Risk Factors for Syphilis: Cocaine Use and Prostitution

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Abstract: In Philadelphia, a large increase in syphilis among minority group heterosexuals began in 1986 and preceded similar increases elsewhere in the United States. To determine reasons for this increase, we conducted a case-control study in the metropolitan sexually transmitted diseases clinic during 1987 and 1988. Cocaine use (odds ratio [OR] 3.1; 95% confidence interval [95% CI] = 1.5, 6.5 among men; OR 5.8; 95% CI = 1.5, 33 among women) and exchange of drugs for sex (OR 3.5; 95% CI = 1.4, 8.7 among men) were risk factors for syphilis. Although cocaine users reported more sexual

partners and more frequently reported sex with prostitutes, cocaine use remained a risk factor after adjustment for these behaviors. These data suggest that sexual behavior or another factor, such as availability or utilization of health care, among cocaine users leads to increased risk of syphilis in this population. Increases in cocaine use may be partly responsible for recent increases in syphilis incidence in the United States. (*Am J Public Health* 1990; 80:853–857.)

Introduction

In 1986, the incidence of reported primary and secondary syphilis in Philadelphia, Pennsylvania was 38.0 cases per 100,000 persons, a 62 percent increase compared to 1985. This increase reversed a four-year period of declining syphilis incidence in Philadelphia. The increase continued during 1987 and 1988, reaching 71.9 cases/100,000 in 1988. This increase preceded increases in other areas, such as New York City, California, and Florida.[1] In Philadelphia, as in the rest of the United States, increases were greatest for Black and Hispanic heterosexuals.[2]

Reports by syphilis interviewers, and a review of interview records between 1985 and 1987,[3] suggested that an increasing proportion of syphilis patients were users of illegal drugs, especially of smoked or "crack" cocaine. In addition, use of smoked cocaine increased during this period in Philadelphia and in many other metropolitan areas experiencing increases in syphilis.[4,5] Authorities suggested that cocaine-addicted female prostitutes, exchanging sex for a dose of "crack" cocaine, were responsible for syphilis outbreaks in Philadelphia and elsewhere. To test this hypothesis and to explore the relation between cocaine use and syphilis, we conducted a prospective case-control study of risk factors for syphilis in the sexually transmitted disease (STD) clinic operated by the city of Philadelphia.

Methods

Subjects

Consecutive patients diagnosed with primary and secondary syphilis and latent syphilis of less than six months duration and interviewed for partner notification at the STD clinic were enrolled as cases. Interviews occurred between September 1987 and January 1988. We accepted a clinical diagnosis of syphilis if confirmed by review of test results by the syphilis interviewers. During the study period, 82 percent of reported syphilis cases were interviewed for partner notification. We excluded patients whose partner notification interview occurred outside of the STD clinic (approximately 30 percent of interviews) because information obtained in

these settings might not be comparable to that obtained in the STD clinic.

Controls were recruited from among other patients seen in the STD clinic during the same time period. We enrolled as controls consecutive patients seen in the clinic during specified periods of the day and week who had not had syphilis during the past six months. Since anecdotal evidence suggested that gonorrhea was also linked to cocaine use, we also excluded patients with gonorrhea from the control group. All male controls with symptoms or signs of urethritis and all female controls had negative cultures for gonorrhea. All patients were tested serologically for syphilis.

Measurements

A standard questionnaire administered to all patients by STD interviewers recorded demographic data, STD history, reason for coming to the clinic, site at which medical care was initially sought, medical diagnoses and laboratory test results from that clinic visit, as well as specific questions about sexual and drug use behavior during the three-month period before the clinic visit. This time interval was chosen to be short enough for accurate recall but long enough to reflect behavior during the period immediately before infection for most patients. The questionnaire was administered before the usual partner notification interview for syphilis patients.

We abstracted results of partner notification efforts conducted on syphilis patients, after completion of the study. We recorded the number of exposed sexual partners identified and the outcome of partner notification efforts for each identified partner. The abstracter was blinded to the patients' questionnaire results.

Analysis

We calculated crude and adjusted odds ratios and 95% confidence intervals using standard methods.[6,7] We used chi-square analysis or Fisher's exact test to compare categorical variables and Student's t test and the Wilcoxon rank-sum test to compare continuous variables.

