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Injection of Amphetamines, Heterosexual Sex Risk and Syringe Exchange in Central and Eastern Europe

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Abstract

Objectives. As the psychostimulant effects of amphetamines have been implicated in the sensitization of sexual behavior, this study examined if the injection of amphetamines predicted heterosexual sex risk behavior among people who injected drugs (PWIDs) in Central and Eastern Europe who were, predominantly, opiate injectors. HIV serostatus and other STI diagnoses were also examined as potential covariates of amphetamine injection predicting sex risk. Furthermore, the effect of established syringe exchange programs (SEPs) on the relationship between amphetamine injection and sex risk in the region of Central Europe and Ukraine was compared to that of recently initiated SEPs in the Russian Federation. **Method**. PWIDs (N=1671) were randomly recruited at SEPs in ten cities of Central and Eastern Europe in 1999 and 2000, for confidential interviews about their drug use and HIV-related injection and sex risk behavior. **Results**. Results of multivariate logistic regressions indicated that the injection of amphetamines predicted heterosexual sex risk in the Russian Federation with two types of sex partners: (1) primary partners (OR=1.6; 95% CI=1.0, 2.5; p=.04); and (2) casual partners (OR=2.3; 95% CI= 1.2, 4.4; p=.01). Age was a marginally significant covariate of amphetamine injection predicting sex risk among Russian PWIDs and their primary partners (OR=1.032; CI=1.002, 1.063; p=.04), indicating a marginal increase in sex risk among those who were older. Amphetamine injection was not significantly related to heterosexual sex risk in Central Europe and Ukraine. HIV serostatus and history of STIs were not significantly associated with amphetamine injection to predict sex risk in either region. No significant relationship was found between number of months participating at SEPs and sex risk among amphetamine injectors. **Conclusions**. Amphetamine injection amplified heterosexual sex risk in the Russian Federation but did not in Central Europe and Ukraine. Further investigation of findings of this study that suggest a

subculture of preferential amphetamine injectors in the Russian Federation could illuminate the regional differences in heterosexual sex risk among amphetamine injectors.

Amphetamines, sexual risk behavior, injecting drug use, HIV, Central and Eastern Europe

Injection of Amphetamines, Heterosexual Sex Risk, and Syringe Exchange in Central and Eastern Europe

Amphetamine Use in Central and Eastern Europe

The illicit use of amphetamines in Central and Eastern Europe has been based in a convention of home-made drug production. Limited data exist about stimulant use patterns in those regions (Des Jarlais et al., 2002; Grund, Zabransky, Irwin & Heimer, 2010). However, research about amphetamine use in Central and Eastern Europe indicates that illicit amphetamines had been commonly derived from non-prescription products and black market prescription medications containing ephedrine or pseudoephedrine since the 1980's (Grund et al., 2010; Pinkham, 2010). Recipes for amphetamine-type stimulants utilized in those areas have generally differed between those that call for the reduction of (pseudo-)ephedrine to produce methamphetamine and those that call for the oxidization of (pseudo-)ephedrine to produce methcathinone (Grund et al., 2010). Both analogs may be produced in crystal, powder or liquid form. Information about some black marketing of amphetamines in the 1990's was reported by syringe exchange programs (SEPs) in the Czech Republic, Hungary and Poland (Ban, 1993; Sananim, 1998; Wodowski & Zygadlo, 1997). In the Czech Republic, where methamphetamine was a major drug of choice and ecstasy had newly appeared on the black market, the marketing of amphetamines was described as moderate:

"The marke[t] was supplied with pills and volatile crude opium and home made drugs mainly codeine derivate and amphetamine … there wasn't a real market because drug users were a closed group, making, changing and using drugs within themselves (Sananim, 1998)."

The popularity of the production of home-made amphetamines in Central and Eastern Europe for injection purposes has been particularly relevant to the spread of HIV. Their use may

also have physical consequences that amplify the risk of sexual transmission of HIV by drying mucous membranes in the vagina and rectum, decreasing membrane sensitivity and increasing the risk of torn membranes and infection during penetrative sex (Reference Group to the United Nations on HIV and Injecting Drug Use, 2007). Indeed, complex psychophysical effects of amphetamine use (Hoffman et al., 2007) include important implications for the interrelationship of amphetamine injection and HIV-related sexual risk.

