

Trends of HIV Risk Behaviors in a Cohort of Injecting Drug Users and Their Sex Partners in Miami, Florida, 1988–1998

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A cohort of 111 injection drug users (IDUs) and their sex partners was assessed in 1988 concerning risk behaviors for HIV and knowledge of HIV/AIDS. Ten years later, in 1998, the cohort was reassessed using the same instrument. All who were HIV negative in 1988 were retested by blood draw for antibodies to HIV. A paired analysis was utilized to determine individual changes in risk behaviors for three serostatus groups—those who remained HIV negative (long-term HIV negatives), seroconverters, and those positive in 1988 (long-term HIV positives). Incidence was twice as high for sex partners (37.5%) as for IDUs (18.0%). Drug and needle use risk behaviors, except crack use, showed decreases; sexual risk behaviors were less amenable to change. Knowledge significantly increased among the long-term HIV negatives and seroconverters but not among those HIV positive in 1988. This analysis demonstrates the need for continued intervention among IDUs and their sex partners.

KEY WORDS: HIV/AIDS; serostatus; injecting drug use; risk behavior.

INTRODUCTION

Early in the AIDS epidemic, risk factors for HIV transmission among injection drug users (IDUs) and their sex partners became known. Drug-use behaviors such as frequency of injection, sharing injection equipment, renting or borrowing used equipment and crack use (Chaisson *et al.*, 1987; Fullilove *et al.*, 1990; Marmor *et al.*, 1987; Schoenbaum *et al.*, 1989; Vlahov *et al.*, 1990) were some of the behaviors implicated in HIV transmission. Likewise, it became known that certain sex behaviors including exchanging sex for drugs or money, a history of a sexually transmitted infections (STI) other than HIV, and neglect of condom use during sex (Chirgwin *et al.*, 1991; Edlin *et al.*, 1992; Kwiatkowski *et al.*, 1999;

Schoenbaum *et al.*, 1989) also placed individuals at high risk for HIV infection.

Interventions targeted toward IDUs have been around since the late 1980s, some of which reported short-term efficacy in reducing risk behaviors (Booth and Watters, 1994; Gibson *et al.*, 1998; Semaan *et al.*, 2002). In some instances, brief pre- and posttest counseling alone was sufficient to reduce risk behavior (Gibson *et al.*, 1999). These initial intervention programs provided information and skills-building activities related to HIV/AIDS and attendant drug use and sexual risk behavior which placed an individual at high risk for acquiring or transmitting HIV (Des Jarlais *et al.*, 1985; Normand *et al.*, 1995). Subsequent intervention programs were initiated for other subcultural groups (Eldridge *et al.*, 1997; Trotter, 1996) including crack users (McCoy *et al.*, 1996; Sterk, 2002; Wechsberg *et al.*, 2004) and, more recently, heroin sniffers (Chitwood *et al.*, 2004). A recent study (McCoy *et al.*, 2004) confirmed the role of crack cocaine and injection drug use on seroprevalence and found that IDUs and subsequently IDUs who used crack, crack smokers only, and finally a

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community control group of nondrug users were progressively more likely to be HIV positive and called for interventions taking into account these diverse drug-use patterns.

On the one hand, there is support that drug risk behaviors (Cottler *et al.*, 1998; Kotranski *et al.*, 1998; McCoy *et al.*, 1993; McCusker *et al.*, 1998; Stephens *et al.*, 1993), and, to a lesser extent, sexual risk behaviors (Calsyn *et al.*, 1992; Gossop *et al.*, 2002; Latkin *et al.*, 2003) among IDUs can decrease after participating in intervention programs; on the other hand there also is evidence that many IDUs, including HIV positive drug users, continue to engage in risk behaviors (Avants *et al.*, 2000; Deren *et al.*, 1998; McGowan *et al.*, 2004; Metsch *et al.*, 1998) even after learning their HIV serostatus and/or attending posttest counseling or intervention sessions to reduce high risk behavior.

There are compelling data that clients of drug treatment programs engage in less high-risk behavior than those who did not enroll in drug treatment (Gerstein and Harwood, 1990; Hubbard *et al.*, 1988; Metzger and Navaline, 2003; Shoptaw *et al.*, 1997). Hoffman *et al.* (1998) examined the effect of entering drug treatment on involvement in HIV-related risk behaviors among 8241 injecting drug users and crack cocaine smokers recruited from the streets in 22 US cities and Puerto Rico. Observing crack cocaine smokers and other drug users over a 6-month period, they found that entry to drug treatment was associated with substantial reductions in drug use and unsafe injection practices and some (but much less substantial) reductions in sexual risk behaviors. There have been behavioral intervention studies carried out in drug treatment settings that have been shown to reduce sexual risk behaviors among crack cocaine smokers (McCusker *et al.*, 1992).

