

Prostitution and the sex discrepancy in reported number of sexual partners

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One of the most reliable and perplexing findings from surveys of sexual behavior is that men report substantially more sexual partners than women do. We use data from national sex surveys and studies of prostitutes and their clients in the United States to examine sampling bias as an explanation for this disparity. We find that prostitute women are underrepresented in the national surveys. Once their undersampling and very high numbers of sexual partners are factored in, the discrepancy disappears. Prostitution's role in the discrepancy is not readily apparent because men are reluctant to acknowledge that their reported partners include prostitutes.

Across the world, probability sample household surveys of adult sexual behavior show that men report substantially more sexual partners than women do (1–13). This finding is puzzling, because in a closed population of heterosexuals, men and women actually have the same number of sexual partners in the aggregate. Explanations for this discrepancy pertain to either sex-linked reporting bias or sampling bias. Sex-linked reporting bias means that, for whatever reason, men overreport and/or women underreport the number of their partners. Sampling bias refers to the undersampling of women who have had many partners and/or women with whom sampled men have had sex but are outside the sampling frame. In our analysis, we evaluated sampling bias related to prostitution as an explanation for the disparity.

Measuring the Discrepancy

Data. We used data from the 1988–1991 General Social Surveys (GSS) (14) and the 1992 National Health and Social Life Survey (NHLS) (8). These cross-sectional surveys involved multistage area probability samples of adults living in United States households (the NHLS included adults under age 60 only). Although the population of the United States is not closed, we treated it as if it were, given the consistency of the measured sex discrepancy in countries from each major region of the world and at different levels of development.

We used data based on responses to questions in paper self-administered questionnaires (SAQs), except as noted. In both surveys, two questions ask about the number of sexual partners in the last 12 months and 5 years (asked in the GSS since 1991), respectively. Response options include 1, 2, 3, 4, 5–10, 11–20, 21–100, and more than 100. In the 1991 GSS, some respondents answered these questions in an open-ended fashion. For each recall period, we recoded open-ended responses to the closed-ended response categories. Following T. W. Smith's procedures (personal communication), we recoded response categories involving ranges to the midpoints and recoded “more than 100” partners to “101.” For the NHLS 12-month recall period, we followed Laumann *et al.* (8) by using the greater of the SAQ response and the face-to-face response to a similar question. For both surveys, we defined heterosexuals as those who reported only opposite-sex partners for a given recall period.

Our analyses of the GSS are based on data from 1988 to 1991 combined. Overall sample sizes are 5,907 for the GSS and 3,159 for the NHLS.

Analysis and Results. Because of slight differences in the numbers of men and women in the population at large and differences in the proportions of men and women who are heterosexual, estimates must be obtained at the United States population level rather than simply by relying on the surveys' sample means for men's and women's numbers of partners. (Detailed calculations for all analyses are presented in the *Appendix*, which is published as supplementary material on the PNAS web site, www.pnas.org.) To measure the sex discrepancy, we first weighted responses by the number of adults in respondents' households to compensate for the fact that persons in large households were less likely to be interviewed (only one person in a sampled household was interviewed). Then, for each survey and recall period, we computed the total numbers of partnerships reported by heterosexual men and women in the United States based on (i) the proportions of men and women in the survey sample who were heterosexual, (ii) census figures from 1990 (GSS) and 1992 (NHLS) (<http://www.census.gov/population/estimates/nation/intfile2-1.txt>) for adult men and women (men and women age 18–59 years for the NHLS), and (iii) the mean numbers of partners reported by heterosexual men and women in the survey sample.

The ratios of the total number of sex partners heterosexual men report to the number heterosexual women report (see Table 1) show substantial sex disparities, as indicated by their departure from the expected value of 1. Consistent with prior research, the discrepancy ratios are larger for the 5-year recall period than for the 12-month recall period. We obtained very similar results to those in Table 1 when we used only the data from the open-ended GSS questions about numbers of partners and when we included data on bisexuals, treating them as if they were heterosexuals.

Adjusting the Discrepancy for Prostitution

To assess how much of the discrepancy prostitution can explain, we estimated the prevalence of prostitute women and their number of partners and then compared these estimates with observations in the GSS and NHLS.

Abbreviations: GSS, General Social Survey; NHLS, National Health and Social Life Survey; SAQ, self-administered questionnaire.

