	31	58 (10.9%)	3 (9.7%)			
Criminal Justice Commission (1967)	Baltimore Non-White White Total	384 96 480	68 13 81	28 7 35 (7.3%)	10 2 12 (14.8%)	-0.96 -1.06	No	Numbers may include jealousy cases that occur outside a mating context.
Daly & Wilson (1988)	Canada Spousal Homicides	766	240	195 (25.5%)	19 (7.9%)	1.05	No	Base rates are for spousal murders.
Daly et al. (1982) (expansion of Wilt, 1974)	Detroit	420	92	30 (7.1%)	10 (10.9%)	-0.52	No	Numbers reflect cases precipitated by male or female jealousy. The actual murderer may not have been the jealous party.
Elwin (1950)	Maria (India)	112	5	12 (10.7%)	1 (20%)	-0.93	8 sexual 2 emotional 3 unknown	In the female jealousy-precipitated case, a wife caught her husband and his lover having sex. When she started hitting them both, her husband killed her.
Gillies (1976)	Scotland Abnormal Normal Total	79 194 273	15 19 34	4 13 17 (6.2%)	U U $\leq 1 (\leq 3\%)$	0.23	Text refers to all male cases as sexual jealousy.	Motives are displayed by number of victims killed by each sex. Three female jealousy cases are listed in original table but 2 are described in the text as occurring in nonmating relationships. Unclear if third female case is sexual jealousy.

(continued)

Table 2. (Continued)

Study	Population	Total Number of Murderers		Number of Murderers Motivated by Jealousy		Effect Size ^a	Can Emotional vs. Sexual Jealousy be Determined?	Comments
		Men	Women	Men	Women			
Harlan (1950)	Alabama African American	236	88	66 (28%)	57 (64.8%)	-1.56	No	Cannot determine whether the jealous party was the murderer or victim. 22 females allegedly killed males in self-defense. Deducting this number from total female murderer cases still results in 40% motivated by love triangle.
Horoszowski (1975)	Poland	276	79	28 (10.1%)	5 (6.3%)	0.45	A mate's unfaithfulness or seduction was the motive for 28 males and 4 females	These numbers reflect number of motives, not number of murderers (male murderers = 263; female murderers = 77). A murder may have multiple motives. The author notes that 41 women murdered their illegitimate children and 1 woman murdered her legitimate child due to honor/economic reasons. No men did so. The author excludes these cases from his charts, which results in 5/37 female jealousy motives or 13.5%.
Saran (1974)	Oraon (India)	72	4	4 (5.6%)	0 (0%)	1.10	2 sexual 2 unknown	Females never murdered alone; they always acted as conmurderers. Total number of murderers may be greater (the original table simply has a symbol for two or more).
Varma (1978)	Bhil (India)	122	2	13 (10.7%)	1 (5.0%)	-3.90	4 sexual 10 unknown	In 1 male jealousy case, rival killed jealous man.
West (1968)	Manhattan	92	8	13 (14.1%)	0 (0%)	1.24	Text refers to cases as "sexual jealousy."	
Wilbanks (1984)	Miami	533	45	23 (4.3%)	5 (11.1%)	-1.47	No	Jealousy-precipitated cases. One jealous husband was killed by his wife and one, by a rival. One jealous woman was killed by her husband.
Wolfgang (1958)	Philadelphia African American White Total	364 130 494	93 15 108	45 7 52 (10.5%)	15 2 17 (15.7%)	-0.33 -1.36	No	Original tables do not specifically state that the jealousy-motivated murders were all due to jealousy in a love triangle, but text implies such.
Totals		4408	817	546 (12.4%)	130 (15.9%)			

Note: U = unknown^a Effect size expressed as a log-odds ratio. Negative numbers represent a greater proportion of female jealousy-inspired homicides.

Table 3. Studies That Provide Incomplete Information on Male and Female Jealousy-Inspired Homicide

Study	Population	Total Number of Murderers		Number of Murderers Motivated by Jealousy		Comments
		Men	Women	Men	Women	
Chimbos (1978)	Canada interspousal homicides	29	5	U	U	16/34 murders were motivated by the category labeled "love and sexual matters" (including affairs and refusals), but breakdown of motive by sex is not provided. Daly et al. noted that the text makes several references to men being upset over a mate's infidelity. However, the article also describes at least two cases in which a woman was jealous over her mate's affairs. Right before one woman killed her husband, her neighbors heard her say "If I can't have you, no one else can" (p. 67).
Gibson & Klein (1961)	England & Wales	176	9	21 (11.9%)	(≥11%)	The authors state that 7 out of the 9 female murderers were motivated by "a quarrel or from jealousy" and do not give a further breakdown of numbers. However, if even 1 woman was motivated by jealousy, this would result in a proportion of 11%, which is similar to that of men.
Gutttmacher (1955)	Baltimore	28	8	U	U	No breakdown of motive by sex. 26/46 of the motivating factors in killing a family member pertained to jealousy/infidelity. Sample includes mentally ill patients with delusions.
Levy et al. (1969)	Navajo	41	5	U	U	Cannot determine number of men and women who murdered over jealousy. Text states that domestic quarrels and sexual jealousy comprise 41% of motives and the wife is usually the victim.
Lobban (1972)	North Sudan South Sudan Total	246 60 306	U U 58	61 (24.8%) U	U	The author states that among men, sexual jealousy is the number one motive for murder in North Sudan and the third in South Sudan and that women do not usually kill out of jealousy, but numbers are not given. The leading motive/murder type for Northern women is infanticide.
Saran (1974)	Munda	69	0	8 (11.6%)	—	No female murderers of any type.
Sessar (1975)	Germany	129	13	U	U	Author states that in the killing of a close relative/friend, common motives are faithlessness (26%) and separation (41%). Further details not provided.
Tanner (1970)	Uganda	Total victims: 1,267		Total victims: 43		Data are presented by victims rather than by murderer. 43 cases involved sexual jealousy and adultery. Some subtables suggest that women did not kill husbands, but base rates cannot be calculated since breakdown of male and female murders is not provided for total sample or for jealousy murders.

Note: U = unknown.

the female data included self-defense cases. However, it should be noted that although cross-sex killings are ambiguous due to the previously noted problem, statistics on murders involving the rival do provide relevant information. In same-sex African American killings, a sexual triangle was the motive for only 18.7% of the male perpetrators but was the motive for 47% of the female perpetrators. The fourth sample was Daly and Wilson's Canadian study (1988), which did not include base rates for all forms of homicide but, instead, was restricted just to spousal homicides. It is possible that women, who might not otherwise kill, may sometimes kill in a mating situation in acts of self-defense against abusive mates (with the opposite occurring less often). This restriction, therefore, would artificially reduce the estimated number of female murderers motivated by jealousy.

Given the nonoptimal features of these four studies, a second random-effects analysis was conducted without them. The findings were essentially the same as the first analysis. There was a mean effect size of -0.25 , with a 95% confidence interval ranging from -0.71 to 0.22 . There was no evidence for heterogeneity of studies here, $Q(15) = 16.42$, $p > .35$. Again, we find no evidence that men disproportionately kill due to jealousy.

Definition of Sexual Jealousy

This work also attempted to address another weakness in the Daly et al. (1982) interpretation of homicide statistics, namely, their definition of sexual jealousy. They noted that jealousy in the two sexes should be qualitatively different, with men "specifically focused on the sexual act" (p. 17). Yet, the definition of sexual jealousy that they used in their article is "Jealousy is 'sexual' if the valued relationship is sexual" (p. 12). Daly et al. rarely distinguished between jealousy over a mate's emotional infidelity and jealousy over a mate's sexual infidelity. However, this distinction is critical because proponents of JSIM argue that although men have been shaped by evolution to be particularly bothered by sexual infidelity (as a means of ensuring paternity), women have been shaped to be particularly bothered by emotional infidelity (as a means of securing resources). Therefore, the JSIM hypothesis as it presently stands should predict differences in the type of jealousy that spurs men and women to murder. The impetus for such crimes by women should be a mate's emotional infidelity, and by men a mate's sexual infidelity.