Metzger *et al.* (1993) and Metzger and Navaline (2003) reported that IDUs who were clients of methadone maintenance clinics were much less likely to become HIV positive incident cases than were opiate addicts who were not in treatment. That drug injection is decreased during methadone treatment is well documented (Ball *et al.*, 1988; Ball and Ross, 1991). This evidence, however, is based on relatively short-term follow-up. How sustainable changes are over a longer period of time remains unknown. Conversely, a study in Australia found that whereas injection decreased among clients of methadone treatment, syringe sharing among those still injecting did not decrease (Caplehorn and Ross, 1995). It is important, however, to recognize that many active drug

users do not want treatment, and those who do often encounter significant obstacles to access care (Zule *et al.*, 2003).

HIV positive IDUs pose the threat of transmission of HIV through unsafe needle use and sexual risk behaviors. Unprotected sex with an IDU is the leading HIV risk factor among heterosexual non-IDUs, with increasing HIV incidence in this group from 1998 through 2002 (CDC, 2002). Recent studies suggest that much of the spread of HIV among IDUs can be attributed to unprotected sexual activity (Kral *et al.*, 2001; Strathdee and Sherman, 2003; Strathdee *et al.*, 2001). In addition, HIV positive IDUs who are receiving highly active antiretroviral therapy (HAART) pose a risk to their syringe sharing and sex partners for the transmission of drug resistant HIV (Hecht *et al.*, 1998; Little *et al.*, 1999). This is of particular importance because studies have indicated increased sexual risk behavior after the initiation of HAART therapy (Tun *et al.*, 2004; Vlahov *et al.*, 2001).

It is rare that a cohort of IDUs and sex partners of IDUs can be assessed concerning risk behaviors for HIV and knowledge of HIV/AIDS using the identical instrument at baseline and 10 years later. This opportunity presented itself in the course of conducting two cross-sectional studies 10 years apart. The first study occurred in 1988 whereas the second study was carried out in 1998. The identical baseline instrument was administered to participants on both studies. We were able to identify 111 individuals from the 1988 study who had also participated in the 1998 study. By using a paired analysis approach, we were able to examine changes in serostatus, risk behaviors and HIV/AIDS knowledge between that reported in 1988 and that reported in 1998.

To permit an examination of behavior change by participants who remained HIV negative, those who seroconverted during the decade, and participants who were HIV positive in 1988, the data were analyzed for each of these three serostatus groups and changes reported are within group changes. This study offers new information because it is the first to present 10-year follow-up data for these three serostatus groups. Although short-term data are critical in the evaluation and implementation of intervention programs, the long-term outcomes have been unknown. Although temporal factors as well as intervention issues may play a role in the outcome over this extensive time period, data such as that presented in this paper can assist public health personnel to plan for future prevention needs.

METHODS

Data for this analysis were obtained from two separate studies carried out 10 years apart at the University of Miami Comprehensive Drug Research Center (CDRC). The first study, conducted in 1988, was part of the multisite NADR Program funded by the National Institute on Drug Abuse. In the course of the 1988 National AIDS Demonstration Research (NADR) study, the AIA questionnaire (Chitwood *et al.*, 1991) was administered to 1023 active IDUs and 336 female sex partners of male IDUs in South Florida as a means of identifying high-risk drug use and sexual practices in an effort to develop intervention strategies targeting active IDUs and their sex partners. Ten years later, in 1998, the same questionnaire was administered to active drug users as part of a sexual risk reduction study.

After obtaining informed consent, both studies collected extensive tracking information including name, social security number, date of birth, street names or aliases, and mother's maiden name. These data were entered into a computerized tracking system, which displayed all studies performed at the CDRC in which the individual had participated. A total of 111 participants (88 IDUs and 23 sex partners) from the NADR study were identified as part of the recruiting process for the sexual risk reduction study (SRS). The individuals who were sex partners in the 1988 study were not necessarily sex partners of IDUs in 1998 but were active drug users. In the NADR study the sex partners represented 24% of the sample; in this sample, a similar proportion of those originally identified as sex partners (20%) are included in this analysis.

Sample Eligibility and Recruitment

In both studies, outreach workers recruited potential participants from street venues, housing projects, public transport, and other public areas not associated with medical care, drug treatment, or the criminal justice system utilizing a targeted snowball sampling technique (Watters and Biernacki, 1989). Eligible participants were active drug users, at least 18 years of age, had not been in drug treatment for 30 days prior to assessment, and reported current drug use. Current drug use was defined as the injection (AIA) or use (SRS) of heroin or cocaine within the past 6 months. To confirm the drug-use eligibility criteria before entry into the study, direct examination

for physical track marks was made for self-reported IDUs in both studies. In the sexual risk reduction study, a urine screen (ONTRAK from Roche Diagnostic System) was used which detected metabolites of heroin and/or cocaine to validate self-report of opiate and/or cocaine use. The ONTRAK system is a simple test performed by the phlebotomist or interviewer and consisted of placing a coded strip into newly obtained urine. The test strip reads out a positive or negative for each substance being tested. Total test time takes approximately 5 min.

