Comparison of HIV Infection Risk Behaviors Among Injection Drug Users From East and West Coast US Cities

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ABSTRACT *This study assessed whether behavioral differences explained higher human immunodeficiency virus (HIV) seroprevalence among injection drug users (IDUs) in three East Coast versus two West Coast cities in the United States. Sociodemographic, sexual, and injecting information were collected during semiannual face-to-face interviews. Baseline data from New York City; Baltimore, Maryland; and New Haven, Connecticut, were compared with data from Los Angeles, California, and San Jose, California. Among 1,528 East Coast and 1,149 West Coast participants, HIV seroprevalence was 21.5% and 2.3%, respectively (odds ratio [OR] 11.9; 95% confidence interval [CI] 7.9–17.8). HIV risk behaviors were common among IDUs on both coasts, and several were more common among West Coast participants. Adjusting for potential risk factors, East (vs. West) Coast of residence remained highly associated with HIV status (adjusted OR 12.14; 95% CI 7.36–20.00). Differences in HIV seroprevalence between East and West Coast cities did not reflect self-reported injection or sexual risk behavior differences. This suggests that other factors must be considered, such as the probability of having HIV-infected injection or sexual partners. Prevention efforts are needed on the West Coast to decrease HIV-associated risk behaviors among IDUs, and further efforts are also needed to reduce HIV incidence on the East Coast.*

KEYWORDS *Epidemiology, Human immunodeficiency virus, Incidence, Injection drug use, Prevalence, Risk factors.*

BACKGROUND

Human immunodeficiency virus (HIV) prevalence and incidence among injection drug users (IDUs) in the United States vary substantially by city, especially when comparing East Coast with West Coast cities.^{1,2} The reasons for these differences

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have never been satisfactorily elucidated. Geographic differences in HIV prevalence and incidence could reflect the stage in the epidemic depending on when the virus was first introduced among IDUs. Alternatively, cultural and social norms around injection practices might differ by city, leading to heterogeneity in risk behaviors by geographic area. Exploration of this second hypothesis could shed light on observed geographic variation in HIV infection rates as well as provide insights for intervention.

From 1994 to 1996, the Collaborative Injection Drug User Study, a multicenter study funded by the Centers for Disease Control and Prevention and implemented in academic institutions, local health departments, and community-based organizations serving IDUs, was conducted to estimate HIV prevalence and incidence among street-recruited, active IDUs and assess sexual and drug-using behaviors to target for HIV prevention.³ HIV prevalence ranged from 30% in New York to 2% in California. The highest incidence rate was observed in New York City (7.4/100 person-years at risk); no seroconversions were observed in either Los Angeles or San Jose, California. We analyzed baseline data to see whether sexual and injection practices were solely responsible for differences in HIV prevalence between East Coast and West Coast cities.

MATERIALS AND METHODS

Study Population

Between 1994 and 1996, a convenience sample of IDUs recruited through street outreach, flyers, newspaper ads, and participant referrals were enrolled into a prospective cohort study.² Study sites included San Jose and Los Angeles, California; Baltimore, Maryland; New York City's Lower East Side and Harlem; New Haven, Connecticut; and Chicago, Illinois. Eligible participants were at least 18 years old and had injected illicit drugs at least once in the past year. Recruitment involved targeted and snowball sampling techniques found to be effective in identifying hidden populations.^{4,5} Recruitment in two sites differed somewhat from the rest. In New Haven, potential participants were approached in a women's prison at the time of incarceration. Most women were arrested for misdemeanors, such as prostitution or drug possession, and were enrolled in the study within days of arrest after paying fines or posting bail. Baltimore enrolled only 18- to 25-year-old IDUs; median duration of injecting was less than 3 years.

Data Collection

Participants were interviewed face-to-face in private rooms using a standardized instrument. The baseline interview assessed sociodemographics, noninjection and injection drug use practices, and sexual practices. Questions referred to behaviors during the past 6 months or to lifetime history. HIV pretest counseling was conducted after the interview to minimize socially desirable responding. HIV antibody was detected from serum using enzyme-linked immunosorbent assay (Ortho Diagnostics, Raritan, NJ), and all repeatedly reactive specimens were confirmed by Western blot (Ortho Diagnostics). Participants were scheduled to return 2 weeks later for test results and posttest counseling. Procedures were similar at up to two semiannual follow-up visits to assess incidence and risk factors for HIV infection.

