Risks for HIV infection among users and sellers of crack, powder cocaine and heroin in central Harlem: Implications for interventions

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Abstract

This article investigates behaviours that may be associated HIV infection among users and sellers of crack, powder cocaine and heroin in central Harlem. Chain referral sampling and other strategies were combined to acquire a sample of 637 (Users = 546; Sellers = 91) who provided urine specimens that were tested for the presence of drugs and HIV. Nearly a quarter (23.9%) of all respondents were HIV positive. Drug injectors were more than 2.5 times more likely to have HIV infections than other respondents (OR = 2.66; 95% CI 1.66–4.26). Those involved in frauds/cons were almost as likely to be HIV positive (OR = 2.58; 95% CI 1.64–4.06). Those with a marital status of being separated, divorced or widowed were twice as likely to be HIV infected (OR 2.16; 95% CI 1.43–3.25). Respondents currently having multiple partner sex (OR = 1.66; 95% CI 1.1–2.51) or who were female (OR = 1.66; 95% CI 1.12–2.45) were more than 1.5 times more likely to be HIV positive. Thus, controlling for lifetime drug injection and current multiple partner sex, other factors, such as participating in frauds/cons, as well as relationship status and being female, were also associated with HIV infection.

Introduction

This article focuses on factors directly involved in HIV transmission, and a wide variety of sociodemographic, crime, and drug-use factors, to determine their relative impact on HIV infection among a sample of crack, powder cocaine, and heroin users and sellers in central Harlem. The clustering and relative associations of risk factors with HIV infection may describe the contexts of HIV transmission among users/sellers of these drugs. Patterns of factors associated with HIV infection may be of importance to HIV prevention and treatment interventions, especially those associated with criminal justice systems and programmes providing drug treatment and prevention services.

At the outset of HIV epidemic in New York City (NYC), HIV positive persons were more likely to belong to specific groups already stigmatized for engaging in hidden or criminalized behaviours. Men who had sex with men (MSM) and injection drug users (IDUs) had accounted for the large majority of AIDS cases in 1999, the final year of data collection in this research. NYC AIDS surveillance data indicated that 50% of adult cases with a reported transmission category were IDUs, 35% MSM, and 14% heterosexual (NYC Department of Health– NYCDOH, 1999). Current data (through 2002) indicate several changes since 1999, as only 35.7% of adult cases with a reported transmission category were IDUs, 35.1% MSM, and 24.4% heterosexual (NYCDOH, 2004). Research and prevention efforts may have been

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responsible for the reduction in seroprevalence and transmission behaviours among IDUs in the last decade (Maslow, et al., 2002;Des Jarlais et al., 1998,1999).

Factors not directly involved in HIV transmission, hereafter referred to as 'lifestyle risk factors', have emerged from a variety of research efforts as important to reducing the spread of HIV. For instance, the proportion of those meeting criteria for alcohol abuse among HIV+ persons has ranged from 29% to 60% (Brown et al., 1992;Summers et al., 1995;Dew et al., 1997). Those who have multiple sex partners, particularly crack users engaging in sex work, have also been found to have higher proportions of AIDS cases, HIV seroprevalence, and HIV risk factors (Elwood et al., 1997;Inciardi, 1995;Boyd et al., 1994).

More than one-fifth (22%) of NYC AIDS-diagnosed cases were women in 1999 (NYCDOH, 1999). In the last few years, women of color have experienced the most rapid increase in HIV infections (Pulerwitz et al., 2000;CDC, 1999;Chu and Curran, 1997). Several other factors have possibly significant associations with HIV infection, including age, education, housing, criminal activities, and marital status. For instance, low education level may interfere with understanding or acceptance of prevention efforts (Deren et al., 1997).

Methods

Sample

Several methods were combined to obtain a representative sample of crack, powder cocaine, and heroin users and sellers. The New York Police Department (NYPD) provided the researchers with indicator data in the form of a computerized map of Central Harlem, pinpointing the locations of all drug-related 'allegations'/'complaints' over a two-year period; April, 1996, through March, 1998. The drug allegations were linked to 1990 census block maps, and allegations/capita were computed to subdivide Central Harlem into 45 primary sampling units (PSUs), 11 with a high number of drug allegations/capita, 13 with mid-level allegations/capita and 21 with low allegations/capita.