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Table 1. Unadjusted and prostitution-adjusted ratios of the number of sexual partners reported by heterosexual men to the number reported by heterosexual women

Survey	12 months		5 years	
	Unadjusted	Adjusted	Unadjusted	Adjusted
GSS, 1988–1991	1.74	1.19	2.44	1.01
NHSLS, 1992	1.47	0.98	2.12	0.91

Prevalence of Prostitutes. Potterat *et al.* (15) estimated the annual prevalence of full-time equivalent prostitutes in the United States to be 23 per 100,000 population based on a capture–recapture study of prostitutes found in Colorado Springs, CO, police and sexually transmitted diseases clinic records between 1970 and 1988. The estimation procedure took into account prostitutes’ mobility by weighting women proportional to the fraction of a year that they worked in Colorado Springs. The Colorado Springs Standard Metropolitan Statistical Area during this period had demographic characteristics and sexually transmitted disease rates similar to those of the United States as a whole. The 23 per 100,000 estimate reflects the 1970–1988 period overall as well as annual prevalences observed between 1986 and 1988. Studies of prostitute prevalence in other North American communities that are less typical of the United States demographically indicate higher estimates (see supplementary material).

Prostitutes’ Number of Partners. We estimated prostitutes’ number of partners from our prospective study of the sexual, drug-using, and social networks of persons (including prostitutes) presumed to be at high risk for HIV infection in Colorado Springs (16). We recruited respondents from the county sexually transmitted diseases clinic, HIV testing site, drug treatment program, and outreach activities, and then enrolled some of respondents’ sexual, drug-using, and social contacts through a link-tracing design. Although the prostitutes in this study do not constitute a probability sample of Colorado Springs prostitutes, our experience indicates that they are demographically and behaviorally representative of those working between 1988 and 1991. In the first interview, 98 adult prostitute women reported a mean of 347 male sexual partners in the last 6 months (median = 103; interquartile range = 11–228; range = 1–5,401). The four prostitutes with the most partners (2,700–5,401) in this period reported very heavy cocaine/crack use. Their high level of reported activity is consistent with field observations of crack-addicted prostitutes (17). We doubled the 6-month mean to obtain an estimated mean of 694 male partners in the last 12 months for these women.

This doubled figure is consistent with an estimate derived from prostitutes’ reported number of male partners in the last 5 years. For the latter estimate, we assumed that the rates of entry into and exit from prostitution were equal for the Colorado Springs cohort of prostitutes, which implies that these women were, on average, halfway through their prostitution careers (18). Because prostitute women in Colorado Springs have a mean career length of 5 years (15), prostitute women in this sample most likely worked as prostitutes for only 2.5 of the last 5 years, on average. Therefore, currently active adult prostitutes’ ($n = 98$) mean of 2,171 reported male partners in the last 5 years corresponds to an estimated mean of 868 male partners per year (2,171 partners per 2.5 years) for working adult prostitutes. We opted for the more conservative estimate based on doubling the 6-month mean.

Other research in the United States during the past 25 years tends to indicate higher numbers of partners for prostitute women, but these results seem to derive from methodological

features of these studies (see supplementary material). These 10 other studies of prostitute women in 17 different communities (involving a total of 2,319 women) either did not include representative samples of prostitutes or used recall periods less appropriate for estimating the number of partners in a year. Numbers of partners reported by prostitutes are not likely to be overestimates. In one study, South African prostitutes’ retrospective estimates of the number of their partners in the past week were actually less than (only 59% of) those recorded in daily diaries for the same period (19).

Analysis and Results. With these estimates of the national prevalence of prostitute women and their number of male sex partners, we calculated the number of prostitutes and their number of partnerships expected to be reported for the last 12 months and 5 years in the GSS and NHSLS. In merging information from different sources, we sometimes excluded observations from particular studies or adjusted estimates of key parameters (as detailed below) to ensure that the age ranges of respondents and partnerships reported in the different studies were comparable. The GSS and NHSLS involved only adult respondents, and the NHSLS also excluded adults over age 59. The studies of prostitutes and their clients, however, often involved some juveniles and individuals over age 59.

For the 12-month recall period, we estimated the adult prostitute prevalence rate to be 22.1 per 100,000, correcting for that fraction (4% in the Colorado Springs sample) of prostitutes who were under age 18. Because studies cited in the supplementary material show that virtually all working prostitutes are under age 45, we computed the number of women aged 18–44 in a survey expected to be prostitutes from this adult prevalence rate, census figures, and a survey sample’s age distribution. We then computed the expected total number of partnerships reported by prostitutes by multiplying the expected number of prostitutes by 694, the estimated mean number of partners for prostitutes in a year. [For the NHSLS, we reduced this expected number of partnerships for prostitutes by the percentage of commercial partnerships (3%) in the last 6 months that were reported by clients over age 59 in the Colorado Springs study.] For both national surveys, we defined prostitutes in the last year as those women who indicated, in response to one question, that they had received payment or paid for sex in the last 12 months.