In our review of each study, we attempted to code for emotional versus sexual jealousy. As can be seen in Column 8 of Table 2, most studies did not lend themselves to such coding. Even the cases that were descriptive enough to gather additional information were often problematic to code. Although catching a mate *flagrante delicto* is a pretty straightforward case of sexual infidelity, most cases were not so clear-cut. For ex-

ample, one common entry was simply that a wife wanted to leave her husband for someone else. Other cases included jealousy over someone else marrying the beloved. Jealousy in these cases could be sexual, emotional, or both. Moreover, even the cases that were coded as sexual jealousy do not rule out the possibility that the jealous party felt both emotionally and sexually betrayed (e.g., some of these cases simply listed "adultery" as the motive). Finally, in contrast to JSIM predictions, in the studies that provided some opportunity to code for emotional versus sexual jealousy, 2 female jealousy-precipitated murders were due to the woman finding her husband and a rival in *flagrante delicto*; the remaining 3 cases were unclear.

In summary, the existing data on homicide offers no support for the hypothesis that men are disproportionately motivated by jealousy (much less by sexual jealousy specifically).¹⁰ The results in Table 2 highlight the importance of including adequate samples of both male and female murderers and of comparing the ratio of jealousy-inspired murders committed by the two sexes to the ratio of overall murders committed by each sex. Although there was cross-cultural variability in the number of murders inspired by jealousy, there was no overall evidence suggesting a universal sexually dimorphic sexual jealousy mechanism.

When Infidelity Inspires Others to Kill—Evidence of a More General Mechanism?

In addition to blurring the distinction between jealousy as a leading homicide motive and sex differences in jealousy-inspired homicides, Daly et al. (1982) also tended to collapse two other distinct phenomena: male sexual jealousy within a mating relationship versus what they term the "coercive constraint of women" by men in general (not just by lovers). This distinction is quite important in assessing the putative evidence for a specific sexual jealousy mechanism in men. For example, in discussing anticuckoldry tactics, Daly et al. acknowledged that "a young woman's genealogical kin have been just as concerned with her chastity as is a husband or suitor since families wishing to marry their daughters to high-status men have competed partly by public guarantee of their women's virtue" (p. 19). Con-

¹⁰The same anonymous reviewer pointed out that the hypothesis of a specific innate male propensity to jealousy-inspired violence is not completely ruled out by the finding that jealousy is associated with no greater proportion of homicides committed by men as against women; this is because men might have additional innate specific modules triggering them to commit certain other types of homicides as well. Although this cannot be logically excluded, the burden of proof would clearly lie with proponents of such a view to document these additional categories (such a notion seems hard to reconcile with the great diversity of forms of conflicts and with victims associated with homicides committed by both sexes; see Siegel, 1992).

sistent with this is the fact that infidelity-related homicides are not always committed by one of the participants in the "love triangle" but, instead, by friends or family, often fathers or brothers. However, we surely would not wish to say that fathers or brothers experience jealousy at the thought of their daughters or sisters engaging in sex with men other than their husbands. It is hard to see why the JSIM position, correctly understood, would predict anything at all about noninvolved parties' reactions to another's sexual betrayal.

Whereas Daly et al. (1982) would urge us to take the reactions both of husbands and of other kin as evidence that men have a sexual jealousy mechanism, this interpretation does not comport with the JSIM model (cf. Harris & Pashler, 1995). A brief review of JSIM logic should help clarify this. A key assumption underlying most modern evolutionary psychology is not that people consciously select behaviors that enhance their inclusive fitness, but rather that evolution has shaped emotional tendencies that motivate behaviors that tended to increase fitness (Symons, 1979). In the case of sexual infidelity, JSIM proponents argue that men have a specific "module" or trigger that produces jealousy in reaction to possible sexual betrayal (a trigger relatively lacking in women); this in turn motivates behaviors that tend to prevent cuckoldry. Sexual jealousy as an adaptation to prevent cuckoldry neither predicts nor explains why other family members would respond to sexual infidelity with violence.

Instead, such diverse data more parsimoniously argue for operation of a much more general mechanism (e.g., feel anger when one feels aggrieved.) Men may simply be more prone to violence or more willing to inflict serious injury under such circumstances. Ironically, therefore, the inclusion of kin data by Daly et al. (1982), rather than supporting JSIM, instead tends to favor a more general sex difference—men resort to greater violence than women, regardless of domain (Mullen, 1995). (Of note, even this difference need not be the result of some specific innate mechanism. Body strength, too, is sexually dimorphic, so the behavioral difference may simply reflect that the strong use physical force more successfully.)

Spousal Abuse

Daly et al. (1982) also discussed forms of violence less severe than murder. They described findings suggesting that, according to the victims, jealous anger involving real or imagined infidelity figures prominently in male assault on spouses. However, the studies cited deal exclusively with female victims of abuse. Obviously, research focusing entirely on female victims can neither determine whether women are less (or more) prone to jealous rages than men, nor whether female

jealous anger is less (or more) tied to sexual infidelity than male jealous anger.

What do data on assault by women disclose? Several large surveys of domestic violence have found that women admit to instigating family violence at rates roughly comparable to those of men (Straus & Gelles, 1990). In a recent article, Daly and colleagues (Dobash, Dobash, Wilson, & Daly, 1992) acknowledged that many self-report studies have found that women report slapping, hitting, or kicking their mates about as often as men. Nonetheless, Dobash et al. claimed that acts of violence committed by women are probably more benign than those committed by men (cf. Archer, 2000a). Even if this is the case, before drawing any conclusions about possible innate sex differences in jealousy on the basis of domestic violence, one needs to examine the motives behind violent acts instigated by both sexes, not just men. The data described by Daly et al. (1982) fail to address this question, and as far as I have been able to ascertain, so do other studies of family violence.

A few recent studies nevertheless provide some evidence that bears on this issue. De Weerth and Kalma (1993) asked Dutch students about how they would react to betrayal by a mate. As the authors stated, "In blatant contrast to our expectations, women scored much higher than men on 'general sexual jealousy'" (p. 271). Almost all of the women (94.9%) speculated that they would physically attack an unfaithful mate, compared to 67.3% of the men. Another study of U.S. undergraduates (Paul & Galloway, 1994) also found that more women than men said they would harass the rival and show anger toward the partner in response to sexual infidelity. Although one might question whether these predictions are accurate, these data certainly provide no support for the JSIM model of raging, cuckolded men and passive, betrayed women. Perhaps even more compelling is a study by Mullen and Martin (1994) that surveyed New Zealand adults of various ages and found that men and women reported equal numbers of experiences with being attacked by a jealous mate.

Morbid Jealousy

In addition to acts of violence, Daly et al. (1982) also discussed what psychiatrists call *morbid jealousy*. This term is used to describe patients who exhibit symptoms of a usually delusional conviction that their mates are cheating on them, which is frequently accompanied by anger, depression, and urges to check up on and spy on their mates. Before making this diagnosis, a clinician must think that the patient has only weak and implausible evidence of betrayal or at least that the patient's reaction is exaggerated. In some cases, morbidly jealous people attempt to prevent infidelity in an aggressive fashion; Pinker (1997) put it in

vivid terms: "Often a morbidly jealous man will imprison his wife in the house and interpret every incoming phone call as proof that she is unfaithful" (p. 489).