Chain referral ('snowball' – Goodman, 1961) sampling was modified by targeted sampling (Watters & Biernacki, 1989) and aspects of respondent driven sampling (RDS – Heckathorn, 1997,2002) to recruit respondents in nine randomly selected PSUs. Project ethnographers ('privileged access interviewers'– Griffiths et al., 1993) led by coauthor Doris Randolph, spent 2–4 weeks in each PSU locating where crack, powder cocaine, and heroin use/sales activities occurred. Locations were recorded on an 'ethnographic map' and initial respondents were chosen over the entire PSU in order to reduce bias by selecting individuals with diverse social networks and locations, approximating a random sample (Snijders, 1992).

Recruitment

Selection criteria excluded anyone who did not use or sell crack, powder cocaine, or heroin. Users were limited to those who only used these drugs and had no operative role; operatives could use these drugs as well as report their role(s) in the distribution of these drugs. Interviews were conducted in a variety of settings (parks, cars, the streets, restaurants, a room rented for two hours from someone known to interviewers, etc.).

The chain referral methods were refined in a pilot phase to avoid ethical pitfalls and to investigate various methods of steering the recruitment of respondents in order to minimize bias. Confidentiality was protected primarily by recording only the first and/or street names of respondents and excluding all police and/or government identifiers such as height, weight, eye color, home address, birthmarks/tattoos, etc. Further details concerning the sampling methods employed can be found in the existing literature (Davis & Johnson, 2000;Cross et al., 2001;Davis et al., 2003,2004,2005).

Interviews were approximately 1.5 hours long, excluding 15 to 30 minutes for the informed consent review and signature. Interviewers asked all potential respondents to review informed consent materials and agree to participate in the study in exchange for $20. Respondents who successfully recruited a new respondent received a $20 recruiter's fee. Only three persons were approached but refused to participate.

Urine testing

In the informed consent process, respondents were told that they would remain anonymous; their full names and addresses were never obtained. Respondents were also told that they would be asked to provide urine specimens so that drug use could be confirmed by biological analyses before the interview began. They were also told that these specimens might be tested for diseases. The urine specimen was tested for cocaine and heroin metabolites immediately with a Testcup™ from Hoffman-LaRoche. Only ten of all respondents did not provide urine specimens, and results from Testcup analyses indicated that only 11 self-reported users may not have been users of crack, powder cocaine or heroin. However, cocaine and heroin metabolites in urine can only be detected within three days of use, and the 11 respondents may have used drugs four or more days prior to interviewing.

HIV testing

All but 20 respondents' urine samples were tested for the presence of HIV with the Calypte method for a total N of 637. Specimens were tested at least three months after collection with the ELISA screening method and positive results were confirmed using the Western Blot method. Since the respondents were anonymous, without any contact information, no attempt was made to convey results to respondents.

Description of data

Most of the information regarding the focal behaviours of this study were elicited from respondents in terms of the recency of self-reported behaviour. The investigators defined 'current' behaviours as occurring within the last 30 days and 'lifetime' behaviours as those occurring at some other time in the person's life but not in the last 30 days.

Pilot testing determined that questions concerning sexual activities were limited to the past 30 days, and questions regarding quality of life offences (Kelling & Coles, 1996) such as loitering, littering, drinking alcohol from an open container, transit fare beating, etc., were limited to the past year. Inquiries regarding violence were limited to the past two years. Results concerning most factors in this article use the lifetime criteria.

Analytic approach

Chi-square analyses were performed to test for significant associations between HIV status and direct transmission factors, sociodemographic factors, and lifestyle risk factors as independent factors. Statistically significant ($P < .05$) independent factors were dummy coded for simultaneous entry in multivariate logistic regression analyses to determine the relative risks of HIV infection for all independent factors. A subsequent analysis restricted the number of independent factors to those with P values less than .15 in the first logistic model. Finally, the number of risk factors for each respondent was computed to analyse whether the proportions of HIV infections increased directly with the number of risk factors.

Results

Demographic factors

Almost a quarter (23.9%; N = 152) of the 637 specimens tested positive for HIV. Women (28.5%) were more likely to be HIV positive than males (20.2% – Table I). Those who were HIV positive at various age levels were consistent with the overall percentage of 23.9% except for those aged 25 or younger (5.6%). Those few (8.5%) in the sample who were not African-American were more likely to be HIV+, especially the 38 Latinos, 42.1% of whom were HIV +.

