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Longitudinal Determinants of Consistent Condom Use by Partner Type Among Young Injection Drug Users: The Role of Personal and Partner Characteristics

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Abstract We investigated the longitudinal influence of individual-, relationship- and social-level factors on condom use by partner type among young injections drug users (IDUs) enrolled in the Collaborative Injection Drug Users Study-III/ Drug Users Intervention Trial (CIDUS-III/DUIT) from 2002 to 2004. Based on longitudinal analysis using generalized estimating equations (GEE), consistent condom use with main partners was more commonly reported among males and those with greater self-efficacy for condom use; main

partner's desire for pregnancy and needle sharing were negatively associated with consistent condom use. Among those with casual partners, having fewer sex partners was associated with consistent condom use. Positive attitudes toward condom use and partner norms supporting condom use were associated with greater consistent condom use with both partner types. These findings suggest that intervention strategies targeting individual- and partner-level factors may provide avenues for intervening upon sexual risks among young IDUs.

The findings and conclusions in this report are those of the authors and do not necessarily represent the views of the Centers for Disease Control and Prevention.

This study has been conducted by the authors for the CIDUS III-DUIT team.

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Introduction

Injection drug users (IDUs) continue to be at risk for both parenteral and sexual transmission of human immunodeficiency virus (HIV) infection (Bogart et al. 2005a; Kral et al. 2001; Strathdee et al. 2001). In the absence of a HIV vaccine, effective evidence-based behavioral interventions to reduce injection and sexual risk behaviors associated with HIV acquisition and transmission among IDUs are critically needed. To date, there is a growing body of evidence indicating that behavioral interventions can reduce parenteral risk behaviors associated with HIV among IDUs (Garfein et al. 2007a; Latkin et al. 2003; Sterk et al. 2003a; Robles et al. 2004). However, results from a meta-analysis designed specifically to estimate the effectiveness of HIV interventions in reducing sexual risk behaviors among IDUs indicated their impact on sexual risk reduction has been modest (Semaan et al. 2002).

One possible explanation for these modest sexual risk reduction effects among IDUs may be that changing sexual behaviors within steady relationships is more difficult than engaging in safer behaviors in new relationships or with casual sexual partners. In addition, for young, HIV-negative IDUs, the lack of perceived risk for acquiring and subsequently transmitting HIV may be a potential barrier to sexual risk reduction (Smith et al. 2007). Younger IDUs are at high risk for acquiring HIV infection. Compared to older IDUs, several studies have found that young IDUs, as well as those who recently began injecting, are more likely to engage in concurrent, risky sexual and injection practices such as unprotected sex with main and casual partners who inject drugs with other IDUs (Bogart et al. 2005b; Kapadia et al. 2007; Williams et al. 2006), sharing of syringes and other injection paraphernalia with sex partners (Frajzyngier et al. 2007; Gyarmathy and Neaigus 2007), exchanging sex for money or drugs (Astemborski et al. 1994) and having sex while high or intoxicated (Falck et al. 1997).

While our current understanding of factors associated with sexual risk behaviors now encompasses a range of individual behavioral and psychosocial factors, there is a growing body of evidence supporting the influence of relationship and social dynamics such as partner and peer support for condom use on sexual risk behaviors (Bogart et al. 2005a; Bowen et al. 2001; Latka et al. 2001; Somlai et al. 2003; van Empelen et al. 2001). As adoption and maintenance of safer sex behaviors has been shown to be more difficult compared to safer injection practices, a more nuanced understanding of how individual sex and injection risk behaviors, as well as contextual characteristics, are associated with safer sexual behaviors over time and with different types of partners is warranted. Such information is critical to increasing the effectiveness of future HIV

interventions with regard to sexual risk reduction among IDUs. Not only can this information directly benefit IDUs by avoiding HIV acquisition, but it can indirectly benefit the sex partners and children of IDUs by protecting them from HIV transmission.

Data for this report derive from participants enrolled in the Third Collaborative Injection Drug Users Study/Drug Users Intervention Trial (CIDUS-III/DUIT). This study was a multi-site randomized controlled trial of a cognitive-behavioral skills building and peer-education based intervention to reduce HIV and hepatitis C virus (HCV) risk behaviors among young-adult IDUs. As described in detail elsewhere (Purcell et al. 2007) the theoretical framework for the DUIT peer education intervention drew upon facets of the Information, Motivation and Behavioral (IMB) skills model (Fisher and Fisher 1992), Social Learning Theory (Bandura 1986) and peer education and leadership (Broadhead et al. 1998; Wiebel 1988). The peer education intervention was also designed to allow participants an opportunity to engage in social-cognitive theory based activities such as role playing and skills-building to master injection and sexual risk reduction strategies. Thus, the intervention sought to act upon IDUs self-efficacy to engage in injection and sexual risk reduction behaviors and also their outcome expectancies or anticipated responses from peers and partners to requests to engage in safer injection and sexual behaviors (Bandura 1977, 1986). Furthermore, participants were encouraged to take on a pro-social role as peer educators to encourage not only their own behavior change but that of their partners and peers as well. As such, the DUIT intervention was designed to take advantage of relationship and social attitudes toward risk reduction that could influence initiation and, ultimately, maintenance of risk safer injection and sexual behaviors.