In line with Pinker's (1997) suggestion, Daly et al. (1982) pointed to a "preponderance of male patients in all studies of morbid jealousy" (p. 18), but they also admitted that "the true incidence in the two sexes cannot be estimated" in light of possible referral biases. Should one suspect a preponderance, and if so, what would it mean? Daly et al. cited three studies in the literature that described substantial series of patients diagnosed with morbid jealousy (Lagache, 1947; Shepherd, 1961; Vauhkonen, 1968). An examination of the literature since the Daly et al. article turned up only two new group studies of any size that include both sexes (DeSilva & DeSilva, 1999; Mullen & Mack, 1985). The data from these five studies were aggregated together. This yielded a total of 228 men (64% of the total) versus 127 women (36%) diagnosed with morbid jealousy. Unfortunately, one cannot determine the focus of the pathological jealousy (sexual vs. romantic) from these studies. Therefore, we do not know if the sexes differed in the focus of their jealousy.¹¹ What proponents of the JSIM hypothesis should predict is not a difference in overall incidence of morbid jealousy, but rather that the focus of the morbid jealousy should be different (men focusing on sexual betrayal and women on emotional betrayal). One can find colorful cases that are in stark contrast to this expectation. For example, S. Wright (1994) described a woman whose pathological jealousy led her to mark her husband's "penis with a pen and examine it later to see if it had been touched" (p. 431), which clearly sounds like a case of sexual jealousy. This example illustrates that discussions of case studies, without appropriate sex comparison groups, may be quite misleading.

However, for the sake of argument, let us assume for the moment that a roughly 65:35 preponderance of male cases reflects the true incidence, and that men uniquely focus on sexual betrayal. What could be made of this? For many mental disorders, sex ratios are not 1:1. Men are overrepresented in several psychiatric disorders, from substance abuse to autism (Burke & Regier, 1994). Recent psychiatric opinion has begun to view morbid jealousy as a form of obsessive-compulsive disorder (OCD; Parker & Barrett, 1997). Three research groups recently reported successful treatment of morbid jealousy with fluoxetine, a serotonin reuptake inhibitor widely used in treatment of OCD (Stein, Hollander & Josephson, 1994; Wing, Lee, Chiu, Ho, & Chen, 1994; S. Wright, 1994). Stein et al. stated that "this response was as ro-

bust as that seen in patients with classical symptoms of obsessive compulsive disorder" (p. 30).

The overall incidence of OCD seems to be about the same in men and women (DeVeaugh-Geiss, 1993), although some studies have found that men are slightly overrepresented (Chia, 1996). There appears to be a general agreement, however, that OCD with sexual obsessions occurs much more frequently in men than it does in women. Lensi et al. (1996), for example, reported a more than 2:1 male-to-female ratio for these symptoms within a large sample of consecutive OCD patients admitted for evaluation to an Italian psychiatric hospital, and Roy (1979) reported similar findings.

If morbid jealousy is a manifestation of a psychiatric disorder, namely OCD, and men are prone to suffer from OCD with sexual obsessions, it seems questionable to draw any general conclusions about male psychology based on occurrence of this disorder. Although symptoms found in male OCD patients might reflect male-female differences in the general population, they might not and probably often do not. "Exactness and symmetry obsessions," for example, are another OCD symptom that shows up much more often in men than women (ratio is more than 3:1; Lensi et al., 1996), but it would seem far-fetched to conclude that men in general have greater interest than women in symmetry or exactness.

In sum, on closer examination, the pathological data like the homicide data fail to support the hypothesis that women and men differ in the types of infidelity that they find upsetting. First, there is no evidence that the morbidly jealous men focus more on sex than the morbidly jealous women. Second, even if they did, the disorder may well represent a form of OCD with sexual obsession, having no relevance to the general psychological mechanisms that exist in all men. Finally, these pathological forms of jealousy may have little to do with more "normal" levels of jealousy. The abnormal quality of these jealousy states is further highlighted by the fact that in several cases the jealous person was accusing a mate of incestuous relations (e.g., a wife of having sexual relations with her father or brothers).

Conclusions

In closing, this article has critically examined five lines of research that have been previously reported to bolster the specific innate modular view of sex differences in jealousy. The review raises grave doubts about how much of a sex difference actually exists. Even the most robust support for the JSIM model (i.e., the forced-choice hypothetical data) is less clear-cut than it seems at first glance. As mentioned previously, there is great variability among men; in many samples, only a minority of men report that a mate's sexual infidelity

¹¹DeSilva and DeSilva (1999) did provide descriptions of 10 of their 31 cases. Three of the four female cases discussed showed clear evidence that these women's delusions focused on sexual infidelity.

would be worse. Further, the use of cognitive load to reduce the role of self-presentation strategies makes the effect disappear (DeSteno et al., 2002). The JSIM model provides no ready account for the fact that even in the United States close to half of the men say that emotional infidelity is the worse of the two infidelities, or for the fact that culture appears to account for as much variance as sex. Other self-report studies, those that rely on continuous measures and those that examine reactions to real infidelity, have almost always failed to find any evidence for a sex difference. In contrast to claims by Daly et al. (1982), when base rates for murder are taken into account, the homicide statistics simply do not support the contention that jealousy leads men to kill more often than women. The spousal abuse data are entirely ambiguous because the data only include female victims and, therefore, are incapable of addressing any potential sex differences. The pathological jealousy evidence is fraught with similar problems.

Proponents of JSIM should be lauded for their enterprising attempt to find converging measures. Fairly assessed, however, the results provide little support for the claim that men and women are innately wired to be differentially upset by emotional and sexual infidelity. Moreover, to the degree differences exist with certain measures or phenomena, they may be better accounted for by fairly broad sex differences rather than the specific innate mechanisms postulated by JSIM.

Why Might There Not be Sexually Dimorphic Jealousy Mechanisms?

The putative existence of sex differences in jealousy over sexual and emotional infidelity is the evidence that has been offered to support the JSIM model. This review's failure to find robust sex differences across a variety of data sets markedly reduces the plausibility of JSIM. The speculations offered by JSIM proponents regarding the threats that faced our ancestors have been intriguing and have made a good story. Given how compelling this story appeared, it seems reasonable to wonder why humans did not evolve such sex-specific jealousy mechanisms. There are two levels of alternative explanations that can potentially address this question (ideas that are not mutually exclusive): (a) Our ancestral past may have been significantly different from the one envisioned by JSIM proponents (i.e., different ultimate causes led to different proximate mechanisms), and (b) even if the adaptive problems were as JSIM proponents describe, more general jealousy mechanisms may have been selected for, rather than the hard-wired specific jealousy module postulated by the JSIM model (different proximate mechanisms).

Alternative Hypotheses Regarding the Ancestral Environment

There are a variety of viable hypotheses regarding the sociocultural aspects of our ancestral environment that differ substantially from the account proposed by adherents to JSIM. One example of such an alternative view of human relationships during the Pleistocene era was recently offered by Miller and Fishkin (1997), who assembled information from a variety of sources (e.g., Bowlby, 1982; Draper & Harpending, 1988; Fisher, 1989; Tague, 1994; Tanner, 1981). Their attachment-fertility theory proposes that significant paternal involvement in childrearing was a key factor in determining the number of viable offspring who lived to reproduce. Miller and Fishkin argued as follows: Due to the likely importance of biparental care, natural selection may have shaped the mating strategies of men and women to be quite similar in many respects. A major problem faced by humans is that infants are born less mature than other species and, thus, require relatively more extensive care. Other primates, such as the chimpanzees, also give birth to immature young. However, in general these young remain dependent for only a few years, and therefore, female primates usually only have one dependent offspring to care for at a time. By contrast, Miller and Fishkin pointed out, human young remain dependent for many years, and human mothers frequently care for more than one dependent offspring at a time. This suggests that help from others would have been vital. Fathers investing more time in the young would have been one possible solution to this adaptive problem. Miller and Fishkin also argued that female mortality during childbirth was probably quite high, which would often leave other dependent young at risk. Children rendered motherless, but who had investing fathers, would have had a strong selective advantage over those who did not have such fathers.

