

# Sexual Risk Reduction in a Cohort of Injecting Drug Users in Bangkok, Thailand

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**Objective:** Interventions to reduce sexual risk behavior among injecting drug users (IDUs) have generally had very modest effects, but almost all such interventions have been conducted within short time frames. This study assessed whether long-term participation in interventions to reduce sexual risk behavior was associated with reduced sexual risk behavior.

**Methods:** A total of 806 IDUs participated in the Bangkok HIV Vaccine Trial Preparatory Cohort Study from 1995–1998 and remained in the study for at least 4 follow-up visits (approximately 16 months). Participants received HIV counseling and testing every 4 months and free condoms were provided. Structured interviews including questions on sexual behavior were administered every 4 months.

**Results:** Approximately 40% of participants reported engaging in unprotected sex (vaginal intercourse without always using a condom) with a regular partner at each study visit, without any decline over time in this behavior. There were declines in the proportions of participants reporting unprotected sex with casual partners and with paid partners (men only) over time, but the declines were confined to the early period of the study. Unprotected sex with casual partners was associated with amphetamine use. Condom use increased substantially among participants who seroconverted for HIV during the study.

**Conclusions:** Interventions to reduce sexual risk behavior among HIV-seronegative IDUs over extended periods were no more likely to be effective than shorter interventions. New programs are needed to reduce sexual risk behavior among amphetamine users and among

IDUs who are currently seronegative but are engaging in injection risk behaviors and in unprotected sex with regular partners.

**Key Words:** injecting drug users, substance abuse, sexual behavior, HIV, Bangkok, Thailand

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Injecting drug users (IDUs) are at risk for both blood-borne and sexual transmission of HIV, and almost all HIV prevention programs for IDUs address both injection and sexual risk. While there is consensus that the programs to reduce injection risk behaviors of IDUs lead to substantial risk reduction, and that this risk reduction can lead to dramatic reductions in injection-related transmission of HIV,<sup>1–3</sup> there is much less agreement regarding the effectiveness of programs to reduce sexual risk behaviors of IDUs. A number of qualitative literature reviews have addressed the effectiveness of interventions to reduce sexual risk behavior of IDUs.<sup>4–7</sup> These reviews have generally concluded that such interventions can be effective and that IDUs will change their sexual behavior to reduce their risk of becoming infected with HIV or of transmitting HIV to others. These reviews, however, have also noted the relatively large number of studies in which there were no differences in the rates of sexual risk behaviors at follow-up between subjects in the intervention group and subjects in the comparison group.<sup>3</sup>

To date, there have been 2 formal meta-analyses of research on interventions to change sexual behavior among IDUs.<sup>8,9</sup> The first was a review of 16 US-based studies published between 1990–1995, which found that drug users increased their condom use after exposure to interventions.<sup>8</sup> The overall weighted average effect measured as a standardized mean difference was 0.40, with a 95% CI from 0.33–0.46 and an odds ratio (OR) of 0.49 and 95% CI from 0.44–0.54. This significant effect is surprising given the mixed results from the qualitative reviews. Part of the reason for this difference may be that this meta-analysis included 7 studies that used single-group, pre- and postcomparison research designs. This is a

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relatively weak research design, which can lead to overestimation of the effectiveness of an intervention.<sup>10</sup>

The second meta-analysis used more rigorous research designs and had a sufficiently large number of studies to conduct stratified analyses.<sup>9</sup> The overall weighted average effect size for the 33 included studies was significant and protective (OR = 0.86; 95% CI 0.76–0.98) but quite modest. The interventions included in these reviews were of relatively short duration, often conducted over several weeks or months.<sup>8,9</sup> It is possible that the modest average effects of these interventions may be due to their short duration. Changing sexual risk behavior, particularly behavior within ongoing relationships, may require programs that extend over long periods.