Based on trial results, participants in the DUIT peer education intervention arm significantly reduced injection related risk behaviors compared to participants in the control condition arm; however, sexual risk reduction did not significantly differ between these two trial arms (Garfein et al. 2007a). The aim of the present analysis was to identify factors associated with sexual risk among young IDUs. In particular, we investigated relationship- and social-level factors as well as individual psychosocial factors, drug use practices and sexual risk behaviors and their association with consistent condom use among IDUs by partner type.

Methods

Study Design

Trial participants were recruited between May 2002 and January 2004 in five US cities: Baltimore, MD; Chicago,

IL; Los Angeles, CA; New York City, NY; and Seattle, WA. Details of the study objectives, design and methodology as well as description of the intervention have been described elsewhere (Garfein et al. 2007b; Purcell et al. 2007). Briefly, participants were recruited via street-based outreach, targeted advertising, and coupon-based peer referrals. Participants were eligible for the trial if they reported injecting illicit drugs in the past 6 months, intended on residing in their recruitment city for at least the next 12 months, spoke English, were between 15 and 30 years old, and tested negative for HIV and HCV. At baseline and follow-up visits, participants completed a behavioral assessment using audio computer assisted self-interview (ACASI) technology to minimize socially desirable responding. Retention rates for the 3- and 6-month visits were 64 and 76%, respectively, with 83% of the sample returning for at least one visit overall (Garfein et al. 2007a, b). All individuals provided written, informed consent to participate in the study and were remunerated for each visit according to local guidelines.

Sample

To identify determinants of consistent condom use over time, the present analysis was restricted to participants who reported being sexually active with a partner of the opposite sex during the 3 months preceding baseline interview and returned for a follow-up visit. Of the 854 individuals randomized to a trial arm, 673 (79%) were sexually active at baseline and included in this analysis. To investigate whether predictors of condom use differed by partner type, we conducted separate analyses for individuals who reported having a main partner and for those who reported having ‘other steady’ or casual partners (hereafter referred to as casual partners). A main sex partner was an individual identified by the participant as their closest or most important sex partner. Casual partners were those whom participants felt were ‘non-main’ or sex-trading partners. Of these 673 sexually active IDUs, 631 (94%) reported sex with a main partner and 388 (58%) reported sex with casual partners. These groups are not mutually exclusive as some individuals had partners in both categories.

Dependent Variable

Data on condom use were examined separately for main sex partner and casual partners as reported during baseline and follow-up visits. Consistency of condom use was measured by first asking participants to report the number of times they engaged in vaginal and anal sex during the past 3 months. Participants were subsequently asked to report on how many of those acts were protected using either a male or female condom. Data on proportion of

protected vaginal and anal sex acts where a male or female condom was used were dichotomized as consistent condom use (use at every event) versus inconsistent condom use (less than every event). This was done for both partner types. This dichotomization is supported by previous research indicating that consistent condom use is the most effective method of HIV prevention among HIV serodiscordant couples (De Vincenzi 1994).

Independent Variables

The present analysis examined individual-, relationship- and social-level variables as predictors of consistent condom use with different types of partners during follow-up visits. Individual-level characteristics included sociodemographic characteristics (age, race/ethnicity, sexual orientation, education background, source of usual income, current homelessness and history of incarceration), sexual practices (type of sexual activity, number of sex partners and trading sex for money or drugs) and drug use behaviors (duration and frequency of IDU, type of illicit drugs used, needle sharing and injecting with sex partners and other IDUs and alcohol use). The recall period for these behaviors was 3 months prior to survey unless otherwise noted.

Three individual-level, psychosocial factors related to condom use were also examined. Self-efficacy for condom use with a main partner was measured using a nine-item scale that assessed participants’ ability to use condoms with their main partner in a variety of circumstances (e.g., can use a condom even if main partner does not want to, etc.); a higher score indicated greater self-efficacy for condom use (Cronbach’s $\alpha = 0.95$). Condom use outcome expectancies, an 8-item scale, assessed participants’ expectations of their main partner reactions to requests for condom use (e.g., one’s partner would be mad, etc.); a higher score indicated a favorable anticipated response to condom use (Cronbach’s $\alpha = 0.84$). Attitudes toward physical pleasure associated with condom use (e.g., sex with condoms doesn’t feel natural, etc.) were measured using a 4-item, hedonistic outcome expectancies scale (O’Leary et al. 2005); a higher score indicated a positive attitude toward condom use (Cronbach’s $\alpha = 0.91$).

Three relationship-level characteristics were obtained in reference to an individual’s main partner. These characteristics included partner’s pregnancy intentions, partner’s IDU history and needle sharing with one’s main partner. Additionally, partner norms around condom use were evaluated by two items assessing normative beliefs regarding condom use. These subjective norms were measured, irrespective of partner type, using a composite variable that asked individuals to report on (1) whether their partners thought it was important to use condoms every time for vaginal sex and (2) whether they felt it was

important to comply with their partners expectations regarding condom use; a higher score indicated stronger normative support for condom use (Jamner et al. 1998; Richard et al. 2000). Finally, two questions were also used to assess social norms around condom use. These items were similar to those assessing partner norms, but referred to participants' peers rather than sexual partners.

