Sexually Transmitted Diseases Among Young Heterosexual Urban Adults

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Synopsis

A self-administered, confidential survey of respondents' history of selected sexually transmitted disease (STD) was conducted in 1987–88 among adults enrolled in a multicenter study of cardiovascular disease. Respondents (and response rates) included 535 white men (78 percent), 694 white women (89 percent), 262 black men (48 percent), and 472 black women (64 percent), ages 21 to 40 years at the time of the survey. Among those who were heterosexually active, 43 percent of black women, 37 percent of black men, 33 percent of white women, and 21 percent of white men reported ever having had at least one STD in the survey. A history of syphilis or gonorrhea was more commonly reported by blacks than whites; a history of genital herpes, chlamydia, or genital warts was more commonly reported by women than men.

Independent risk factors for having had at least one STD in the survey included female sex; use of cocaine, amphetamines, or opiates; and lifetime number of sex partners. The number of sex partners was the most predictive risk factor. Black race was a significant marker for other, unidentified STD risk factors. The data show a high prevalence of a lifetime history of STD among young heterosexual urban U.S. adults with possible implications for the future spread of human immunodeficiency virus infection.

THE RISK OF CONTRACTING human immunodeficiency virus (HIV) infection is higher among persons with previous or concomitant sexually transmitted disease (STD) (*1–5*).

In laboratory studies, infection with herpes simplex virus types I and II has been found to increase HIV replication (*2*). In the United States, men who have sex with men have been reported to be 2.3 times more likely to have HIV antibodies if they also have a history of genital, anal, or oral herpes. They are 8.4 times more likely to have HIV antibodies if they have serologic evidence of syphilis (*3*). Among prospectively followed commercial sex workers in Nairobi, those with genital ulcers were 3.7 times more likely to develop HIV antibodies than were those without genital ulcers (*4, 5*). Prior HIV infection also has been associated with increased risk of contracting other STD upon subsequent exposure (*6*). While a portion of the increased risk may be explained by factors common

'In 1990, the incidence of AIDS increased most rapidly among persons exposed to the virus through heterosexual contact and among women. Thus, the high frequency of STD reported by this select group of young, heterosexual, urban adults is of concern.'

to both HIV and other STD, it appears that persons with prior STD are at especially high risk of acquiring HIV infection.

Available STD data have been derived primarily from persons attending STD clinics or from other special populations (*7–13*). Data from healthy young adults are important as well, because late adolescence and young adulthood are prime ages for transmission of HIV and other STD (*14–16*). In light of concerns about the spread of HIV infection and other STDs, information on STD in surveyed populations is useful in devising and guiding prevention strategies that are specific for a population subgroup and for specific STDs. The investigators present epidemiologic information on STD history in a cohort of young, heterosexual, urban, black and white adults living in four U.S. cities in 1987–88.

Methods

Participants for this study were recruited from those 21–40 years old who had already enrolled in a multicenter study of risk factors for cardiovascular disease. The survey was approved by the Institutional Review Board of each participating center. The recruitment and methods of followup for the cardiovascular study are described (*17*). Briefly, 5,115 young adults from Birmingham, AL; Chicago, IL; Minneapolis, MN; and Oakland, CA, initially were enrolled in the cardiovascular study in 1985–86.

A second examination was conducted in 1987–88 among 4,624 persons responding (90 percent response rate). Information on respondents' age, race, sex, level of education, and city of residence was obtained from the second cardiovascular examination of 1987–88, together with lifetime frequency of use of marijuana, cocaine, amphetamines, and opiates (requested as whether used 0, 1–2, 3–10, 11–99, or 100 times or more).

In September 1989, all Minneapolis participants and 50 percent of the participants from the other three sites, a total of 2,729 persons (677 white men, 777 white women, 541 black men, and 734 black women) were mailed a self-administered confidential questionnaire. The survey concerned their STD history and their risk behaviors, attitudes, and beliefs related to acquired immunodeficiency syndrome (AIDS). The sampling fraction for the AIDS survey was determined by the availability of funds at each site and by the desire to assess the potential impact of the ancillary survey on retention in the overall cardiovascular cohort. Subjects were assured that no responses would be sent to the clinical centers, where names were known. Two additional mailings and a followup postcard were sent to maximize response rates (*18*). The AIDS survey methodology has been described (*19*).