The NADR study eligibility requirements for sex partners included a female who had sex with a male IDU at least once in the 6 months prior to assessment, was at least 18 years of age, and had not injected any drug in the last 6 months. The use of non-injected drugs by sex partners was acceptable but not required for entry into the study. The SRS did not recruit specifically for sex partners. Those sex partners from the 1988 study who are included in this analysis were recruited for the SRS on the basis of drug use.

Data Collection

Following the informed consent process and after agreeing to participate and signing a consent statement with a written assurance of confidentiality, study participants were administered the AIA risk assessment instrument. Trained interviewers at the community assessment center in Miami conducted face-to-face, one-on-one interviews with participants in individual rooms where confidentiality could be assured. The structured instrument took approximately 1–1.5 h to administer. The identical AIA assessment used in the 1988 NADR study was included in the data collection instruments administered in the 1998 SRS study facilitating comparisons of variables. The 1988 study also included an intervention program to educate participants on the risk factors for HIV. Details of the intervention programs can be found elsewhere (McCoy *et al.*, 1993). All data were kept confidential and no names appeared on the data files or biological tests.

The AIA instrument includes questions concerning demographics, drug use and drug-use history, injection risk behaviors, sexual risk behaviors, participation in drug treatment and knowledge concerning HIV/AIDS. The complete questionnaire can be found elsewhere (Chitwood *et al.*, 1991). HIV/AIDS transmission knowledge was assessed using the 16-item AIDS Information Sheet (NIDA, 1994).

In the NADR study the pretest counseling and blood draw occurred prior to the interview. In order not to bias the interview, only the meaning of the test including the ELISA and Western Blot procedures were discussed. Risk factors were discussed in the intervention programs which took place subsequent to the administration of the questionnaire. The 1988 NADR study occurred before the standardization by the CDC and state public health agencies of requirements for the HIV pre- and posttest counseling of IDUs. Individuals recruited for possible inclusion in the SRS study who had participated in the NADR study were administered the AIA regardless of whether they met the criteria for entry in the entire protocol. Those individuals recruited through the SRS were provided with pretest counseling and were tested for antibodies to HIV after completing the baseline assessment. In both studies, certified phlebotomists collected the blood samples by venipuncture and the samples were transported to the University of Miami Immunology Laboratory to be tested for antibodies to HIV. Individuals were determined to be seropositive with repeatedly reactive ELISA and a confirmatory Western Blot. In both studies, participants were given, after completing the baseline visit, a nominal monetary compensation for their time and effort.

Variable Definitions

Two variables (gender, male = 1, female = 2) and ethnicity did not change over the 4 year period. Because of the sparse number of participants ($n = 10$) who were other than African American, ethnicity was coded 1 = Black, 2 = non-Black. Age was age at last birthday; education was recoded into 1 = less than high school diploma, 2 = high school diploma or GED, and 3 = post high school. Employment was coded no = 1, yes = 2 and measured current employment. "Living alone" (no = 1, yes = 2) recorded if the individual was currently living alone; "homeless" measured whether the participant was currently homeless and living on the street (no = 1, yes = 2). The independent variables for drug use and sex risk were coded 1 = no, 2 = yes and, except for the treatment variable, recorded behavior that occurred in the 6 months prior to interview. "Injection" included injection intravenously or by skin-popping. "Shared needles in the past 6 months" included any sharing of a needle with anyone during the past 6 months. "Rented or borrowed used needle in the

past 6 months" indicated whether the participants had rented or borrowed a needle he/she thought had been used previously by someone else. The drug treatment variable was coded "2, yes" if the individual had participated in a formal drug treatment program in the five years prior to interview. The sex variables were defined as follows and were for the six months prior to interview: "Exchanged sex for drugs or money" was coded yes if the participant had sex with someone and in return received drugs and/or money. "Men to men sex" was coded yes if a male reported having a male sex partner in the previous 6-month period. "STIs" was coded yes if the respondent replied "yes" to any of a list of STIs (genital herpes, gonorrhea, syphilis, or chlamydia). Condom use was coded yes if any condom use in the last 6 months was reported. Only those individuals who reported having sex in the preceding 6-month period are included in the condom analysis. The HIV/AIDS transmission knowledge scale consisted of basic true or false statements concerning HIV/AIDS such as "If a person is positive on the blood test for the AIDS virus, that means the person has AIDS." The knowledge score was determined by summing the number of right answers on the scale. The possible range of the knowledge test score was 0 through 16.