Statistical Analysis

First, descriptive statistics were generated to describe the sample and assess the extent of consistent condom use at baseline among IDUs by partner type. Next, associations between independent variables and consistent condom use at the baseline visit were examined using *t*-tests or chi-square statistics, as appropriate. To understand associations with consistent condom use during 3- and 6-month follow-up visits, separate generalized estimating equation (GEE) models were used to estimate odds ratios for consistent condom use among IDUs by partner type. Model building was conducted separately for main and casual partners since IDUs could report both partner types and our main objective was to understand differences in predictors of condom use between partner types. Models were built by adding variables significant at $P < .05$ to the equation in conceptually related groups, starting first with individual-level sociodemographic and alcohol and drug-related behavioral characteristics, then relationship-level characteristics and finally the social-level variable. Modeling decisions were guided by use of the -2 log likelihood value. The models of best fit were obtained by first identifying a significant set of individual-level characteristics and then considering whether relationship and social variables improved the fit of the models. Pairwise interactions between main independent effects and time were also assessed and interaction terms were included in the final model if they met the significance criterion set at 0.05. GEE was chosen because of the robustness of this approach in accounting for the dependency of observations between multiple measurements taken over time on the same individual (Hardin 2002; Zeger and Liang 1986).

Results

Of the 673 participants included in this analysis, across partner type, approximately two-thirds were male and self-identified as white (Table 1). The median age of participants in both groups was 23 years (IQR = 21–27 years). Two-thirds reported at least a high school education and nearly three-quarters had a legal source of income; across both groups over one-third reported being recently

Table 1 Baseline demographic, drug use and sexual behaviors among young, sexually active IDUs by partner type; DUIT Intervention Trial, 2001–2004

Characteristic	Main partner (<i>n</i> = 631) %(<i>n</i>)	Casual partners (<i>n</i> = 388) %(<i>n</i>)
Study site		
Baltimore, MD	20% (126)	22% (85)
Chicago, IL	39% (248)	33% (127)
Los Angeles, CA	10% (61)	11% (42)
New York, NY	11% (72)	14% (56)
Seattle, WA	30% (127)	20% (78)
Gender		
Male	64% (403)	70% (272)
Female	36% (228)	30% (115)
Race/ethnicity		
Hispanic/Latino	17% (108)	18% (71)
African American	9% (58)	10% (40)
White	63% (395)	58% (226)
Other	11% (69)	13% (50)
Age, median (IQR)	23 (21–27)	23 (21–27)
Education (HS grad or higher)	66% (416)	64% (246)
Source of income		
Legal	73% (459)	70% (271)
Illegal	24% (154)	27% (105)
Other	3% (18)	3% (10)
Homeless, last 6 months	35% (222)	39% (151)
Ever incarcerated (yes)	68% (430)	72% (281)
Alcohol use, last 3 months		
Never	19% (120)	17% (65)
Less than daily	72% (453)	72% (280)
Daily	9% (60)	11% (43)
Type of drug used, last 3 months		
Heroin only	5% (33)	3% (12)
Crack/cocaine only	7% (41)	8% (32)
Heroin and crack/cocaine	71% (447)	74% (282)
Other drug	17% (107)	15% (57)
Years injecting (4 or more years)	51% (321)	54% (208)
Injected drugs with a used needle (yes)	42% (258)	44% (166)
No. of people injected with, last 3 months		
0	17% (108)	19% (74)
1	18% (111)	15% (58)
2 or more	65% (408)	66% (251)
No. of sex partners, last 3 months, median (IQR)	2 (1–4)	3 (2–6)
Type of sexual activity, last 3 months		
Vaginal sex only	62% (379)	54% (203)
Vaginal and anal sex	38% (228)	46% (173)
Condom use for vaginal/anal sex, last 3 months		
Consistent use	14% (86)	36% (141)
Inconsistent use	86% (545)	64% (247)

Table 1 continued

Characteristic	Main partner (<i>n</i> = 631) %(<i>n</i>)	Casual partners (<i>n</i> = 388) %(<i>n</i>)
Trial arm		
Intervention group	49% (310)	52% (200)
Comparison group	51% (321)	48% (188)

IQR Interquartile range; data in columns are not mutually exclusive as 351 individuals reported both types of partners. Data within cells may not sum to column total due to missing data

homeless and more than two-thirds reported a history of incarceration. Slightly more than half of these participants reported injecting for at least 4 or more years, over 40% reported injecting with a syringe previously used by someone else and two-thirds had injected drugs with 2 or more individuals.

The majority of participants in both partnership categories, approximately 90%, self-identified as heterosexual. Participants with a main partner reported a median of 2 (interquartile range [IQR] = 1–4) sex partners while those with casual partners reported a median of 3 (IQR = 2–6) sex partners. A greater proportion of participants reported vaginal and anal sex with casual partners compared to participants with main partners (46 vs. 38%, respectively). Baseline reports of consistent condom use during vaginal/anal sex were higher with casual partners compared to a main partner (36 vs. 14%, respectively). Consistent condom use for both main and casual partners increased slightly from baseline to the 3-month follow up visit (41 and 19%, respectively), but at the 6-month follow-up visit these proportions were similar to those found at baseline (data not shown).