Of the 2,729 young adults eligible for the AIDS survey, 72 percent (1,971) returned their questionnaires. White women had the highest response rate (89 percent), black men had the lowest (48 percent), and white men (78 percent) and black women (64 percent) had intermediate response rates. Response rates were 62 percent for those with high-school level education or less, and 75 percent for those with at least some college. No consistent differences in response rates were observed among the four surveyed cities.

Eight persons were excluded from analysis because of missing information on race or sex, 69 because they reported never having been sexually active, and 254 who reported a lifetime history of same-sex partners, yielding a final study population of 1,640 persons, which inclued 420 white men, 576 white women, 226 black men, and 418 black women. Eight percent of black men, 8 percent of black women, 4 percent of white women, and 3 percent of white men refused to answer at least one specific STD question (table 1). Missing data rates were consistent for specific STDs and were in the range of 1–3 percent for each STD that was asked about among whites and 3–6 percent among blacks (table 1).

The questionnaire assessed past and present sexual behaviors, including age at first vaginal, oral, or anal intercourse; the lifetime number of sex partners; and use of condoms. In addition, participants were asked if they had ever been told by a physician that they had syphilis, gonorrhea, genital herpes, chlamydia, genital warts, or any other STD. Association between the presence of one or more STDs and each covariate was assessed using chi-square tests, two-tailed Fisher's exact tests,

Cochran-Mantel-Haenszel tests for nonzero correlation, and Wilcoxon's nonparametric test (*20*).

Unconditional multiple logistic regression (*21*) was used to determine the odds of ever having had one or more of the surveyed STDs among persons with one or more of the covariates, relative to the odds among those without one or more covariates. Covariates in the regression models included sex, race, drug use (amphetamines, cocaine, opiates, or marijuana), lifetime number of sex partners, age at first sexual intercourse, type of intercourse (vaginal, anal, or oral), condom use, city of residence, level of education, and age at the time of the survey. The adjusted odds ratios were determined by exponentiating the coefficient of the dichotomous outcome variable; 95 percent confidence limits and two-tailed *P*-values were established from the regression coefficients and their standard errors.

Results

The mean age of the subjects at the time of the survey was 30 years. The proportions of respondents reporting a history of the surveyed STDs are given in table 2. More black respondents than white respondents reported having had at least one of the surveyed STDs during their lifetimes. Black women reported the highest lifetime prevalence of one or more surveyed STDs and white men the lowest.

The proportions of respondents reporting a history of one or more of the surveyed STDs during their lifetimes are shown in table 3, according to selected respondent characteristics. Among black women, those who were younger at the time of the survey were significantly more likely than the older respondents to report ever having had one of the surveyed STDs during their lifetime. Region of the country was significantly associated with lifetime STD history among white women only. There were no consistent patterns found for STD history by level of education. Among black women, ever having had oral intercourse placed them at higher likelihood of an STD history than those who reporting never having had oral intercourse. Condom usage and STD history were significantly associated only among black women. The proportion reporting one or more STDs was highest among those who had used street drugs more than 10 times during their lifetime.

The proportions of respondents reporting having had one or more of the surveyed STDs during the previous year, according to the number of years of sexual activity and the number of partners in the year preceding the survey, are shown in table 4. A significant relationship among the previous year history of STD, the number of years sexually active, and the number of sex partners in the previous year was present only among white men.

Multiple logistic regression analyses for the association between lifetime history of one or more of the surveyed STDs and respondents' characteristics are shown in table 5. Independent predictors of a lifetime history of one or more STDs among men included lifetime use of cocaine, amphetamines, or opiates more than 10 times, and number of sex partners.

Independent STD predictors among women were number of sex partners, and age at first sexual intercourse. Black race was significantly associated as a risk marker for STD history in both sexes.

Table 6 shows multiple logistic regression results for two categories of STD (syphilis or gonorrhea and genital herpes, chlamydia, or genital warts). Independent predictors for lifetime history of syph-

Table 1. Percentages of respondents who refused to answer survey questions regarding their lifetime history of specific STDs among 1,640 sexually active heterosexual urban adults, ages 21–40 years, in 4 U.S. cities, 1987–88, by racial group and sex

Specified STD	White men (N = 420)	White women (N = 576)	Black men (N = 226)	Black women (N = 418)
At least 1 STD	3	4	8	8
Syphilis	2	2	6	5
Gonorrhea	2	2	4	3
Genital herpes	2	3	6	6
Chlamydia	2	2	5	5
Genital warts	2	1	6	5

NOTE: STD = sexually transmitted disease.