We report here on sexual risk behavior among participants in the Bangkok HIV Vaccine Trial Preparatory Cohort Study. This study was conducted from 1995–1998. The study determined follow-up rates, HIV incidence, subtypes among incident infections, and willingness to participate in an HIV vaccine efficacy trial.<sup>11,12</sup> Participants in the study received HIV counseling and testing every 4 months for up to 3.5 years. The counseling targeted reducing injecting and sexual risk behaviors, and free condoms were provided at each study visit. Participation in the study was associated with significant declines in injection risk behavior that continued through the first 3 years of the study.<sup>13</sup> In this paper, we assess the effectiveness of these long-term efforts to reduce sexual risk behavior among IDUs in Bangkok. This study thus provides a good opportunity to test whether long-term counseling and condom promotion efforts lead to substantial reductions in sexual risk behaviors of IDUs.

## METHODS

A full description of the methods has been presented previously,<sup>11,12</sup> so an abbreviated description is presented here. In the cohort study as a whole, the HIV incidence rate was 5.8/100 person-years at risk, and HIV incidence was strongly related to reported injection risk behaviors (frequency of injection, sharing of injection equipment, and injecting in jails) but not related to any reported sexual risk behavior, including unprotected sex with regular, casual, or paid partners.<sup>13</sup>

### Subject Recruitment

Potential subjects were recruited from persons attending any of 15 Bangkok Metropolitan Administration (BMA) drug treatment clinics. Following informed consent, a blood sample for HIV testing was collected, and a brief standardized questionnaire was administered by a trained interviewer. After the HIV test result was known, each volunteer was counseled confidentially about his or her HIV status. A second HIV test was administered to exclude persons who might have been in a seroconversion “window period” at the initial test. HIV-seronegative persons were then offered enrollment with informed consent into the prospective cohort study. Participants

were asked to return for follow-up visits every 4 months. On each study visit, participants received 200 Thai baht (about US \$8 in 1996). Screening and enrollment were conducted during 2 periods: May through November 1995, and May through December 1996.

The primary analyses reported here are restricted to “long-term participants” in the study, specifically persons who remained in the study through the first 4 scheduled follow-up visits (at 4, 8, 12, and 16 months). This restriction ensures that all persons in these primary analyses received a long-term intervention to reduce injection and sexual risk behavior. Not all of these long-term participants kept all follow-up appointments, but these long-term study participants did have a high rate of attending follow-up visits, with >80% keeping all of the 4-, 8-, 12-, and 16-month visits.

IDUs who seroconverted for HIV while participating in the HIV Vaccine Preparatory Cohort Study were discontinued in the main cohort study and offered enrollment in a separate study on clinical, immunologic, and virologic evaluation of HIV seroconverters.<sup>14</sup> Those IDUs received social and medical care according to BMA guidelines. Sexual risk behavioral data were available from 121 seroconverters who agreed to enroll in a follow-up study of the seroconverters. An additional analysis was conducted to examine possible sexual behavior change from the time when they were HIV seronegative to the time after HIV seroconversion.

### Intervention

At each visit participants were interviewed using a standard questionnaire, had blood collected for HIV testing, and received HIV risk reduction counseling and health education. The purpose of the education and counseling was to reduce both injection and sexual risk behaviors. Bleach for cleaning injection equipment and male condoms were available to the subjects at no charge. The drug treatment clinics also provided HIV education and risk reduction messages for both study subjects and clinic attendees who were not participating in the study. The extra attention received by the study participants, e.g., being contacted for follow-up if an appointment was missed, may also be considered part of the intervention to reduce risk behaviors.

### Outcome Variables

The questionnaire included questions about vaginal sexual intercourse with different types of partners, all of the opposite sex: regular (primary, most important partner), casual (of lesser importance), and paid partners (for men only). If a participant reported vaginal sexual intercourse with a specific type of partner, an additional question was asked about frequency of condom use with that partner type. The period for sexual activity and condom use was the 6 months prior to interview for the baseline interview and the time since the previous interview for each 4-month follow-up period. Variables