In bivariate analysis, consistent condom use with a main partner at the baseline visit was associated with being male, a heroin only user, having positive hedonistic outcome expectancies toward condom use, anticipating a positive response (outcome expectancy) to requests for condom use, having greater self-efficacy for condom use and supportive peer and partner norms for condom use (Table 2). Having a main partner who expressed interest in a pregnancy, injected drugs or whom one shared syringes with was negatively associated with consistent condom use at baseline. Among IDUs with casual partners, baseline reports of consistent condom use were associated with not injecting with other IDUs, possessing positive hedonistic outcome expectancies toward condom use and having supportive peer and partner norms regarding condom use.

In multivariate analyses examining condom use behaviors across baseline and follow-up visits, consistent condom use with a main partner was positively associated with personal- and relationship-level variables. Specifically, male gender (AOR = 1.98; 95% CI = 1.32, 2.97), positive

hedonistic attitudes toward condom use (AOR = 2.31; 95% CI = 1.58, 3.35), greater self-efficacy for condom use with a main partner (AOR = 1.65; 95% CI = 1.03, 2.65) and positive condom use outcome expectancies (AOR = 2.77; 95% CI = 1.76, 4.36) were associated with consistent condom use. However, we also detected a statistically significant interaction between time and condom use outcome expectancies with main partners (AOR = 0.89; 95% CI = 0.82, 0.97) suggesting that over time, individuals are actually less likely to expect a positive reaction from their partner to requests for condom use. In addition, having a main partner who expressed pregnancy desires (AOR = 0.42; 95% CI = 0.26, 0.67) or sharing needles with a main partner (AOR = 0.56; 95% CI = 0.36, 0.85) was negatively associated with consistent condom use. While supportive partner norms (AOR = 2.84; 95% CI = 2.03, 3.97) were associated with consistent condom use, we also detected a greater likelihood of consistent condom use among IDUs reporting partner norms not supporting consistent condom use (AOR = 1.74; 95% CI = 1.18, 2.55) when compared to IDUs who reported neutral partners norms. Consistent condom use with casual partners across baseline and follow-up visits was associated with having fewer sex partners (AOR = 1.65, 95% CI = 1.09, 2.50), having a positive hedonistic attitudes toward condom use (AOR = 1.79, 95% CI = 1.26, 2.52) and partner norms supporting condom use (AOR = 2.11; 95% CI = 1.51, 2.95) (Table 3).

Discussion

We found that individual-level psychosocial as well as relationship-level factors were determinants of consistent condom use among young IDUs with both main and casual partners. Rates of consistent condom use reported in this sample—14 and 36% with main and casual partners, respectively—were low yet consistent with those reported in prior studies with similar high-risk populations (Bogart et al. 2005a; Fals-Stewart et al. 2003). Finally, high proportions of individuals reported engaging in sex with multiple partners and anal sex with main and casual partners, both of which are strong risk factors for acquiring HIV. However, among this group of young, HIV-negative IDUs, HIV incidence was very low despite high levels of both inconsistent condom use and multiple sex partnerships rates (Garfein et al. 2007a). In fact, HIV testing was performed at baseline and the 3- and 6-month follow-up visits and there were no seroconversions during this period. This suggests that perhaps, despite the involvement in both risky sexual and injection drug use practices, the individuals in this particular sample were, in fact, at a lower risk of acquiring HIV. Alternatively, these IDUs may have been at

Table 2 Baseline associations between demographic, drug use, sexual and psychosocial characteristics and condom use by partner type among young, sexually active IDU

Characteristic	Main partner			Casual partners		
	Inconsistent condom use (n = 545)	Consistent condom use (n = 86)	P value	Inconsistent condom use (n = 247)	Consistent condom use (n = 141)	P value
Gender (male)	62% (339)	73% (63)	0.05	72% (177)	68% (96)	0.46
Sex trading in last 3 months (yes)	15% (79)	20% (17)	0.21	21% (53)	30% (42)	0.07
Years injecting (≥ 4 years)	52% (281)	47% (40)	0.38	56% (139)	49% (69)	0.16
Injected drugs with used needle (yes)	43% (228)	35% (29)	0.15	46% (109)	41% (57)	0.39
Number of people injected with						
0	16% (88)	23% (19)	0.23	16% (38)	26% (36)	0.04
1	18% (100)	13% (11)		17% (41)	12% (17)	
2 or more	65% (353)	64% (54)		67% (164)	62% (87)	
In L3M, drug type used						
Heroin only	4% (24)	10% (9)	0.02	3% (7)	4% (5)	0.72
Crack/cocaine only	7% (40)	1% (1)		9% (22)	7% (10)	
Heroin and crack/cocaine	72% (386)	67% (58)		74% (181)	72% (101)	
Other drug	16% (89)	21% (18)		14% (33)	17% (24)	
Number of sex partners						
1	38% (203)	36% (31)	0.97	1% (2)	3% (4)	0.21
2	26% (140)	26% (22)		36% (89)	40% (56)	
3 or more	36% (195)	38% (32)		63% (153)	57% (80)	
Type of sex						
Vaginal only	62% (323)	66% (56)	0.48	51% (121)	59% (82)	0.14
Vaginal and/or anal	38% (199)	34% (29)		48% (116)	41% (57)	
Hedonistic outcome expectancies toward condom use (positive)	12% (65)	34% (29)	<0.01	12% (29)	26% (36)	<0.01
Main partner's reaction to request for condom use (positive)	36% (195)	77% (65)	<0.01	— [†]	— [†]	— [†]
Ability to advocate for condom use with main partner (high)	59% (305)	84% (71)	<0.01	— [†]	— [†]	— [†]
Main partner pregnancy desire (yes)	34% (181)	9% (7)	<0.01	— [†]	— [†]	— [†]
Main partner injects (yes)	59% (318)	44% (35)	0.01	— [†]	— [†]	— [†]
Share needles with main partner (yes)	39% (211)	18% (14)	<0.01	— [†]	— [†]	— [†]
Partner norms around condom use						
Support	21% (114)	78% (66)	<0.01	26% (65)	56% (78)	<0.01
Oppose	47% (253)	7% (6)		42% (104)	19% (26)	
Neutral	32% (172)	15% (13)		32% (78)	25% (35)	
Peer norms around condom use						
Support	38% (202)	59% (48)	<0.01	38% (92)	55% (74)	<0.01
Oppose	30% (161)	11% (9)		32% (78)	16% (21)	
Neutral	32% (169)	30% (25)		30% (72)	29% (39)	