Table 2. Percentages of respondents reporting a lifetime history of specific STDs among 1,640 sexually active heterosexual urban adults, ages 21–40 years, in 4 U.S. cities, 1987–88, by racial group and sex

STD	White men (N = 420)	White women (N = 576)	Black men (N = 226)	Black women (N = 418)
At least 1 STD	21	33	37	43
Syphilis	1	1	4	3
Gonorrhea	4	7	22	22
Genital herpes	3	10	6	6
Chlamydia	5	9	8	12
Genital warts	8	13	4	9
Syphilis or gonorrhea	5	7	24	23
Genital herpes, chlamydia, or genital warts	14	25	15	24

NOTE: STD = sexually transmitted disease.

Table 3. Proportions of respondents reporting a lifetime history of 1 or more STDs among 1,640 sexually active heterosexual urban adults, ages 21–40 years, in 4 U.S. cities, 1987–88, by racial group and sex

Characteristic	White men		White women		Black men		Black women	
	Number responding	Percent with history	Number responding	Percent with history	Number responding	Percent with history	Number responding	Percent with history
Age (years):								
21–26	74	18	110	32	69	30	149	53
27–30	148	24	197	30	67	39	120	36
31–34	171	20	248	34	83	40	126	38
35–40	12	17	7	14	5	60	13	54
		$P=0.65$		$P=0.64$		$P=0.43$		$P=0.02$
Study site:								
Birmingham	73	15	82	17	54	30	86	33
Chicago	74	26	96	25	41	24	81	47
Minneapolis	199	21	276	39	74	42	117	44
Oakland	73	25	121	33	57	46	132	47
		$P=0.38$		$P<0.01$		$P=0.08$		$P=0.71$
Education:								
Some high school	90	26	130	40	110	35	158	42
Some college	113	21	146	32	70	41	163	42
College graduate	201	19	285	29	43	33	80	48
		$P=0.44$		$P=0.07$		$P=0.59$		$P=0.71$
Type of intercourse:								
Vaginal never	1	0	4	25	2	0	2	0
Vaginal ever	351	24	495	34	198	37	355	44
		$P=1.00$		$P=1.00$		$P=0.53$		$O=0.21$
Anal never	301	23	432	33	170	35	314	43
Anal ever	50	28	62	40	28	50	42	52
		$P=0.40$		$P=0.25$		$P=0.14$		$P=0.25$
Oral never	22	18	36	33	60	32	131	36
Oral ever	325	24	460	34	138	40	222	50
		$P=0.53$		$P=0.94$		$P=0.27$		$P=0.01$
Condom use with steady sex partner in the past year:								
Never	154	19	260	32	107	35	196	41
Sometimes	133	23	167	35	66	39	102	54
Always	29	28	43	30	12	42	25	24
		$P=0.54$		$P=0.71$		$P=0.76$		$P=0.01$
Condom use with sex partners other than steady sex partner in the past year:								
Never	34	29	57	53	31	55	52	69
Sometimes	45	47	48	46	39	44	50	54
Always	10	40	15	33	21	29	21	43
		$P=0.30$		$P=0.39$		$P=0.17$		$P=0.08$
Ever used marijuana:								
Never	77	8	101	15	54	28	145	36
1–2 times	18	6	48	21	10	30	48	42
3–10 times	53	8	111	27	27	33	74	49
11–100 times	84	30	190	35	51	33	84	45
More than 100 times	172	28	111	53	81	47	52	58
		$P<0.02$		$P<0.01$		$P=0.20$		$P=0.07$
Ever used cocaine, amphetamines, or opiates:								
Never	171	11	253	20	130	27	281	39
1–2 times	36	8	67	30	23	43	42	48
3–10 times	80	24	113	44	26	42	46	59
11–100 times	88	35	95	43	32	56	22	50
More than 100 times	29	45	33	58	12	67	12	67
		$P<0.01$		$P<0.01$		$P<0.01$		$P=0.05$

NOTE: STD = sexually transmitted disease. Numbers available for analysis differed slightly because of missing data for some variables.