## High Injection Risk and Sexual Risk

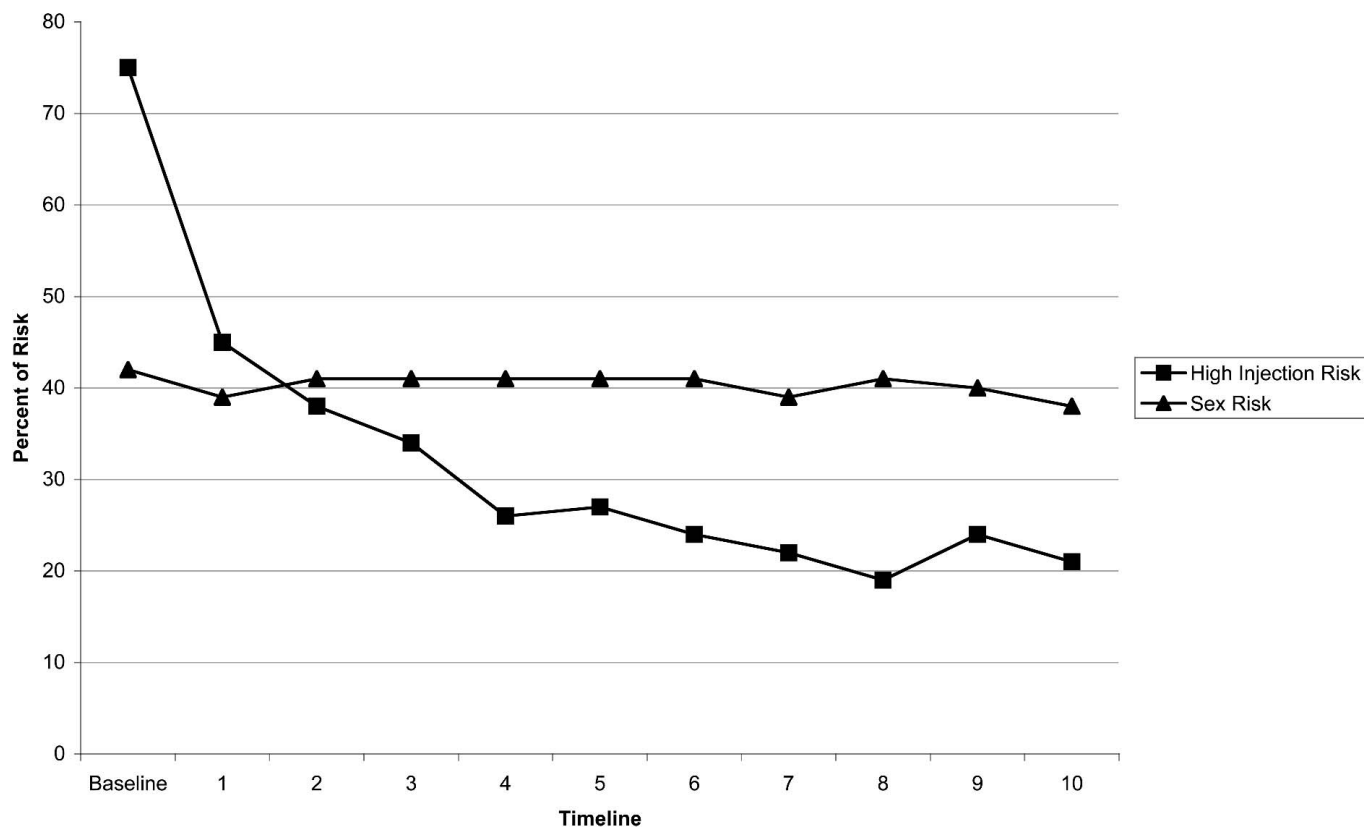


FIGURE 1. High injection risk and sexual risk.

of “any unprotected sex” were created for each specific type of partner; a participant who reported vaginal sexual intercourse with a partner type and reported <100% condom use with that type of partner was classified as having unprotected sex with that partner type.

### Data Management and Statistical Analyses

We used Epi-Info (version 6.04c; Centers for Disease Control [CDC], Atlanta, GA), SAS (version 6.12; SAS Institute, Cary, NC), and Stata (version 6; Stata Corp., College Station, TX) for data management and analyses. As the data for these analyses were longitudinal, we used the generalized estimating equation (GEE) approach for logistic model estimation with statistical inferences based on robust standard errors.<sup>15</sup>

### Ethics Review

The study protocols were approved by the Human Subjects Research Committee, Ministry of Public Health, Nonthaburi, Thailand; the Ethical Review Committee of the BMA, Bangkok, Thailand; an Institutional Review Board of the

CDC, Atlanta, GA; and the Global Program on AIDS, World Health Organization, Geneva, Switzerland.