[†] Data on these items were not collected for casual partners

lower risk for HIV due to the lower rates of circulating virus as evidenced by both the low incidence of HIV in this sample and the high proportion reporting HIV-negative main sex partners (Garfein et al. 2007a).

Nonetheless, the findings of the present analysis have specific implications for the refinement and development of

future HIV interventions for IDUs as they indicate the need to account for the differences in determinants of condom use by partner type. Specifically, while both psychosocial and relationship characteristics were related to condom use in main partnerships, psychosocial factors were stronger predictors of safer sexual behaviors with casual partners

Table 3 Adjusted odds ratios from GEE (generalized estimating equation) models for longitudinal determinants of consistent condom use among young, sexually active IDUs by partner type (2002–2004)

	Adjusted OR	95% CI	
<i>Model 1: sex with a main partner</i>			
Gender (male)	1.98**	1.32	2.97
Hedonistic outcome expectancies toward condom use (positive)	2.31**	1.58	3.35
Self-efficacy for condom use with main partner (high)	1.65*	1.03	2.65
Condom use outcome expectancies with main partner (positive)	2.77**	1.76	4.36
Time × condom use outcome expectancies with main partner (positive)	0.89**	0.82	0.97
Main partner wants to get pregnant (yes)	0.42**	0.26	0.67
Share needles with main partner (yes)	0.56**	0.36	0.85
Partner norms regarding condom use			
Support	2.84**	2.03	3.97
Oppose	1.74**	1.18	2.55
Neutral	Referent group		
<i>Model 2: sex with a casual partner(s)</i>			
Number of partners			
<10	1.65**	1.09	2.50
≥10	Referent group		
Hedonistic outcome expectancies toward condom use (positive)	1.79**	1.26	2.52
Partner norms regarding condom use			
Support	2.11**	1.51	2.95
Oppose	1.13	0.81	1.58
Neutral	Referent group		

* $P < .05$, ** $P < .01$

among young IDUs. Consequently, future prevention efforts developed for IDUs may be more effective at reducing HIV associated sexual risk by addressing psychosocial and attitudinal characteristics related to condom use but also by acknowledging and addressing relationship-level factors associated with condom use among young, HIV-negative IDUs.

With regard to individual-level psychosocial characteristics, among IDUs with a main partner, greater self-efficacy and outcome expectancies around using condoms were both associated with consistent condom use. This is not surprising as an individual's self-efficacy or perceived confidence in their ability to carry out certain actions (use condoms) is related to what they expect the response, or consequence of those actions to be (main partners reaction to request for condom use) (Ajzen and Fishbein 1980; Bandura 1977; O'leary et al. 2008; Sterk et al. 2003b). Consequently, future prevention efforts should continue to include components that can enhance condom use self-efficacy and outcome expectancies. Such modules would

provide condom use skills, model positive communication techniques with sex partners, and engage participants in activities where they can practice and receive feedback to gain mastery of these techniques. In addition, future interventionists will need to develop innovative strategies that can enhance these interpersonal factors especially with respect to condom use with casual partners.

IDUs reporting positive attitudes toward condom use—such as not associating condom use with decreased physical pleasure—were more likely to report consistent condom use. However, over time, perceptions of positive reactions from main partners to requests for condom use were not maintained. In other words, the re-introduction or continued consistent use of condoms with an established partner and their positive response to condom use requests may be more challenging to maintain over a longer period of time. These findings echo that of prior research (Bogart et al. 2005a; Falck et al. 1997; Malow et al. 1993) suggesting that effective HIV interventions should continue to provide ways for IDUs, especially younger IDUs, to

incorporate condom use in their sexual repertoire without jeopardizing the romantic, intimate or erotic aspects of sex both in new and ongoing relationships.