Those who had not earned a GED or graduated from high school were more likely to be HIV + (28.1%) than those with a GED or who finished high school (20.7%; $P < .032$). Those widowed (51.9%), separated (35.6%), or divorced (30.8%) had proportionately more HIV+ persons that those who were single (19.0%) or married (18.5% – $P < .000$). Higher amounts of illegal income, particularly those having $500 to $1,999 in illegal income in the past 30 days, were more likely to be HIV+ ($P < .000$).

Factors directly involved in HIV transmission

Those who ever injected drugs ($P < .000$), participated in current multiple partner sex ($P < .002$), or sex work ($P < .000$) were proportionally more HIV+ than drug users/sellers who did not do so (Table II). Since only 17 respondents self-reported currently having same sex partners, large percentage differences between sexual minorities and heterosexuals were not statistically significant.

Criminal justice and drug use factors

Users and sellers of crack, powder cocaine, and/or heroin who had been arrested (26.1%), in prison (31.6%), or had quality of life offences in the past year (29.1%), had proportionately higher levels of HIV infections ($P < .039$, $P < .028$ and $P < .022$, respectively – Table II). Also, those engaging in property crimes, such as stealing (38.7%) and participating in frauds and cons (44.7%), had much higher percentages of HIV+ persons ($P < .000$). These property crimes were not associated with drug injection or the use of any specific drug (data not shown). Persons engaging in drug selling (29.5%) and helping with drug sales (31.1%) were also significantly more likely to have HIV infections. Although few participated in robbery, it was significantly associated with HIV infection ($P < .041$). Those who were attacked at least once in the past two years had higher proportions of HIV infection than those not attacked ($P < .011$). Those who ever used crack, powder cocaine, or heroin were more likely to be HIV+ than those never using these drugs (Table II). The 53.5% of the heroin users who used heroin without injecting it were not statistically associated with increased proportions of HIV infection (data not shown).

Logistic regression analyses

The first logistic regression model included the 20 independent factors statistically associated with HIV infections in chi-square analyses, but only two of these factors resulted in definitely increased odds of HIV infection, having lower bounds greater than one (Table III). Drug injectors were almost three times more likely to be HIV+ (OR = 2.7; $P < .002$) than non-injecting drug users and sellers of crack, powder cocaine, and heroin. Also, the respondents who were widowed, separated or divorced, compared with single and married respondents, were twice as likely to be HIV+ (OR = 2.03; $P < .002$). Five additional factors in model 1 had P values less than .15, including being female, not being African-American, currently having multiple sex partners, ever participating in frauds/cons, and ever using crack. These factors, drug injection, and marital status were used in a second logistic regression analysis, and only crack use and race did not yield statistically significant results. In model 2, odds ratios for

injection and marital status remained relatively the same as in model 1, but those participating in frauds/cons were 2.5 times more likely to have HIV infection (OR = 2.58; *P* < .000). Female respondents and respondents currently having multiple sex partners were considerably more likely to have HIV infections (OR = 1.66; *P* < .02).

Multiple risk factors

To investigate whether those having multiple risk factors increase their likelihood for having HIV infection, the four direct transmission factors (injection, sex work, multiple sex partners, and same sex partners), five crime factors (stealing, frauds/cons, drug dealing, drug sales assistance, and robbery) and three drug use factors (heroin, powder cocaine, and crack) were totalled and used in a chi-square analysis (data not shown). The proportion of those HIV positive increased directly with the number of direct transmission factors (1 factor, 25%; 2, 35.2%; 3, 75% – *P* < .000). Although over half the sample reported no participation in the five crimes examined, levels of HIV infections increased directly as the number of kinds of crime increased (*P* < .000). Those who used all of the three focal drugs were more likely to be infected than those using one or two (*P* < .000). The totalled 12 factors indicated that especially large increases in HIV+ status occurred in three places, between three (14.7% HIV+) and four factors (25.5% HIV+), between five (28.0% HIV+) and six factors (37.3% HIV+), and between eight (42.3% HIV+) and nine factors (75% HIV+).

Discussion

Factors associated with HIV infection

Nearly a quarter (23.9%) of 637 users and sellers of crack, powder cocaine, and heroin from Central Harlem were found to have HIV infections. Chi-square analyses (Tables I and II) indicated that HIV infection was associated with twenty statistically significant factors. There appeared to be three thresholds, or tipping points, where taking an additional behavioural risk substantially increased the proportions of respondents having HIV infections. Thus, our investigation confirms other studies' (Wagner & Anthony, 2002;Boyer et al., 1999;Crum et al., 1996;Holmberg, 1997) documentation that risks cluster, and demonstrates that the number of risks increases the likelihood of HIV infection.