Statistical Analysis

A total of 111 DUs (including sex partners) who participated in both studies were stratified into three groups; long-term HIV negatives (participants who remained HIV negative throughout the 10-year interval), seroconverters (participants who were HIV negative in 1988 but were HIV positive in 1998), and long-term HIV positives (participants who were HIV positive in 1988). Analysis of dichotomous variables was performed using the McNemar test or the McNemar exact test to examine paired sample changes. The continuous variables were analyzed using the paired sample *t*-test. Significance level was set at $p \leq .05$ and, because the data are descriptive and the sample size small, no correction was made for multiple tests on the same data set.

RESULTS

Table I presents the demographic characteristics of the 111 individuals who are the focus of this analysis and illustrates individual paired differences over the 10-year interval. The first four variables are

Table I. Demographic Characteristics ($N = 111$)

Variables	1988 (%)	1998 (%)	Test statistic ^a
Gender			
Male	54.0		
Female	46.0		
Ethnicity			
African American	91.0		
Other	9.0		
Age—Mean (<i>SD</i>)	34.2 (6.9)		
Education			
Less than high school	54.1		
High school/GED	27.0		
More than high school	18.9		
Employment			17.82**
Unemployed	47.8	73.0	
Employed	52.3	27.0	
Lives Alone			8.26**
No	77.5	62.2	
Yes	22.5	37.8	
Homeless—Living on Street			9.78**
No	95.5	82.0	
Yes	4.5	18.0	
HIV serostatus			18.00**
Negative	79.3	63.1	
Positive	20.7	36.9	

^aMcNemar/Exact McNemar test.

** $p < .01$.

presented only for 1988. Gender and ethnicity were not subject to change and no one increased their level of education. Over one-half (54%) of study participants were male, the majority (91%) were Black, and less than one-half (45%) had at least a high school education or greater. The mean age of participants in 1988 was 34 years. In 1998, participants were 10 years older thus placing the mean age at 44 years. A significantly greater proportion in 1998 than in 1988 was unemployed (73% vs. 47%), living alone (37% vs. 22%) and homeless (18% vs. 4%). In 1988, 20% of the 111 study participants tested positive for HIV while 36% were HIV positive in 1998.

In 1988 the HIV seroprevalance among the IDUs was 25% and 4% among the sex partners. A similar proportion of IDUs (61%) and sex partners (69%) were negative over the 10-year period. Almost twice the percentage of sex partners (26%) seroconverted as IDUs (13%). Among those negative in 1988, the 10-year incidence rate for sex partners was 37%, double the rate for IDUs (18%).

Drug and Needle Use Behaviors

In the 1988 NADR study, sex partners were screened and limited to noninjectors. Sex partners

were included in the analysis of drug and needle use behaviors since, though not injectors in 1988, sex partners could have become injectors or users of other drugs prior to the 1998 interview. Table II presents paired changes in drug and needle risk behavior among the three serostatus groups. The non-injectors in 1988 (those in the no–yes and no–no cells in the “any injection in past 6 months” variable) in the three subgroups in Table II correspond to the sex partners.

Long-Term HIV Negative Participants (LTHIV–)

Among the LTHIV–s, 10% had not used crack in the 6 months prior to the 1988 study, but had used crack in the 6 months prior to the 1998 study; 14% had ceased crack use, and 64% reported continued crack use. There was a significant decrease in injection drug use; 45% injected in 1988 but did not in 1998. Only 2% injected in 1998 but did not inject in 1988. Among the LTHIV–s, 31% reported injection at both periods. LTHIV–s also displayed a significant decrease in the injection of cocaine; 40% ceased injection versus 2% who initiated injection of cocaine. There was also a trend toward the decrease of injection of heroin; 24% stopped heroin injection whereas 11% initiated heroin injection. Significantly more individuals ceased (32%) rather than initiated (4%) speedball (combined heroin and cocaine) injection. One-fourth of the sample stopped sharing needles but a disturbing percentage (12%) who had not shared in 1988 reported sharing in 1998. The same held true of renting or borrowing used syringes. Significantly more individuals ceased renting or borrowing used equipment (35%) than initiated such practice (8%). However, 10% shared needles and 1% rented or borrowed used syringes during both 6-month time periods. Approximately one-third, 30% of all LTHIV–s reported receiving drug treatment in the 5 years prior to 1988 and no treatment in the 5 years prior to 1998; conversely, only 12% who had no treatment in the 5 years prior to 1988 did receive treatment in the 5 years prior to 1998. Among the LTHIV–s, 21% had not received treatment in either time period.