The possible necessity of paternal involvement may have shaped quite different psychological mechanisms in men than those proposed in theories such as JSIM. Men who experienced greater emotional bonding with both mate and child would be more likely to raise viable offspring and, thus, would have a selective advantage over those men who did not have such emotional tendencies. Zeifman and Hazan (1997) noted that natural selection tends to capitalize on existing mechanisms and that "the multitude of similarities between pair-bond and infant-caregiver relationships provide strong evidence that the already available attachment mechanism was exploited for the purpose of keeping mates together" (p. 251). Miller and Fishkin (1997) further argued that this deep emotional bonding with a woman and her young might have had several psychological effects that impacted infidelity.

For one, on this scenario, sexual infidelity may simply not have occurred at the rates that would have ne-

cessitated the evolution of a specific anticuckoldry mechanism. Miller and Fishkin (1997) suggested that high early female mortality rates (due to difficulty giving birth) may have worked to reduce male promiscuity. A pair-bonded male who engaged in infidelity not only risked harm from the other female's mate, but also risked losing his own mate (a scarce commodity). Therefore, the most adaptive strategy, if there were high need for paternal investment, might usually have been to remain monogamous once a mate was found. They do not claim that infidelity never occurred, but rather that the high inclusive fitness risks may have usually outweighed the inclusive fitness benefits, making infidelity not a primary mating strategy.¹²

Furthermore, several authors have argued that sexual jealousy may not have been the only possible mechanism or, perhaps, even the best mechanism to prevent cuckoldry (e.g., Miller & Fishkin, 1997; White & Mullen, 1989). For example, Miller and Fishkin suggested that one way that a man could prevent cuckoldry might be by maintaining emotional closeness with a mate, thereby decreasing a mate's desire for another man. Miller and her colleagues reported that early emotional bonding in a relationship was associated with greater later sexual enjoyment for both husbands and wives (Miller, Fishkin, Gonzales-Tumey, & Rothspan's 1996 study, as cited in Miller & Fishkin, 1997). Glass and Wright (1985) found that women who have affairs report greater marital dissatisfaction. Hence, forming and maintaining a deep emotional attachment with a mate might have been a mechanism to increase inclusive fitness for both men and women in a variety of ways.

This view therefore suggests one account for why both men and women find emotional infidelity threatening. If pair-bonds were important in the raising of viable offspring, losing a mate's emotional attachment would most likely have posed a severe threat to the inclusive fitness of both men and women. Jealousy would be one means of reducing this threat by eliciting behaviors designed to help repair the primary relationship (e.g., by making oneself more physically attractive or by engaging in more intimate interactions; White & Mullen, 1989).

White and Mullen (1989) also offered several criticisms and alternatives to the JSIM model, only a few of which are noted here. One of their arguments was that

it is questionable whether evolution would have shaped a sexual jealousy mechanism that frequently leads men to kill their mates. Such a mechanism might actually decrease inclusive fitness by impairing the survival of any existing offspring as well as eliminating the opportunity to have future offspring with that mate. They also note that present-day hunting and gathering societies tend to be characterized by less competition and more cooperation or sharing than modern Western societies. If Pleistocene-era groups resembled these hunter and gatherer groups, then individual men may not have been as responsible for providing resources to their young, and therefore, the cost of cuckoldry may not have been as great as envisioned in JSIM. Of relevance, Wood and Eagly (2002) discussed cross-cultural data that suggest that the relative contribution of men and women to subsistence varies greatly across cultures, depending on the type of resources available. For example, in some gathering societies, women contribute more than men. This present-day variability makes it quite difficult to infer what the precise conditions were in the Pleistocene era.

In sum, several alternative accounts of mating strategies of our Pleistocene ancestors exist that do not predict sexually dimorphic jealousy mechanisms. Uncovering the true nature of our ancestral environment is a difficult task and clearly beyond the scope of this work. These various accounts are described (a) to remind the reader that there are other viable characterizations of mating relationships in the Pleistocene era, besides the one put forth by JSIM proponents, which are consistent with the current jealousy findings; and (b) to illustrate that where "selectionist thinking" leads depends greatly on the evolutionary scenario one assumes, and scenarios can easily be envisioned that would entail very different consequences for our innate specializations.

Alternative Mechanisms to the Content-Specific Ones Proposed in JSIM

As previously discussed, there is great uncertainty regarding the mating relationships between Pleistocene-era men and women. However, even if men did indeed invest heavily in offspring so that a man's inclusive fitness was seriously threatened by cuckoldry, the relatively inflexible content-specific mechanisms proposed by JSIM proponents might not have been the best solution. Buss (1995) stated, "Evolutionary psychologists have predicted that the inputs that activate jealousy for men will focus heavily on the sex act per se" (p. 14). However, it is not clear that preoccupation with the "sex act per se" would have been the most effective anticuckoldry mechanism. A man who waits until there are clear signs of sexual betrayal on the part of his mate is likely already in danger of being cuck-

¹²JSIM proponents frequently offer cuckoldry data from birds as evidence for cuckoldry occurring in humans. However, there are salient differences between birds and humans—for one, the former have several young at once, but humans typically have singular births. Perhaps more germane would be data from monogamous primates. Unfortunately, according to Dixson (1998), to date such DNA studies do not exist, but "it is usually inferred that men in family groups are probably the sires of most (if not all) offspring produced" (p. 28). Dixson also noted that hostility between female gibbons may contribute to monogamy.

olded. A better strategy might be to be vigilant to any cues of possible impending infidelity. Sexual infidelity rarely occurs abruptly. Humans, like most other animals, have mating rituals that lead up to intercourse, for example, flirting. These behaviors are not easily classified as purely sexual or purely emotional. Indeed, the same behaviors (e.g., increased eye contact, smiling, hugging) can be signals of the beginning of sexual interest, emotional interest, or both. Vigilance regarding these signals might have been the best way for both sexes to prevent either form of infidelity from occurring. Some of the more detailed homicide cases reviewed for this article speak to the issue that it is not easy to clearly differentiate between sexual and emotional jealousy, not easy as a coder, and probably not easy as a mate.

Given the inherent overlap in cues to sexual and emotional infidelity and the cross-cultural variability in what behaviors elicit jealousy (Buunk & Hupka, 1987), it seems reasonable to expect that evolution might have shaped a much more general jealousy mechanism that does not require hard-wired specific triggers. The conclusion that humans may have developed a more flexible, less content-specific jealousy mechanism is consistent with theories regarding the origin of complex cognition in humans. One of the major theories to account for proportionally large brain size (relative to body size) and highly developed neocortex in primates generally and humans specifically is that these emerged at least partially in response to an increasingly complex social environment. It is likely that reflexive responses and fixed action patterns that respond to specific releasing stimuli were not the most effective adaptations as social groups became larger and more complex (Barton, 2000; Byrne & Whiten, 1988). Therefore, natural selection may have shaped a less content-specific jealousy mechanism, which was capable of responding to a variety of inputs that might signal threat to a romantic relationship.

This is related to one of the serious limitations of the JSIM position: It can only account for jealousy that exists in limited domains, namely, over sexual and emotional infidelity. However, jealousy clearly occurs in nonmating situations such as that between siblings. Even within a mating context, people are jealous over a host of possible characteristics that a rival may have. JSIM provides a specific hypothesis about infidelity reactions but does not shed light on the jealousy that occurs in response to a diverse assortment of threats. Although one could argue that natural selection has hard-wired many specific appraisals into our minds, such as being jealous over a rival's slim waist (or a particular hip-to-waist ratio), pretty smile, sharp wit, and so forth, to my knowledge no one has proposed such a view. Therefore, jealousy can clearly be elicited from noninnate triggers, which suggests the need for a more parsimonious

theory that can account for jealousy triggered by a diverse and potentially open-ended set of threats.