We used the Statistical Analysis System logistic regression package[8] for multivariate analyses. Separate logistic regression models were used for men and women to adjust for confounding variables. Variables examined in these analyses included: age, race, education, histories of syphilis and gonorrhea, reason for coming to clinic, location of residence

within the city, and numbers of sexual partners in the last three months and last five years.

Results

We initially enrolled 170 syphilis patients (cases) and 166 controls in the study. Twenty percent of cases had primary syphilis, 36 percent had secondary syphilis, and 44 percent had latent syphilis. Sixty-nine percent of controls received a diagnosis associated with *Chlamydia trachomatis* (non-gonococcal urethritis, mucopurulent cervicitis, pelvic inflammatory disease), 10 percent were diagnosed with trichomoniasis, 5 percent with pubic lice, 5 percent with genital warts, 2 percent with genital herpes, and 1 percent with chancroid. Fourteen patients (9 percent) received more than one STD diagnosis. In 16 percent of control patients, no sexually transmitted infection was detected.

Nineteen percent of male cases reported sex with another man compared with 7 percent of controls. All men reporting sex with another man were excluded from the rest of these analyses, since the goal of this study was to determine reasons for the increase in syphilis among heterosexuals.

Among heterosexuals, cases were more likely than controls to be women and of Hispanic origin, and had completed fewer years of school (Table 1). The number of sexual partners reported in the last three months and the last five years were not significantly different between cases and controls. Controls were more likely to have come voluntarily to the clinic for care while over half of cases were detected by serologic screening or health department partner notification efforts. Controls were significantly more likely to have a past history of gonorrhea but history of syphilis was not different.

Use of cocaine during the three months before the interview was significantly more common among both male and female cases (Tables 2 and 3). Among men, having given a woman drugs in exchange for sex, having had sex with a woman met at a "crack house" or a place where drugs are sold or used ("crack house" sex), and sex with a woman on the same day she was met (first day sex) were also risk factors for syphilis. Twenty-six of 27 men, for whom the specific drug exchanged for sex was recorded, reported trading cocaine for sex. These associations persisted after adjustment for age, race, education, location of residence within the city, and whether the patient presented voluntarily to the city STD clinic for care, using logistic regression (Table 2). Adjustment for the number of sexual partners reported in the last three months and five years also did not change the risk estimates.

Among women, having accepted money or drugs for sex (prostitution) was more common among cases than controls (Table 3). "Crack house" sex and first day sex were uncommon among women and were not associated with syphilis. We could not obtain valid adjusted odds ratio estimates for women using logistic regression, because of the small number of female subjects. Odds ratio estimates were not reduced in any case, however.

When we examined route of cocaine use, the patterns of association were somewhat different for men and women, although the small number of women limits these comparisons. Among men, the strongest association was with intravenous cocaine use, although non-intravenous use was more commonly reported and was also a significant risk factor for syphilis. In contrast to men, non-intravenous cocaine use, primarily by the nasal route, was the strongest risk factor for syphilis among women. In this population, nearly all intravenous drug users reported using intravenous cocaine.

TABLE 1—Characteristics of Heterosexual Patients in Study, Philadelphia 1987–88

Characteristics	Cases (n = 147)	Controls (n = 157)	P value
Age (median)	27	25.5	p = .003[a]
Sex			
Men (%)	95 (65)	126 (80)	p = .002[b]
Women (%)	52	31	
Race			
White (%)	12 (8)	9 (6)	p = .002[b]
Black (%)	116 (80)	144 (92)	
Hispanic (%)	17 (12)	3 (2)	
Unknown	2	1	
Education			
< High school (%)	58 (43)	34 (23)	p < .001[b]
12 (%)	66 (49)	80 (53)	
> 12 (%)	11 (8)	37 (25)	
Unknown	12	6	
Sexual partners (mean [median])			
Last 3 months			
Men	2.9 [2]	3.8 [2]	N.S.[a]
Women	2.1]1]	1.5 [1]	
Last 5 years			
Men	36.9 [10]	23.1 [10]	N.S.[a]
Women	7.5 [3]	8.4 [3]	
Reason for presentation			
Volunteer (%)	64 (44)	143 (92)	p < .00001[2]
Health department partner referral (%)	21 (15)	7 (4)	
Detected by serological screening (%)	59 (41)	6 (4)	
Unknown	3	1	
History of syphilis (%)	7 (5)	6 (4)	N.S.[2]
History of gonorrhea (%)	29 (20)	54 (34)	p = .004[2]

a) Wilcoxon rank-sum test
b) Chi-square test

TABLE 2—Risk Factors for Syphilis among Heterosexual Men in Philadelphia, 1987–88