## RESULTS

### Subject Characteristics

Table 1 presents selected baseline sociodemographic characteristics for the 806 persons who participated in the cohort study for at least 4 follow-up visits (16 months). All participants were Thai, most were male, between 20–39 years of age, had some form of employment, and were injecting heroin. Note that 43% reported that they had not had sexual intercourse in the 6 months prior to the baseline interview, while 15% reported weekly or more frequent sexual intercourse during this period.

Table 2 presents the percentages of IDUs who reported any unprotected vaginal sex at the baseline and each of the follow-up interviews. There was no change in the percentages of IDUs reporting any unprotected sex with all partner types combined (GEE  $\chi^2 = 11.3$ , 10 df,  $P = 0.3$ ) or unprotected sex with a regular partner (GEE  $\chi^2 = 6.2$ , 10 df,  $P = 0.8$ ). There were significant declines in unprotected sex with a casual partner (GEE  $\chi^2 = 23.5$ , 10 df,  $P < 0.01$ ) and, for men, with a paid partner (GEE  $\chi^2 = 23.8$ , 10 df,  $P < 0.01$ ). For both of these

**TABLE 1.** Demographic Characteristics of Long-Term Participants in the Bangkok Injection Drug User HIV Vaccine Preparatory Cohort Study\*

Characteristics, n (%)	
Male	756 (94)
Female	50 (6)
Age, y	
<25	174 (22)
25–30	151 (19)
31–39	329 (41)
40+	152 (19)
Education	
Primary	353 (44)
Secondary	305 (38)
Postsecondary	147 (18)
Marital status	
Single	273 (34)
Married	376 (47)
Separated/divorced	147 (19)
Income	
>5000 baht/mo	
Yes	365 (45)
No	441 (55)
Treatment program	
Maintenance	168 (22)
45-detoxification	608 (78)
Year since first injection	
<3	149 (18)
3–6	198 (25)
7–14	211 (26)
15+	248 (31)
Years since first treatment	
<2	176 (22)
2–3	147 (18)
4–8	175 (22)
9+	308 (38)
Times in jail	
0	258 (32)
1	175 (22)
2	140 (17)
3+	233 (29)
Heroin injection in last 6 mo	
Yes	767 (95)
No	37 (5)
Shared injection equipment in last 6 mo	
Never	523 (65)
Monthly	239 (30)
Weekly	14 (2)
Daily	28 (3)

**TABLE 1.** (continued) Demographic Characteristics of Long-Term Participants in the Bangkok Injection Drug User HIV Vaccine Preparatory Cohort Study\*

Characteristics, n (%)	
Frequency of any vaginal sex in last 6 mo	
Never	346 (43)
Rarely	134 (17)
Monthly	201 (25)
Weekly or more	124 (15)
Frequency of vaginal sex with casual partners in last 6 mo	
Never	718 (89)
Rarely	47 (6)
Monthly or more	41 (5)

\*Values for n may not total 806 due to missing data.

behaviors, the highest percentage of subjects reported unprotected sex at the baseline interview. The declines in unprotected sex with casual and with paid partners were no longer significant when the analysis was repeated with the elimination of the baseline visit (GEE  $\chi^2 = 12.7$ , 9 df,  $P = 0.2$  for casual sex and GEE  $\chi^2 = 13.1$ , 9 df,  $P = 0.2$  for paid sex).

Whether engaging in unprotected sex with one type of partner is positively or negatively associated with engaging in unprotected sex with other types of partners is an important question for sexual transmission of HIV. To assess these possible associations, we classified each subject as ever/never engaging in unprotected sex with each type of partner during the entire follow-up period. Table 3 presents the percentages of subjects and ORs for engaging in unprotected sex across partner types for male participants. Male participants who reported unprotected sex with regular partners were more likely to report unprotected sex with casual partners, and male participants who reported unprotected sex with casual partners were more likely to report unprotected sex with paid partners. The modest number of female participants (50) precluded meaningful statistical testing of associations among unprotected sex with different types of partners.

