

## RESEARCH AND PRACTICE

# Concurrent Partnerships, Nonmonogamous Partners, and Substance Use Among Women in the United States

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Population-level parameters of sexual behavior are critical determinants of the spread of sexually transmitted infections (STIs), including HIV.<sup>1</sup> Concurrent sexual partnerships (partnerships that overlap in time) have emerged as potentially important determinants of STI dissemination throughout the population. Concurrent partnerships can spread infection through a sexual network faster than the same number of sequential partnerships.<sup>2–4</sup> Thus, the extent of concurrency contributes to the distribution of STIs among the population.<sup>1</sup>

Our analysis of cycle 5 (1995) of the National Survey of Family Growth (NSFG) reported a 5-year concurrency prevalence of 12% for US women during 1991 through 1995. Women with concurrent partnerships were younger, began having sexual intercourse earlier, and were less likely to be married than were women who did not have concurrent partnerships.<sup>5</sup> That analysis was restricted to the public use data file, however, and therefore did not examine drug use behaviors and other sexual risk behaviors that are key factors in the US epidemic of heterosexual HIV transmission. We recently analyzed the NSFG cycle 6 (2002) public use data file and “omitted items” file, which contains questions concerning drug use and sensitive sexual risk behaviors, to investigate demographic, socioeconomic, and behavioral risk correlates of concurrency among US men.<sup>6</sup> We now present a parallel analysis of concurrent sexual partnerships during the past year for US women interviewed in the NSFG cycle 6. By examining the relationship between concurrency, other sexual and drug use behaviors, and social and demographic characteristics, we aimed to further characterize aspects of sexual networks among US women that promote the spread of HIV and other STIs.

## METHODS

The NSFG, conducted periodically by the National Center for Health Statistics (NCHS) of

**Objectives.** We determined the prevalence, distribution, and correlates of US women’s involvement in concurrent sexual partnerships, a sexual-network pattern that speeds population-wide HIV dissemination.

**Methods.** We used sexual partnership dates reported by 7643 women in the 2002 National Survey of Family Growth to determine prevalence of concurrent sexual partnerships during the preceding 12 months. We examined associations between concurrency and sociodemographic characteristics and risk behaviors.

**Results.** Prevalence of concurrent partnerships was 5.7% based on reported partnerships and 8.3% after adjustment for possible underreporting. Concurrency was associated with younger age (22 to 24 years: prevalence odds ratio [POR]=2.44) versus older age (40 to 44 years); marital status (formerly married: POR=6.56; never married: POR=3.81; vs married); Black race/ethnicity (POR=1.78); younger age at first sexual intercourse (12 to 13 years: POR=2.89) versus 18 years or older); having a nonmonogamous sexual partner (POR=6.96); having intercourse while “high” on drugs or alcohol (POR=1.61); binge drinking (POR=1.70); and crack or cocaine use (POR=2.72).

**Conclusions.** The association of concurrency with nonmonogamous sexual partners and substance use suggests the existence of extensive sexual networks that link people at higher risk for HIV infection with increased opportunities for disseminating infection. (*Am J Public Health.* 2011;101:128–136. doi:10.2105/AJPH.2009.174292)

the Centers for Disease Control and Prevention, uses area probability sampling and a complex, multistage, stratified design to obtain a national probability sample representative of the US household population aged 15 to 44 years.<sup>7,8</sup> Cycle 6, which took place from March 2002 through March 2003, was the first cycle to survey both men and women. Persons living away from home in college or university dormitories, fraternities, and sororities were listed in their household of usual residence and were eligible for the interview. The sampling design employed higher selection probabilities for women, adolescents aged 15 to 19 years, young adults aged 20 to 24 years, and Black and Hispanic persons. The overall 80% response rate for women yielded 7643 completed interviews, including approximately 1500 interviews each for Black and Hispanic women. Details of the survey design, sample selection, survey conduct, nonresponse adjustments, missing data imputation procedures, and derivation of sample weights have been described previously.<sup>7,8</sup>

## Interview Technique

Female interviewers conducted home interviews with computer-assisted personal interview (CAPI) technology, which included questions about demographic and socioeconomic characteristics and some sexual behaviors. Especially sensitive questions about sexual behaviors and drug use were also self-administered with audio computer-assisted self-interviewing (ACASI). The CAPI survey asked each respondent the number of men with whom she had had vaginal sex, including her current or former husband or cohabiting partner, if any. For each of these men and for her first male sexual partner ever, each respondent was asked the date (month and year) of first and last vaginal sex with him and, except for her current husband or cohabiting partner, whether she considered him to be a current sexual partner. The ACASI section of the interview also asked the respondent the number of men with whom she had had sexual intercourse (vaginal, oral, or anal). Additional ACASI questions asked

about giving or receiving money or drugs to have sexual intercourse and how often she was “high” on alcohol or drugs when she had sexual intercourse with a man. All of the ACASI responses analyzed referred to the past 12 months.

### Definition of Concurrent Partnerships and Prevalence

We identified concurrent partnerships by comparing the dates of first and last sexual intercourse for all male partners for whom the date of last sexual intercourse fell within the preceding 12 months. Two partnerships were considered concurrent if the month of first sexual intercourse with one partner occurred before the month of last intercourse with the earlier partner.