Risk Behavior[a]	Cases (n = 95) n	(%)	Controls (n = 126) n	(%)	Odds Ratio (95% CI) Crude	Adjusted[b]
No cocaine use	50	(53)	93	(74)	1.0	
Cocaine use	45	(47)	33	(26)	2.5 (1.4,4.5)	3.1 (1.5,6.5)
Cocaine, by route of use[c]						
Intravenous	10	(11)	1	(1)	18.6 (2.3, 150)	24.1 (2.0, 295)
Smoked	15	(16)	13	(10)	2.2 (0.9,5.3)	2.2 (0.8,6.3)
Nasal and unknown	20	(21)	19	(15)	2.0 (0.9,4.3)	2.7 (1.1,6.9)
Cocaine use, other than intravenous	35	(37)	32	(25)	2.0 (1.1,3.8)	2.5 (1.2,5.4)
Sex with prostitute	26	(27)	22	(17)	1.8 (0.9,4.7)	2.4 (1.1,5.4)
Sex with prostitute by what was exchanged[d]						
Drugs	21	(22)	14	(11)	2.3 (1.1,4.7)	3.5 (1.4,8.7)
Money	15	(16)	11	(9)	2.1 (0.9,4.7)	2.9 (1.03,8.5)
"Crack house" sex[e]	23	(25)	16	(13)	2.2 (1.1,4.5)	2.6 (1.1,6.2)
First day sex[f]	51	(54)	50	(40)	1.8 (1.03,3.0)	2.2 (1.1,4.4)

a) All behaviors refer to the 3 months prior to the interview.
b) Adjusted for age, race, education, geographic residence within the city, and whether patient presented voluntarily to STD clinic for care.
c) Route of cocaine use is classified hierarchically as follows: any intravenous, smoked but not intravenous, and nasal or unspecified route, but not intravenous or smoked.
d) Exchange of drugs and money are not mutually exclusive categories.
e) Sex with a woman met at a "crack house" or a place where drugs are sold or used.
f) Sex with a woman on the same day that woman was met.

TABLE 3—Risk Factors for Syphilis among Women in Philadelphia, 1987–88

Risk Behavior[a]	Cases (n = 52) n	(%)	Controls (n = 31) n	(%)	Odds Ratio (95% CI)
No cocaine use	33	(63)	28	(90)	1.0
Cocaine use	19	(37)	3	(10)	5.4 (1.4, 31)
Prostitution:	6	(12)	1	(3)	3.9 (0.4, 91)
"Crack house" sex[b]	2	(4)	3	(10)	0.4 (0.1,2.4)
First day sex[c]	8	(16)	6	(19)	0.8 (0.2,2.5)

a) All behaviors refer to the 3 months prior to the interview.
b) Sex with a man met at a "crack house" or a place where drugs are sold or used.
c) Sex with a man on the same day that man was met.

Cocaine use remained a significant risk factor after adjusting for sex with a prostitute among men (OR 2.4; 95% CI = 1.3, 4.4) and for prostitution among women (OR 4.6; 95% CI = 1.2, 31). Among men, "crack house" sex and having had sex with a prostitute appear to measure a common risk behavior. A large proportion of patients reporting "crack house" sex also reported having had sex with a prostitute, and no risk was attached to either risk factor when present alone, while risk was greatly increased when both behaviors were reported (OR, 6.2; 95% CI = 2.0, 19). Cocaine use remained a risk factor for syphilis after adjusting for "crack house" sex.

Cocaine users were more likely to report sex with a prostitute and other behaviors likely to increase syphilis transmission, such as greater number of sexual partners and first day sex (Table 4). Men who smoked cocaine reported the highest frequency of each of these behaviors. Women who used cocaine also reported more sexual partners in the last three months (mean, 3.7 compared to 1.2; p < 0.01) and were more likely to report prostitution (6/22 compared to 1/60; p < 0.1) than women who did not use cocaine.

