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Women's Drug Injection Practices in East Harlem: An Event Analysis in a High-Risk Community

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This study described the most recent injection events of injection-drug-using women, determined the prevalence of HIV, hepatitis B (HBV), and hepatitis C (HCV), and identified significant predictors of injection-related risk behaviors. After validation of drug use, 185 street-recruited women participated in structured interviews and were offered HIV, HBV, and HCV testing and counseling. Interview topics included (1) demographic characteristics, (2) characteristics of injection partners (IPs), and (3) relevant situation-specific factors. Prevalence was 28% for HIV infection, 80% for HBV, and 70% for HCV. Injection events were either solitary ($n = 110$) or social ($n = 75$). Most were safe, and 75% of syringes used were obtained from a syringe exchange. Inferential analyses identified two variables that independently predicted unsafe events: (1) respondent had injected previously with her IP, and (2) her IP was her spouse or primary heterosexual partner. Two trends were identified: Injection events in which women felt "very close" to their IP or reported lack of control over injection practices tended to be unsafe. Although most events were safe, safe practices were not adhered to with spouses or primary partners. Syringe exchanges should be supported and may be an ideal setting for interventions targeted to drug-injecting couples.

KEY WORDS: Women and HIV; drug injection and HIV; social context; event analysis.

INTRODUCTION

Use of injected drugs increases women's risk for infectious diseases such as HIV, hepatitis B, and hepatitis C. As observed in New York City, high rates of these diseases are found in the most impoverished neighborhoods, where injected drug use is greatest. East Harlem is one such neighborhood. Located in the northeast corner of Manhattan, it has a population of 110,508 and is characterized by high unemployment, poor education, and the second highest infant mortality rate in New York City. About 36% of residents receive some form of public assistance, and about half live near or under the poverty level. East Harlem residents are primarily Latino (52%; mainly Puerto Rican) and African American (36%), and the majority (53%) are female, many of whom are heads of households (New York City Department of City Planning, 2001). The prevalence of AIDS in East Harlem is the second highest (4,330 per 100,000 adults) in New York City [NYC/DOH-OAS] (New York City Department of Health, Office of AIDS Surveillance, 1998), and hepatitis B and C are endemic among drug users, with rates as high as 70–80% in some groups (Tortu *et al.*, 2001).

Due to the illicit and stigmatized nature of injection drug use, it is usually difficult to estimate the number of women who are injection drug users (IDUs) in East Harlem. However, this community maintains the highest rate for HIV infection through intravenous transmission (62%) in Manhattan, with East Harlem women accounting for 28% of all transmissions in this category, more than double the citywide rate (NYC/DOH-OAS, 1999). Recent reports have

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indicated a reduction in seroprevalence among injection drug users in New York City (Des Jarlais *et al.*, 1998; Beardsley *et al.*, 1999), primarily due to the success of educational outreach, syringe exchange programs, and other harm reduction strategies. The reporting of citywide reductions of HIV seroprevalence, however, may obscure increases in seroprevalence among smaller subgroups. Moreover, it is important to remember that any relapses toward risk behavior at this time may lead to increases in the number of new infections in the future (Des Jarlais *et al.*, 1998). Thus, injection behavior in communities such as East Harlem should be closely monitored to determine levels of risk within various subgroups, and barriers to maintaining low-risk injection behaviors should be identified and addressed by community-based interventions.

Recently, it has been noted that social context is not usually addressed by current theoretical models of risk behavior (Harvey, 2000). New thinking on women's risk for HIV infection has begun to address the diverse, gender-related contextual factors that influence women's risk for infection (Tortu *et al.*, 2000a; Wingood and DiClemente, 2000). Social context can include such broad factors as socioeconomic status, sociocultural norms, and gender inequality (Amaro, 1995; Ickovics and Rodin, 1992; Zierler and Kreiger, 1997). However, in our conceptualization of risk behaviors, social context can also include the more immediate influences on behavior that operate in specific situations. These variables may be associated with a particular partner (e.g., intimate or casual) or the particular setting of a risk event (e.g., location or communication patterns). For example, research has indicated that safe sex practices are less likely to occur in primary relationships than casual relationships (Booth, 1995; Falck *et al.*, 1997; Siegal *et al.*, 1996). Receptive syringe sharing within dyads was more likely in relationships that were "very close" and in which there was daily contact and sexual relations (Neaigus *et al.*, 1995). In our own work, we have observed that perceived control over condom use is influenced more by event-specific factors than by characteristics of the individual (Tortu *et al.*, 2000a).