We calculated cumulative prevalence of concurrent partnerships<sup>9</sup> by dividing the number of women with a concurrent partnership by the number of women in the total population (analyses incorporated the NCHS sample weights).

### Logic Checks, Missing Data, and Edits

The NCHS performed consistency checks and imputation of numerous variables.<sup>8</sup> Almost all women who reported having 2 or more sexual partners in the past year gave consistent information for the number of partners and dates of first and last sexual intercourse for each partner.

To assess whether our computerized date comparison accurately categorized respondents' concurrency status, we visually reviewed partnership histories, characteristics, and other information for more than 2000 respondents.

### Adjustment of Prevalence for Underreporting

Although reporting of sexual experience in the NSFG was higher with the ACASI method, especially for female adolescents aged 15 to 19 years,<sup>10</sup> only the CAPI questionnaire had the partnership dates needed to infer concurrency. Because partnerships were known to be underreported in the CAPI versus ACASI questionnaires,<sup>11</sup> use of the CAPI questionnaire alone may underestimate concurrency prevalence. We therefore compared for each respondent the CAPI and ACASI report of number of sexual partners in the past year. We assessed the extent

to which CAPI may have underestimated multiple partnerships and we used this information to adjust the prevalence of concurrency. Specifically, both the CAPI and ACASI sections of the interview asked respondents the number of men with whom they had had sexual intercourse during the past year, although the ACASI question was not restricted to vaginal intercourse.

To account for possible underreporting of partnership dates in the CAPI compared with the ACASI questionnaire, we estimated an adjusted overall prevalence of concurrency by assuming that all women reporting a given number of sexual partners in the ACASI (2, 3, or  $\geq 4$  partners) had the same concurrency prevalence as the subset of women who provided dates for that number of recent partnerships. Concurrency prevalences for women reporting dates for 2, 3, or  $\geq 4$  recent sexual partnerships (and reporting that number of partners in the ACASI) were 43.07%, 64.32%, and 82.43%, respectively, and 7.61%, 3.04%, and 3.76% of women, respectively, reported 2, 3, or  $\geq 4$  sexual partnerships in ACASI. The adjusted overall concurrency prevalence was estimated as the dot (scalar) product of these vectors.

### Correlates of Concurrency

We examined the associations of concurrent partnerships with CAPI variables for age at interview, marital status, and age at first sexual intercourse and with ACASI variables concerning behaviors in the past year, which included incarceration, binge drinking, alcohol or drug intoxication during intercourse, use of illicit substances, exchange of sexual intercourse for drugs or money, and diagnosis with an STI. Unlike the overall concurrency prevalence estimates outlined previously, analyses of individual-level associations with concurrency were based on concurrency status as determined only from partnership dates. Indicators of socioeconomic status (education, employment, home ownership, and annual household income in the 12 months prior to the survey as a percentage of the federal poverty limit) were examined only for respondents aged 22 years and older.

We examined associations separately among non-Hispanic Whites, non-Hispanic Blacks, and Hispanics. The survey included too few women of other or multiple racial groups to

permit separate analyses of concurrency among them, but these women were included in analyses of the total population. We fit multiple logistic models with concurrency as the dependent variable in a restricted data set (women aged 22 years and older who had been sexually active for at least 1 year), as in our previous NSFG analyses.<sup>5,6</sup> Variables with multiple levels (age, age at first vaginal intercourse, education, and income) were analyzed as unordered categorical variables. Independent variables were removed from the model if they were not associated with concurrency ( $P > .05$ ); their removal did not change the coefficients of other variables by more than 10%, and the natural log of the odds ratios for the final model and the full model did not differ by more than 10%. For statistical analyses, we used the NCHS-provided sample weights, which adjusted for subsampling, nonlocation, nonresponse, and US Census Bureau estimates of the US population, and the SVY commands in Stata version 9.0 (StataCorp LP, College Station, TX) to account for the NSFG's complex sampling design (see Lepkowski et al.<sup>8</sup>).

## RESULTS

Although the age distribution was fairly similar across all racial/ethnic groups except “other,” and Black women were the most likely to report full-time employment, proportionally fewer Black women and Hispanic women reported a college degree, home ownership, or an annual household income greater than 150% of the 2000 federal poverty line (Table 1). Black women were also much less likely to be currently married (26%) than were White women (51%), Hispanic women (46%), and women of other racial/ethnic groups (41%).