In logistic regression model 2 (Table III), only five of the factors significantly associated with HIV infections had not dropped out. The analysis confirmed previous data (NYCDOH, 1999,2004) that the direct HIV transmission factor of drug injection was the most highly associated with HIV+ status (OR = 2.66). Also in line with other research studies (Elwood et al., 1997;Inciardi, 1995;Boyd et al., 1994), those having sex with multiple partners in the 30 days prior to interviewing had increased odds of HIV infection (OR = 1.66).

Remarkably, participating in frauds and cons (*P* < .000), a property crime, emerged as the second most predictive factor for HIV infection (OR = 2.58); but property crime was not associated with the heroin use or drug injection, as investigators had hypothesized on the basis of previous research (Johnson et al., 1985). Property crimes have few direct or obvious linkages to HIV transmission. Apparently, many HIV+ drug users/sellers support their lifestyles, at least in part, by obtaining income from frauds and cons, independent of their relationship status, drug use practices, or other behaviours examined. This finding demonstrates the importance of including measures for specific kinds of crime in future HIV research.

The model 2 logistic regression analysis also indicated that broken relationships (defined by separation, divorce or being widowed) were significantly associated with HIV infections (*P* < .000; Table III). Controlling for all other factors, this lifestyle factor at least doubled the odds of respondents having HIV infection (OR = 2.16). It is possible (and warrants further

investigation) that broken relationships among those already at risk can result in a decline in risk reduction behaviours such as condom use or limiting injection equipment entirely to self-use.

Gender differences

In chi-square analysis, 28.5% of sampled women were HIV infected. Women were more likely than men to have HIV infections (OR = 1.66; model 2, Table III). The acceleration of HIV infections among women of colour has been attributed to a variety of factors that involve their relative social powerlessness relative to Caucasian women and men (Amaro and Raj, 2000;Amaro, 1995;Jenkins 2000;Jenkins & Coons, 1996). Also, the efficiency of male-to-female transmission of HIV is 2.3 times greater than that of female-to-male transmission (Nicolosi et al., 1994;Padian et al., 1997).

Implications for interventions

Data in this article have identified several lifestyle risk factors associated with HIV infection independent of direct transmission factors. Participation in one behavioural risk or lifestyle factor appears to enhance the probability of participating in others, even though some of these behaviours or factors, such as frauds/cons, or having been separated, divorced or widowed, have no clear linkages with HIV transmission. Interventions should be designed to address how taking one kind of HIV or criminal justice risk is highly likely to provide opportunities and/or increase willingness for taking other such risks. Preventive interventions should target women of colour who take these risks, especially as this and other reports indicate that women of colour are most at risk for HIV infection.

Study limitations and future research

Controlling for drug injection and sexual behaviours directly involved in HIV transmission, many of the lifestyle risk behaviours examined in this article dropped out of the logistic regression models (Table III). The interpretations of both the lifestyle factors that remain (such as being separated, divorced or widowed, or participating in frauds/cons) and the lifestyle factors that drop out of the models are sometimes difficult. Small cell sizes (e.g. in our analysis, for those having both a history of injection and fraud/con participation, there was an N of 10 for those who were HIV negative, and an N of 16 for those HIV+) also increase the likelihood that our results may have occurred by chance. Further research is required to replicate the behavioural lifestyle factors associated with HIV and to understand the complex links between lifestyle factors and direct transmission factors.

Another limitation was the lack of assessment regarding details of behaviours related to HIV infection, such as condom use and syringe cleaning and/or exchange. Also, the study did not collect data concerning many factors likely associated with elevated proportions of HIV infection, such as the ecological factors of impoverished neighbourhoods, domestic violence, or sexual abuse. Data were also not collected on the extent to which those in the sample had been contacted by outreach workers, attended HIV education sessions, or had knowledge of HIV transmission and prevention.

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Table I

Demographic factors for 637 respondents with HIV data.