Amphetamines and Sexual Behavior

The psychostimulant effects of amphetamine and its analogs have been implicated in the sensitization of sexual behavior (Fiorino & Phillips, 1999; Hoffman et al., 2007; Leigh, Ames & Stacy, 2008). The relationship between amphetamine use and sexual behavior, although not thoroughly understood, comprises neurophysiological and environmental components. Amphetamines are psychoactive substances that lower brain stimulation reward thresholds (Hyman, 2005; Nestler, Hyman & Malenka, 2009). They are addictive, positively reinforcing stimuli and can be associated with behaviors and places that increase the probability of their repeated use (Corsi & Booth, 2008; Nestler et al., 2009; Theall, Elifson & Sterk, 2006).

Amphetamines potentiate monoamine transmission in the brain (Moore, 1977). They disrupt vesicular storage of dopamine, norepinephrine and serotonin in nerve terminals, resulting in increased monoamine release (Erickson, 2007; Nestler et al., 2009). Psychostimulant impact on the dopaminergic system projects from the ventral tegmental area of the midbrain along brain reward pathways to the nucleus acumbens and other forebrain structures (Nestler et al., 2009) that regulate cognitive functions and behavioral control (Fillmore, 2003). In healthy adults, low doses of d-amphetamine have improved behavior control by reducing inhibition response time on tasks requiring response suppression (de Wit, Enggasser & Richards, 2002). On the other hand,

both long-term and high-dose amphetamine use have produced neurological maladaptations that impaired behavior control, i.e., caused sensitization and amplified disinhibition, exhibited as impulsiveness and chronic, stereotyped behavior (Fillmore, 2003; Hoffman et al., 2007; Hyman, 2005; McKim, 2007; Moore, 1977).

Some animal studies of amphetamine injection indicated that amphetamine use augmented appetitive and consummatory sexual behavior. Sexually naïve male rats treated with a series of injections of d-amphetamine exhibited greater mounting and intromitting behaviors than controls that were injected with saline, independent of the environment in which the treatment had occurred (Fiorino & Phillips, 1999). Both sexually experienced and sexually naïve female rats were treated with a series of injections of d-amphetamine and subsequently exhibited more solicitations, hops and darts, and female-male mounting behaviors than controls that were injected with saline whether or not the treatment was paired with the testing environment (Afonso, Mueller, Stewart, & Pfaus, 2009). Male rats that were treated with ecstasy ((±) 3,4 methylenedioxymeth-amphetamine, MDMA), an amphetamine derivative, exhibited more erections and ejaculations when sleep-deprived than male rats that were treated with cocaine (Anderson et al., 2006).

Subjective reports of human subjects about the potency of the effects of amphetamine use differ according to the mode of administration and amphetamine type. When injected or smoked, people have reported that they experience an intense rush of pleasurable feeling. When snorted or ingested, the experience is reportedly less intense, yet, still euphoric (Drug Enforcement Administration, U.S. Department of Justice, 2009). The acute effects of methamphetamine can last more than 24 hours, potentially causing more impact on the central nervous system than other amphetamines. The effects of methcathinone have been described as comparable

(Hoffman et al., 2007); although more euphoric (Pinkham, 2010), less potent, and less popular than the effects of methamphetamine use (Grund et al., 2010). The knowledge of chemistry and the skill of producers of home-made amphetamines also contribute to the effects of amphetamine use among drug networks that consume home-made substances (Grund et al., 2010). Additionally, personality factors, such as novelty and sensation seeking, have been associated with greater subjective and psychophysiological responsiveness to the stimulant effects of amphetamine use (Hutchison, Wood & Swift, 1999).