A total of 121 of the 126 seroconverters identified in the Vaccine Preparatory Cohort Study agreed to participate in additional studies to examine various factors associated with their HIV seroconversion, including studies of postseroconversion sexual behavior. In contrast to the stable high percentage of seronegative participants who reported unprotected sex with regular partners, there was a sharp decrease in unprotected sex with regular partners among the seroconverters. Among the 121 seroconverters who enrolled in the follow-up study, 34% reported engaging in unprotected sex with a regular partner in the follow-up period immediately preceding seroconversion, while 24% reported engaging in unprotected sex with a regular partner at the next follow-up interview (after

**TABLE 2.** Prevalence of Vaginal Sexual Activity and Unprotected Vaginal Sexual Activity With Different Types of Partners Over Time Among Long-Term Participants in the Bangkok Injecting Drug User HIV Vaccine Preparatory Cohort Study\*

Follow-Up Visit	n	Prevalence (%)		
		Any Vaginal Sexual Activity	Unprotected Vaginal Sexual Activity	Unprotected (Among Those Reporting Vaginal Sex)
#0 (baseline)				
All types	805	57.0	42.1	73.8
Regular	795	55.4	39.4	86.7
Casual	795	11.1	5.5	50.0
Paid	693	7.7	2.8	36.2
#1 (4 month)				
All types	801	53.9	39.3	72.9
Regular	793	45.6	38.0	83.1
Casual	788	8.6	2.5	29.4
Paid	698	5.3	0.8	15.4
#2 (8 month)				
All types	773	54.3	39.2	72.1
Regular	773	54.3	38.0	77.2
Casual	573	8.2	2.2	27.7
Paid	676	5.3	1.1	21.0
#3 (12 month)				
Overall	764	52.6	41.2	78.4
Regular	760	46.8	39.7	84.8
Casual	761	11.0	4.4	29.4
Paid	676	5.2	0.7	13.5
#4 (16 month)				
Overall	740	54.7	41.1	74.8
Regular	738	46.6	39.8	84.9
Casual	736	8.1	2.3	28.3
Paid	650	4.1	0.8	21.4
#5 (20 month)				
Overall	715	54.9	41.0	76.7
Regular	709	45.3	39.6	87.2
Casual	708	9.6	3.8	39.7
Paid	623	5.7	0.9	16.2
#6 (24 month)				
Overall	610	54.9	41.3	75.2
Regular	608	46.7	38.9	83.4
Casual	605	8.8	3.6	41.5
Paid	528	5.5	0.5	9.7
#7 (28 month)				
Overall	516	53.9	38.6	71.6
Regular	513	45.0	37.2	82.3
Casual	511	8.4	2.7	32.6
Paid	454	5.0	0.2	4.2

**TABLE 2.** (continued) Prevalence of Vaginal Sexual Activity and Unprotected Vaginal Sexual Activity With Different Types of Partners Over Time Among Long-Term Participants in the Bangkok Injecting Drug User HIV Vaccine Preparatory Cohort Study\*

Follow-Up Visit	n	Prevalence (%)		
		Any Vaginal Sexual Activity	Unprotected Vaginal Sexual Activity	Unprotected (Among Those Reporting Vaginal Sex)
#8 (32 month)				
Overall	272	61.0	41.2	67.4
Regular	267	49.4	40.1	81.1
Casual	264	7.9	2.7	33.3
Paid	229	7.3	1.2	16.7
#9 (36 month)				
Overall	203	56.2	39.9	71.1
Regular	203	51.7	39.4	76.2
Casual	199	8.4	2.7	23.5
Paid	174	5.9	0.5	9.1
#10 (40 month)				
Overall	225	55.1	38.2	69.4
Regular	221	49.8	38.0	76.4
Casual	224	8.5	2.2	26.3
Paid	200	4.7	1.4	30.0

$\chi^2$  test (GEE) for homogeneity of unprotected sex over time.  
 Overall  $\chi^2 = 11.3$ , 10 df,  $P = 0.3$ .  
 Regular partners  $\chi^2 = 6.2$ , 10 df,  $P = 0.8$ .  
 Casual partners  $\chi^2 = 23.5$ , 10 df,  $P < 0.01$ .  
 Paid partners  $\chi^2 = 23.8$ , 10 df,  $P < 0.01$ .  
 \* Values for n may not total 806 due to missing data.

being informed that they had seroconverted). The elapsed time between these 2 follow-ups ranged from 2 weeks to 2 years, with a median of 5 months. The 10% reduction in the prevalence of unprotected sex with regular partners pre- and post-seroconversion was statistically significant (McNemar  $\chi^2 = 5.1$ , 1 df,  $P = 0.02$ ). Condom use with regular partners increased over time after seroconversion. Among seroconverters who reported sexual activity with a regular partner, the average prevalence of using condoms all of the time was 15% in visits prior to seroconversion; this rose to an average prevalence of 55% for the follow-up visits after seroconversion (GEE  $\chi^2 = 21.0$ , 1 df,  $P < 0.001$ ).