In this study, as in prior research with IDUs, contextual factors, such as partner norms that support condom use, were determinants of consistent condom use with both main and casual partners (Corby et al. 1996; Jamner et al. 1998; Latka et al. 2006; Purcell et al. 2006). Yet among IDUs with main partners, individuals who reported partner norms opposing condom use were also more likely to report consistent condom usage. Due to small sample sizes we are not confident in drawing further conclusions about this finding and we recommend that future longitudinal studies with sufficient power explore this association in greater detail. Nonetheless, given that partner norms supporting condom use were predictive of consistent use for both main and casual partners, it may be important for future HIV interventions among IDUs to consider intervening at the level of the couple. This would involve incorporating modules that seek to increase supportive attitudes or desires to use condoms among sex partners as well as the index IDUs desires to comply with their partner's desires. The challenge for future interventions seeking to reduce sexual risks may be to develop components that can cogently address a highly personal and sensitive topic when disseminated among young IDUs who may be more comfortable addressing drug related risks in group-based intervention settings.

Before conclusions can be drawn, study limitations should be considered. First, socially desirable responding is a concern when collecting data on risky sexual behaviors and condom use as participants may be likely to over report condom use and under report risky encounters. However, the use of ACASI technology, rather than interviewer administered surveys, was instituted to minimize these concerns. Second, despite considerable efforts to track participants, retention over follow-up visits was not optimal. However, these retention rates are similar to those from previous trials and longitudinal studies with young IDUs and, moreover, there was no difference in condom use at baseline among IDUs enrolled in the trial compared to those who were eligible but did not return for trial participation. In addition, as this analysis employed GEE for multivariate modeling, we were able to maximize use of all available follow-up data. Third, we were unable to comprehensively evaluate the influence of social factors on the outcome due to limited availability of measures on this topic. In addition, we were not able to assess partner concurrency and its relationship to consistent condom use among this sample of young IDUs. Finally, given that we examined condom use dichotomously as consistent versus inconsistent use, individuals whose condoms use increased but was still less than consistent were classified as

inconsistent users. Since we were not able to fully explore these subtle increases in condom use, the findings presented here may underestimate the associations between condom use and the various independent variables examined.

Developing HIV prevention programs that can effectively reduce sexual risks among young, active IDUs remains a challenge. The findings from this longitudinal analysis confirm those of previous studies indicating that individual-level psychosocial constructs and relationship level factors are important determinants of longitudinal consistent condom use among IDUs for both main and casual partners. However, since a relatively small proportion of IDUs report consistent condom use, with either a main or casual partner, these factors that have been thus far identified as influencing consistent condom use may only be relevant for a minority of IDUs who are amenable to changing their risk behaviors and not to the majority of IDUs who continue to engage in risk sexual activity. One possibility may be for future research to explore why these psychosocial and partnership level factors do not have the same influence among IDUs who are inconsistent condom users. Another possibility, given the importance of partner characteristics and partner norms regarding condom use among IDUs, may be to design interventions or at least individual intervention modules within future intervention programs specifically for couples that focus on skills building and communication techniques promoting healthy sexual relationships without jeopardizing perceived intimacy. Finally, while consistent condom use ought to remain the goal of HIV prevention programs, given the difficulty in maintaining life-long, perfect rates of condom use, both in main and casual partnerships, interventionists may need to develop more realistic strategies focusing on long-term sexual risk reduction such as decreasing involvement in unprotected anal intercourse with main and casual partners. Our findings indicate that developing new interventions or tailoring existing evidence-based intervention strategies that build upon individual- and partnership-level constructs associated with consistent condom use may provide IDUs with greater opportunities to reduce their sexual risk.