Increased arousal, including sexual arousal, confidence and attentiveness; and fatigue and suppressed appetite are commonly experienced with the use of amphetamines (McKim, 2007; Nestler, 2009; National Institute on Drug Abuse, National Institutes of Health, Department of Health and Human Services, 2005). Human subjects research has linked amphetamine, methamphetamine, methcathinone and MDMA use with increased sexual desire and drive as well as sensation seeking and sexual risk (Bang-Ping, 2009; Celentano et al., 2008; Corsi & Booth, 2008; Grund et al., 2010; Leigh et al., 2008; Molitor, Truax, Ruiz, & Sun, 1998; Ross & Williams, 2001; Theall et al., 2006). Sexual risk behaviors — neglecting to use a condom when having sex or having multiple or indiscriminate sex partners — may develop as external expressions of impaired inhibition and "cross-sensitization" (Fiorino & Phillips, 1999) that are induced by increased amphetamine use and unconsciously facilitate sexual desire and sensation seeking.

Injecting Drug Use, Sex Risk and HIV in Central and Eastern Europe

This study examined the impact of the injection of amphetamines on the sexual risk behavior of people who injected drugs (PWIDs) at high risk for HIV infection in Central and Eastern Europe. The data for this study come from a secondary dataset of PWIDs who

participated in SEPs in ten Central and Eastern European cities in 1999 and 2000 and reported recent heterosexual sex behavior (Des Jarlais et al., 2002). Injection of homemade opiates or imported powder heroin predominated in the sample. However, patterns of drug use varied and substantial injection of powder and self-made liquid amphetamines was reported across the PWID enclaves that were represented.

The interrelationship of injecting drug use and sexual risk behavior in the development of the HIV epidemic in Central and Eastern Europe has been documented. In Eastern Europe, an upsurge of already epidemic injecting drug use and corresponding unsafe injection practices (Grund et al., 2010; Kelly & Amirkhanian, 2003; EuroHIV 2003; Lancet (the leading edge) 2003; UNAIDS/WHO 2002) accounted for 60% of HIV incidence from 1996 to 2001 (Hamers & Downs, 2003). In the same period, injecting drug use accounted for the second largest proportion (28%) of HIV incidence in Central Europe; where the source of infection of the largest proportion (47%) of new cases remained unreported through 2001 and men who had sex with men accounted for 10% of new cases (Hamers & Downs, 2003).

Prior to this study, reports of sexual risk-taking among PWIDs in the two regions established that PWID risk was compounded by inconsistent condom use and multiple sex partners. More than three-quarters (77%) of 611 drug users participating at a SEP in Prague, Czech Republic reported having sex without a condom over a recent six-month period; and the proportion of those not using condoms increased as the number of their sexual partners increased (Mikl et al., 1998). A survey among 239 PWIDs in St. Petersburg, Russia who were 14–25 years old found within the most recent 30 days that 41% of the participants shared needles, 36% had multiple sex partners and 70% of the sexually active had engaged in vaginal sex without using condoms (Somlai et al., 2002). Sexual risk among PWIDs also posed a risk among their non-

injecting sex partners, particularly in Eastern Europe, where the epidemic advanced heterosexually and among women beyond communities of PWIDs (UNAIDS, 2002). An assessment of HIV testing in a rural oblast[1] of the Russian Federation found that half (49%) of the patients who had been infected with HIV via heterosexual sex had sexual contact with PWIDs (Molotilov et al., 2003). PWIDs who traded in sex were a special public health concern. Reportedly 10% to 88% of sex workers in cities across Ukraine and the Russian Federation injected drugs (Atlani, Carael, Brunet, Frasca, & Chaika, 2000; Protopopov et al., 2000; Rhodes, Sarang, Bobrik, Bobkov, & Platt, 2004). Sex work placed PWIDs and their clients at an elevated risk for infection with HIV and other sexually transmitted infections (STIs) (Kacena et al., 2001; Protopopov, Martynova & Kolesnikova, 2000) in increasingly STI-endemic areas (Aral, 2001; Waugh, 1999). Their clients could be local or, like truckers who sought sex workers along highway strolls, could be passing through, potentially carrying infections to other locations. Prompted by research findings that different types of sexual relationships were associated with different levels of risk, this study differentiated sex risk among primary, casual and sex work partners of its participants as well as investigated the potential co-morbidity of self-reported HIV incidence and history of STIs among them.