Seroconverters

One-third of the seroconverters had not used crack in the 6 months prior to the 1988 study but had used crack in the 6 months prior to the 1998 study;

Table II. Comparison Changes of Drug Use and Needle Use Categorized by Seroconversion Status 1988–1998

Variables	Long-term HIV negative (N = 70)		Seroconverters (N = 18)		Long-term HIV positive (N = 23)	
	%	Test statistic ^{a,b}	%	Test statistic ^{a,b}	%	Test statistic ^{a,b}
Used crack in past 6 months						
No–yes	10.0	0.53	33.3	6.00*	4.4	1.00
Yes–no	14.3		0.0		0.0	
No–no	11.4		5.6		4.4	
Yes–yes	64.3		61.1		91.3	
Injection in past 6 months						
No–yes	2.9	26.47**	11.1	2.78	4.4	7.36*
Yes–no	45.7		38.9		43.5	
No–no	20.0		22.2		0.0	
Yes–yes	31.4		27.8		52.2	
Inject cocaine in past 6 months						
No–yes	2.9	22.53**	5.6	4.50	4.4	7.36*
Yes–no	40.0		38.9		43.5	
No–no	34.3		27.8		21.7	
Yes–yes	22.9		27.8		30.4	
Inject heroin in past 6 months						
No–yes	11.4	3.24	11.1	0.67	13.0	1.00
Yes–no	24.3		22.2		26.1	
No–no	47.1		50.0		26.1	
Yes–yes	17.1		16.7		34.8	
Inject speedball in past 6 months						
No–yes	4.3	15.38**	5.6	1.80	4.4	7.36*
Yes–no	32.9		22.2		43.5	
No–no	48.6		55.6		21.7	
Yes–yes	14.3		16.7		30.4	
Shared used needle in past 6 months						
No–yes	12.9	3.00	0.0	—	8.7	5.33*
Yes–no	25.7		44.4		43.5	
No–no	51.4		55.6		39.1	
yes–yes	10.0		0.0		8.7	
Rent/borrowed used syringe in past 6 months						
No–yes	8.6	11.65**	0.0	—	4.4	5.44*
Yes–no	35.7		44.4		34.8	
No–no	54.3		55.6		52.2	
Yes–yes	1.4		0.0		8.7	
Drug treatment in past 5 year						
No–yes	12.9	4.80*	0.0	8.00**	26.1	0.40
Yes–no	30.0		44.4		17.4	
No–no	21.4		11.1		34.8	
Yes–yes	35.7		44.4		21.7	

^aMcNemar/Exact McNemar Test.^b1 degree of freedom.* $p \leq 0.05$; ** $p \leq 0.01$.

no one had ceased crack use and 61% reported continued crack use. There was a decrease in injection drug use; 38% of the seroconverters had injected in 1988 but not in 1998 with only 11% who injected in 1998 but did not in 1988. Over a quarter reported injection at both periods. Although not significant, more seroconverters ceased heroin and/or speedball injection than initiated it. Among the seroconverters, 44% had shared in 1988 and had not shared injection equipment in 1998 and the remaining 55% had

not shared at either time period. The same held true of renting or borrowing used syringes. In 1998, no one had rented or borrowed a used needle; in 1988 44% of the seroconverters had done so. Treatment was reduced among the seroconverters; 44% had received treatment in the 5 years prior to 1988 and received no treatment in the 5 years prior to 1998; conversely, no one who had not received treatment in the 5 years prior to 1988 received treatment in the 5 years prior to 1998. Among the seroconverters,

1 in 10 had not received treatment in either time period.

Long-Term HIV Positive Participants (LTHIV+)

Crack use was pervasive among this group as it was among the seroconverters. Among the 23 individuals in the LTHIV+ group, no one ceased crack use, one person initiated it and 21 individuals (91%) used crack at both time periods. There was a significant decrease in injection drug use; 43% of the sample injected in 1988 but did not inject in 1998 and only one sex partner (4%) initiated injection. There was also a significant decrease (43%) in the injection of cocaine compared to the initiation of cocaine injection (4%). There was not a significant decrease in heroin injection; 26% ceased heroin injection compared to 13% who initiated heroin injection. As with cocaine, there was a significant decrease in speedball

injection over initiation of speedball (43% vs. 4%). Among the LTHIV+s, there was also a significant decrease compared with initiation in sharing needles (43% vs. 8%) and renting or borrowing injection equipment (34% vs. 4%). Four of the HIV positive individuals (17%) reported treatment in the 5 years prior to 1988 and no treatment in the 5 years prior to 1998. However, six participants (26%) who had not received treatment in the 5 years prior to 1988 did receive treatment in the 5 years prior to 1998. This was the only group to show an increase in the number of people in treatment from 1988 to 1998.