Men with syphilis who reported IV drug use were significantly more likely to have been diagnosed with secondary syphilis (73 percent) than were men who did not report IV drug use (27 percent), and were somewhat less likely to have been diagnosed with primary syphilis (18

TABLE 4—Sexual Behavior Associated with Cocaine Use, Heterosexual Men, Philadelphia, 1987–88

Sexual Behavior[a]	Cocaine Use n = 78	(%)	No Cocaine Use n = 143	(%)	P value[b]
Exchanged money or drugs for sex	30	(38)	18	(13)	p < .001
Drugs for sex	28	(36)	7	(5)	p < .001
Sexual partners in last 3 months					
0–1	17	(22)	49	(35)	p < .01
2–3	33	(42)	69	(49)	
4–5	15	(19)	15	(11)	
6–10	8	(10)	4	(3)	
> 10	5	(6)	4	(3)	
First day sex	48	(62)	53	(37)	p < .001
"Crack house" sex	25	(32)	14	(10)	p < .001

a) All behaviors refer to the 3 month interval prior to interview.
b) All p values are by chi-square. Number of sexual partners in last 3 months yields a Wilcoxon rank-sum test p value < 0.001.

percent compared to 33 percent).

Partner notification results were available for 88 percent (130/147) of syphilis patients. While men who had sex with a prostitute and men who used cocaine reported significantly more sexual partners in the last three months than did men who reported neither risk behavior (means 4.3, 4.0, and 1.8, respectively; p < 0.05), the average number of exposed sexual partners identified for partner notification purposes was lower for men reporting sex with a prostitute and cocaine use than for men reporting neither behavior (0.7, 1.0, and 1.3, respectively; p < 0.05 for sex with a prostitute). Prostitution and cocaine use were not associated with partner notification effectiveness among women, but the number of women in each group was small.

Discussion

These data support the hypothesis that cocaine use and sexual behaviors related to it are risk factors for syphilis in Philadelphia. The association between syphilis and cocaine

use was not fully explained by contact with prostitutes among men or by prostitution among women.

This study has several potential limitations. Data were collected in a public STD clinic in Philadelphia; results may not be generalizable to other locations or other health care settings. Moreover, our control group was chosen to control for factors related to the tendency to seek care at a public STD clinic. If cocaine use is also important in the transmission of other sexually transmitted infections, associations between syphilis and cocaine use would be underestimated. We excluded gonorrhea patients from the control group because of the possible link between gonorrhea and cocaine use; gonorrhea incidence was increasing in Philadelphia when the study began. The information we collected on gonorrhea patients suggests our concern was valid. Gonorrhea patients reported cocaine use and sex with prostitutes nearly as frequently as did syphilis patients. In contrast, no consistent differences in the frequencies of these behaviors existed among controls with different diagnoses. The exclusion of patients with gonorrhea is further supported by a report linking illicit drug use with spread of penicillinase-producing *Neisseria gonorrhoeae* in King County, Washington.[9]

Selection bias[10] could occur if, among persons with sexually acquired infection, cocaine users are more or less likely than nonusers to be seen for care in the STD clinic. If cocaine users are less likely to seek care, active syphilis case detection (laboratory screening and partner notification) could artificially increase the proportion of syphilis patients who are cocaine users, producing a spurious association between syphilis and cocaine use. Patients who presented voluntarily to the clinic were as likely to report cocaine use and prostitution as were patients detected by health department partner notification efforts and screening, so this bias was probably absent.

High-risk sexual behaviors, such as sex with prostitutes, were common among cocaine users and are partly responsible for the increased risk of syphilis associated with cocaine use. However, cocaine use remained a risk factor after adjusting for differences in these sexual behaviors and is not merely a marker for differences in sexual behavior. Cocaine use may indicate a population with a greater prevalence of syphilis, resulting in increased risk of infection for any given behavior. An increased prevalence of syphilis among cocaine users could result from differences in sexual behavior, such as those described here. Alternatively, drug use may reduce health care access or utilization, resulting in longer duration of infectivity and therefore increased transmission.

While smoked cocaine or "crack" has received attention as a possible cause of increases in syphilis incidence,[11] cocaine use by all routes was associated with syphilis in this population. Especially among men, intravenous cocaine was most strongly associated with syphilis. "Crack" use, which has increased dramatically in the populations most affected by syphilis and was most strongly associated with high risk sexual behaviors among drug users in this population, may be a more important factor in the current syphilis epidemic. However, the strong association with intravenous cocaine use, not explained by differences in sexual behavior among drug users in this study, may suggest the importance of some other factor, such as health care behavior.