One approach to learning about current injection practices in East Harlem, especially the role played by situation-specific variables, is to analyze detailed information regarding IDU's most recent injection events. This approach minimizes recall bias if events are of recent origin, eliminates generalizations across a given time period (e.g., 30 days or 6 months), and permits a detailed description of the immediate, situational context of risk. In a previous study, we examined situation-specific variables that were associated with sexual risk (Tortu *et al.*, 2000a). This report applies event analysis methodology to the study of current injection practices among women IDUs in East Harlem. This study (1) determines the prevalence of HIV, hepatitis B, and hepatitis C infections, (2) describes the most recent injection events of injection drug-using women in East Harlem, and (3) identifies individual, dyadic, and situation-specific determinants of injection-related risk during these events.

METHODS

Recruitment and Eligibility Criteria

Women were recruited from the streets of East Harlem from 1997 to 1999 as part of a larger study on sex- and injection-related HIV risk behavior. Study participants were recruited by experienced outreach workers using targeted sampling (Watters and Biernacki, 1989) and by participant referrals. A brief screening form was administered at the time of initial contact to determine study eligibility. In order to participate, women had to be at least 18 years of age, heterosexually active at least once in the previous 6 months, and report the use of injected or noninjected heroin, cocaine, or crack in the previous 30 days. For this report, a subsample of drug-injecting women was analyzed.

Procedure

Women who qualified and agreed to participate in the project were either escorted directly to the field site for screening and assessment or were given an appointment card and invited to participate at a later time. Once at the field site, participants were asked to review and sign an informed consent. Urine was analyzed to validate recent self-reported drug use. A face-to-face, structured interview, lasting approximately 2 hr, was administered in a private room by trained and experienced female interviewers. Injector status was determined on the basis of self-reported data and interviewer observations. Our interviewers have had extensive experience dealing with injection drug users and were instructed to check for signs of injection (e.g., track marks) during the session. In addition, the study from which this sample was drawn accepted both self-reported injectors and noninjectors;

thus, there was no incentive for potential participants to misrepresent their injector status to get into the study. After the interview, women were paid $25 for their participation. Study participants were offered counseling and testing for HIV and hepatitis B and C infections. About 85% of participants consented to HIV testing and 70% consented to screening for hepatitis B and C; all tests were conducted on the day of the interview and took place at the field site. At posttest counseling sessions, participants were given medical and social service referrals as needed.

Sample

The events examined in this study were obtained from 185 women drug injectors, each of whom reported on their most recent injection event. The sample of women injectors was 44% African American, 43% Latina (mainly Puerto Rican), and 13% other (mainly White). Median age was 39 years, 51% were high school graduates, 40% were either married or living with a primary heterosexual partner, and 89% were unemployed. In the 30 days prior to the interview, women reported injecting an average of 26 times for heroin ($n = 137$), 23 times for cocaine ($n = 68$), and 18 for some combination of the two (i.e., "speedball"; $n = 60$). Percentages of women who reported any use of noninjected drugs in the 30 days prior to interview were as follows: crack, 50%; heroin, 48%; marijuana, 34%; and cocaine, 26%.

Measurement

The interview included questions on respondent's demographics and disease risk factors. In addition, detailed information was collected concerning each respondent's most recent injection event. Respondents were asked about their own HIV serostatus at the time of the event as well as the context surrounding the injection event. Contextual and situation-specific factors included the setting of the event, the use of noninjected drugs or alcohol, discussion of safe injection practices, sources of syringes, and respondent's perceived control over injection practices. For each event, respondents were asked whether they injected alone (solitary injection) or with one or more other injectors (social injection). For social injection events, respondents were asked about the characteristics of their injection partner(s) (IPs), including partner demographics (e.g., gender, age, race/ethnicity) and perceived HIV serostatus. Information concerning the relationship between respondents and their IPs was also collected, including the type of relationship (e.g., spouse, family member, etc.), previous injection history, dyadic-level factors such as age difference, and IP's level of influence over injection practices. A complete list of variables is presented in Tables I and II. In addition, using an open-ended format, respondents who reported injecting unsafely were asked, "What problems, barriers, or obstacles did you feel prevented you from cleaning your needles/syringes or using new needles/syringes?" Subject responses were recorded by the interviewers and later reviewed and coded by research staff. The most frequent responses are presented in Table V.