### Sexual Relationship History

Median age at first vaginal intercourse was 17 years. Black women were more likely to have initiated sexual intercourse before the age of 16 years (38%) than were Whites (24%), Hispanics (27%), and women of other races/ethnicities (27%). White and Black women had more male sexual partners during their lifetime (median=2) than did Hispanic women (median=1). Blacks were more likely than were women of other racial/ethnic groups to

**TABLE 1—Demographic Characteristics by Race/Ethnicity: US Women, National Survey of Family Growth, 2002**

	Non-Hispanic White	Non-Hispanic Black	Hispanic	Other	Total
Unweighted No.	4139	1530	1589	385	7643
Weighted %	65.87	13.79	14.76	5.59	100.00
Age, y, %					
15-17	9.06	10.53	10.06	18.20	9.47
18-22	16.09	17.66	16.86	6.63	16.48
23-24	5.34	6.22	7.76	16.60	6.00
25-29	14.13	15.18	18.20	18.45	15.03
30-34	16.31	16.20	17.50	19.46	16.70
35-39	18.40	16.95	15.91	20.66	17.62
40-45	20.67	17.26	13.72	0.00	18.70
Nativity, %					
US-born	95.85	89.31	50.19	84.92	85.64
Foreign-born	4.15	10.69	49.81	15.08	14.36
Work status, <sup>a</sup> %					
Full-time	52.34	57.90	43.31	51.72	54.99
Part-time	21.29	15.82	18.30	19.74	17.29
Not working	24.93	24.63	36.99	26.99	26.17
Other	1.44	1.65	1.40	1.56	1.56
Education, <sup>a</sup> %					
Less than high school	6.43	14.19	36.37	11.79	15.77
High-school diploma or GED	29.39	35.95	29.30	29.90	21.12
Some college	31.24	31.91	22.49	29.87	31.19
Bachelor's degree or higher	32.94	17.94	11.83	28.45	31.19
Household income as a percentage of 2000 poverty level, <sup>a</sup> %					
<150%	19.33	41.40	50.51	27.26	27.26
150%-249%	18.90	20.84	23.39	20.08	20.08
250%-399%	28.02	19.03	14.17	24.41	24.41
≥400%	33.76	18.74	11.93	28.26	28.26
Residence, <sup>a</sup> %					
Homeowner	65.19	39.05	41.53	57.04	57.04
Renter	34.81	60.95	58.47	42.96	42.96
Marital status, %					
Married	50.53	25.80	45.56	50.88	46.07
Cohabiting	8.00	9.45	13.42	9.77	9.04
Separated, divorced, or widowed	9.56	12.03	9.72	10.88	9.85
Never married	31.91	52.71	31.29	28.47	35.05
Age at first sexual intercourse, %					
<12	1.21	2.63	0.55	1.38	1.26
12-13	4.71	9.39	4.97	5.40	5.05
14-15	18.51	25.68	21.04	20.28	18.88
16-17	30.13	36.15	26.15	32.67	28.53
≥18	33.98	26.15	47.29	40.28	34.29
No sexual intercourse	11.47	10.44	13.45	18.25	12.00

Continued

report having had 2 or more male sexual partners in the past 12 months or to report having exchanged sexual intercourse for drugs or money in the past 12 months and were much more likely to have had a nonmonogamous male sexual partner in the past 12 months (15%) than were all other groups (6% to 9%). Black women were also more likely to report having used condoms during their most recent sexual intercourse.

### Substance Use

Hispanic women most commonly reported being “high” on drugs or alcohol during sexual intercourse (55%), followed by women of other racial/ethnic groups (33%), White women (31%), and Black women (23%). Binge drinking in the past 12 months was most common among White women (41%), followed by women of other racial/ethnic groups (38%) and Hispanic women (35%), and was lowest among Black women (26%). Marijuana use in the past 12 months was reported by 11% of Hispanic women and 15% of all other women. Crack or cocaine use was reported by 1.5% of Black women and 3% of all other women.

### Prevalence of Concurrent Sexual Partnerships

The unadjusted prevalence of concurrent sexual partnerships in the past 12 months was 5.7% (95% confidence interval [CI]=5.1%, 6.4%); prevalence was 4.3% among Hispanic women, 5.3% among non-Hispanic White women, 10.0% among Black women, and 3.8% among women of other races/ethnicities. The overall concurrency prevalence estimate adjusted for possible underreporting of partners was 8.3%. Adjusted constructed estimates for Hispanic, non-Hispanic White, and non-Hispanic Black women were, respectively, 7.0%, 7.3%, and 16.3%.

### Correlates of Concurrent Sexual Partnerships

Unadjusted analyses indicated moderate to strong associations between sociodemographic factors and sexual partner concurrency (Table 2). Women who were aged younger than 40 years had higher odds of concurrency than those aged 40 years or older; compared with women aged 40 to 44 years, the referent

TABLE 1—Continued

Number of male sexual partners during lifetime, %					
0	11.47	10.44	13.45	5.96	12.00
1-2	30.55	20.96	50.09	32.32	32.74
3-5	26.25	36.65	22.61	28.65	26.86
6-10	19.27	22.18	9.43	19.33	17.69
11-49	11.38	9.12	4.10	10.78	11.18
≥50	1.08	0.65	0.32	0.95	1.24
Number of male sexual partners in the past 12 mo, %					
0	8.95	14.55	9.96	9.85	9.98
1	79.73	69.18	81.98	79.17	78.59
2	6.56	11.01	4.75	6.76	6.89
3	2.86	3.09	1.70	2.38	2.65
≥4	1.90	2.16	1.61	1.84	1.90
Exchanged intercourse for drugs or money in the past 12 mo, %	1.58	4.43	1.55	2.09	2.02
Nonmonogamous male sexual partner in the past 12 mo, %	7.84	15.11	6.33	8.75	8.56
“High” on drugs or alcohol during sexual intercourse in the past 12 mo, %	30.55	23.47	55.32	32.91	32.91
Binge drinking in the past 12 mo, %	40.7	25.92	34.86	37.68	37.12
Marijuana use in the past 12 mo, %	17.36	15.36	10.80	14.89	15.98
Crack or cocaine use in the past 12 mo, %	3.12	1.53	2.82	2.98	2.99
Condom use at most recent vaginal intercourse with a male, %	23.50	36.33	27.27	34.53	26.37

Note. GED = general equivalency diploma.