A Social-Cognitive Theory of Jealousy

What might a more general, less content-specific jealousy mechanism entail? In most theories of emotion, cognitive appraisals are assigned a major role in eliciting an emotional reaction (Frijda, 1986). In contrast to the JSIM view, many psychologists who have studied jealousy have approached it from the perspective of emotion theory, emphasizing the importance of cognitive appraisals. Although there are various nuances to the different approaches used by these researchers, there are some commonly shared premises. I have attempted to unite these various propositions to form the core of what I refer to as a social-cognitive theory of jealousy. This approach stresses the importance of interpretation and appraisal of a diverse assortment of threats in the elicitation of jealousy. In particular, it views romantic and sexual jealousy as the result of perceptions that another person or rival (even if only imaginary) poses a threat to what one perceives to be valuable in oneself and in an important relationship (Parrott, 1991; White & Mullen, 1989). Inherent in such an account is the idea that jealousy can be induced when any important aspect of an interpersonal relationship is threatened. For example, Parrott wrote that "the emotion people *experience* is determined by the cognitive appraisals that they make and by the aspects of those appraisals on which they focus their attention" (p. 4).

Social-cognitive theorists have particularly emphasized the importance of two factors that can impact the likelihood of experiencing jealousy: (a) when relationship rewards are threatened and (b) when some aspect of a person's self-concept, self-regard, or other representations of oneself is challenged by a rival. For example, White and Mullen (1989) defined jealousy as follows:

Romantic jealousy is a complex of thoughts, emotions, and actions that follows loss or threat to self-esteem and/or the existence or quality of the romantic relationship. The perceived loss or threat is generated by the perception of a real or potential romantic attraction between one's partner and a (perhaps imaginary) rival. (p. 9)

Working within a social-cognitive approach, Salovey and colleagues proposed what they termed the "domain relevance hypothesis," which predicts that people will feel the greatest jealousy when a rival outdoes them in domains that are particularly important to the self (Salovey & Rodin, 1984; Salovey & Rothman, 1991). Pointing to ethnographic evidence, Margaret Mead

(1931) suggested that threats to self-esteem are at the root of jealousy in a wide variety of social settings. Similarly, other writers have emphasized the importance of threats to aspects relevant to one's self concept,¹³ such as self-esteem (Mathes, 1991), self-definition (Parrott, 1991), and self-identity (Salovey & Rothman, 1991), as underlying triggers of the experience of jealousy. According to these theorists, such threats are particularly salient and emotionally compelling in romantic relationships because these relationships are potentially rich sources of personal rewards (Turner, 1970; White & Mullen, 1989). Moreover, interpersonal relationships are often used to assist in self-definition and self-evaluation (as emphasized by Festinger, 1954, in his social comparison theory).

One feasible model of how jealousy might unfold draws on Lazarus's theory of emotion (1991), which includes primary and secondary appraisals. The ideas described here are influenced by the writings of White (1981), Mathes (1991), and Hupka (1981), all of whom made prior applications of Lazarus's theory to jealousy. Primary appraisal is the assessment that some event has either positive, negative, or no impact on oneself or on one's goals. If negative, one tries to determine the scope of the threat and then engages in secondary appraisals, which are attempts aimed at coping with the threat. In the case of jealousy, I suggest that the primary appraisal may be as simple as a possible positive interaction between a rival and the beloved, which then triggers the assessment of threat. This vague sense of possible threat when two others interact does not have to be consciously assessed, may even be innate, and may occur in other animals besides humans.¹⁴ At least in human adults, however, additional appraisals then come into play, including attempts to determine the meaning of the interactions of the other two for one's own relationship and one's own self. Depending on the specific content and focus of the appraisals, different emotions can be elicited. For example, an association between jealousy and at least three primary emotions, namely, anger, fear,

and sadness is frequently noted in the literature. According to the model offered here, if one focuses on the potential loss of a mate, sadness or fear may be elicited, whereas focusing on the sense that the rival has wronged one may elicit anger (see Hupka, 1984, for data consistent with this).

This model is still consistent with natural selection and with jealousy serving the adaptive function of protecting a valued relationship, which presumably would have aided in increasing one's inclusive fitness. Contemplating the reasons for a mate's infidelity and the relevance of such an act to the self also can be viewed in an adaptive light. For example, determining that the self may have contributed to the mate's infidelity can help to identify areas in which to improve and thereby increase the likelihood of sustaining the relationship. Forming emotional attachments to others is important to both women and men, and to the degree that those attachments are threatened, jealousy will be elicited.

The social-cognitive theory can be contrasted with JSIM in several related ways. Perhaps the most distinctive contrast is that feelings about the self are seen as playing a key role in the distress characterized as jealousy. This view provides a way for culture to impact jealousy: in that what is perceived as a personal threat will to a large extent be influenced by the values of one's culture. As noted previously, for JSIM, infidelity is the threat that elicits jealousy. In particular, the sex act is the threat for men, and appraisals involving the self are beside the point. Another important difference is that social-cognitive theorists hypothesize that the same basic process is involved not only in jealousy that arises in sexual relationships between men and women but also in the various phenomena commonly labeled as jealousy that arise in other kinds of human relationships as well (parent-child relationships, friendships, etc.). These theorists would contend, for example, that ordinary linguistic usage is accurate in applying the term *jealousy* to the feelings of a child who exhibits distress when her parents shower attention on a new sibling, or the feelings of an adult whose two closest friends have begun socializing together without him. Finally, these accounts do not assume that men and women have different innate mechanisms or processes giving rise to jealousy; they do not require that sexual and emotional betrayal be hard-wired as triggers for jealousy. Instead, people, regardless of gender, are assumed to make assessments of threat (not just to the romantic or sexual exclusivity of their relationships but also to their own positive concepts of themselves), and it is these appraisals that give rise to jealous emotions. As noted previously, it can be assumed that these emotional responses exist because they were adaptive, but the adaptive payoffs would not have been confined to the narrow context of resource loss and cuckoldry.

According to this perspective, the extent to which one experiences jealousy over a mate sleeping with

¹³Self-concept, self-identity, self-definition, and self-schema generally refer to knowledge about the self (White & Mullen, 1989). Self-esteem is usually defined as a valence judgment about oneself along a positive-negative dimension (Baron & Byrne, 1997). Researchers vary in the degree to which they distinguish between these concepts as related to jealousy. However, the nuances of these views are not germane to the purpose of this article.