Regional differences in sexual risk behavior. Regional differences in exposure to syringe exchange services and subsequent impact on sexual risk among amphetamine injectors were also examined. Central European and Ukrainian participants in this study utilized SEPs that had been in operation for several years (Table 1). On the other hand, four of five SEPs in the Russian Federation that were utilized by study participants were new the year that interviews for this study took place (Table 2). In 2000, Cox, Lawless, Cassin and Geoghegan found no change in reported levels of condom use among PWIDs in the first three months of their

[1] Oblast: the largest governmental subdivision within countries that were formerly republics of the U.S.S.R.

utilization of SEP services. Quite differently, more recent research followed PWIDs' utilization of syringe exchange services over a more extended period of time and found that unprotected vaginal intercourse among them was reduced by 26% after three years (Huo & Ouellet, 2009). This study therefore also investigated if amphetamine injectors at SEPs in five cities of Central Europe and Ukraine reported less sexual risk behavior than those at SEPs in five cities of the Russian Federation.

Method

Participants

Participants of this study were randomly recruited to be interviewed among PWIDs who utilized syringe exchange at SEPs in ten Central and Eastern European cities. They were recruited by locally hired, independent interviewers who had been trained in research methods for the study. A goal of 2250 interviews was set, consisting of:

1. 200 interviews per SEP in the five cities of Prague, the Czech Republic; Budapest, Hungary; Skopje, FYR Macedonia; Krakow, Poland; and Poltava, Ukraine; and
2. 250 interviews per SEP in the five Russian cities of Nizhniy-Novgorod, Pskov, Rostov-na-Donu, St. Petersburg and Volgograd.

Some events occurred prior to and during data collection that impeded fulfillment of the original data collection goals at each of the SEPs. Arsonists destroyed the bus that served as the mobile SEP unit in St. Petersburg early in the project year, disabling full operations for most of the year. Drug user "round-up" campaigns by police and drug-dealer territorial conflicts terrorized drug users in Krakow. SEP participants' distrust of strangers in Krakow was aggravated. To bridge the distrust, SEP staff were permitted to conduct research interviews in

Krakow and subsequently 91 participants were interviewed there. The resignation of the director of the SEP in Budapest disrupted SEP management and operations and consequently only 73 participants were interviewed there.

Getting the project up and running in Russia was an extended process overall that delayed the initiation of Russian data collection until December, the last month of the project year. Although Russian data collection was extended through the following January, was well organized and generally successful, the constraints of time and rough, winter weather were challenging and Russian data collection fell somewhat short of its goals.

Taking into account the elimination of 60 duplicate interviews collected across the ten SEPs, the total number of participants came to 1955. For purposes of consensus across the ten SEPs, only interviews of participants who provided data for both "30 days prior" to participation in syringe exchange and "in the past 30 days" of SEP participation were used in data analysis. The resulting sample (N=1671) comprises 74% of all participants of the study sample.

Syringe Exchange Programs. The selection of ten SEPs for this study was made among Central and Eastern European SEPs that were funded by the International Harm Reduction Development Program of the Open Society Institute (IHRD/OSI).[2] IHRD/OSI participated in the selection, guided by its interest to determine the success of a diverse group of SEPs to reduce risk of infection with HIV in injecting-drug-use endemic locations. Computer, electronic mail and photocopier/printing capacities of each SEP were assessed to assure communications with the research team and to confirm the SEPs' abilities to print study instruments or to have them printed. SEP locations, membership sizes, current and projected patterns of syringe exchange and the starting dates of new SEPs were considered in order to estimate the total number of

[2] OSI is a private, philanthropic foundation that funds human rights programs and initiatives around the world. IHRD is an OSI public health initiative focused "on diminishing the individual and social harms associated with drug use." (Open Society Foundations 2011).

interviews that might be completed within the project year. Central European and Ukrainian SEPs had been in operation from two to four years (Table 1). The three-year-old SEP in St. Petersburg with an established client base was selected as a counterweight of SEP participation experience to the choice of four, new SEPs in other Russian cities that were about to initiate their enrollment process (Table 2).