<sup>a</sup>For respondents aged 22 years and older.

category, concurrency was much more common among women aged 18 to 22 years (prevalence odds ratio [POR]=5.77) and 23 to 24 years (POR=3.86). Foreign-born women were less likely than US-born women to have concurrent partnerships (POR=0.36). Renting (as opposed to owning) a home was the strongest socioeconomic correlate of concurrency (POR=3.41), with particularly strong associations observed among White women (POR=5.68). Having a college education and having an income greater than 150% of the poverty line were inversely associated with concurrency.

In comparison with married women, the odds of concurrency were much higher among women who were separated or previously married (POR=11.55), never married (POR=7.79), or cohabitating (POR=3.24). Concurrency was also strongly associated with younger age at first sexual intercourse. Compared with women who initiated sexual intercourse at age 18 years or older, concurrency prevalence was disproportionately high

among those who first had intercourse at age 12 to 13 years (POR=6.98) and at age 11 years or younger (POR=9.69).

Concurrency was associated with exchange of sexual intercourse for drugs or money and was also strongly associated with indicators of substance use, including drug or alcohol intoxication during sexual intercourse, binge alcohol consumption, and crack or cocaine use. Almost all of these past-year associations had odds ratios (ORs) of 4 or greater overall and among each of the 3 racial/ethnic groups analyzed.

Women who reported having a nonmonogamous male sexual partner were dramatically more likely to have had concurrent sexual partnerships than were women who believed their partners were monogamous (POR=22.64). Women who reported both concurrency and a nonmonogamous male sexual partner were the group most likely to report having had 4 or more male sexual partners (31.2%), binge drinking (77.0%), use of drugs or alcohol during sexual intercourse

(76.0%), marijuana use (52.7%), and crack or cocaine use (18.9%; data not shown; all behaviors referred to the past 12 months). The great majority of women who reported having multiple sexual partners in the past 12 months were involved in concurrent partnerships either directly (i.e., the respondent herself had concurrent partners), indirectly (i.e., respondent believed her partner had concurrent partnerships during the course of their sexual relationship), or both directly and indirectly (Figure 1).

### Multiple Logistic Models

The associations between concurrent sexual partnerships and Black race/ethnicity, age, marital status, age at first sexual intercourse, having a nonmonogamous male sexual partner, binge drinking, alcohol or drug intoxication during sexual intercourse, and using crack or cocaine persisted in multiple logistic models. Associations between concurrency and nativity, employment status, education, poverty indicators, home ownership, exchanging sexual intercourse for money or drugs, and marijuana use were not statistically significant, and their removal did not meaningfully change the values of the ORs for the other covariates. ORs for the final model are presented in Table 3.

### DISCUSSION

The prevalence of concurrent sexual partnerships during the preceding year in this nationally representative sample of US women of reproductive age was 5.7% based on reported partnerships and 8.3% when adjusted for possible underreporting. The unadjusted concurrency prevalence of 5.7% is consistent with the unadjusted 5-year prevalence (12%) we found in the 1995 NSFG<sup>5</sup> and very close to our (unpublished) preliminary estimate of 1-year prevalence from the 1995 data. As in the earlier study, multivariable analyses indicated that concurrency among women was independently associated with younger age at time of interview, marital status other than currently married, younger age at first sexual intercourse, and non-Hispanic Black race/ethnicity. We examined additional potential correlates and found that concurrency was also associated with exchanging intercourse for money or drugs, binge drinking, drug or

**TABLE 2—Unadjusted Prevalence Odds Ratios (PORs) for Concurrency, by Race/Ethnicity: US Women, National Survey of Family Growth, 2002**