Table 4. Proportions of respondents reporting a history of 1 or more STDs in the previous year among 1,640 sexually active heterosexual urban adults, ages 21–40 years, in 4 U.S. cities, 1987–88, by racial group and sex

Characteristic	White men		White women		Black men		Black women	
	Number responding	Percent with history	Number responding	Percent with history	Number responding	Percent with history	Number responding	Percent with history
Number of years sexually active:								
0–2	2	0	3	0	1	0	4	0
3–7	56	0	73	1	14	0	51	16
8–14	200	2	283	7	81	5	201	8
More than 14	138	7	186	5	115	8	133	8
	$P<0.01$		$P=0.52$		$P=0.20$		$P=0.37$	
Number of sex partners in previous year:								
None	65	0	68	4	27	11	63	5
1	276	3	398	5	112	1	249	8
2	24	4	54	6	15	13	45	11
3–6	48	8	51	10	57	7	54	15
More than 6	7	14	5	0	15	20	7	14
	$P<0.01$		$P=0.32$		$P=0.07$		$P=0.04$	

NOTE: STD = sexually transmitted disease.
Numbers available for analysis differed slightly because of missing data for some variables.
P values are from Cochran-Mantel-Haenszel Test for nonzero correlation (linear trend).

Table 5. Multiple logistic regression analysis of the association between a lifetime history of 1 or more STDs and selected characteristics of sexually active heterosexual urban adults, ages 21–40 years, in 4 U.S. cities, 1987–88

Characteristic[1]	Men (Number in model = 605)			Women (Number in model = 929)		
	OR	CI	P-value	OR	CI	P-value
Race[2]	2.1	1.3–3.2	<0.01	1.9	1.4–2.6	<0.01
Marijuana use[3]	1.5	0.9–2.5	0.10	1.2	0.8–1.6	0.36
Cocaine, amphetamines, opiates[3]	2.1	1.3–3.3	<0.01	1.0	0.7–1.5	0.99
Lifetime number of sex partners[4]	1.7	1.4–2.1	<0.01	2.0	1.7–2.4	<0.01
Age at first sexual intercourse[4]	0.7	0.3–1.6	0.37	0.3	0.1–0.7	<0.01
Likelihood ratio test	97.13		0.0001	138.13		0.0001

[1]Refers to the effect for that characteristic, adjusted for the effects of all other characteristics included in the model. Study site, age at survey, level of education, type of intercourse (vaginal, anal, or oral), history of prostitution or rape, and condom usage were included in full models, but dropped from final models.
[2]Blacks = 1, whites = 0. This variable should be viewed as a risk marker for other, unidentified, risk factors.
[3]Lifetime use more than 10 times = 1, use 10 times or fewer = 0.
[4]Entered in the model as the log (characteristic).
NOTE: STD = sexually transmitted disease. OR = odds ratio. CI = confidence interval.

ilis or gonorrhea included female sex; lifetime use of cocaine, amphetamines, or opiates more than 10 times; being a college graduate; the number of sex partners; age at first intercourse, and having had vaginal intercourse. Black race was a significant marker for other, unidentified risk factors. STD predictors for genital herpes, chlamydia, or genital warts included female sex; lifetime marijuana use more than 10 times; and number of sex partners.

Discussion

The key finding is that 43 percent of black women, 37 percent of black men, 33 percent of white women, and 21 percent of white men who responded to the survey reported ever having had at least one of the specific STDs assessed. After adjusting for the effects of other covariates, the strongest independent STD predictors among this group of heterosexual, young, urban adults were female sex, age at first intercourse, and number of partners. Black race was a significant risk marker. Black respondents more commonly reported having had gonorrhea or chlamydia; whites most commonly reported a history of genital herpes, genital warts, or chlamydia. Racial differences reported should be interpreted cautiously, however, because of variations in response rates among the race-sex

Table 6. Multiple logistic regression analysis of the association between a lifetime history of STD category and selected characteristics of sexually active heterosexual urban adults, ages 21–40 years, in 4 U.S. cities, 1987–88