Study participants' most recent injection events were categorized as either "safe" or "unsafe" as follows. An unsafe injection event was defined as an occasion on which the respondent injected at least once using any of the following methods: (1) with a needle/syringe that another injector had already used, or (2) with a needle/syringe that had been filled with drugs from another injector's syringe (i.e., backloaded/piggybacked), or (3) with a cooker, cotton, or rinse water first used by another injector. Each of these injection practices has been shown to be a risk factor for HIV transmission (Des Jarlais *et al.*, 1990; Jose *et al.*, 1994; Shah *et al.*, 1996). A safe injection event was defined as an occasion on which the respondent used her own new or sterile needle/syringe and did *not* backload, nor did she share a cooker, cotton, or rinse water. For the purpose of analysis, each event was determined to be safe or unsafe on the basis of respondent's self-reported injection behavior, not on her perception of risk. The terms "safe" and "unsafe" were not disclosed to the respondents prior to or during the interview.

For study participants who consented to HIV testing, oral fluid was collected using the OraSure procedure. HIV antibodies were identified using the standard ELISA screening, confirmed by Western blot. For hepatitis, blood was collected through venipuncture. Core antibody assays (hepatitis B) were performed using CORZYME enzyme immunoassay, and for hepatitis C, core antibody assays were run using Abbott HCV EIA 2.0.

Data Analysis

Prevalence data were calculated from biological test results for HIV, hepatitis B, and hepatitis C.

Table I. Comparison of Respondent and Situational Variables between Social and Solitary Injection Events ($N = 185$)

Variable	Social (%)	Solitary (%)	p
Respondent-specific variables			
Respondent's age at event (years)	39.4 (7.5)[a]	41.9 (6.9)[a]	*
Respondent's race/ethnicity			
African American	44.0	43.6	
Latina	41.3	43.6	
White	14.7	12.7	
Respondent completed high school education	54.7	48.6	
Respondent was homeless	9.5	12.8	
Respondent was HIV-positive and seroaware	14.7	20.4	
Respondent's age at first injection (years)	23.7 (7.3)[a]	21.8 (7.4)[a]	*
Number of years injecting prior to event (years)	15.7 (11.5)[a]	19.8 (12.1)[a]	**
Respondent had primary sexual partner	85.3	78.2	
Situation-specific variables			
Time of event			
Day event occurred[b]	46.7	42.2	
Event occurred between 7 pm and 4 am	40.0	16.5	***
Location of event			
At respondent's home	56.0	76.4	***
At someone else's home	37.3	10.0	***
At a public place (abandoned building, park)	5.3	7.3	
Drugs injected at event			
Heroin	69.3	74.6	
Cocaine	20.0	20.9	
Speed	21.3	12.7	
Heroin only	60.0	69.1	
Noninjection drugs/alcohol used at event			
Alcohol	29.3	14.6	**
Marijuana	13.3	5.5	*
Crack	25.3	22.7	
Heroin	14.7	5.5	**
Cocaine	9.3	3.6	
Respondent felt in control over injecting safely[c]	80.0	97.3	***
Event was special (e.g., birthday, anniversary)	12.2	10.0	

[a]Mean (*SD*) is reported.
[b]Friday–Sunday = 1; Monday–Thursday = 0.
[c]More than somewhat = 1; somewhat or less = 0.
$^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$.

Standard univariate statistics were used to describe the women who participated in the study as well as the sample of injection events reported by these women. Respondents' most recent injection event, whether safe or unsafe, was the unit of analysis in all inferential statistical procedures. In order to minimize recall bias, 118 events that occurred more than 6 months prior to the interview were excluded from the analyses, yielding a sample of 185 events that occurred within the prior 6 months.

Descriptive analyses identified two types of injection events: solitary and social. Two separate inferential analyses were performed ($\alpha = .05$). In the first, Fisher's exact test was used to identify significant differences between social and solitary events on dichotomous variables and t tests were used to assess differences in the means of continuous variables. The sample size provided sufficient power (above 80%) to detect a difference in proportions on a given variable of about 10% between the social and solitary events.