Project coordination of the five Central European and Ukrainian SEPs was done from New York City. Therefore, English-speaking study contacts among the SEP staff of all five Central European and Ukrainian cities were appointed. Coordination of the study in Russia was two-tiered. An English-speaking Russian partner was appointed in Moscow to supervise the study at the five Russian SEPs in coordination with the New York City research team.

Procedures and Materials

An informed consent statement and interview instrument were first developed in English by the research team and then translated by a professional translation company in New York City into the languages that were spoken at the locations of the SEPs:

1. Prague: Czech
2. Budapest: Hungarian
3. Skopje: Macedonian
4. Krakow: Polish
5. Poltava: Ukrainian; Russian
6. Nizhny-Novgorod, Pskov, Rostov-na-Donu, St. Petersburg and Volgograd: Russian

Each translation was additionally critiqued by harm reduction educator experts to include drug-user terminology that was commonly used in the different cities and regions of the study.

Independent interviewers were hired in each of the cities in the study and were trained by the research team to conduct data collection at nine of the ten SEPs. SEP staff were trained to interview participants in Krakow because the staff of the SEP was firmly convinced that participants would not trust non-staff to interview them. Potential bias of the self-reports of the Krakow participants will be considered in the discussion of the results.

A random sampling method was used to recruit participants for the survey. Interviewers utilized a random-number (n) chart to approach each n^{th} SEP participant who was witnessed exchanging syringes at SEP exchange sites. SEP participants typically formed short lines at the sites of exchanges, so a random-number chart based on the numbers one through five was used to optimize recruitment results. As a result, the likelihood of sampling frequent exchangers was also increased (Des Jarlais et al., 2002).

All data collection was conducted in a face-to-face and confidential manner as was determined appropriate for vulnerable populations. No personal information was requested that would allow individual identification of the participants. Before conducting every interview, an informed consent statement was read aloud to each participant and participants provided verbal informed consents only. All interview data were individual, self-reports. All interviews were conducted at syringe exchange sites or nearby locations, as was required for adequate privacy and, in the case of outdoor sites of exchange, as was dictated by the weather. All responses to interview questions were noted by hand on hard-copy, paper questionnaires by the individual interviewers.

At the beginning of each interview, participants at nine of the ten SEPs generated unique ten-character ID codes based on a formula developed for the study to distinguish their interviews. Participant ID codes consisted of the first three letters of the first name of the

participant's mother; a two-digit day of the participant's birth; the first three letters of the participant's first name; and a two-digit month of the participant's birth. Budapest participants were reportedly resistant to revealing information to generate the study ID code and were permitted to use their established SEP membership codes, instead.

Interviews were approximately 45 minutes in length. Each participant received a small gift or cash valued at US$1-3 immediately upon completing an interview. SEP staff had been consulted to determine what types of reimbursements were appropriate for each location.

Measures

The interview instrument included questions about demographics; experience with the criminal justice system; types of drug use (in the 30 days prior to participation at the SEP; and in the most recent 30 days); injection risk behaviors (in the 30 days prior to participation at the SEP; and in the most recent 30 days); penetrative sex and sexual risk behaviors (in the most recent 30 days); testing, status and treatment of HIV, STIs and other illnesses for which PWIDs were particularly at risk; AIDS knowledge; and experience with each city's social services system. Questions about penetrative sex and sexual risk behaviors applied to any penetrative sex, site of penetration unspecified, with partners of the same and opposite sex who were primary, casual or sex work partners for money or drugs. Questions about kinds of drugs used and references to methods of drug manufacture and administration were adapted to the cultural practices of the sample in consultation with IHRD/OSI staff that mentored the SEPs participating in the study. To permit quantitative statistical analysis of the total sample as a whole, responses were either categorical, multiple-choice items that were coded numerically or were continuous variables.