Characteristic[1]	*Syphilis or gonorrhea (Number in model = 1,534)*			*Genital herpes, chlamydia, or genital warts (Number in model = 1,591)*		
	OR	CI	P-value	OR	CI	P-value
Sex[2]	1.9	1.3—2.7	<0.01	2.7	2.0—3.6	<0.01
Race[3]	5.4	3.7—7.8	<0.01	...	...	...
Cocaine, amphetamines, or opiates[4]	2.0	1.4—3.0	<0.01	...	...	...
Marijuana use[4]	...	...	...	1.5	1.1—2.0	<0.01
Lifetime number of partners[5]	1.6	1.3—1.9	<0.01	1.8	1.6—2.1	<0.01
Age at first sexual intercourse[6]	0.2	0.1—0.5	<0.01	...	...	...
Vaginal intercourse[6]	0.3	0.1—0.8	0.02	...	...	...
Education[7]	0.3	0.0—0.9	0.03	...	...	...
Likelihood ratio test	197.54		<0.001	142.59		<0.001

[1] Refers to the effect for that characteristic, adjusted for the effects of all other characteristics included in the model. Study site, age at survey, level of education, type of intercourse (vaginal, anal, or oral), history of prostitution or rape, and condom usage were included in full models, but dropped from final models.
[2] Women = 1, men = 0.
[3] Blacks = 1, whites = 0. This variable should be viewed as a risk marker for other, unidentified, risk factors.
[4] Lifetime use more than 10 times = 1, use 10 times or fewer = 0.
[5] Entered into the model as the log (characteristic).
[6] Yes = 1, no = 0.
[7] College graduate = 1, less than college degree = 0.
NOTE: STD = sexually transmitted disease. OR = odds ratio. CI = confidence interval.

groups, and because race can be interpreted only as a risk marker for unmeasured true STD risk factors (*22*).

The frequency of STDs reported in these data may be underestimates. Whites were more likely than blacks, and women more likely than men, to return their questionnaires (*23–25*). In a comparison of response rates and data quality in mailed self-administered questionnaires, compared with face-to-face interviews for collection of data on sexual behavior, including history of STDs, Rolnick and coworkers found that college-age women with a recent history of STD were less likely to respond to a mailed survey than were a comparison group of college-age women without prior STD (*24*). The fact that respondents in general were more highly educated than nonrespondents may have further reduced our estimates. Furthermore, the questionnaire did not ask about all common STDs, such as *Trichomonas vaginalis*, bacterial vaginosis, or parasites. Also, as questions were limited to STDs that had been physician-diagnosed, asymptomatic infections would have been missed. Finally, despite efforts to assure subjects that their responses would be confidential, it is possible that nonresponse was biased by some people declining to respond because they had an STD history.

The validity of response for the STD questions across the race-sex groups is an issue. The use of mailed self-administered questionnaires, rather than face-to-face interviews, the guarantee of confidentiality to respondents, and the established long-term collaboration of subjects and investigators in the ongoing cardiovascular study was expected to encourage honesty of response. In other surveys, question-specific refusal rates, such as refusing to respond about a specific STD, on self-administered questionnaires in adult samples ranged from 6–13 percent for sexual behavior items (*25–27*). Item-specific refusal rates in this questionnaire were somewhat lower, ranging from 1 to 6 percent (table 1). However, item non-response was higher for the surveyed STDs among blacks than among whites. The reasons for this differential nonresponse between blacks and whites are unclear.

A possible effect of differential nonresponse such as we have observed (assuming that nonresponders were more likely to have had STD) might have been to overestimate differences found between the two racial groups. Differences in education between blacks and whites did not explain the higher proportion reporting STD history among blacks, when the effects of other variables were considered.

The 1990 Health Objectives for the Nation included reductions in the incidence of syphilis, gonorrhea, gonococcal pelvic inflammatory disease, and nongonococcal urethritis (*28*). However, the incidence of syphilis, genital herpes, chancroid, and genital chlamydia has increased, with chlamydia becoming the most common bacterial sexually transmitted infection (*11, 29*). Gonorrhea, syphilis, and chancroid, diseases that had nearly disappeared in the United States, have been increasing at epidemic rates (*29*).

The relatively high proportion of surveyed white heterosexuals who reported ever having had syphilis or gonorrhea is of particular interest. In addition to increases in incidence, the population at risk for

STDs has increased because of the aging of the baby-boom generation (*30*).

STDs, especially those causing mucocutaneous ulcerations, have been found to facilitate the spread of HIV infection (*5*). In 1990, the incidence of AIDS increased most rapidly among persons exposed to the virus through heterosexual contact and among women (*31*). Thus, the high frequency of STD reported by this select group of young, heterosexual, urban adults is of concern. Public health control efforts should be directed specifically at reducing the numbers of sexual partners as a preventative measure.

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