Data Analysis

Based on site-specific findings from previously reported analyses,³ we combined data across sites for this analysis. Data were combined for West Coast participants

(WCP) from San Jose ($n = 605$) and Los Angeles ($n = 544$) and East Coast participants (ECP) from Harlem ($n = 599$), Lower East Side New York ($n = 447$), New Haven ($n = 239$), and Baltimore ($n = 243$). Because this analysis was intended to elucidate differences in HIV prevalence and behaviors between East Coast and West Coast residence, Chicago was excluded.

HIV incidence rates were computed for each coast of residence by dividing the number of seroconverters by the total person-years of follow-up. Persistently negative participants contributed the amount of time from the baseline to the last follow-up visit attended to the total person-years; seroconverters contributed the amount of time from the baseline to the midpoint between their last negative and first positive tests. Exact 95% confidence intervals (CIs) for Poisson rates were calculated for each rate.

Mantel-Haenszel chi-square tests or Wilcoxon rank sums were calculated for binary and continuous factors, respectively, to identify potential confounders of the association between coast of residence and HIV status. Factors significantly associated with both HIV infection and coast were included in multivariate logistic regression analysis to determine the independent association between HIV status and coast. Forward and backward stepwise regression techniques were employed to identify factors that could have confounded the association between HIV serostatus and coast of residence. Because our main objective was to rule out the possibility that this association was spurious, we also ran several models in which putative confounders were selectively forced into the model until we produced a model that minimized the odds ratio for coast.

Preliminary analysis determined that HIV status and coast were both associated with self-reported history of sexual contact or sharing syringes with HIV-positive partners. Although only 26% of the HIV-positive participants knew their status at baseline, there was a possibility that participant's HIV status might have biased recall or these behaviors might have changed as a result of knowing their HIV status. Therefore, the data were analyzed with and without participants who knew that they were HIV positive at baseline. Results presented include all participants unless otherwise stated.

RESULTS

A total of 2,677 study participants had complete interview data and HIV antibody testing. Overall, 355 (13.3%) participants were HIV positive at baseline. Of the 1,149 WCP and 1,528 ECP, 26 (2.3%) and 329 (21.5%), respectively, were HIV positive at baseline. None of the 781 WCP who returned for at least one follow-up visit and contributed a total of 441 person-years (PY) of follow-up seroconverted to HIV positive (upper 95% exact confidence limit = 0.84); 12 of the 788 ECP contributing 481 person-years of follow-up seroconverted (incidence rate = 2.49/100 person-years, 95% confidence interval 1.33–3.66). Because of the fact that there were no incident infections among the WCP, the remainder of the analyses were restricted to baseline, cross-sectional data.

The Table shows the univariate associations between coast of residence and sociodemographic, drug use, and sexual factors. Compared to ECP, a greater proportion of WCP were older, male, black or Hispanic, and had a history of incarceration; a lower proportion reported being homeless in the past 6 months. WCP had a longer average duration of injection drug use than ECP. During the 6 months prior to baseline, a greater proportion of WCP than ECP drank alcohol daily, injected daily, injected heroin, bought drugs with other IDUs, injected with other

TABLE. Sociodemographics, drug use and sexual risk factors associated with Coast of residence among street-recruited injection drug users, Collaborative Injection Drug User Study cohort, 1994–1996