For purposes of testing the impact of amphetamine injection on sexual risk behaviors, the following subset of variables was investigated:

1. frequency of amphetamine injection in the past 30 days of SEP participation; participants could choose one of ten ranked responses within a range of "never" to "10 or more times a day almost every day;"
2. frequency of penetrative sex in the past 30 days of SEP participation with opposite-sex primary partners, casual partners, sex work partners who gave money for sex and sex work partners who gave drugs for sex; participants could choose one of ten ranked responses within a range of "never" to "10 or more times a day almost every day;"
3. sexual risk behaviors in the past 30 days of SEP participation measured as the proportion of the times participants used condoms when having sex with each type of partner of the opposite sex; participants could choose one of five ranked responses within a range of "never" to "always;" any response less than "always" was defined as sexual risk;
4. current HIV serostatus, if known; and
5. ever having been diagnosed with other STIs that included syphilis, gonorrhea, chlamydia and pelvic inflammatory disease.

Although interview questions addressed penetrative sex and sexual risk behavior with partners of the same sex and partners of the opposite sex, only 23 (1%) of participants reported any sex with the same sex, precluding valid statistical tests of same sex data. As a result, this

study specifically investigated the relationship between amphetamine injection and heterosexual sex risk.

Data preparation and corrections. The preparation of data for statistical analysis for this study required a number of corrections. Central European and Ukrainian data were sent by each of the SEPs to the New York office for cleaning. Data collected in cities of the Russian Federation were cleaned at the office of the Russian partner. As a result, types of errors detected in Central European and Ukrainian data varied among those cities; whereas a single coding discrepancy detected in Russian data was consistent across those cities and was most likely the result of a recoding decision made by that office.

Some individual interviewers in Prague, Budapest, Skopje and Krakow did not follow skip instructions properly when asking questions about sexual risk behavior. Consequently, 18 participants who reported having no penetrative sex in exchange for drugs in the past 30 days also responded to questions about consistency of condom use with partners who gave drugs for sex in the past 30 days. Left uncorrected, this series of errors would increase the frequency of sexual risk behavior with partners who gave drugs for sex by 60%. The findings of univariate logistic regression tests for sexual risk with partners who gave drugs for sex among amphetamine injectors were insignificant for both uncorrected and corrected data. As a result, findings in this paper for this type of sex risk reflect tests of those data after being corrected. Responses about sexual risk with partners who gave drugs for sex among participants who first reported no sex with that type of partner were redefined as missing. The same pattern of skip errors occurred among data about sex risk with primary partners, casual partners and partners who gave money for sex to much less extent. As those errors comprised no more than 1% of the totals for each of those types of sex risk, the findings reported in this paper are of those data after being corrected.

Interviewer skip errors also produced discrepancies among reports of number of participants who had HIV tests, number of participants who received HIV test results and number of participants who received positive HIV test results. In Prague, Skopje, Krakow and Poltava, a sum of 24 more participants reported test results than reported tests. Responses given about test results were redefined as missing for those participants who reported no past HIV tests and never receiving HIV test results. HIV prevalence in Krakow and in Poltava was reduced by 1% in each city after data were corrected. The findings about HIV serostatus in this paper are based on the analysis of the corrected data.

Some data from the cities of the Russian Federation and from Krakow and Poltava about the frequency of use of different types of drugs in the past 30 days were not coded according to the coding system designed for the study. As the estimated difference caused by the error was less than 5%, results of this analysis are based on corrections of those errors.