We also examined risk factors for unprotected sex with the various types of sexual partners. In these analyses, GEE was used to model the odds of unprotected sex with specific types of partners. Potential predictor variables included time-fixed variables such as age and time-dependent variables such as use of different drugs within the same follow-up period as unprotected sex with a specific type of partner. To examine

**TABLE 3.** Associations Between Engaging in Unprotected Vaginal Sex Across Different Types of Sexual Partners Among Long-Term Participants in the Bangkok Injecting Drug Users HIV Vaccine Preparatory Cohort Study

Men, n = 756			
Any Unprotected Sex With a Casual Partner			
	Yes	No	OR (95% CI)
Any unprotected sex with a regular partner			
Yes	100 (21%)	386 (79%)	1.0
No	35 (13%)	235 (87%)	1.7 (1.1–2.6)
<b>Any Paid Unprotected Sex</b>			
Any unprotected sex with a regular partner			
Yes	28 (6%)	458 (95%)	1.0
No	17 (6%)	253 (94%)	0.9 (0.5–1.7)
<b>Any Paid Unprotected Sex</b>			
Any unprotected sex with a casual partner			
Yes	29 (22%)	106 (78%)	1.0
No	16 (3%)	605 (97%)	10.3 (5.4–19.7)

possible consistency of unprotected sexual behavior across the follow-up periods, we created an additional variable of any unprotected sex with that partner type during previous periods.

Table 4 presents univariate and multiple logistic predictors of unprotected sex with a regular partner during follow-up. Married IDUs were much more likely to engage in unprotected sex with a regular partner (adjusted OR = 8.10), and having engaged in unprotected sex in any previous period was also associated with engaging in protected sex with a regular partner in the current follow-up period (adjusted OR = 3.52). There were also modest associations of more education and using heroin associated with a higher likelihood of unprotected sex with regular partners.

Table 5 presents the risk factors for engaging in unprotected sex with a casual partner during follow-up. Not being married, having more education, and using stimulant drugs were all independently associated with a higher likelihood of unprotected sex with casual partners. Methamphetamine was the primary stimulant drug used by these IDUs.

Table 6 presents the risk factors for engaging in unprotected sex with a paid partner among the male subjects during follow-up. Not being married and having had any previous unprotected sex with a paid partner were the only 2 significant independent risk factors.

### DISCUSSION

The interventions to reduce sexual risk behavior among IDUs assessed in previous reviews were typically of relatively short duration—from several weeks to several months<sup>9</sup>—and resulted in very modest effects on sexual risk behavior. All of

the participants in our analysis received interventions for ≥16 months. These interventions included HIV education, HIV counseling and testing, and free condoms, all common elements in most interventions to reduce sexual risk behavior.

Despite the sustained interventions, we observed minimal reduction of sexual risk behavior. Approximately 40% of the study participants reported unprotected sexual behavior (vaginal intercourse without 100% condom use) with regular sexual partners at each of the study visits, and this did not decline over time. Unprotected sex with regular partners was reported by approximately 80% of the participants who reported being sexually active with a regular partner at each of the study visits, and this also did not decline over time. Unprotected sexual behavior with casual partners and with paid sexual partners (among male participants only) did decline significantly, but these declines did not continue beyond the first follow-up visit.