Variable	Non-Hispanic White, POR (95% CI)	Non-Hispanic Black, POR (95% CI)	Hispanic, POR (95% CI)	Total, POR (95% CI)
POR	1.00	1.99 (1.44, 2.75)	0.80 (0.51, 1.24)	NA <sup>b</sup>
Age, y				
15-17	2.73 (1.22, 6.10)	1.23 (0.51, 2.92)	0.96 (0.20, 4.69)	2.01 (1.12, 3.58)
18-22	7.84 (4.35, 14.14)	2.81 (1.35, 5.88)	4.58 (1.12, 18.79)	5.77 (3.77, 8.83)
23-24	4.23 (2.17, 8.25)	2.41 (0.90, 6.46)	5.35 (1.44, 19.86)	3.86 (2.27, 6.58)
25-29	3.53 (1.94, 6.43)	1.86 (0.93, 3.71)	2.04 (0.58, 7.22)	2.76 (1.71, 4.44)
30-34	3.25 (1.67, 6.33)	1.67 (0.65, 4.28)	2.30 (0.57, 9.23)	2.64 (1.54, 4.53)
35-39	2.10 (0.94, 4.70)	0.97 (0.36, 2.58)	2.33 (0.80, 6.77)	1.73 (1.03, 2.90)
40-44 (Ref)	1.00	1.00	1.00	1.00
Nativity				
US-born (Ref)	1.00	1.00	1.00	1.00
Foreign-born	0.44 (0.20, 0.96)	0.40 (0.11, 1.43)	0.25 (0.12, 0.53)	0.36 (0.21, 0.60)
Work status <sup>a</sup>				
Full-time (Ref)	1.00	1.00	1.00	1.00
Part-time	0.81 (0.52, 1.28)	1.08 (0.65, 1.81)	1.50 (0.67, 3.39)	0.94 (0.67, 1.30)
Not working	0.71 (0.42, 1.19)	0.91 (0.50, 1.63)	0.77 (0.31, 1.90)	0.72 (0.49, 1.04)
Other	0.95 (0.28, 3.20)	4.69 (0.99, 88.29)	NA <sup>b</sup>	1.46 (0.52, 4.09)
Education <sup>a</sup>				
Less than high school (Ref)	1.00	1.00	1.00	1.00
High-school diploma	1.59 (0.69, 3.66)	0.63 (0.33, 1.19)	0.86 (0.40, 1.86)	0.97 (0.62, 1.51)
Some college	1.42 (0.64, 3.15)	0.39 (0.20, 0.78)	1.23 (0.48, 3.14)	0.81 (0.51, 1.28)
Bachelor's degree or higher	0.80 (0.37, 1.72)	0.42 (0.17, 1.04)	0.58 (0.17, 2.00)	0.47 (0.29, 0.78)
Household income as a percentage of 2000 poverty level <sup>a</sup>				
< 150 (Ref)	1.00	1.00	1.00	1.00
150-249	0.55 (0.31, 1.00)	0.80 (0.44, 1.46)	0.86 (0.40, 1.85)	0.67 (0.46, 0.97)
250-399	0.65 (0.37, 1.15)	0.38 (0.19, 0.78)	1.19 (0.50, 2.84)	0.65 (0.42, 1.00)
≥ 400	0.39 (0.23, 0.66)	0.83 (0.42, 1.61)	0.56 (0.18, 1.78)	0.48 (0.33, 0.71)
Residence				
Owned home (Ref)	1.00	1.00	1.00	1.00
Rented	5.68 (3.47, 9.31)	1.55 (0.88, 2.74)	1.28 (0.59, 2.77)	3.41 (2.43, 4.79)
Marital status				
Married (Ref)	1.00	1.00	1.00	1.00
Cohabiting	4.34 (1.98, 9.51)	1.88 (0.60, 5.90)	0.62 (0.15, 2.61)	3.24 (1.85, 5.69)
Separated, divorced, or widowed	13.33 (7.04, 25.26)	6.99 (3.53, 13.81)	6.61 (2.48, 17.63)	11.55 (7.25, 18.41)
Never married	9.32 (5.52, 15.72)	4.52 (2.52, 8.10)	4.42 (1.83, 10.69)	7.79 (5.24, 11.59)
Age, y, at first sexual intercourse				
< 12	9.63 (3.33, 27.90)	8.47 (2.44, 29.34)	NA <sup>b</sup>	9.69 (4.62, 20.30)
12-13	6.98 (3.52, 13.82)	7.04 (2.72, 18.22)	3.80 (1.55, 9.29)	6.98 (4.27, 11.40)
14-15	3.09 (1.79, 5.35)	5.92 (3.18, 11.01)	3.70 (1.67, 8.18)	3.96 (2.71, 5.80)
16-17	2.32 (1.34, 3.99)	2.43 (1.25, 4.73)	1.68 (0.73, 3.85)	2.31 (1.55, 3.44)
≥ 18 (Ref)	1.00	1.00	1.00	1.00
Exchanged intercourse for drugs or money in past 12 mo				
No (Ref)	1.00	1.00	1.00	1.00
Yes	5.00 (1.71, 14.65)	3.36 (1.83, 6.17)	7.43 (2.16, 25.58)	4.73 (2.46, 9.08)