Sexual Risk Behaviors and HIV/AIDS Knowledge

Table III displays the changes in sexual risk behavior between 1988 and 1998. The analysis of the sex variables revealed little statistically significant change but did yield important information.

Table III. Comparison Changes of Sexual Behaviors and Knowledge Categorized by Seroconversion Status 1988–1998

Variables	Long-term HIV negative (N = 70)		Seroconverters (N = 18)		Long-term HIV positive (N = 23)	
	%	Test statistic ^{a,b}	%	Test statistic ^{a,b}	%	Test statistic ^{a,b}
Exchanged sex for money/drugs past 6 months						
No–yes	8.6	1.47	27.8	0.11	8.7	0.00
Yes–no	15.7		22.2		8.7	
No–no	61.4		50.0		69.6	
Yes–yes	14.3		0.0		13.0	
Male to male sex in past 6 months						
No–yes	0.0	4.00	0.0	—	0.0	1.00
Yes–no	9.8		20.0		11.1	
No–no	87.8		80.0		77.8	
Yes–yes	2.4		0.0		11.1	
STI in past 6 months						
No–yes	1.4	3.57	11.1	0.00	4.4	1.80
Yes–no	8.6		11.1		17.4	
No–no	88.6		77.8		73.9	
Yes–yes	1.4		0.0		4.4	
Condom use in past 6 months ^c						
No–yes	8.5	0.50	18.2	0.00	41.2	7.00*
Yes–no	5.1		18.2		0.0	
No–no	84.8		54.6		52.9	
Yes–yes	1.7		9.1		5.9	
HIV knowledge score mean (SD) ^d						
1988	5.8(2.0)	–4.61 ^{e**}	5.1(1.8)	–3.61 ^{f,**}	6.4(1.9)	–0.60 ^g
1998	7.2(1.0)		6.9(1.0)		6.7(1.7)	

^aMcNemar/Exact McNemar Test.

^bDegree of freedom = 1.

^cOf those who had sex.

^dPaired sample *t*-test.

^eDegrees of freedom = 69.

^fDegrees of freedom = 16.

^gDegrees of freedom = 22.

p* ≤ 0.05; *p* ≤ 0.01.

There was a decrease in the exchange of sex for drugs or money. Almost 16% of the LTHIV-s exchanged sex for drugs or money in 1988 but did not do so in 1998; 8% did not exchange in 1988 but did so in 1998. Almost 1 in 10 of the male LTHIV-s who had a male sex partner in 1988 reported having one in 1998. No man who did not have a male partner in 1988 reported having one in 1998. The occurrence of STIs was low among this group compared to the two positive groups. Almost 90% reported no STIs at either time period. Any condom use among this group was rare; 84% of those having sex reported no condom use during either time period.

An almost equal percentage of seroconverters ceased having sex for drugs or money (22%) and initiated having sex for drug or money (27%) in 1998. Among the seroconverters, 20% reported a male partner in 1988 but no male partner in 1998. No male participant acquired a male partner. An equal percentage (11%) of the seroconverters reported an STI in 1988 and 1998; the remaining 77% did not have an STI at either time period. There was very little change in condom use among the seroconverters who had engaged in sex. The same percentage 18% initiated condom use as ceased condom use. A slight majority (54%) reported no condom use at either time period.

Finally, for the long-term HIV positives, an equal proportion (8%) reported ceasing exchanging sex for drugs or money as initiated the exchange. One man who had a male sex partner in 1988 did not have one in 1998; one man had a male sex partner in both time periods. A decrease in the prevalence of STIs was noted in the HIV positive group. This group also presented the greatest change in condom use. Four out of ten (41%) long-term HIV positives reported no condom use in 1988 and some condom use in 1998 and no one reported using and condom in 1988 and not in 1998. This was a statistically significant change. About half had not used a condom during either 6-month period.

HIV Knowledge

Table III also displays the average HIV knowledge scores in 1988 and 1998 for the three serogroups. Knowledge significantly increased among the LTHIV-s. This group held the highest mean score for knowledge in 1998. The seroconverters also significantly increased their mean knowledge score. The LTHIV+s had no such increase in mean

score and although they had the highest mean score in 1988, they had the lowest mean score in 1998.