Our calculations for the 5-year recall period followed those for the 12-month recall period except that we (*i*) defined prostitutes as heterosexual women who reported ever having received payment or paid for sex (GSS) or been paid by a man for sex (NHSLS) and were younger than age 45 sometime in the last 5 years; (*ii*) multiplied the expected number of prostitutes’ partnerships by 5; and (*iii*) for the NHSLS, corrected for partnerships between prostitutes and men who were age 55–59 in the last 5 years but older than 59 at the time of the NHSLS, based on data from the Colorado Springs study reported by clients of prostitutes.

The observed number of partnerships reported by prostitute women in the national surveys falls far short of the number expected. For example, in the GSS between 1988 and 1991, there was one prostitute woman and she reported between 21 and 100 male sexual partners in the last 12 months. This contrasts with 1.67 expected prostitutes reporting an expected total of 1,158 partnerships with men.

To compensate for this shortfall, we added prostitutes’ expected partnerships that were not reported in the national surveys to heterosexual women’s reports and computed a prostitution-adjusted mean number of partners for heterosexual women. We then used this prostitution-adjusted mean for re-computing the estimated number of partnerships for heterosexual women in the United States. We also reduced the estimated number of partnerships reported by heterosexual men by the

number of prostitutes' partnerships in the United States multiplied by the proportion of Colorado Springs prostitutes' partnerships attributable to prostitutes who were juveniles throughout the recall period (2% for the last year and 1% for the last 5 years). All calculations for these adjustments are based on household-size-weighted data.

After adjusting for these prostitution-related factors, the ratios for the sex discrepancy in the reported number of sexual partners hover slightly above and below 1 (see Table 1), indicating that prostitution can account for essentially all of the disparity. In the NHSLs it is possible that, in fact, no genuine discrepancy in reporting exists. For the 12-month recall period, one bisexual prostitute woman (not included in our analyses) reported more than 100 partners. If she had an above-average number of partners for a prostitute and primarily male partners, her report might eliminate most or all of the discrepancy. Likewise, the discrepancy for the 5-year recall period could also possibly be eliminated with similar assumptions about the two bisexual prostitute women who reported more than 100 partners. (No nonprostitute woman reported more than 100 partners for either recall period in the national surveys.) In any event, prostitution would still explain the disparity.

There are several reasons why prostitutes, especially those with typical numbers of partners, are unlikely to be represented in household surveys in the United States. First, many prostitutes temporarily reside in institutions (such as jails/prisons, homeless shelters, and halfway houses) or live in other lodgings (such as motels/hotels and rooming houses) not considered to be households, placing them outside of sampling frames for such surveys. On enrollment in the Colorado Springs study, 34% of the 98 adult women who worked as prostitutes in the last 6 months did not live in households. Similarly, in a study that involved prostitute women representing the main locales and sectors of prostitution in Seattle in 1991–1993, 46% of the 57 adult women who worked as prostitutes in the last 3 months did not live in households on entry to the study (20). In addition, 15% of a probability sample of 1,024 street prostitutes in Los Angeles County in 1990–1991 were homeless,** as were 17% of 1,963 street prostitutes in New York City contacted by outreach workers in 1989–1992 (21). Second, prostitute women's work schedule (usually beginning in the late afternoon and often stretching into the early morning) (22) conflicts with the GSS interviewers' schedule (weekdays after 3:00 p.m., weekends, and holidays) (14). Furthermore, prostitute women in the United States tend to be quite mobile (15, 23) and have high mortality (24).

Men's Underreporting of Contact with Prostitutes

Prostitution's role in explaining the discrepancy is not readily apparent because heterosexual men underreport contact with prostitutes. We defined clients of prostitutes as heterosexual men who indicated they had paid for sex or received payment for sex (GSS/NHSLs) or paid for sex (NHSLs) in the last 12 months. In both the GSS and the NHSLs, even if all of the partners reported by acknowledged clients of prostitutes are assumed to have been prostitutes, the sum of these partnerships constitutes only 15–23% of the expected number of prostitutes' partnerships. This result is not likely due to undersampling of clients, as clients do not seem to be underrepresented in household surveys. In the GSS and NHSLs, clients and nonclients in the last year do not differ meaningfully in terms of age, education, employment status, or income. [We based these and the following analyses of clients in the NHSLs on the whole NHSLs sample ($n = 3,432$),

which includes the oversample of blacks and Hispanics.] Furthermore, studies in which clients have been sampled directly at prostitution venues indicate that they resemble adult men in the United States overall on these and other demographic characteristics (25, 26).