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References

- Astemborski, J., Vlahov, D., Warren, D., Solomon, L., & Nelson, K. E. (1994). The trading of sex for drugs or money and HIV seropositivity among female intravenous drug users. *American Journal of Public Health*, *84*, 382–387. doi:10.2105/AJPH.84.3.382.
- Azjen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behavior*. Englewood Cliffs, NJ: Prentice-Hall.
- Bandura, A. (1977). Self-efficacy. *Psychological Review*, *84*, 191–215. doi:10.1037/0033-295X.84.2.191.
- Bandura, A. (1986). *Social foundations of thought and action*. Englewood Cliffs, NJ: Prentice-Hall.
- Bogart, L. M., Kral, A. H., Scott, A., Anderson, R., Flynn, N., Gilbert, M. L., et al. (2005a). Sexual risk among injection drug users recruited from syringe exchange programs in California. *Sexually Transmitted Diseases*, *32*, 27–34. doi:10.1097/01.olq.0000148294.83012.d0.
- Bogart, L. M., Kral, A. H., Scott, A., Anderson, R., Flynn, N., Gilbert, M. L., et al. (2005b). Condom attitudes and behaviors among injection drug users participating in California syringe exchange programs. *AIDS and Behavior*, *9*, 423–432. doi:10.1007/s10461-005-9014-1.
- Bowen, A. M., Williams, M., McCoy, H. V., & McCoy, C. B. (2001). Crack smokers' intention to use condoms with loved partners: Intervention development using the theory of reasoned action, condom beliefs, and processes of change. *AIDS Care*, *13*, 579–594. doi:10.1080/09540120120063214.
- Broadhead, R. S., Heckathorn, D. D., Weakliem, D. L., Anthony, D. L., Madray, H., Mills, R. J., et al. (1998). Harnessing peer networks as an instrument for AIDS prevention: Results from a peer-driven intervention. *Public Health Reports*, *113*(Suppl 1), 42–57.
- Corby, N. H., Jamner, M. S., & Wolitski, R. J. (1996). Using the theory of planned behavior to predict condom use among injecting drug users. *Journal of Applied Social Psychology*, *26*, 52–75. doi:10.1111/j.1559-1816.1996.tb01838.x.
- De Vincenzi, I. (1994). A longitudinal study of human immunodeficiency virus transmission by heterosexual partners. European Study Group on Heterosexual Transmission of HIV. *The New England Journal of Medicine*, *331*, 341–346. doi:10.1056/NEJM199408113310601.
- Falck, R. S., Wang, J., Carlson, R. G., & Siegal, H. A. (1997). Factors influencing condom use among heterosexual users of injection drugs and crack cocaine. *Sexually Transmitted Diseases*, *24*, 204–210. doi:10.1097/00007435-199704000-00004.
- Fals-Stewart, W., Birchler, G. R., Hoebbel, C., Kashdan, T. B., Golden, J., & Parks, K. (2003). An examination of indirect risk of exposure to HIV among wives of substance-abusing men. *Drug and Alcohol Dependence*, *70*, 65–76. doi:10.1016/S0376-8716(02)00338-1.
- Fisher, J. D., & Fisher, W. A. (1992). Changing AIDS-risk behavior. *Psychological Bulletin*, *111*, 455–474. doi:10.1037/0033-2909.111.3.455.
- Frajzyngier, V., Neaigus, A., Gyarmathy, V. A., Miller, M., & Friedman, S. R. (2007). Gender differences in injection risk behaviors at the first injection episode. *Drug and Alcohol Dependence*, *89*, 145–152. doi:10.1016/j.drugalcdep.2006.12.021.
- Garfein, R. S., Golub, E. T., Greenberg, A. E., Hagan, H., Hanson, D. L., Hudson, S. M., et al. (2007a). A peer-education intervention to reduce injection risk behaviors for HIV and hepatitis C virus infection in young injection drug users. *AIDS (London, England)*, *21*, 1923–1932. doi:10.1097/QAD.0b013e32823f9066.
- Garfein, R. S., Swartzendruber, A., Ouellet, L. J., Kapadia, F., Hudson, S. M., Thiede, H., et al. (2007b). Methods to recruit and retain a cohort of young-adult injection drug users for the Third Collaborative Injection Drug Users Study/Drug Users Intervention Trial (CIDUS III/DUIT). *Drug and Alcohol Dependence*, *91*(Suppl 1), S4–S17. doi:10.1016/j.drugalcdep.2007.05.007.
- Gyarmathy, V. A., & Neaigus, A. (2007). The relationship of sexual dyad and personal network characteristics and individual attributes to unprotected sex among young injecting drug users. *AIDS and Behavior*, *10* (Epub ahead of print).
- Hardin, J. W. (2002). *Generalized estimating equations* (1st ed.). Boca Raton: Chapman & Hall/CRC Press.
- Jamner, M. S., Wolitski, R. J., Corby, N. H., & Fishbein, M. (1998). Using the theory of planned behavior to predict intention to use condoms among female sex workers. *Psychology & Health*, *13*, 187–205. doi:10.1080/08870449808406746.
- Kapadia, F., Latka, M. H., Hudson, S. M., Golub, E. T., Campbell, J. V., Bailey, S., et al. (2007). Correlates of consistent condom use with main partners by partnership patterns among young adult male injection drug users from five US cities. *Drug and Alcohol Dependence*, *91*(Suppl 1), S56–S63. doi:10.1016/j.drugalcdep.2007.01.004.
- Kral, A. H., Bluthenthal, R. N., Lorvick, J., Gee, L., Bacchetti, P., & Edlin, B. R. (2001). Sexual transmission of HIV-1 among injection drug users in San Francisco, USA: Risk-factor analysis. *Lancet*, *357*, 1397–1401. doi:10.1016/S0140-6736(00)04562-1.
- Latka, M., Ahern, J., Garfein, R. S., Ouellet, L., Kerndt, P., Morse, P., et al. (2001). Prevalence, incidence, and correlates of chlamydia and gonorrhea among young adult injection drug users. *Journal of Substance Abuse*, *13*, 73–88. doi:10.1016/S0899-3289(01)00071-2.
- Latka, M. H., Metsch, L. R., Mizuno, Y., Tobin, K., Mackenzie, S., Arnsten, J. H., et al. (2006). Unprotected sex among HIV-positive injection drug-using women and their serodiscordant male partners: Role of personal and partnership influences. *Journal of Acquired Immune Deficiency Syndrome*, *42*, 222–228. doi:10.1097/01.qai.0000214813.50045.09.
- Latkin, C. A., Sherman, S., & Knowlton, A. (2003). HIV prevention among drug users: Outcome of a network-oriented peer outreach intervention. *Health Psychology*, *22*, 332–339. doi:10.1037/0278-6133.22.4.332.
- Malow, R. M., Corrigan, S. A., Cunningham, S. C., West, J. A., & Pena, J. M. (1993). Psychosocial factors associated with condom use among African-American drug abusers in treatment. *AIDS Education and Prevention*, *5*, 244–253.