	West Coast % (n) (N = 1,149)	East Coast % (n) (N = 1,528)	Odds ratio*	P
Sociodemographic factors				
Age, median (range), years	41 (18–70)	34 (18–68)	—	<.001
Race/ethnicity				
White or other	23.9 (274)	29.6 (452)	Ref.	.001
Black or Hispanic	76.2 (875)	70.4 (1,076)	1.34	
Male gender	72.1 (828)	57.8 (882)	0.53	<.001
Homeless in the past 6 months	34.6 (396)	40.3 (613)	0.78	.003
Education less than high school graduate	53.0 (609)	55.3 (841)	0.91	.247
Ever in jail, prison, or juvenile detention	95.4 (1,095)	69.7 (1,064)	9.00	<.001
Drug use factors				
Years of injecting, median (range)	21 (<1–51)	11 (<1–46)	—	<.001
Years of injecting >2 years	96.0 (1,103)	81.9 (1,251)	5.31	<.001
Used Syringe after HIV-positive IDU During the past 6 months	5.2 (55)	16.0 (205)	0.29	<.001
Any drug treatment	34.3 (393)	47.4 (723)	0.58	<.001
Drank alcohol daily	29.5 (339)	16.8 (253)	2.07	<.001
Smoked crack cocaine	52.9 (607)	57.9 (879)	0.82	.010
Injected at least daily	63.9 (733)	41.5 (631)	2.49	<.001
Injected cocaine	39.9 (456)	48.7 (741)	0.70	<.001
Injected speedball	54.8 (629)	60.2 (918)	0.80	.006
Injected heroin	92.7 (1,065)	86.0 (1,309)	2.08	<.001
Bought drugs with other IDUs	84.6 (970)	69.4 (1,054)	2.42	<.001
Mostly injected in own home	65.2 (749)	71.7 (1,093)	0.74	<.001
Injected with other IDUs	95.2 (1,093)	76.2 (1,159)	6.22	<.001

TABLE. *Continued*

	West Coast % (n) (N = 1,149)	East Coast % (n) (N = 1,528)	Odds ratio*	P
Used syringe after another IDU	67.4 (774)	33.5 (510)	4.11	<.001
Shared cooker, cotton, or water	85.9 (987)	53.8 (822)	5.23	<.001
Used needle-exchange program	32.3 (333)	51.9 (775)	0.44	<.001
Most needles from needle-exchange program/pharmacy	7.5 (84)	17.4 (261)	0.39	<.001
Sexual factors				
Age of first sex 14 years old	57.7 (660)	49.9 (768)	1.37	<.001
Homosexual or bisexual person	6.3 (72)	10.8 (160)	0.55	<.001
Homo/bisexual				
Male	2.3 (19)	4.6 (40)	0.49	.011
Female	16.6 (53)	19.4 (124)	0.83	.300
Had sex with an HIV-infected person	2.7 (29)	14.8 (174)	0.16	<.001
During the past 6 months				
More than one sex partner	37.8 (432)	45.6 (690)	0.72	<.001
Any anal/vaginal sex without a condom	71.0 (816)	57.7 (882)	1.79	<.001
Received drugs or money for sex	16.1 (183)	21.8 (329)	0.69	<.001

* Odds ratios are the odds of reporting affirmatively to each factor among West Coast compared to East Coast participants.

IDUs, used syringes after another IDU had used them, and used cookers, cotton, or water after another IDU. However, fewer WCP than ECP reported using a syringe after an HIV-infected IDU had used it. This relationship remained statistically significant after excluding participants who knew they were HIV positive at baseline (4.7% among WCP vs. 12.7% among ECP; odds ratio [OR] 0.34, $P < .001$). During the 6 months prior to baseline, fewer WCP reported being in drug treatment, smoking crack cocaine, injecting cocaine or speedball (cocaine and heroin mixture), injecting mostly at home, using needle exchange, or obtaining most of their syringes from a syringe exchange or pharmacy.

Among sex variables, more WCP than ECP reported having first sexual intercourse at age 14 years or younger and having vaginal or anal intercourse during the past 6 months. A greater proportion of ECP than WCP reported having ever had sex with an HIV-infected partner. This relationship remained statistically significant after excluding participants who knew they were HIV positive at baseline (WCP 2.5% vs. ECP 9.6%; OR 0.24, $P < .001$). WCP were more often homosexual or bisexual among men and, in the past 6 months, were more likely to have had more than one sex partner or received money or drugs for sex than ECP.