Continued



TABLE 2—Continued

Nonmonogamous male sexual partner in the past 12 mo				
No (Ref)	1.00	1.00	1.00	1.00
Yes	23.28 (16.11, 33.66)	12.46 (7.71, 20.14)	41.88 (22.49, 77.98)	22.64 (17.45, 29.36)
Drugs or alcohol during sexual intercourse in the past 12 mo				
No (Ref)	1.00	1.00	1.00	1.00
Yes	7.29 (5.00, 10.62)	5.22 (2.81, 9.70)	1.30 (0.79, 2.13)	4.75 (3.48, 6.49)
Binge drinking in the past 12 mo				
No (Ref)	1.00	1.00	1.00	1.00
Yes	5.89 (3.79, 9.14)	3.96 (2.31, 6.81)	6.05 (3.34, 10.95)	4.73 (3.44, 6.51)
Crack or cocaine use in the past 12 mo				
No (Ref)	1.00	1.00	1.00	1.00
Yes	12.06 (7.52, 19.33)	5.98 (2.78, 12.86)	11.80 (5.77, 24.14)	9.64 (6.59, 14.10)
Marijuana use in the past 12 mo				
No (Ref)	1.00	1.00	1.00	1.00
Yes	6.12 (4.32, 8.65)	4.33 (2.70, 6.95)	5.51 (2.83, 10.74)	5.54 (4.29, 7.15)

Note. CI = confidence interval; NA = not available.

<sup>a</sup>For respondents aged 22 years and older.

<sup>b</sup><20 observations.

alcohol intoxication during sexual intercourse, using crack or cocaine, and having a nonmonogamous male sexual partner. Our observation that women with concurrent partnerships are very likely to be linked sexually with men with concurrent partnerships suggests that the sexual networks to which respondents with concurrent partnerships belong are extensive and interconnected.

### Correlates of Concurrency

Correlates of concurrency were generally comparable among Black, White, and Hispanic women, although some racial/ethnic differences were observed. Black women were twice as likely as White women to have concurrent partnerships (an association that decreased after control for covariates) and were also more likely than White women to have used condoms

during their most recent sexual intercourse. As in our previous study, younger women were most likely to have had concurrent partnerships, an association that was most visible for White women aged 18 to 22 years and Hispanic women aged 23 to 24 years. Although age was inversely associated with concurrency among Black women, the association was considerably weaker than among White and Hispanic women.

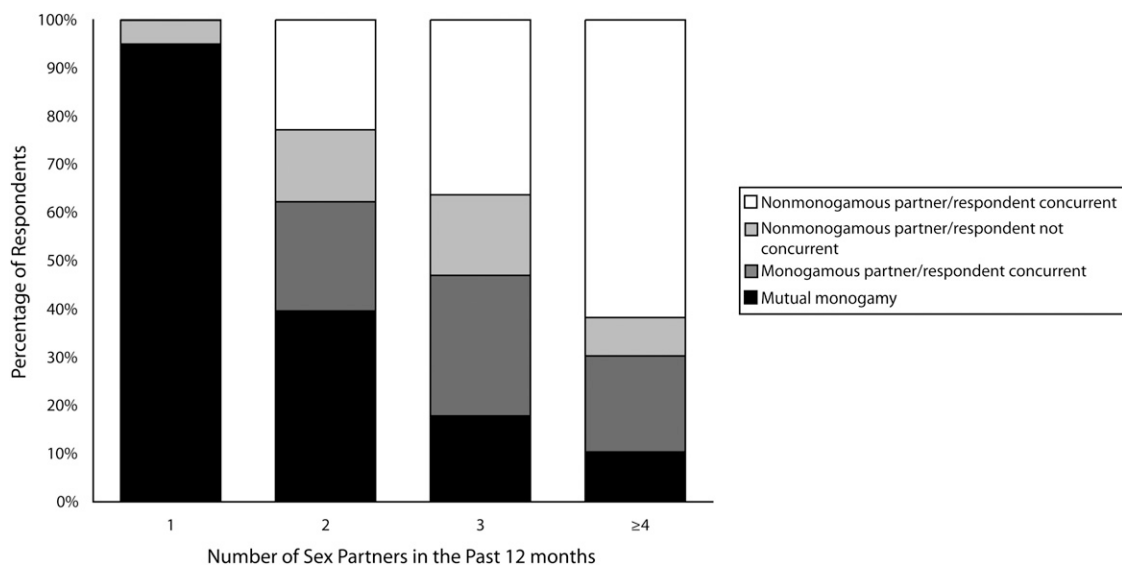


FIGURE 1—Concurrent sexual partnerships and nonmonogamous sexual partners by number of sexual partners in the past 12 months: US women, National Survey of Family Growth, 2002.

**TABLE 3—Multiple Logistic Prevalence Odds Ratios for Concurrent Sexual Partnerships Among US Women (n = 5435) Aged 22 to 44 Years With at Least 1 Year of Sexual Intercourse Experience: National Survey of Family Growth, 2002**