This stability over time in unprotected sexual behavior is in sharp contrast with drug injection risk behavior among the same participants (see Fig. 1). A statistically significant decline in reported injection risk behavior was reported by these subjects that continued through the 8th follow-up visit (32 months) before reaching a floor effect.<sup>13</sup>

Several aspects of the findings deserve additional comment. First, the number of participants who reported unprotected sex with casual and paid partners was already quite low at entry into the study. This may reflect previous sexual risk reduction among IDUs in Bangkok.<sup>16</sup> The percentages reporting unprotected sex with casual and paid partners, however, did decline after the initial HIV counseling and testing to an even lower level (approximately 3% reporting unprotected sex with a casual partner and approximately 1% reporting unpro-

**TABLE 4.** Risk Factors for Any Unprotected Vaginal Sex With a Regular Partner During Follow-Up Among Long-Term Participants in the Bangkok Injecting Drug User HIV Vaccine Preparatory Cohort Study

Factor	Univariate			Multivariate		
	OR	(95% CI)	P	OR	(95% CI)	P
Sex (fixed)						
Male	1.0					
Female	1.20	(0.8–1.8)	0.04			
Age (fixed)						
<25	1.05	(0.7–1.5)				
25–30	1.04	(0.7–1.5)				
31–39	0.97	(0.7–1.3)				
40+	1.0		0.9			
Education (fixed)						
Primary	0.75	(0.6–1.0)		0.72	(0.5–1.0)	
Secondary	0.94	(0.7–1.3)		0.86	(0.6–1.2)	
Postsecondary	1.0		0.04	1.0		0.04
Income (fixed)						
>5000 baht						
Yes	1.53	(1.2–1.9)		1.15	(0.9–1.4)	
No	1.0		<0.01	1.0		0.3
Treatment program						
Detox	1.0					
Maintenance	1.23	(0.9–1.6)	0.1			
Marital status						
Married	8.67	(7.0–10.7)		8.10	(6.5–10.1)	
Single	1.0		<0.01	1.0		<0.01
Jail						
Yes	0.82	(0.7–0.9)		0.83	(0.7–1.0)	
No	1.0		<0.01	1.0		0.1
Heroin use						
No	1.0			1.0		
Yes	1.24	(1.1–1.4)	<0.01	1.26	(1.1–1.5)	<0.01
Stimulants						
No	1.0					
Yes	1.06	(0.9–1.2)	0.5			
Tranquillizers						
No	1.0					
Yes	0.96	(0.8–1.1)	0.6			
Previous unprotected sex						
No	1.0			1.0		
Yes	4.49	(3.5–5.6)	<0.01	3.52	(2.8–4.5)	<0.01

All analysis via logistic regression (GEE) with exchangeable correlation structure and stratified on follow-up time panel.

tected sex with a paid partner at each subsequent follow-up visit). It may be difficult to reduce unprotected sex with casual and paid partners below these levels.

Second, unprotected sex with casual partners was positively associated with current amphetamine use. There has been a rapid increase in amphetamine use in Thailand and in

other countries in Southeast Asia over the past several years.<sup>17</sup> Since HIV prevalence is already high among IDUs in Bangkok,<sup>13</sup> the increase in unprotected sex with casual partners in relation to amphetamine use is of concern. Additional programs to reduce sexual risk behavior among amphetamine users are clearly needed.

**TABLE 5.** Risk Factors for Any Unprotected Vaginal Sex With a Casual Partner During Follow-Up Among Long-Term Participants in the Bangkok Injecting Drug User HIV Vaccine Preparatory Cohort Study

Factor	Univariate			Multivariate		
	OR	(95% CI)	P	OR	(95% CI)	P
Sex (fixed)						
Male	1.0					
Female	0.31	(0.2–0.8)	0.02	0.39	(0.1–1.2)	1.0
Age (fixed)						
<25	2.00	(1.1–3.8)		1.21		
25–30	1.22	(0.7–2.5)		0.80		
31–39	1.11	(0.6–2.1)		0.99		
40+	1.0		0.03	1.0		0.6
Education (fixed)						
Primary	0.37	(0.2–0.6)		0.46	(0.3–0.8)	
Secondary	0.85	(0.5–1.4)		0.96	(0.6–1.6)	
Postsecondary	1.0		<1.0	1.0		<0.01
Income (fixed)						
>5000 baht						
Yes	1.01	(0.7–1.5)				
No	1.0		1.0			
Treatment program						
Detox	1.0					
Maintenance	0.43	(0.2–0.8)	<0.01	0.52	(0.3–1.0)	0.1
Marital status						
Married	0.43	(0.3–0.7)		0.48		
Single	1.0		<0.01	1.0		<0.01
Jail						
Yes	0.77	(0.4–1.4)				
No	1.0		0.4			
Heroin use						
No	1.0					
Yes	0.79	(0.6–1.1)	0.2			
Stimulants						
No	1.0					
Yes	1.76	(1.2–2.6)	<0.01	1.58	(1.0–2.4)	0.03
Tranquillizers						
No	1.0					
Yes	1.43	(1.0–2.1)	0.1			
Previous unprotected sex						
No	1.0					
Yes	2.07	(1.2–3.6)	0.01			