Multivariate logistic regression was used to identify the independent effect of coast on HIV prevalence after adjusting for putative risk factors found on univariate analysis. East Coast residence had a much stronger association with HIV seropositivity (adjusted odds ratio [AOR] 12.14; 95% CI 7.36–20.00) than any other factor in the multivariate analysis (all AORs < 2.7), which included age, female gender, duration of injection drug use, black or Hispanic race, lifetime history of incarceration, lifetime history of sex with an HIV-positive partner, vaginal or anal sex without a condom, injecting speedball, and injecting heroin during the past 6 months. When the analysis was rerun without participants who knew they were HIV positive at baseline, the association between HIV infection and coast remained significant (AOR 16.51; 95% CI 9.05–30.13), but gender and lifetime history of sex with an HIV-positive partner were no longer significant (data not shown).

DISCUSSION

There was a 10-fold difference in HIV prevalence in IDUs with East Coast compared with West Coast residence (21.5% and 2.3%, respectively), and incident HIV infections occurred only among ECP. However, these differences were not attributable to differences in HIV risk behaviors. Given that HIV-associated high-risk behaviors were common among both ECP and WCP, one possible explanation for the observed difference in HIV prevalence is that a critical mass or “threshold” prevalence had not been reached on the West Coast that could support the rapid spread of the virus, as it already has among East Coast IDUs.⁶ This was the situation among gay men in San Francisco between 1978 and 1981, when HIV infection rates suddenly increased markedly.^{7,8} More recently, such explosive increases in HIV transmissions have been seen in northern Thailand⁹ and India.¹⁰

Alternatively, social networks may play a role in differences by coast. Although we did not assess injecting and sexual network characteristics that could affect HIV risk,¹¹ a greater proportion of WCP than ECP reported injecting drugs with other people or having unprotected vaginal and anal sex in the past 6 months. However, ECP had greater than a three-fold higher odds than WCP of reporting having used a syringe after an HIV-infected partner and six-fold higher odds of having had sex with a known HIV-infected partner; these associations disappeared in multivariate

analysis after persons who knew they were HIV positive at baseline were excluded. Another explanation includes differing maturity levels of the epidemics, with HIV being spread among IDUs earlier in Eastern cities. Finally, there might be differences in drug preparation or other practices that were not measured in our study. For example, the black tar heroin commonly injected in the west requires greater amounts of heat to dissolve and has been suggested to reach temperatures sufficiently high to have a virucidal effect¹² compared to the powdered heroin common in the East.

Some limitations must be considered. First, although study protocols were largely standardized to allow data to be pooled from all sites, recruitment strategies relied mostly on street outreach or word of mouth and might have differed across cities, thus precluding statements about the representativeness of HIV prevalence and incidence estimates obtained. HIV prevalence estimates were similar to those previously reported^{1,2,13}; however, lack of representativeness should not have an impact on our ability to assess whether geographic differences in HIV prevalence could be explained by putative risk factors. Second, recall bias could have occurred if HIV-infected participants who knew their status had a greater propensity than uninfected participants to recall having had syringe sharing or sexual partners who were HIV infected or at least rationalized their own HIV-positive status by assuming that their partners were infected. However, after excluding persons who knew their HIV status at baseline, we obtained similar results. Third, this was a cross-sectional analysis; thus, any temporal relation between risk behaviors and time of infection was unknown. Finally, because of the low HIV prevalence in WCP (26 HIV positive among 1,148 participants), final logistic regression models for HIV infection contained only one factor for WCP, while the ECP model contained 12 factors, preventing direct comparison (data not shown). Given a larger sample of HIV-infected WCP to saturate the model, we might have had greater evidence to suggest that factors other than injection and sexual risk behaviors accounted for differences in HIV prevalence if the models contained similar covariates. Nonetheless, factors found here were similar to those found in other studies.

The question of why IDUs from two West Coast cities had lower HIV prevalence than in three East Coast cities requires further study. However, this analysis clearly showed that the difference was not attributable to differences in commonly measured injection and sexual risk behaviors. Although interventions in the east should focus on decreasing the continued high HIV incidence, prevention programs are greatly needed for IDUs in the west to decrease the very high prevalence of HIV-associated risk behaviors that could spread the virus. Future studies from these same cities might also provide information on whether high-risk practices in the west lead to an increasing prevalence of infection among IDUs.

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