DISCUSSION

Before addressing the findings of this report, the limitations of the study should be considered. First, as mentioned earlier, the small sample size limits the power of the statistical analysis to detect differences. Second, both studies relied on self-reported behaviors which occurred in the 6 months prior to interview and thus is open to recall bias. However, six month recall among IDUs has been shown to be reliable (McElrath *et al.*, 1994). Temporality also plays a role in behavior change; risk behaviors will change over time with or without the stimulus of an intervention program. It is impossible to determine what proportion of the change is secular and because of an aging population, and what proportion is due to intervention programs. What is of importance, however, is that decreases in risk behaviors occur and appear to be sustained over a lengthy period of time. There is also the question of the representativeness of the small sample of 111 to the larger sample of 1359 incurred in 1988. Statistical analysis indicated that the only significantly different demographic characteristics were gender, the proportion of women was smaller in the larger 1988 study, and education, larger 1988 study had a higher proportion of high school graduates than the current sample. Because of the possibility of interactions with gender, all independent variables were cross-tabulated with gender. No significant differences by gender emerged; however, the small sample size may have precluded detection of differences. The knowledge scale was created in 1988 and did not include current issues such as the role of antiretroviral medications in influencing high-risk behaviors. Finally, as in all studies of IDUs, a random sample could not be generated.

The three groups described in this analysis provide important insights into the risk behaviors of active drug users over time. In all three groups, IDUs continue to be at risk for HIV infection despite the increase in knowledge about risk factors and the numerous interventions to decrease high-risk behaviors that have been conducted among drug users. IDUs also serve as a bridge to the heterosexual population through sex with partners who are not drug users who in turn have sex with others. This study indicates that over a 10-year period, there is a substantial decrease in needle use risk behaviors among this sample of IDUs. A similar decrease in high-risk sex behaviors

was not seen. A recent study among heroin users found the attributable risk percent of HIV due to injection was 55% among those who initiated injection prior to 1984 and only 5% among those who initiated injection within the previous 4 years; the percent of risk not attributable to injection would presumably be sexual risk (Chitwood *et al.*, 2003). This is consistent with the findings of other researchers who have suggested that changing sexual risk behaviors, compared to changing drug risk behaviors is more difficult and may require new and innovative approaches (Cottler *et al.*, 1998; Coyle *et al.*, 1998; Kotranski *et al.*, 1998).

The decade under study was one of heightened HIV/AIDS risk awareness. Interventions to decrease high-risk drug and sexual risk as well as to increase knowledge of HIV/AIDS were being implemented nationwide (Booth and Watters, 1994; Gibson *et al.*, 1998; Semaan *et al.*, 2002; Stephens *et al.*, 1993). All individuals in our sample had attended at least one of two intervention programs which were part of the original 1988 NADR study and all had received pre- and posttest counseling in 1988. Whether these interventions could result in changes over a relatively long period is unknown. This is the first report to examine the risk behaviors of a sample of individuals 10 years after participating in an HIV/AIDS counseling/intervention program.

Overall, four salient points emerge from the analysis. First, by examining Table I, it appears that the quality of life of many of the participants decreased. More were unemployed, living alone and homeless in 1998 than in 1988. This study indicates that many experience a deterioration in living standard even after decreasing high-risk behaviors. This may reflect a sampling bias, as those who had improved their life situations might be less likely to be enrolled in the second study. It may also reflect the increase in crack use. The lifestyle associated with crack use is often unstable (Latkin *et al.*, 2001; Sterk, 1999, 2002) and is associated with poverty, crime, family dysfunction and violence (Boyd and Mieczkowski, 1990; Sherman and Steckler, 1998).

Second, there was a substantial number of individuals who seroconverted at some time during the 10-year period. Among the 88 individuals who were HIV negative in 1988, 18 (20%) seroconverted at some time during the 10-year period for an annual rate of approximately 2% or, when calculated by person years, 10-year incidence was 4.1 per 100 person years, an incidence greater than that found in other studies (Chitwood *et al.*, 1999; Murrill *et al.*, 2001;

Nelson *et al.*, 1995). Although this rate of HIV infection suggests that over time seroconversion may be higher than expected from earlier studies, it also is an indication that the HIV positive pool of drug users is increasing. The average life span of HIV positive individuals has increased dramatically in the last decade because of advances in the medical management of HIV and thus promotes a larger HIV positive base from which the infection can be transmitted. It also points to the role of drug treatment in decreasing seroconversion among drug users. In our sample, though not statistically significant, none of the seroconverters reported taking part in a drug treatment program in the 5 years prior to 10-year follow-up. Other studies have found a link between decreased risk behaviors and participation in drug treatment programs (Chitwood and McCoy, 1990; Hoffman *et al.*, 1998; Metzger and Navaline, 2003; Shoptaw *et al.*, 1997). This finding of increased incidence must be taken with caution, as only 88 seronegatives from the original sample of 975 seronegative individuals were included in this analysis.