¹⁴Relevant to this point is the finding that some infants as young as 8 months displayed behaviors indicative of jealousy when their mothers held another infant or paid attention to another child, suggesting that complex cognitions are not needed to elicit at least some form of jealousy (Masciuch & Kienapple, 1993). However, with age, the elicitation of jealousy appeared to be affected by children's evaluations of the specifics of the social triangle. An interesting possibility is that the emotion of jealousy may have originally evolved as a response to competition of offspring who were rivals for a parent's time, attention, resources, and so forth, and then later was usurped for the purpose of keeping friendships and mateships together.

someone else will depend on appraisals for why he or she is doing so and how it reflects on one's own self and one's relationship rewards. This view, unlike JSIM, leads one to expect variability across cultures. For example, if a mate sleeping with someone else is socially sanctioned, then the threat is minimized. Wood and Eagly, (2002), citing work by Crocker and Crocker (1994), noted that the Canela, a Brazilian people, accept extramarital sexual practices that even include socially sanctioned situations in which women may have up to four sequential sexual partners. Sexual jealousy is considered deviant, presumably because infidelity does not violate personal or social norms or expectations.¹⁵ (See also Hupka, 1981; Reiss, 1986, for other sociocultural factors that may impact jealousy.) The importance of appraisals in reactions to a mate's infidelity is also suggested in some of the homicide data sets reviewed previously. For example, in discussing his Tiv sample, Bohannan (1960) noted that although adultery between a wife and her husband's kin is more common than between a wife and nonkin, the latter are more likely to be killed by a jealous husband (e.g., only 2 of the 8 rivals that were killed were relatives of the jealous husband). Bohannan wrote,

Any field worker in Tivland realizes that adulteries between women and their husbands' kinsmen occur frequently. Tiv do not suggest that such adultery does not occur. They insist, however—and the cases prove them right—that a wife's adulteries must not be allowed to disturb relationships among kinsmen. If a woman continues to commit adultery with her husband's kinsman, she is made to leave. (p. 42)

Yet, this differential response to kin and nonkin rivals does not seem to emerge simply out of a hesitancy to kill a relative: At least 39% of the murder cases in which the relationship between the killer and victim was known appeared to involve biological kin.

Other students of homicide also have noted the probable importance of sociocultural norms in impacting murder rates over infidelity, presumably because they impact men's appraisals of infidelity. For example, across samples, North Sudan had one of the highest male jealousy-precipitated murder rates (25%). Numbers for female jealousy were not provided, but Lobban (1972) hinted that it is low. She suggested that this high rate is "because sexual behavior, good morals, and respectability are all associated with deep conceptions of honor, a fundamental value in society" (p. 22). More generally, violations of sexual norms can lead people, on discovering these violations, to kill others

even in cases that are clearly not jealousy inspired. For example, in many of the African and Indian groups reviewed previously, one finds cases in which a man kills another man for sleeping with his daughter or sister or even with a wife of a third man. Eleven percent of the murders in the Munda group (the same number as jealousy murders) were of this type. Although Daly et al. (1982) might consider these cases of male proprietariness, there are clear differences.

To whatever degree the self-report questionnaire findings regarding hypothetical infidelity assess jealousy, they also argue for a more flexible content, general jealousy mechanism, such as the one embodied in the social-cognitive perspective. The JSIM view has no ready way to account for the findings that emotional infidelity appears to be a stronger jealousy trigger than sexual infidelity in the majority of men in over half the samples for which the forced-choice measures were used (although, as discussed previously, the validity of these measures is highly suspect). The divergent findings with more continuous measures also point to the importance of cognitive appraisals in jealousy reactions. Far from simply showing that men report greater distress to sexual infidelity and women to emotional infidelity, these measures have shown that, depending on the exact scenario, both sexes sometimes report greater distress to sexual infidelity and other times to emotional infidelity. Such variability emphasizes the importance of cognitive interpretation in these responses.

It should be noted that innate hard-wired triggers could be incorporated into the social-cognitive theory of jealousy. However, as this review has shown, there simply is no clear evidence that the two forms of infidelity innately lead men and women to experience different reactions. One might, of course, criticize the social-cognitive perspective for making less clear-cut predictions than JSIM. However, it seems doubtful that any empirically adequate account of jealousy can avoid the fact that the instigating factors for this emotion often include complex attributions and judgments. In this regard, jealousy may parallel other emotions. As Frijda (1986) put it, "on the whole it is impossible to define effective emotional stimuli independently of the subject: of his goals and desires, his expectations, and his abilities for coping with the events involved" (p. 268). The best known effort to define a single objective trigger for an emotion was the frustration-aggression hypothesis of Dollard and his colleagues (Dollard, Doob, Miller, Mowrer, & Sears, 1939). However, even this body of research revealed that whether frustration elicits anger depends heavily on whether the frustration is regarded as somehow illegitimate or arbitrary (Pastore, 1952; Rule, Dyck, & Nesdale, 1978). What is considered illegitimate or arbitrary will vary greatly across individuals and cultures. In short, the elicitation of jealousy, like other emotions, is likely to arise from cognitive appraisals rather than simple innate hard-wired triggers.

¹⁵More broadly, Wood and Eagly (2002) pointed out that the great variability in sociocultural norms for female extramarital sexuality seriously challenges the assumption that male sexual jealousy results from an evolved tendency to seek control over female sexuality in general.

Could a Weaker Version of JSIM Account for the Data?

So far we have been focusing on a relatively strong version of JSIM, which claims that because sexual jealousy arose as a solution to cuckoldry, and emotional jealousy arose as a solution to resource loss, each problem would have been unique to each sex. Therefore it is hypothesized that there should be strong sex differences in the types of jealousy the two sexes experience. As has been previously argued, there is very little support for such a strong version of JSIM, and many findings argue against such a dimorphic pattern. An anonymous reviewer of this manuscript, however, suggested that a weaker version of JSIM could be constructed, which might be more consistent with the data. This requires two major modifications: First, within the jealousy module, there are hard-wired modulators that affect the responses of men and women, allowing environmental inputs to modify the strong sex differences predicted by JSIM (cf. Tooby & Cosmides, 1992, for a general discussion of "adaptive flexibility" within innate modules). These modifications, it is claimed, were designed by natural selection to allow certain prewired environmental inputs to modulate men's reactions to sexual infidelity and women's reaction to emotional infidelity. Buunk, Angleitner, Oubaid, and Buss (1996) suggested an example of this kind of modification. To account for the fact that 30% or less of their German and Dutch men chose sexual infidelity as worse than emotional infidelity, they suggested that the strength of male sexual jealousy may be related positively to the degree to which a man invests in a mate. If a man will invest little in a mate, sexual jealousy may be attenuated: "In sexually more liberal cultures where men may distribute their mating effort over a number of women, and hence devote less investment toward any one woman, men are less sexually jealous of any particular woman" (p. 363). It should be noted that this kind of account does not posit conscious means–ends thinking on the part of the person ("I need to make sure I'm not investing heavily in an offspring not my own"), but rather an automatic unconscious modulation of the jealousy response. Further, the modulators would have to be of the sort who could have operated in the ancestral environment. Thus Buss (1995) writes: "The domain-specific psychologist ... would predict that cues to sexual infidelity would still trigger a man's rage and sexual jealousy, even if his wife is taking reliable birth control" (p. 82).

As of yet, JSIM proponents have offered no clear enumeration of what these hard-wired modulators of jealousy might be. The Buunk et al. (1996) suggestion quoted, concerning why German and Dutch men show less sexual jealousy is at odds with the data from China, one of the most sexually restricted cultures studied. It would seem, by their reasoning, that cultures, such as China, where couples only have one or two children should be the very places where cuckoldry would pose the highest threat to a man and, therefore,

fore, where male sexual jealousy would be at its peak. (After all, one wrong investment and a man would be out of the inclusive fitness competition.) Yet, the vast majority of Chinese men (75%) said they would care more about emotional infidelity than sexual infidelity. Moreover, no JSIM proponent, to my knowledge, has offered any explanation for why, within any U.S. college sample—even ones that appear fairly ethically or culturally homogeneous—half the men predict that they would be more jealous of emotion betrayal.