Variable	Odds Ratio (95% CI)
<b>Race/ethnicity</b>	
Non-Hispanic Black	1.78 (1.09, 2.91)
Hispanic	1.03 (0.57, 1.85)
Other	0.78 (0.38, 1.59)
Non-Hispanic White (Ref)	1.00
<b>Age, y</b>	
22-24	2.44 (1.34, 4.46)
25-29	2.16 (1.13, 4.11)
30-34	2.94 (1.73, 4.99)
35-39	1.95 (1.05, 3.64)
40-44 (Ref)	1.00
<b>Marital status</b>	
Cohabiting	1.04 (0.56, 1.95)
Separated, divorced, or widowed	6.56 (3.61, 11.92)
Never married	3.81 (2.13, 6.81)
Married (Ref)	1.00
<b>Age, y, at first sexual intercourse</b>	
12-13	2.89 (1.64, 5.08)
14-15	1.76 (1.08, 2.87)
16-17	1.24 (0.77, 1.98)
≥18 (Ref)	1.00
<b>Nonmonogamous male sexual partner in the past 12 mo</b>	
Yes	6.96 (4.81, 10.07)
No (Ref)	1.00
<b>Drugs or alcohol during sexual intercourse in the past 12 mo</b>	
Yes	1.61 (1.10, 2.37)
No (Ref)	1.00
<b>Binge drinking in the past 12 mo</b>	
Yes	1.70 (1.12, 2.54)
No (Ref)	1.00
<b>Crack or cocaine use in the past 12 mo</b>	
Yes	2.72 (1.43, 5.16)
No (Ref)	1.00

Note. CI = confidence interval.

Foreign-born women of all racial/ethnic groups were much less likely than were US-born women to have concurrent sexual partnerships. Similarly, our previous analysis of concurrency among US men revealed that foreign-born Hispanic men were less likely to have concurrent sexual partnerships than were those born in the United States, although the association between concurrency and country of birth was weaker for men than for women.<sup>6</sup> Minnis et al. observed a lower prevalence of

some sexual risk behaviors (first vaginal sexual intercourse before age 17 years, multiple partners) among foreign-born Latinas than among both non-Latinas and US-born Latinas.<sup>12</sup> Compared with their US-born counterparts, foreign-born Asian and Latino youths were less likely to use illicit drugs or to participate in sexual risk behaviors.<sup>13</sup> We did not evaluate measures of acculturation, such as length of residence in the United States and primary language spoken among NSFG respondents. Nevertheless, others

have reported that more-acculturated people tend to adopt the sexual practices of the majority culture, although the extent to which this adoption changes their risk behaviors may vary by gender and ethnicity.<sup>14</sup>

Previous studies have documented the association between substance use and concurrency among Blacks,<sup>15,16</sup> Cameroonian men,<sup>17</sup> and US men,<sup>6</sup> but few reports have examined the relationship between substance use and concurrency among women in the general US population. White women were more likely than Black or Hispanic women to report binge alcohol consumption and use of marijuana, crack, or cocaine. Prevalence of binge alcohol consumption among White women (40.7%) was especially high. Thus, if binge drinking is causally related to concurrent partnerships, its population-attributable risk for concurrency, especially among White women, is likely to be substantial.

#### Direct and Indirect Concurrency

Women with concurrent sexual partnerships (“direct concurrency”) were much more likely than other women to report that their partners were also nonmonogamous (“indirect concurrency”), a pattern we have seen among 3 other groups—male NSFG respondents, Blacks from eastern North Carolina’s general population, and North Carolina Blacks with heterosexually transmitted HIV infection—where ORs for the association between having overlapping partnerships and having a nonmonogamous heterosexual partner were, respectively, 6.1, 6.4, and 2.4.<sup>6,15,16</sup>

The proportion of US women in the present study who believed their partners had concurrent partnerships (8.6%) is quite close to the proportion of US men who had concurrent partnerships in the past year (approximately 11%),<sup>6</sup> and the proportion of US men who believe they had a nonmonogamous partner (10.5%)<sup>6</sup> is similar to our estimate of concurrency prevalence among women in this study (8.3%). All 4 of these percentages (men’s and women’s concurrency prevalence and belief in partner concurrency) are much greater among non-Hispanic Black men and women, which likely contributes to the high incidence and prevalence of HIV and other STIs among Blacks. The association between concurrency and nonmonogamous partners also overlaps with other risk behaviors. Among women with concurrent sexual partnerships,

those women who also had a nonmonogamous partner were much more likely than those women with only monogamous partners to have had 4 or more sexual partners in the past year and to report substance use (Figure 1).

Although men and women share several other correlates of concurrency, including single marital status, younger age at first sexual intercourse, and drug or alcohol intoxication during sexual intercourse,<sup>6</sup> concurrency's relation to income, education, and home ownership (an indicator of wealth) appeared to vary by gender and race. For women in our study, those who had higher income or owned their homes were much less likely to have concurrent partnerships than were women in lower income strata or women who rented their dwelling. The association between low income and concurrency was much stronger among White women than among Black or Hispanic women. By contrast, higher income was positively associated with concurrency among men of all races/ethnicities.<sup>6</sup> The role of economic resources in concurrency likely differs substantially for men and women.