A sizable number of study participants did stop drug injection. This may be in reaction to the HIV/AIDS epidemic especially because there has been sustained focus on harm reduction or may simply be an artifact of aging. However, high-risk drug-use behavior such as sharing needles continues among some drug users and although most have stopped sharing, some individuals reported sharing needles in 1998 who had were not sharing in 1988. This initiation of high-risk behavior among some persons is particularly disturbing and parallels the continued incidence of HIV infection noted above.

Third, there were continued drug and sexual risk behaviors in all three groups. Crack use was pervasive and increased in all three serostatus groups. This finding is important because, in addition to the risk for HIV exposure due to injection, crack use has been associated with increased sexual activity and sexual transmission of HIV and other STI (Booth *et al.*, 2000; Chiasson *et al.*, 1991; Chirgwin *et al.*, 1991; Edlin *et al.*, 1992, 1994; Fullilove *et al.*, 1990; Kral *et al.*, 1998). There was an increase in those reporting STI in the prior 6 months among LTHIV–s and those positive in 1988. The LTHIV– group had the highest percentage who reported no STI an either time period. There is a strong correlation between a history of having an STI and being HIV positive (Nelson *et al.*, 1991). That STIs were elevated in the second time period indicates that safer sex behaviors were not being practiced. Although there were

significant increases in condom use, STIs increased. Because our variable was any condom use, this would suggest that condoms are not being used regularly and/or they are not being used properly. In addition, over three-fourths of long-term HIV negatives and one-third of seroconverters and long-term HIV positives were never using condoms.

Fourth, the HIV/AIDS knowledge scores increased significantly among the non-seroconverters and even among the seroconverters but not among those already positive in 1988. With a possible range of 0–16, the mean scores indicate that, in general, all three groups have a low level of knowledge concerning HIV/AIDS. An increased knowledge among all IDUs would be expected as the information available increased exponentially during the decade (Bell *et al.*, 2003). That individuals already seropositive did not increase their knowledge is somewhat puzzling considering what they have at stake in learning the fundamentals of the infection. At baseline, positives displayed the highest HIV/AIDS knowledge scores; at follow-up they exhibited the lowest scores among the three groups. This may reflect that, until recently, there have been few prevention intervention programs designed to meet the special needs of drug users living with HIV (Margolin *et al.*, 2003; Purcell *et al.*, 2004).

Collectively, these findings highlight the need for continuous sustained intervention with both HIV negative and HIV positive drug users. A one-time intervention program that lasts perhaps a month probably is insufficient to change some long-term behaviors among some drug users. Drug users need to receive continuous sustained interventions that provide them with needed skills to decrease or eliminate risky drug and sex behaviors.

For HIV negative drug users, there is a need for skills training to strengthen the capacity for self-protection. The observed increase in crack use highlights the need for specialized intervention for HIV negative crack users (Sterk, 2002; Wechsberg *et al.*, 2004). For HIV positive drug users, there is a need for skills training to strengthen the desire for the protection of others and to heighten their perceived responsibility (Avants *et al.*, 2000; Parsons and Halkitis, 2002; Steins and Weiner, 1999). The perceived benefits of behavior change may be less apparent (Fisher *et al.*, 1998) but it is important to recognize there is a need for skills training to equip HIV positive individuals with the ability to negotiate sexual protection for both themselves and their partners. Fisher *et al.* (1998) showed that HIV positive individuals

might assume that their partners are also HIV positive and choose sexual practices based on this assumption. Kelly and Kalichman (2002) found that although most people who are aware of their positive HIV status engage in safer behaviors, a substantial number also continue to engage in high-risk transmission behaviors. However, Kalichman *et al.* (2001) found significantly lower rates of unprotected sex and greater condom use at follow-up following an intervention to improve coping and increase self-efficacy for managing disclosure of HIV to sex partners and skills for practicing safer sex over one's lifetime. This is particularly important because HIV positive IDUs constitute a bridge for HIV transmission to their sex partners (Eicher *et al.*, 2000).

As other studies have indicated, although some interventions have demonstrated effective changes in drug injection behaviors (Coyle *et al.*, 1998; Gibson *et al.*, 1998; Kotranski *et al.*, 1998; Margolin *et al.*, 2003), behavioral interventions are still needed to address the high-risk sexual behaviors practiced by active drug users and their sex partners (Sharma *et al.*, 2002; Semaan *et al.*, 2002). The data presented in this paper suggest the need for continuing efforts in preventing new infections as well as new strategies to provide prevention services to drug users living with HIV. Although there are effective treatments to prolong the lifespan of those with HIV/AIDS, changing high-risk behaviors remains the primary means of reducing transmission. These high-risk behaviors all contribute to HIV transmission and are amenable to change through the continued use of both primary and secondary prevention interventions.

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