The second analysis examined the subset of 75 social events in order to identify significant determinants of unsafe injection behavior. Because respondents may have engaged in risky injection practices with more than one person during their most recent injection event, the generalized estimating equation (GEE) was used to test for partner-specific predictors of unsafe injection while accounting for multiple partners within subjects. However, the GEE results did not differ from those produced using a maximum likelihood estimation (MLE) logistic regression technique in which only one injection partner per

Table II. Univariate Logistic Regression Tests for Significant Predictors of Unsafe Syringe Sharing

Variable	*n*	Percentage or mean	MLE logistic regression OR (95% CI)	*p*
Respondent-specific variables				
Respondent's age at event (years)	75	39[a]	1.03 (0.96, 1.11)	0.38
Respondent's race/ethnicity				
African American	75	44.0	1.07 (0.38, 3.03)	0.96
Latina	75	41.3	0.96 (0.52, 1.76)	0.90
White	75	14.7	Reference	
Respondent completed high school education	75	54.7	0.92 (0.33, 2.60)	0.88
Respondent was HIV-positive and seroaware	75	16.3	0.54 (0.06, 4.65)	0.57
Respondent's age at first injection (years)	75	24[a]	1.01 (0.94, 1.08)	0.79
Number of years injecting prior to event (years)	75	16[a]	1.01 (0.96, 1.06)	0.69
Injection Partner (IP)-specific variables				
IP was male	75	64.0	2.25 (0.70, 7.21)	0.17
IP's race/ethnicity				
African American	75	44.0	0.50 (0.09, 2.69)	0.42
Latino	75	46.6	0.48 (0.09, 2.58)	0.39
White	75	9.4	Reference	
IP was age 40 or older	75	62.7	0.32 (0.11, 0.90)	0.03
IP exchanges sex for drug or money	75	14.7	1.17 (0.26, 5.19)	0.84
Respondent felt IP was HIV-positive	75	21.3	0.67 (0.19, 2.38)	0.53
Relationship-specific variables				
Relationship of respondent to IP				
Family member, friend, acquaintance	75	46.7	0.18 (0.05, 0.62)	0.007
Spouse or primary partner (husband/boyfriend)	75	53.3	5.52 (1.61, 19.0)	0.007
Had injected with IP previously	75	92.0	0.96 (0.91, 1.02)	0.42
Had shared needles/syringes with IP previously	75	54.7	31.43 (3.92, 251.98)	0.001
Respondent–IP age difference (years)	75	−0.8[a]	1.05 (0.99, 1.11)	0.08
Respondent–IP same race/ethnicity	75	84.0	2.30 (0.45, 11.78)	0.31
Respondent–IP HIV dyadic seroawareness				
Respondent HIV+/IP HIV−	75	8.0	0.53 (0.06, 5.01)	0.58
Respondent HIV−/IP HIV+	75	14.7	0.79 (0.19, 3.34)	0.75
Respondent HIV+/IP HIV+	75	6.7	0.54 (0.23, 5.06)	0.58
Respondent HIV−/IP HIV−	75	70.7	Reference	
Respondent's feeling of closeness to IP[b]	75	71.6	3.5 (0.90, 13.7)	0.07
IP influence over injection practices[c]	73	49.3	0.79 (0.28, 2.25)	0.65
Situation-specific variables				
Time of event				
Day event occurred[d]	75	46.7	1.90 (0.67, 5.39)	0.23
Event occurred between 7 pm and 4 am	71	40.0	0.85 (0.27, 2.70)	0.78
Location of event				
At respondent's home	75	56.0	1.36 (0.48, 3.92)	0.56
At someone else's home	75	37.3	0.31 (0.09, 1.05)	0.06
At a public place (abandoned building, park)	75	5.3	7.5 (0.73, 76.9)	0.09
Drugs injected at event				
Heroin	75	69.3	1.21 (0.39, 3.74)	0.74
Cocaine	75	20.0	1.90 (0.56, 6.41)	0.30
Speed	75	21.3	0.74 (0.21, 2.70)	0.65
Heroin only	75	60.0	0.65 (0.23, 1.83)	0.41
Noninjection drugs/alcohol used at event				
Alcohol	75	29.3	1.96 (0.65, 5.95)	0.24
Marijuana	75	13.3	1.57 (0.39, 6.28)	0.52
Crack	75	25.3	1.59 (0.51, 4.94)	0.42
Heroin	75	14.7	0.50 (0.10, 2.59)	0.41
Cocaine	75	9.3	0.86 (0.15, 4.86)	0.87
Sniffed heroin or cocaine	75	17.3	0.69 (0.17, 2.84)	0.60
Discussion of cleaning needles/injecting safely occurred	75	34.1	0.68 (0.22, 2.09)	0.50
Respondent felt in control over injecting safely[e]	75	80.0	0.24 (0.07, 0.83)	0.02
Event was special (e.g., birthday, anniversary)	75	12.2	1.33 (0.29, 6.25)	0.71

[a]Median is reported.
[b]Very close = 1; less than very close = 0.
[c]Very much = 1; less than very much = 0.
[d]Friday–Sunday = 1; Monday–Thursday = 0.
[e]More than somewhat = 1; somewhat or less = 0.

respondent was included in the analysis (the first partner reported in the case of multiple partners). This was not surprising, because only four respondents injected with multiple partners at their last injection event. Use of the MLE approach permitted partner-specific variables to be included with other variable types in subsequent multiple regression analysis.