Responses to repeated questioning about involvement in prostitution indicate men's reluctance to acknowledge contact with prostitutes. In two different parts of the Colorado Springs interview, heterosexual men were asked about contact with prostitutes in the last 5 years, with the second question referring to prostitutes in Colorado Springs only. Eleven of the 110 clients acknowledged prostitute partners only in response to the second question, and 2 additional men who did not report contact with prostitutes were known to be clients from prostitutes' naming them specifically as clients in another part of the interview. In the NHSLs, 7 of the 13 heterosexual men who admitted to contact with prostitutes in the last year acknowledged this only in response to the second question on the topic (the two questions were presented in separate SAQs).

Methodological experiments involving audio computer-assisted self-interviewing (ACASI), which is thought to promote accurate reporting, also point to men's underreporting contact with prostitutes. In a national probability sample of males aged 15–19 in the United States (27), the proportion of those reporting contact with prostitutes was almost four times higher with ACASI than with paper SAQs, which were used in the GSS and NHSLs. However, ACASI and SAQs did not differ appreciably in the proportion of respondents reporting more than five lifetime sexual partners. In a probability sample of Hong Kong men returning from Shenzhen in mainland China, the percentage of those reporting contact with prostitutes in mainland China in the last 6 months was 37% higher with ACASI than with SAQs (32% vs. 24%) (28).

In the GSS and the NHSLs, clients reported, on average, seven to nine times more partners for the last year than nonclients did. In the Colorado Springs study, on average, prostitutes accounted for 48% of the partners for heterosexual men reporting more than 15 partners in the last 6 months ($n = 15$) but only 17% of the partners for heterosexual men reporting 15 or fewer partners in the last 6 months ($n = 228$). These observations suggest that the primary source of underreporting contact with prostitutes may be men who do not acknowledge being clients but still report a large number of partners that likely includes many prostitutes. Indeed, clients in the Colorado Springs study and the NHSLs who admitted contact with prostitutes only after being asked twice reported as many partners on average as did clients who admitted contact with prostitutes when first asked.

Discussion

In our calculations, prostitution-related partnerships make up 30–32% of the adjusted number of women's partnerships for the last 12 months, but 54–61% of the adjusted number for the last 5 years. Prostitution allows men to accrue *new* partners at a higher rate than nonprostitute women, which causes the unadjusted ratios to increase with longer recall periods.

In prior research, the discrepancy could not be eliminated by removing those respondents who reported involvement in prostitution or by reducing men's number of partners by an estimate of admitted clients' number of prostitute partners (2, 13, 29, 30). These previous results are consistent with ours and can be explained by heterosexual men underreporting their contact with prostitutes.

Einon (18) addressed and dismissed the prostitution explanation for the discrepancy in the British household survey (5). However, her analysis of the lifetime number of reported partners is undermined by the use of point and annual, rather than lifetime, prevalences of prostitutes, and thus does not adjust

**Berry, S. H., Kanouse, D. E., Duan, N. & Lillard, L. A., Poster #PoD 5604, The Eighth International Conference on AIDS/Third Sexually Transmitted Diseases World Congress, July 19–24, 1992, Amsterdam.

for the cumulative number of partners that all prostitutes from multiple cohorts had over respondents' lifetimes. Furthermore, available empirical information indicates that prostitution also can account for the discrepancies in the British (5) and Ivorian (29) surveys for recall periods between 1 and 5 years (see supplementary material).

Other types of sampling bias cannot account for the sex discrepancy in reported number of partners. In 1990, the number of men from the United States who traveled overseas is balanced almost perfectly by the number of men from overseas countries who traveled to the United States (31). Foreign men visiting the United States also tend to be younger than men from the United States traveling overseas. These facts imply that the number of sexual partnerships (commercial and otherwise) men from the United States have in other countries is likely canceled out by the number of partnerships foreign men have in the United States. Moreover, the excess partners reported by adult men cannot be accounted for by partnerships with adolescent females. In a probability sample

of 882 18-year-olds in Detroit, the sex discrepancy ratio in reported number of lifetime sexual partners is 1.57 (32). This ratio would need to be substantially less than 1 for adolescent females to account for a significant share of adult men's excess partners.

In sum, prostitutes are underrepresented in national household sex surveys, and their undersampling can account for the sex discrepancy in reported numbers of sexual partners. These results suggest that respondents' reports of the number of their sex partners, although possibly limited in other ways, may not be significantly affected by sex-linked reporting bias.

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