- O'Leary, A., Hoff, C. C., Purcell, D. W., Gomez, C. A., Parsons, J. T., Hardnett, F., et al. (2005). What happened in the SUMIT trial? Mediation and behavior change. *AIDS*, *19*(Suppl 1), S111–S121.
- O'Leary, A., Jemmott, L. S., Jemmott, J. B. (2008). Mediation analysis of an effective sexual risk reduction intervention for women: The importance of self-efficacy. *Health and Psychology*, *27*(Suppl 2):S180–S184.
- Purcell, D. W., Garfein, R. S., Latka, M. H., Thiede, H., Hudson, S., Bonner, S., et al. (2007). Development, description, and acceptability of a small-group, behavioral intervention to prevent HIV and hepatitis C virus infections among young adult injection drug users. *Drug and Alcohol Dependence*, *91*(Suppl 1), S73–S80. doi:10.1016/j.drugalcdep.2007.03.004.
- Purcell, D. W., Mizuno, Y., Metsch, L. R., Garfein, R., Tobin, K., Knight, K., et al. (2006). Unprotected sexual behavior among heterosexual HIV-positive injection drug using men: Associations by partner type and partner serostatus. *Journal of Urban Health*, *83*, 656–668. doi:10.1007/s11524-006-9066-1.
- Richard, A. J., Bell, D. C., & Montoya, I. D. (2000). Normative influence on condom use in the personal networks of female cocaine smokers. *AIDS Education and Prevention*, *12*, 357–374.
- Robles, R. R., Reyes, J. C., Colon, H. M., Sahai, H., Marrero, C. A., Matos, T. D., et al. (2004). Effects of combined counseling and case management to reduce HIV risk behaviors among Hispanic drug injectors in Puerto Rico: A randomized controlled study. *Journal of Substance Abuse Treatment*, *27*, 145–152. doi:10.1016/j.jsat.2004.06.004.
- Semaan, S., Des, J., Sogolow, E., Johnson, W. D., Hedges, L. V., Ramirez, G., et al. (2002). A meta-analysis of the effect of HIV prevention interventions on the sex behaviors of drug users in the United States. *Journal of Acquired Immune Deficiency Syndrome*, *30*(Suppl 1), S73–S93. doi:10.1097/00126334-200205010-00010.
- Smith, K. C., Lillie, T. L., & Latkin, C. (2007). Injection drug users' strategies to manage perceptions of personal risk: How do IDUs see HIV as having affected them? *AIDS Education and Prevention*, *19*, 245–257. doi:10.1521/aeap.2007.19.3.245.
- Somlai, A. M., Kelly, J. A., McAuliffe, T. L., Ksobiech, K., & Hackl, K. L. (2003). Predictors of HIV sexual risk behaviors in a community sample of injection drug-using men and women. *AIDS and Behavior*, *7*, 383–393. doi:10.1023/B:AIBE.0000004730.62934.ed.
- Sterk, C. E., Klein, H., & Elifson, K. W. (2003a). Perceived condom use self-efficacy among at-risk women. *AIDS and Behavior*, *7*, 175–182. doi:10.1023/A:1023950425731.
- Sterk, C. E., Theall, K. P., Elifson, K. W., & Kidder, D. (2003b). HIV risk reduction among African-American women who inject drugs: A randomized controlled trial. *AIDS and Behavior*, *7*, 73–86. doi:10.1023/A:1022565524508.
- Strathdee, S. A., Galai, N., Safaiean, M., Celentano, D. D., Vlahov, D., Johnson, L., et al. (2001). Sex differences in risk factors for HIV seroconversion among injection drug users: A 10-year perspective. *Archives of Internal Medicine*, *161*, 1281–1288. doi:10.1001/archinte.161.10.1281.
- van Empelen, P., Schaalma, H. P., Kok, G., & Jansen, M. W. (2001). Predicting condom use with casual and steady sex partners among drug users. *Health Education Research*, *16*, 293–305. doi:10.1093/her/16.3.293.
- Wiebel, W. W. (1988). Combining ethnographic and epidemiologic methods in targeted AIDS interventions: The Chicago model. In R. J. Battjes & R. W. Pickens (Eds.), *Needle sharing among intravenous drug abusers: National and international perspectives. National institutes on drug abuse research monograph 80* (pp. 137–150). Washington, DC: U.S. Government Printing Office.
- Williams, M. L., Ross, M. W., Atkinson, J., Bowen, A., Klovdahl, A., & Timpson, S. C. (2006). An investigation of concurrent sex partnering in two samples of drug users having large numbers of sex partners. *International Journal of STD and AIDS*, *17*, 309–314. doi:10.1258/095646206776790123.
- Zeger, S. L., & Liang, K. Y. (1986). Longitudinal data analysis for discrete and continuous outcomes. *Biometrics*, *42*, 121–130. doi:10.2307/2531248.