The MLE-based analysis consisted of three parts. First, univariate logistic regression was applied to each of the predictor variables listed in Table II. Predictors of unsafe injection events with $p \leq .10$ were retained for further multivariate analysis. Principal components analysis (PCA) with oblique (promax) rotation was employed as an exploratory tool to clarify the correlational structure among predictors of unsafe injection events. The PCA results were used to aid model specification. Finally, multiple logistic regression was performed to determine which variables independently predict unsafe injection practices. In each analysis, events missing relevant information (due to nonresponse) were excluded.

The instrument was designed to include a series of "analogous" items for which a measure of agreement could be attained. For example, responses on the use of noninjection drugs during the injection event should be consistent with responses given about noninjection drug use over the past 30 days or 6 months in an earlier section of the questionnaire. Analysis of 22 pairs of analogous items yielded a kappa coefficient of 99.1% (a total of only 18 disagreements over 4,070 comparisons), indicating a high level of intrainstrument agreement with regard to response consistency.

RESULTS

Prevalence of Blood-Borne Infections

Twenty-eight percent ($n = 46$) of women who consented to voluntary HIV testing ($n = 165$) were seropositive. Of the women who were tested for hepatitis B and C ($n = 119$), 80% were hepatitis B-reactive and 71% were hepatitis C-reactive.

Description of Most Recent Injection Events

The total number of injection events that occurred within 6 months prior to interview was 185, of which 110 (60%) were categorized as solitary and 75 (40%) were social. Solitary injection was not associated with any risk for HIV infection; that is, all solitary injections conformed to the definition of safe, as defined previously. Of the 75 social injection events reported, 21 (28%) involved some risk for HIV infection and were coded as unsafe (as previously defined): 20 events involved sharing cookers, cottons, or rinse water; 18 included receptive syringe sharing; and 1 event involved backloading. Of the 166 solitary and social events in which new or sterile syringes were used, 75% were obtained at a local syringe exchange. The drugs reportedly injected during the events were heroin only (65%), cocaine only (13%), and speedball (22%). Tables I and II provide descriptive data for other characteristics of respondent-reported recent injection events.

Approximately 68% of the events occurred within 1 week of the interview and 85% occurred within 1 month. The mean number of days that had elapsed between the date of the event and the date of the interview was not significantly different between solitary and social events ($z = 1.19$, $p > .05$) or between safe and unsafe social events ($z = 0.57$, $p > .05$) as determined by the Wilcoxon rank-sum test.

Differences Between Social and Solitary Injection Events

Analysis of social ($n = 75$) and solitary ($n = 110$) events revealed several differences between the two types of events. Only one respondent-specific variable significantly differentiated social from solitary events: Solitary events tended to involve women who had been injecting drugs for a longer period of time than women who reported social events. The remainder of the variables distinguishing the two types of events were all event specific: Social events were more likely to occur (1) in the evening or early morning hours, (2) outside of the respondent's home, (3) in conjunction with alcohol or noninjected heroin use, and (4) when respondents felt less in control over injecting safely (see Table I).

Predictors of Unsafe Injection Events

Univariate Analyses

Safe/unsafe injection behavior (dependent variable) was regressed separately on respondent characteristics and situation-specific descriptors. The univariate logistic regression analyses revealed nine variables associated with unsafe injection events, with

a p value under .10. All variables were IP-specific, relationship-specific, or event-specific variables. Significant IP- and relationship-specific predictors included "IP was spouse or primary sexual partner," "IP was family member, friend, or acquaintance," "IP was age 40 or older," "Respondent had shared needles/syringes previously with IP," "Age difference between respondent and IP," and "Respondent's feeling of closeness to IP" (see Table II). Situation-specific predictors of unsafe injection practices at most recent event included "Event occurred at someone else's home," "Event occurred at a public place (e.g., abandoned building, park, etc.)," and "Respondent's feeling of control over injecting safely" (see Table II).