All analysis via logistic regression (GEE) with exchangeable correlation structure and stratified on follow-up time panel.

Third, the great majority of the participants who reported unprotected sex were engaging in unprotected intercourse with their regular partners. Achieving consistent condom use with regular partners has generally been difficult for all persons at high risk for HIV.<sup>9,18,19</sup> The intimate emotional relationships

with regular partners appear to make consistent condom use difficult.

Moreover, for HIV-seronegative IDUs who only infrequently engage in sexual risk behavior with high-risk partners, the important aspect of sexual risk reduction would appear to



**TABLE 6.** Risk Factors for Any Unprotected Paid Vaginal Sex During Follow-Up Among Long-Term Participants in the Bangkok Injecting Drug User HIV Vaccine Preparatory Cohort Study

Factor	Univariate			Multivariate		
	OR	(95% CI)	P	OR	(95% CI)	P
Age (fixed)						
<25	0.54	(0.3–1.1)				
25–30	1.03	(0.6–2.0)				
31–39	0.87	(0.5–1.6)				
40+	1.0		0.1			
Education (fixed)						
Primary	0.75	(0.4–1.3)				
Secondary	0.85	(0.5–1.4)				
Postsecondary	1.0		0.6			
Income (fixed)						
>5000 baht						
Yes	1.17	(0.8–1.8)				
No	1.0		0.5			
Treatment program						
45-day detox	1.0		1.0			
Maintenance	0.51	(0.3–0.9)	<0.01	0.61	(0.3–1.2)	0.1
Marital status						
Married	0.32	(0.2–0.5)		0.22	(0.1–0.4)	
Single	1.0		<0.01	1.0		<0.01
Jail						
Yes	0.12	(0.8–1.6)				
No	1.0		0.6			
Heroin use						
No	1.0		1.0			
Yes	0.72	(0.5–1.0)	0.04	0.74	(0.5–1.1)	0.1
Stimulants						
No	1.0					
Yes	1.15	(0.8–1.7)	0.5			
Tranquillizers						
No	1.0					
Yes	1.22	(0.9–1.6)	0.2			
Previous paid sex						
No	1.0		1.0			
Yes	2.07	(1.2–2.1)	<0.01	1.69	(1.3–2.2)	<0.01

All analysis via logistic regression (GEE) with exchangeable correlation structure and stratified on follow-up time panel.

be reducing the risk of transmitting HIV to a regular sexual partner if the IDU became infected with HIV through injection behavior. Consistent condom use in this case would involve an altruistic motivation rather than reducing the likelihood of becoming infected oneself.

The participants who seroconverted in this study did substantially increase their condom use with regular partners after learning that they had become infected with HIV, indi-

cating that altruistic motivation to protect regular partners clearly existed among the participants. Consistent condom use did not occur among all the seroconverters, however, and may have occurred after the initial period of high viremia for some of the seroconverters who did eventually practice consistent condom use with their regular sexual partners. There is clearly room for improvement in preventing newly infected IDUs from transmitting HIV to their regular sexual partners.

Developing programs to reduce potential sexual transmission from IDUs who are currently HIV seronegative but who are engaging in high rates of injection risk behavior and in unprotected sex with regular partners will probably be difficult. This would involve addressing both the continuing injection risk behavior and the emotional issues that make practicing safer sex more difficult in regular sexual partnerships. Such new programs will need to go beyond HIV counseling and testing. Indeed, frequent voluntary counseling and testing for HIV may produce a false sense of security for individuals who engage in risk behavior but remain seronegative for extended periods. Nevertheless, such programs to reduce potential sexual transmission from IDUs who are currently HIV seronegative are likely to be needed in many different parts of the world.

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