This highlights one of the problems of using a forced-choice format to study sexual and emotional jealousy. To test any of these kinds of specific-modulator hypotheses, the forced-choice measure would seem to be a particularly inappropriate instrument. An increase in the number of participants choosing sex could reflect increased sexual jealousy, decreased emotional jealousy, or more complex combinations of several changes. If innate modulator variables have definable effects on these purportedly separate phenomena, these should be documented with separate measures of each. As noted earlier, JSIM proponents have tried to argue for the superiority of the forced-choice questions by arguing that continuous measures are subject to ceiling effects (Buss et al., 1999). This would imply that significant effects would not be found with continuous measures, which is not the case. In contrast to JSIM predictions, some studies have found that women report greater sexual jealousy than men report, but in other studies sexual jealousy is more bothersome than emotional jealousy for both sexes (e.g., DeSteno et al., 2002; de Weerth & Kalma, 1993; Harris, 2003). Equally problematic is the fact that, as previously noted, attempts to validate the forced-choice measure have failed to show any relation to reactions to real infidelity or to physiological responses (Harris, 2000, 2002, 2003). The physiological data also provided no more support for the weaker version of JSIM than they did for the stronger version.¹⁶ In sum, much of the data

¹⁶The same anonymous reviewer pointed out that if one only considers heart rate and only examines interactions between the sexes, then there might be some support for the weaker version of JSIM. However, there are major problems with this. First, there is no a priori theoretical reason to assume that heart rate is a better measure of jealousy than is EDA, systolic blood pressure, diastolic blood pressure, or EMG. Second, this would require discounting much of the data. For one, it would mean ignoring the finding by Grice and Seely (2000) that when sexual and emotional baselines were considered, women showed greater reactivity to sexual infidelity and men to emotional infidelity on one measure. Furthermore, this downplays the overall pattern of results among women. Across studies and measures, there have been 13 attempts to assess physiological responses of women. Five attempts showed some trend in the direction predicted by JSIM, but six attempts showed trends in the opposite direction. Moreover, the weaker version of JSIM cannot account for the fact that for women with sexual relationship experience, the magnitude of the greater reactivity to sexual infidelity is similar to that found in men.

from hypothetical infidelity responses is not consistent with the predictions of even this weaker form of JSIM.

Once one moves beyond the realm of the hypothetical to responses to actual infidelity, or real behaviors triggered by jealousy, the data are as uncongenial to the weak form as to the strong form of JSIM. My study examined 5,225 murders and found no evidence for an overall sex difference in jealousy-inspired murders. It is important to note that there is nothing in the weak form of JSIM to lead one to explain why responses to real infidelity should fail to show a sex difference, whereas hypothetical measures would. On the weak form of JSIM, just as on the strong form, the adaptive function of the putative innate wired-in sex difference is to affect responses to actual behavior of actual mates, not to modulate responding to hypothetical questions. (Indeed, this concern over hypothetical responses was voiced by Daly et al. (1982) in a passage quoted previously.)

On a conceptual level, the new weaker version of JSIM proposes a modest sex difference that is assumed to be both innate and specific to jealousy, but modifiable. It is quite possible that future research may disclose some modest sex differences potentially in line with this hypothesis using some populations or measures or both. However, even if that should happen, it would still be necessary to consider alternative views that do not attribute variability across cultures to innate specific modulators. By itself, simply finding a sex difference plainly does not demonstrate that it is an innate difference. For example, Eagly and Wood (1999) noted that desiring a "good cook and housekeeper" in a mate shows as large a sex difference as any sex difference predicted by current evolutionary psychological hypotheses. Yet, it appears unlikely that anyone would argue that such a difference is likely to be innate. In addition, one would have to find evidence for the specificity of these jealousy triggers. For example, Harris (2000) raised the possibility that a more general difference between men and women (i.e., the degree to which they think about and focus on sex), paired with a general jealousy mechanism, could give rise to sex differences on some measures.

One of the strengths of the original JSIM was that it predicted strong sex differences, which, according to its proponents, were not readily explained by other theories. However, the predictions of the weaker version become much more difficult to distinguish from other viable views that were discussed in the section on the social-cognitive perspectives. A similar problem emerges from another weaker version of JSIM offered by Symons (1979), which claims that sexual jealousy is obligatory in men but may be facultative in women, but it does not specify when or why it will occur in women. Moreover, these weaker versions undercut the kind of strong pronouncements that have

made the evolutionary psychology interpretation of jealousy so compelling and satisfying.

As noted previously, even the inclusion of unspecified modulators in the JSIM model does not enable the weaker version of JSIM to account for all of the data (e.g., the findings that women sometimes have higher distress ratings to sexual infidelity than men, and that for a substantial number of men, emotional infidelity is seen as worse than sexual infidelity). An anonymous reviewer suggested that to account for the data, JSIM proponents might make another concession. Starting with an acknowledgment that a mate's sexual infidelity may have had substantial costs to both sexes as did a mate's emotional infidelity, they could retract their claim to say merely that within the male jealousy module there is a slight tendency to develop a stronger sexual "trigger" than within the female jealousy module. Thus this revised theory would avoid even having to predict that men would be more bothered by sexual infidelity than by emotional infidelity. However, to my knowledge, JSIM proponents have not as yet made such a concession and have offered no a priori theoretical reason for why emotional infidelity would be troubling to men and why sexual infidelity would be troubling to women. Indeed, Buss and Schmitt (1993) wrote, "Men's jealousy will be activated strongly by cues to sexual infidelity because that is *the* [italics added] act that would have been reproductively damaging to ancestral men" (p. 216). The one exception to this is the suggestion that men and women might care about both forms of infidelity because the two likely co-occurred and, therefore, one might have signaled the other (Buss et al., 1992).¹⁷ Of note, even here these researchers are not claiming that a mate's sexual infidelity per se was a cost to women, but rather that it could be a signal to emotional infidelity and, therefore, might be troubling for this reason.

The alteration described in the previous paragraph would represent a fundamental change to the theoretical stand taken by most JSIM proponents, which heavily emphasized the idea that each adaptive problem required a specific solution, rather than some general solution (Buss, 1995). To concede that sexual and emotional infidelity were both costly to the Darwinian fitness of both sexes would require adopting the position that (a) both sexes have both an emotional and a sexual trigger that elicits jealousy, and (b) these triggers were selected as more general solutions to more general adaptive problems (e.g., how to keep a mate from abandoning one). This would sacrifice the one-to-one mapping between sexual jealousy

¹⁷Ironically, these researchers have simultaneously put forth considerable effort to discount the double-shot or two-for-one hypothesis of DeSteno and Salovey (1996) and Harris and Christenfeld (1996a, 1996b), which also claim that co-occurrence of the two forms of infidelity can impact responses to hypothetical infidelity.

and the problem of cuckoldry and between emotional jealousy and the problem of resource loss. It should be noted that with such changes the weaker JSIM position then comes to resemble in many respects the position described under the social-cognitive theory discussed previously, and it loses both its distinctiveness and its testability. Finally, the doubly modified account would still as of now be lacking much in the way of empirical support.

A Final Note About Male “Proprietariness” and Laws

Before closing, it is worth making one final point regarding another piece of purported evidence for a sexual jealousy mechanism in men. Wilson and Daly (1992) argued that male “proprietariness,” which they defined as men laying claim to women much as they do to property, is evidence for a sexual jealousy mechanism in men. However, it should not be assumed that such behavior is motivated by the emotional state of jealousy. As previously noted, jealousy emerges out of threat to an emotional bond. Behaviors of men toward mates in cultures in which marriages are not based on emotional bonds might well result from some other emotional or cognitive state. In these situations, the upset over a potential interloper might be identical to the upset elicited by someone taking a man’s money, camel, or coat—for example, anger and outrage. In cultures where a woman is viewed as a possession or property, her sexual receptivity is “owned” by her husband. This type of mateship may have arisen only after the dawn of agriculture, when resources could be more readily amassed. Such reactions may have little to do with jealousy and may have no relation to any putative innate anticuckoldry mechanism.