Multivariate Analyses

Principal components analysis (PCA) was applied to the nine predictor variables significant at $p \leq .10$ in the univariate logistic regression analyses. The PCA was used as a heuristic, exploratory tool to summarize the relationships among important predictors of unsafe injection events and aid in model specification. Consequently, the PCA scores are not reported here, nor were they used in any subsequent data analysis. The first five principal components accounted for 84% of the total variance among the independent variables and clearly divided the nine predictors of unsafe injection practices into five distinct groups (Table III). The first principal component distinguished a dyadic-based factor involving the type of relationship and feelings of "closeness" between the respondent and her IP at the time of the event. The second component isolated the variable "Shared needles/syringes previously with IP." The third component identified a "safe injection self-efficacy" or "control" factor. The fourth component corresponded to a "location of event" factor. The fifth component contrasted the respondent's age with the age difference between the respondent and her IP. Oblique rotation of the principal axes permitted the components to be correlated in the analysis. Intercomponent correlations ranged from $r = .04$ to $r = .25$, with none significant at alpha $= .05$.

Multiple logistic regression was performed to determine which variables were independent predictors of unsafe injection events. Several hierarchical model selection methods were employed in which different combinations of variables corresponding to the five components revealed in the PCA were entered into the model using simultaneous, stepwise, and maximum chi-square model selection techniques. In each case, the same two variables were found to be independent predictors of unsafe injection events (Table IV). Injection events were significantly more likely to be unsafe if the respondent (1) injected drugs with her main heterosexual partner (AOR $= 5.05$, $p < .05$) or (2) injected with someone with whom she had previously shared syringes (AOR $= 18.36$, $p < .01$). Two additional trends in the final model included the following: Respondents who felt less in control over safe injection practices tended to inject unsafely, as were respondents who felt "very close" to their injection partners.

Table III. PCA Component Loadings Expressed as Standard Regression Coefficients After Oblique (Promax) Rotation[a]

	PC 1	PC 2	PC 3	PC 4	PC 5
Eigenvalues of correlation matrix	2.89	1.62	1.23	0.96	0.79
Variance accounted for by component	0.32	0.18	0.14	0.11	0.09
Predictor variables by component					
Respondent's perception of closeness to injection partner	0.94[b]	0.05	0.22	0.24	0.03
Injection partner was primary male sex partner	0.72[b]	0.00	−0.20	−0.34	−0.02
Injection partner was family, friend or acquaintance	−0.72[b]	0.00	0.20	0.34	0.02
Shared needles/syringes with injection partner previously	0.06	0.98[b]	0.02	0.04	0.00
Respondent felt in control over injecting safely	0.02	0.01	1.00[b]	−0.21	0.02
Injected at someone else's home	0.00	0.03	−0.22	1.00[b]	−0.02
Injected at public place	−0.02	0.02	−0.04	−0.99[b]	0.00
Respondent-injection partner age difference	0.20	−0.13	0.10	0.22	−0.74[b]
Injection partner was age 40 or older	0.15	−0.09	0.05	0.13	0.95[b]

[a] *Note:* $n = 75$.
[b] Value of coefficient exceeds the root mean square of all values in the matrix.

Table IV. Multiple Logistic Regression: Predictors of Unsafe Syringe Sharing[a]

Significant predictor	AOR (95% CI)	*p*
Shared needles/syringes with injection partner previously	18.36 (2.18, 154.58)	0.007
Injection partner was primary male sex partner	5.05 (1.16, 20.99)	0.03
Felt they were not in control of injecting safely	2.56 (0.94, 8.33)	0.06
Felt "very close" to their injection partners	3.53 (0.89, 14.14)	0.08

[a] *Note:* $n = 75$.

Respondent's Self-Reported Motives for Injecting Unsafely

Respondents who injected unsafely at their most recent injection event were asked why they did so. The responses were coded and appear in order of frequency in Table V. The most frequently given reasons for not injecting safely were "respondent did not feel she needed protection from HIV" (48%), "no clean needle/syringe was available" (48%), and "no bleach was available to clean works" (38%).

DISCUSSION

The "last event" methodology was used in this study because it minimizes recall bias and eliminates generalizations over time. Information on the context of drug injection is rarely obtained in traditional risk behavior surveys. In contrast, our respondents were asked to provide a detailed description of the setting in which the behavior occurred, including patterns of interaction with others who were present.

Table V. Most Frequently Given Reasons Why Respondent Injected Unsafely During Most Recent Injection Event[a]

Response	Percentage positive responses
Respondent did not think she needed protection	47.6
No clean needle/syringe was available	47.6
No bleach was available	38.1
It takes too long/respondent was sick and in a hurry	28.6
Others were waiting to use the works	19.1
Respondent did not feel like it/too much trouble	19.1
Respondent was already infected	4.8

[a] *Note:* $n = 21$.