Factor	N	% of Total	% HIV+	*p* value
Gender				
Male	356	55.9	20.2	0.016
Female	281	44.1	28.5	
Age				
< = 25	36	5.7	5.6	0.068
26–30	61	9.6	26.2	
31–35	135	21.2	23.0	
36–40	179	28.1	22.3	
41–45	115	18.1	29.6	
46–50	69	10.8	27.5	
> = 51	42	6.6	23.8	
Generation				
Heroin (born < = 1955)	175	27.6	28.6	0.071
Cocaine (born 1956–1968)	399	62.8	23.1	
Blunt (born > = 1969)	61	9.6	14.8	
Race				
African–American	583	91.5	22.5	0.027
Latino	38	6.0	42.1	
Other	16	2.5	31.3	
Education [*]				
<High school	267	42.1	28.1	0.032
GED or high school grad.	367	57.9	20.7	
Housing Status				
No address	56	8.8	23.2	0.905
Address	581	91.2	23.9	
Marital Status [*]				
Single	401	63.2	19.0	0.000
Married	54	8.5	18.5	
Separated	87	13.7	35.6	
Divorced	65	10.3	30.8	
Widowed	27	4.3	51.9	
Current Illegal Income [**]				
$0	334	52.6	17.1	0.000
$1 to $499	118	18.6	25.4	
$5003–$999	86	13.5	36.0	
$1,0003–$1,999	55	8.7	43.6	
$2,000 or more	42	6.6	23.8	

[*] N = 634;

[**] N = 635.

Table II

Behaviors related to HIV risk for 637 respondents.

Behavioral Factor (Independent Variables–IV)	N	% of Total	% HIV+ w/o IV	% HIV+ w/IV	p value
Direct Transmission Factors					
Current multiple partner sex (N = 634)	314	49.5	18.8	29.3	0.002
Current/lifetime injection	113	17.7	20.6	38.9	0.000
Current/lifetime sex work	126	19.8	20.2	38.9	0.000
Current same sex partners	17	2.7	23.4	41.2	0.110
Current or Lifetime Prison and Crime Factors					
Arrested	444	69.7	18.7	26.1	0.039
Prison	117	18.4	21.8	31.6	0.028
Quality of Life Stop in last year (N = 635)	234	36.9	20.9	29.1	0.022
Stealing	181	28.4	18.0	38.7	0.000
Frauds and cons (N = 636)	123	19.3	18.9	44.7	0.000
Drug dealing	166	26.1	21.9	29.5	0.050
Drug sales assistance (N = 636)	151	23.7	21.6	31.1	0.019
Robbery (N = 636)	53	8.3	22.8	35.8	0.041
Attacker in last 2 years (N = 636)	152	23.9	22.7	27.0	0.288
Attacked in last 2 years (N = 636)	239	37.6	20.4	29.3	0.011
Current or Lifetime Drug Use					
Crack (N = 636)	520	81.8	14.7	26.0	0.007
Cocaine	481	75.5	17.3	26.0	0.023
Heroin	241	37.8	19.7	30.7	0.002
Marijuana	591	92.8	32.6	23.2	0.162
Alcohol	602	94.5	28.6	23.6	0.510

Table III

Logistic regression of behaviors related to HIV+ status.

Lifetime Behavior (unless indicated)	Model 1			Model 2		
	Odds ratio	95% CI	p value	Odds ratio	95% CI	p value
Female	1.49	.89–2.47	0.127	1.66	1.12–2.45	0.011
Latino/other	1.77	.91–3.45	0.092			
Not a high school graduate	1.20	.8–1.82	0.378			
Separated/divorced/widowed	2.03	1.31–3.14	0.002	2.16	1.43–3.25	0.000
Some current illegal income	1.03	.57–1.86	0.925			
Current multiple partner sex	1.48	.95–2.32	0.085	1.66	1.1–2.51	0.015
Ever injected	2.70	1.46–4.99	0.002	2.66	1.66–4.26	0.000
Ever a sex worker	1.11	.56–2.18	0.772			
Ever arrested	0.91	.53–1.54	0.720			
Ever in prison	1.18	.68–2.06	0.556			
Quality of life in past year	1.00	.64–1.58	0.989			
Ever stealing	1.24	.66–2.36	0.506			
Ever drug dealing	1.38	.7–2.72	0.360			
Ever assist in drug sales	0.94	.46–1.90	0.853			
Ever frauds and cons	1.74	.91–3.31	0.093	2.58	1.64–4.06	0.000
Ever robbery	1.15	.55–2.41	0.706			
Attacked in last 2 years	1.28	.81–2.02	0.293			
Ever use crack	1.70	.91–3.19	0.099			
Ever use powder cocaine	0.91	.53–1.58	0.742			
Ever use heroin	1.10	.65–1.88	0.718			