The strong association with intravenous drug use could also be due to nonsexual transmission due to needle sharing. *Treponema pallidum* has been transmitted by blood transfusion and by needle injury during surgery.[12,13] Patients with transfusion-acquired syphilis are usually diagnosed during the secondary stage,[12] since without cutaneous inoculation no primary lesion occurs. Intravenous drug users in this study were somewhat less likely to be diagnosed during the primary stage of syphilis. Further studies are warranted to determine if *T. pallidum* is transmitted by needle sharing.

Finding a history of gonorrhea more commonly reported by controls than by cases was unexpected. While gonorrhea incidence increased over this time period in Philadelphia, it decreased in the face of dramatic syphilis increases elsewhere in the United States. Cocaine-related behaviors which increased syphilis transmission would be expected to increase gonorrhea spread as well. Syphilis and gonorrhea may be distributed differently within the population,[14] providing one explanation for these otherwise surprising findings. Further study of differences between risk factors for syphilis and gonorrhea and of reasons for the divergence between trends in syphilis and gonorrhea incidence are needed.

Prostitution has increased syphilis transmission in the past,[15,16] although it has been overshadowed during the past two decades,[17,18] by the important role of homosexual and bisexual men in syphilis transmission during this time period.[19] Prostitution has also been linked to illegal drug use in the past,[20] often serving as a means of financing drug use. Our data suggest that trading sex for drugs, rather than for money, is an important risk factor for syphilis. However, an increased number of prostitutes and persons exposed to prostitutes, due to the greater availability and use of cocaine, is probably more important than whether drugs or money are exchanged.

Our results are consistent with data from Oregon which suggest that partner notification is less effective among persons trading sex for drugs.[21] Other tools of disease control, such as targeted screening and presumptive treatment,[22] may be useful in appropriately defined populations and settings. Since delay in seeking or gaining access to medical treatment may be important, barriers which prevent drug users from obtaining medical care should be removed.

HIV infection is more prevalent among heterosexual Blacks and Hispanics in inner cities than among heterosexuals in other settings, because of intravenous drug use-related transmission.[23] In addition to being important in needle use-related transmission,[24] cocaine use may also lead to increased sexual transmission of HIV. Because accumulating evidence suggests that genital ulceration is an important co-factor in HIV transmission,[25–27] the potential for sexual transmission within these settings is sizable.

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Workers Satisfied with Health Benefits, but Won't Pay More

Eighty-five percent of American workers are satisfied with their health care benefits, but they resist the idea of paying more for them or accepting less coverage, according to a poll by Northwestern National Life (NWNL) Insurance Company of Minneapolis. The survey involved interviews with 606 full-time employees whose health benefits are provided by private industry and state and local government.

Satisfaction with their benefits persisted whether they pay all, a portion, or none of the premium. However, many said they would contribute little, if anything, more to maintain current benefits: 39 percent said they would not pay even a dollar more; an additional 32 percent said they would agree to a monthly increase of less than $25.

A previous survey of 400 companies by NWNL last year had revealed that nine of 10 employers would soon ask workers to pay a much larger share of health care costs: 70 percent of employees felt the amount their employer now pays toward their health insurance is "about right." According to A. Foster Higgins and Company, employers contribute an average of $149 a month for each employee and his/her dependents for medical, dental, prescription drugs, and vision/hearing benefits.

Employees surveyed by NWNL this year indicated they view health benefits as an entitlement, and tend to be more satisfied with their plan when they have a choice of coverages and an understanding of their benefits. However, many employees are not aware of basic benefits information: 43 percent did not know the amount their employer pays as a premium; 53 percent did not know if their health plan covers catastrophic illness or injury which could run as high as $400,000 (most health plans do cover their expenses, the report noted). Asked about changes they would like, nearly one-third said they would like costs to be reduced; 25 percent would like broader coverage for routine doctor visits, dental care and prescriptions; 9 percent wanted more freedom to choose doctors and hospitals; some wanted fewer restrictions, such as the requirement for pre-authorized care. But 21 percent said they would not change anything.

The results of the report are in: Employee Satisfaction with Health Benefits, (conducted by Winona Market Research Bureau) NWNL, PO Box 20, Minneapolis, MN 55440. Tel: 612/342-7137.