More generally, it is worth noting that cultures with strong attitudes of male proprietariness are typically ones with highly distinct gender roles and large disparities in economic power between the two sexes. As Eagly and Wood (1999) noted, male roles tend to be associated with greater power and status in virtually all cultures. To accommodate to these sex-typical roles, these authors suggested that men tend to engage in more dominant behavior (e.g., controlling and assertive acts, including sexual control), but women tend to engage in more subordinate behavior (e.g., greater compliance, less overt aggression, and less sexual autonomy). Wood and Eagly (2002) further argued that the differential power between the two sexes may ultimately be traced to differences in reproductive activities. For women, these may conflict with performing the kinds of tasks necessary to acquire power and status in complex societies (e.g., women cannot readily engage in activities that require long absences from home or extensive training

due to nursing and other necessary aspects of child rearing). Thus male proprietariness may arise from this biological difference combined with social and economic structures that reinforce dominance in men and submissiveness in women, rather than from innate sexual jealousy mechanisms.

Another point worth noting is the tendency in some of the literature to blur the distinction between social and cultural practices pertaining to infidelity and the psychological phenomenon of jealousy as experienced by an individual who suspects or fears betrayal. Both of these are worthy topics of investigation, but caution is warranted in treating laws, mores, and other cultural or societal phenomena as direct reflections of the emotional state of “sexual jealousy” as experienced by an individual. For example, it has been noted that some cultures license relatively lenient treatment of male violence triggered by betrayal (e.g., killing an interloper found having intercourse with a man’s wife), and a few writers (Daly et al., 1982) have taken this as providing confirmation of the JSIM hypothesis. I would suggest that the link between such practices and underlying psychological reactions—the focus of this article—is quite tenuous. Although social and legal customs of the kind referred to may reflect the belief on the part of some that violent reactions in such conditions are inescapable and, thus, less blameworthy, it seems likely such laws in many societies were chiefly enacted by men and, thus, are more likely to reflect the preferences and thoughts of men rather than women.¹⁸ Thus it is important to keep in mind that the phenomena of sexual jealousy can be analyzed at many levels from the societal to the individual and that different factors may play key roles at each level. However, cultural mores and laws may impact emotional reactions in at least some important ways. Thus future work could benefit by distinguishing between the factors that impact one versus the other and by determining the paths by which laws and cultural practices impact an individual’s emotional response (and vice versa). The interactions between cultural practices, societal norms, and psychological dispositions should prove a potentially rich area for future study.

¹⁸Another area where this is misapplied is the use of sex differences in divorce rates over infidelity. Differences in laws in this matter need not reflect women’s lesser concern over a mate’s unfaithfulness. For example, JSIM proponents frequently cite work by Betzig (1989), which found that across cultures a mate’s infidelity is more often a socially sanctioned reason for men to get a divorce than for women. This difference is offered as support for men being more upset by a mate’s sexual infidelity. However, husbands are also permitted to divorce their wives for infertility more often than the reverse. Using the logic above, this would lead one to conclude that reproduction is more important to men than to women, which is not a defensible view from a Darwinian perspective.

Concluding Remark

In summary, the kinds of sexually dimorphic modular mechanisms proposed by JSIM are by no means the only accounts of human mating psychology consistent with natural selection. As this review discloses, the lack of robust evidence for sex differences in jealousy over infidelity reduces the plausibility of the JSIM model. Instead, it seems quite possible that, in the domains of attachment and jealousy, natural selection shaped the two sexes to be more similar rather than different. When differences in jealousy do emerge, it likely will be due to differences in cognitive appraisal, as emphasized in the social-cognitive theory of jealousy, rather than sexually dimorphic innate mechanisms.

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Appendix

Description of Homicide Samples

Bohannan (1960). Collection of articles on homicides in six African groups; data are from police reports and court records. Where possible, Table 2 excludes accidental deaths and cases in which the motive or perpetrator was unknown.

Chimbos (1978). Thirty-four Canadian inter-spousal homicide cases, including some mentally ill murderers.

Criminal Justice Commission of Baltimore (1967). Criminal homicides that occurred in Baltimore, Maryland, from 1960 through 1964. Motives were judged by staff from statements and press accounts of crime. Table 2 excludes unknown motives and murderers who were found insane.

Daly & Wilson (1988). Includes 1,006 out of 1,060 spousal homicide cases that occurred in Canada between 1974 and 1983. Police determined motive using a 12-choice form. Table 2 excludes cases where motive was unknown.

Daly, Wilson, & Weghorst (1982). Police reports of 512 closed nonaccidental homicide cases that occurred in Detroit, Michigan, in 1972 (based on Wilt, 1974).

Elwin (1950). One hundred randomly selected cases from 250 Bison-horn Maria homicide records, covering the period between 1921 and 1941, supplemented, in some cases, with the author's own interviews with the accused and witnesses.

Gibson & Klein (1961). Based on known motives of murderers convicted and sentenced for murder in England and Wales between 1950 and 1960.

Gillies (1976). Author made psychiatric examinations of 400 people accused of murder in the Glasgow area between 1953 and 1974.

Guttmacher (1955). Author makes a psychiatric opinion on 36 consecutive cases of homicide involving family members from the Medical Office of the Supreme Bench of Baltimore. His psychiatric opinion was that 24 were responsible for actions.

Harlan (1950). Five hundred successive criminal homicide records were obtained from the coroner of Jefferson County, Alabama, covering the dates from January 1, 1937, to December 26, 1944, which included testimonies from witnesses who were under oath and/or reports by homicide investigators. Accidental deaths, homicides by negligence, justifiable and excusable homicides were excluded. Motives from sufficiently complete records were reported for same race killings. Only 5 White women committed murder, and their motives are not discussed. Therefore, I have only included the African American cases in this article.

Horoszowski (1975). Includes 330 committed and attempted homicides of "passion" that resulted in a conviction between 1932 and 1936 in eight district courts in Poland. Table 2 excludes unknown motives but includes multiple motives for the same murder.

Levy et al. (1969). Navajo police files in Window Rock, Arizona, of 46 known Navajo offenders who committed criminal homicide (excludes accidental homicide, justifiable homicide, and involuntary

manslaughter) on or near the reservation between 1956 and 1965.

Lobban (1972). Homicide cases from the Major Court of Sudan, covering the period from 1954 to 1960.

Saran (1974). Murder cases involving the Munda and Oraon people of India from 1955 to 1959. We coded motives from case descriptions provided in the appendix and through supplemental descriptions in the text, when provided.

Sessar (1975). Based on all criminal homicide cases that were brought before the courts in Baden-Wurttemberg, Germany, during 1970 and 1971, including cases in which the defendant was acquitted because of insanity.

Tanner (1970). Homicides committed in 1964 in Uganda. Motives were obtained from police records.

Varma (1978). One hundred homicide court cases involving 124 Bhil (India) murderers that were decided between 1961 and 1975.

West (1968). Files that were available from the Homicide Bureau on 100 of 168 murderers disposed of by the Manhattan courts in 1966. The text states that there were 4 cases of unknown motive and 9 insane offenders and/or pathological jealousy cases. These cases are included in Table 2 because to exclude them we would need to know the sex of the perpetrator, which was not provided.

Wilbanks (1984). Includes 569 homicide cases occurring in Dade County, Florida, in 1980. We coded motives from summaries of each court disposition provided in the appendix. Cases in which the motive was unknown and cases in which the perpetrator was mentally incompetent or involved a police officer killing someone in the line of duty were excluded from our analysis. If the exact number of male murderers was unknown (i.e., the record said, "Caucasian male murderers"), we listed it as 2 (therefore, the total number of murderers was probably greater than 579).

Wolfgang (1958). Police case files of 588 criminal homicides (involving 621 offenders) that occurred between 1948 and 1952 in Philadelphia. Excludes unknown motives. Accidental deaths were included in total number of murderers because it was unclear if these involved a male or female perpetrator.