Social sciences literature provides some insight into possible reasons for these observations concerning concurrency. One conceptual model, derived in part from social exchange theory, argues that sexual networks and other aspects of relationships between men and women are driven by a combination of the gender ratio (number of men to women) and gender differences in structural power (the economic, political, and legal structures of society).<sup>18(p21–26)</sup> We have previously described pathways between sexual network patterns among Blacks and the social and economic context for these pathways. Contextual forces, such as poverty, discrimination, low gender ratios, racial segregation, illicit drug use, and high incarceration rates, influence sexual networks directly and indirectly through a variety of mechanisms.<sup>19–21</sup> These contextual forces, along with gender disparities in structural power, also influence women's ability to refuse sexual partners who are not monogamous, as may be the case with some Hispanic and Black women.<sup>22,23</sup>

Our findings are subject to the usual limitations of self-reported data related to understanding, recall, and communication.<sup>24</sup> Moreover, concurrency is difficult to measure. Methods for measuring concurrent sexual partnerships vary, and there is currently no single

standard.<sup>9</sup> For example, some investigators have determined concurrency by directly asking respondents whether they had had multiple partners during the course of a sexual relationship.<sup>25,26</sup> Other investigators, as we did, have assessed concurrency by comparing dates of first and last sexual intercourse with different sexual partners during a given time frame (for example, Potterat et al.<sup>27</sup> and Koumans et al.<sup>28</sup>)—a method that is considered to be one of the more robust methods of measuring concurrency.<sup>29</sup>

Identifying concurrency by comparing dates has limitations, however. In a study of partnership patterns among young adults in public clinics for treatment of sexually transmitted diseases, Nelson et al. found only fair agreement ( $\kappa=0.395$ ) between the date and direct query methods.<sup>30</sup> The respondents in this study were young adults (aged 18 to 26 years) being treated for sexually transmitted diseases in public clinics. Moreover, individuals were classified as concurrent if the dates of first and last intercourse overlapped or were within the same month and year, a classification scheme that tends to overestimate concurrency because a partnership that began 3 weeks after another ended would be misclassified as concurrent if the dates of first and last sexual intercourse with both partners occurred during the same calendar month.

By contrast, another study yielded substantial agreement ( $\kappa=0.69$ ; 95% CI=0.59, 0.79) between concurrency status computed from partnership dates and respondents' self-report of having engaged in concurrent partnerships.<sup>16</sup> This second study is similar to our current analysis in its use of a study population that included older adults from the general population (as opposed to young patients with sexually transmitted diseases) and its restriction of concurrency definition to partnerships that overlapped by more than 1 month. Thus, we believe that our approach most closely estimates the true prevalence of concurrency among this study population.

Respondents' reports about their partners' concurrent sexual partnerships raise the additional question of whether respondents have accurate knowledge of their partners' monogamy or lack thereof. Although some (but not all, e.g., Ellen et al.<sup>31</sup>) studies have reported poor agreement between individuals' reports of their partners' concurrent partnerships and their partners'

reports of their own concurrent heterosexual partnerships,<sup>32,33</sup> poor agreement in individuals' ability to predict their partners' concurrency appears to arise mainly from participants' failure to recognize or identify lack of monogamy by a partner rather than arising from a tendency to overreport a partner's lack of monogamy. For example, Drumright et al. compared respondents' perceptions of their partners' concurrency during their relationship with their partners' reports of their own concurrency.<sup>34</sup> Most people whose partners reported being monogamous said their partners were monogamous, and 14% said their partners were not monogamous. Conversely, 76% of individuals whose partners reported having concurrent partnerships did not identify their partners' lack of monogamy. Thus, to the extent that these estimates can be generalized to the general population, the NSFG data likely underestimate the extent of concurrency among respondents' partners.

A major strength of our investigation was its use of a large, high-quality, nationally representative data set that oversampled non-Hispanic Blacks and Hispanics. But even high-quality surveys are susceptible to bias from differential nonresponse and from inability or reluctance to disclose accurate and detailed information about past sexual partnerships and other sensitive topics.

## Conclusion

This study, with its inclusion of data concerning substance use, sensitive sexual behaviors, and perceptions of partners' monogamy, extends our findings from the NSFG cycle 5.<sup>5</sup> We estimate that in 2002 more than 8% of US women had concurrent sexual partnerships during the past year, often with men who themselves had concurrent partnerships at the same time. The association of concurrency among women with concurrency among men, together with the substantial numbers of male partners reported by women who had both direct and indirect concurrency, suggests the existence of interconnected sexual networks that contribute to population dissemination of HIV and other STIs. In addition, the association of substance use with concurrency links elevated infection risk with elevated opportunity for dissemination and reinforces the importance of interventions to prevent abuse of alcohol and other substances.



Further research is needed to improve measurement of concurrency, gain more understanding of what personal and contextual factors influence this sexual pattern, increase public awareness of the HIV transmission risk posed by concurrency, and develop effective, culturally appropriate interventions to reduce concurrency or increase condom use in such situations. Successful control of the HIV epidemic will also require addressing the economic forces, social influences, and other contextual factors that militate against stable monogamy, thereby increasing concurrency among the overall population and among different population subgroups. ■

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### Contributors

A.A. Adimora and V.J. Schoenbach originated the study and supervised all aspects of its implementation. E.M. Taylor and M.R. Khan assisted with the study and analyses and helped conceptualize ideas, interpret findings, and review drafts. R.J. Schwartz assisted with the analyses.

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### Human Participant Protection

This study was exempted from review by the School of Medicine's Office of Human Research Ethics at the University of North Carolina at Chapel Hill because the National Survey of Family Growth, a public-use data file, does not contain personal identifiers.

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