However, there are some limitations to be noted. First, it is not possible to obtain a random sample of street-based injection drug users. In addition, data regarding the most recent injection events are self-reported and, although we feel the use of the "most recent event" reporting strategy minimized recall and generalizations, the data may be subject to other reporting biases. For example, socially desirable response bias is always a concern when dealing with stigmatized behavior. However, we do not believe that there was a bias to give the socially desirable response about injection-related risk because our findings are in stark contrast to those observed regarding sexual risk in a previous study with a similar sample. That is, the overwhelming majority of injection events in this study were reported as safe, but, in a study of sexual events, most events were reported to be unsafe (Tortu *et al.*, 2000a). The size of our sample provided sufficient power (80% or greater) to detect only relatively large effect sizes (Cohen, 1988); thus, variables with small to medium effects on injection risk may not have been detected in this study. Finally, the median age of the women in this sample was 39 years. Most women in this sample could be characterized as long-term injectors who probably have well-established patterns of injection behavior (see below). Therefore, results may not generalize to younger injectors with less established injection patterns. Nonetheless, we believe these data have some important implications for research and prevention efforts targeting drug-injecting women in other high-risk urban communities.

Prevalence of HIV, Hepatitis B, and Hepatitis C

Testing for three viral pathogens indicated extremely high rates of infection in this sample. Nearly 30% of the women were HIV-infected; 80% were anti-HBV-reactive and 71% were anti-HCV-reactive. The high rates of infection in this sample of long-time injectors (median years injecting = 18) were not unexpected because viral infections typically occur relatively early in a sustained drug career (Doherty *et al.*, 2000). Although most HIV-infected women were aware of their HIV status, 72% of HBV- or HCV-reactive women were unaware that they were infected with hepatitis B or C (McMahon *et al.*, 2000). Maintenance of low-risk behaviors in this sample is imperative to prevent further transmission of these viral infections.

Injection Patterns: Solitary and Social

Our findings identified two distinct types of injection events, solitary and social. Of these, all solitary events and most (72%) social events were safe. Overall, 89% of the most recent injection events reported did not involve risky injection behavior. This clearly indicates that the majority of women drug injectors in this sample protect themselves during injection events. Furthermore, the pattern of safe injection practices in this sample is not limited to findings using the "last event" methodology. Low rates of unsafe injection behavior were also reported by this sample in the last 30 days. For example, only 14% of study participants reported sharing works in the previous 30 days, and the majority of these women (82%) shared only with their primary sex partner.

It is interesting to consider that most injection events were solitary events. Perhaps this is because most of these women were long-term injectors. Our data indicate that solitary injection events tend to be more frequent among women who began injecting drugs at a somewhat earlier age and who have been injecting, on average, for nearly 20 years. Consistent with this finding, Barber and colleagues (1992) found that among 1,245 IDUs in Sydney, Australia, older and more experienced users were more inclined to inject alone. Among long-term injectors with well-established patterns of drug use, the purpose of solitary injection may not be merely to get high, but to avoid withdrawal effects and maintain daily functioning. This idea is consistent with the timing, location, and drug-use pattern of solitary injection events. The majority of solitary events occurred in the morning or during the day in the respondent's home and did not involve the use of other, noninjected drugs (see Table I).

However, it is important to note that although the solitary injection events reported here were absent any risk for blood-borne infection, there is some risk of overdosing during these events. As noted in a study conducted in San Francisco (Seal *et al.*, 2001), harm reduction efforts at syringe exchanges and elsewhere should address the issue of overdose during solitary injection.

Social injection events, which by their nature have a heightened possibility of risk for infectious diseases, were significantly more likely to take place during the evening, night, and early morning hours and were also more likely to take place away from the respondent's home. At social events, women reported that 9 of 10 IPs had injected with them before. More than half of the IPs at the social events were spouses or primary heterosexual partners, and 21% were thought to be HIV-positive by the respondents. HIV test results for IPs were not available in this study, and we believe the percentage of HIV-infected IPs may actually be greater than the percentage reported by our research participants.