Redefinition of variables. Data preparation also included the redefinition of variables. Because variables about types of amphetamine use differentiated them as "powder" and "self-made, liquid" but did not differentiate them chemically (for example, methamphetamine vs. methcathinone), different variables of amphetamine use were summed as one variable so that the investigation of "amphetamine injection" was undifferentiated by type. As well, amphetamine injectors were a minority among the total sample. The numbers of amphetamine injectors in the individual cities of the study were too small for comparative analyses among the cities. Two general strategies were applied that maximized options for effective logistic regression. First, tests of the impact of amphetamine injection on sexual risk behaviors were limited to the total sample (N=1671) and to two geographical regions represented by the locations of data collection:

1. Central Europe and Ukraine (N= 595): Prague, Budapest, Skopje, Krakow and Poltava; and
2. Russia (N=1076): Nizhny-Novgorod, Pskov, Rostov-na-Donu, St. Petersburg and Volgograd.

Second, as categorical variables used in this study were ordinal and included a zero point, they were converted into dichotomous variables.

As a result, sex risk was defined as "did not always use a condom" when having penetrative sex. Safe sex was defined as "always used a condom" when having penetrative sex.

As data were insufficient for testing individual variables of syphilis, gonorrhea, chlamydia and pelvic inflammatory disease, these variables were combined to create one general variable of the prevalence of sexually transmitted infections (STIs).

For purposes of capturing the diversity of opiates that were injected in one variable, different variables of opiate injection (heroin powder, homemade opiates and opium) were combined to create one general variable of the prevalence of "opiates" injection.

Data Analysis

The t-test procedure was used to evaluate if mean age differed significantly between the two regions of the study. The chi-square test was used to assess if proportions varied significantly in bivariate analyses of gender, diagnostic test results, injection of amphetamines and injection of opiates, and penetrative sex among amphetamine injectors. Logistic regression was used to test if amphetamine injection was significantly related to sexual risk, when controlling for effects of age and gender; and if history of STIs or self-reported HIV serostatus were significant covariates of amphetamine injection predicting sexual risk. Analysis of variance tests were made to test if the number of months of participation at SEPs was

significantly related to sex risk among amphetamine injectors. Only test values with an alpha value below .05 were considered statistically significant.

Results

Demographics and Health

Table 3. Participants in the Russian Federation were younger ($p<.0001$) and more likely to be HIV positive ($p=.01$) than those in Central Europe and Ukraine.

In both regions, participants were predominantly in their twenties (overall $M=25.9$; $SD=6.3$). More than three quarters of the participants were male (77% overall). In light of their general youthfulness, reports of sexually transmitted infections by a quarter of each regional sample (24% overall) were grounds for intensified public health concern (Waugh, 1999), potentially compounding participants' risk for HIV infection. Reports of past HIV tests were equally and generally common in the regions (79% overall). HIV+ test results were twice as common ($p=.01$) in the Russian Federation (11%) as in Central Europe and Ukraine (6%).

Amphetamine Injection among Opiate Injectors

Table 4. As identified in an earlier study of the injection risk behaviors of this sample, the variability of patterns of drug use among the different cities otherwise precluded generalizations about the sample as a whole (Des Jarlais et al., 2002). Therefore, findings here compare regional patterns of amphetamine injection among opiate injectors encountered in the drug user communities in this study within which sexual risk has been examined. Amphetamine injection in the past 30 days was significantly more common ($p=.005$) in Central Europe and Ukraine (25%) than in the Russian Federation (19%). Although opiate injection predominated at similar rates in both regions (87%-90%), half as many amphetamine injectors ($p<.0001$) in the

Russian Federation (41%) reported injecting opiates as did those in Central Europe and Ukraine (83%), suggesting a subculture of preferential amphetamine injectors in the Russian Federation.

Heterosexual Patterns of Penetrative Sex

Table 5. Penetrative heterosexual sex reported by amphetamine injectors reflected regional differences of the sample as a whole. The occurrence of heterosexual sex reported by PWIDs in the Russian Federation (78%) as well as those among them who injected amphetamines (79%) was greater ($p<.0001$) than that of PWIDs in Central Europe and Ukraine (57%) and amphetamine injectors there (60%).