Type and Closeness of Injection Partner Relationship

Three of the four variables associated with unsafe injection practices in this study are related to the respondent's relationship with her injection partner. This finding is consistent with several previous studies indicating that needle/syringe sharing is associated with level of closeness or familiarity among injection partners (Barnard, 1993; Kail *et al.*, 1995; Kelaher and Ross, 1999; Sherman *et al.*, 2001). Although numerous studies have shown that women drug users engage in higher sexual risk behavior with a spouse or primary sex partner than with other partner types (e.g., Booth, 1995; Falck *et al.*, 1997; Siegal *et al.*, 1996; Tortu *et al.*, 2000a; Watkins *et al.*, 1993), this study demonstrates a parallel finding with respect to injection risk behavior (also see Freeman *et al.*, 1994; Johnson *et al.*, 2002). It is reasonable to assume that many of the same dynamics that act as barriers to protective sex behavior within couples, such as gender inequality and issues regarding trust and intimacy, also operate to sustain unsafe injection practices.

Perceived Control of Injection Practices

Our analysis revealed that women's perceived lack of control of injection practices was a trend associated with unsafe injection events. This finding is consistent with previous research indicating that control and self-efficacy are associated with injection risk behavior, even within primary relationships (Brown, 1998; Gibson *et al.*, 1993). Perceived control was also observed to predict condom use in our study on sexual risk events; that is, "not feeling in control" was a significant predictor of risky sexual behaviors (Tortu *et al.*, 2000a). Our previous research (Tortu *et al.*, 1998) has shown considerable intraindividual variation in perception of control, indicating that this variable may be influenced more by contextual factors than individual attributes. Future research should investigate the interrelationships among the determinants

of perceived control in more detail. For example, other contextual factors, such as access to economic resources and relationship-specific communication patterns, may strongly influence women's perceived control.

Perceived HIV Serostatus

Our "most recent events" analysis revealed no correspondence between individual- or dyadic-level HIV seroawareness and safe or unsafe injection behavior. Previous studies have shown inconsistent results with regard to HIV seroawareness and injection risk behavior. For example, knowledge of HIV serostatus appeared to motivate risk-reducing injection behaviors among IDUs who were HIV-positive in a sample of 794 street-recruited injectors in Chicago (Hou *et al.*, 2000); however, several recent studies have found that significant numbers of HIV-seropositive, seroaware IDUs continued to engage in risky injecting practices (Avants *et al.*, 2000; Metsch *et al.*, 1998). Very few studies have examined respondent–IP *dyadic* seroawareness in the context of injection risk behavior.

Noninjected Drug and Alcohol Use

Our analysis also revealed no significant association between the use of psychoactive drugs or alcohol consumption and risky injection behavior. It must be noted, however, that this finding may be due to limited power rather than lack of association. However, our results are consistent with previous research showing a lack of association between alcohol use (Rees *et al.*, 2000) or other noninjection drugs and injection risk behavior. For instance, Carlson *et al.* (1999) found that IDUs who smoked *less* crack were actually more likely to have injected with previously used syringes.

Relevance to HIV Prevention

These findings indicate the importance of community-based syringe exchanges. As women reported, an overwhelming majority (75%) of the new, sterile syringes used in the events were obtained from a local exchange. This finding is not due to a bias of subject recruitment near syringe exchanges: All East Harlem neighborhoods were targeted for recruitment. The finding demonstrates that exchange programs serving the East Harlem community play a major role in providing women with sterile syringes. These programs are a significant public health resource in East Harlem and should continue to be supported. Recently, New York has expanded the availability of sterile syringes by enabling pharmacies to serve as sources of sterile syringes. At this time, only preliminary data are available on the effect of New York State's expanded syringe acquisition program (Deren *et al.*, in press).

However, in spite of the strong support for the use of clean/sterile needles among injection drug users in East Harlem, we must not ignore the fact that drug-injecting women are still at substantial risk of infection through heterosexual transmission of HIV. This has been documented using sexual event data from the same sample of women (Tortu *et al.*, 2000a). Sexual risk behaviors are often less of a priority in interventions that target injection drug users, but they play an important role in the continuance of the epidemic, especially among women (Tortu *et al.*, 2000b). Given the high prevalence of hepatitis B and C documented in this sample, prevention efforts must also focus on these pathogens.

Because injection events involving receptive syringe sharing by women are most likely to occur with their primary sex partner, our findings indicate a need for innovative interventions targeted at drug-injecting couples that address the risk for HIV as well as hepatitis B and C. Women who inject unsafely with spouses or main heterosexual partners are at extremely high risk for disease because they usually engage in unprotected sex with their partners as well (Brown, 1998; Tortu *et al.*, 2000a). Syringe exchanges may be an ideal setting for interventions that target both injection- and sex-related risk among injecting couples, given their widespread use and availability in East Harlem.

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