Amphetamine Injection and Heterosexual Sex Risk

Tables 6 – 8. Regardless of age, gender, history of STIs and HIV serostatus, amphetamine injection did not predict heterosexual sex risk in the five cities of Central Europe and Ukraine. Being male when controlling for age and gender ($p=.03$) and additionally controlling for STIs ($p=.02$) was significantly associated with sex risk with casual partners in that region, however, suggesting that the gender of Central European and Ukrainian participants predicted sex risk with casual partners independent of the type of drug that was injected.

Tables 9 – 11. In comparison, when controlling for age and gender, findings in the five cities of the Russian Federation indicated that amphetamine injection predicted heterosexual sex risk with (1) primary partners (OR=1.6; 95% CI=1.0, 2.5; $p=.04$); and (2) casual partners (OR=2.3; 95% CI= 1.2, 4.4; $p=.01$). Age was a marginally significant modifier of the effect of amphetamine injection on sex risk with primary partners (OR=1.032; CI=1.002, 1.063; $p=.04$), indicating a marginally increased probability of sex risk among older amphetamine injectors. HIV status and history of STIs did not significantly modify the effect of amphetamine injection on heterosexual sex risk in the Russian Federation. However, those who reported that they were

HIV+ were significantly more likely to have safe sex with their primary partners ($p<.0001$) than those who were HIV–, suggesting the possibility that knowledge that one were HIV+ may have been a mitigating factor of sex risk dependent on type of sex partner.

Impact of SEP Participation on Heterosexual Sex Risk

Table 12. In order to illuminate regional differences in the research findings about amphetamine injection and heterosexual sex risk, differences in the number of months that amphetamine injectors participated at SEPs were compared to determine if the duration of SEP membership was associated with a reduction of sexual risk behavior in different types of sexual relationships. No significant associations were found.

Discussion

The findings of this study confirm that the injection of amphetamines significantly predicted heterosexual sex risk among PWIDs who participated in syringe exchange in the Russian Federation with their primary and non-commercial, casual sex partners.

No findings differentiated between amphetamine injection and heterosexual sex risk behaviors among participants who traded sex for money or for drugs. The numbers of participants who reported trading sex were usually low, or were too low to permit meaningful analysis. The extra stigma associated with the trade may have inhibited disclosure or participation in the study. Sex workers may also have visited the SEPs less frequently than other participants, limiting opportunities for interviewers to recruit them for the study. Sex workers were among the most impoverished in their communities and the demands of working on night strolls, sometimes along highways on the fringe of their cities, and maintaining their drug habits could have made SEP participation prohibitive. Notably, most reports of sex work by this sample were by participants in Ukraine and Russia, indicating the reach of syringe exchange to

areas where a synergistic impact of injecting drug use and sex work on the spread of STIs had generated international public health concern.

Differentiation of findings otherwise between regions of the study posed a puzzle. Although amphetamine injection was twice as common in Central Europe and Ukraine, all significant regional findings that amphetamine injection predicted heterosexual sex risk were in the Russian Federation.

One hypothesis of this study anticipated a difference in sexual risk findings between the two regions that might be attributed to a protective factor of SEP participation in Central Europe and Ukraine. Prior to the study, Central European and Ukrainian SEPs had been in operation for two to four years, dependent on the city, providing PWID communities with free, non-judgmental safe injection and safe sex education, syringe exchange and condoms and medical testing (Chemical Dependency Institute, Beth Israel Medical Center, 2000). In stark contrast, nearly all SEP services among drug use communities in the Russian Federation had been launched during or just prior to the year of this study. However, the examination of the actual number of months of SEP utilization by participants did not indicate that amphetamine injectors who had utilized SEPs longer were less likely to engage in sexual risk. One possible explanation could be the inordinate discontinuity of SEP services in both regions during the year of the study caused by the disruption and suppression of services at two of the SEPs in Central Europe and Ukraine; and by an act of terrorist destruction against the oldest SEP in the Russian Federation.

An alternative explanation for the regional differences in sex risk among amphetamine injectors could be that PWIDs of Central Europe and Ukraine did not inject amphetamines as frequently or for as long as their Russian counterparts. Maladaptive behavioral sensitization is a

consequence of high dosage and long-term use of amphetamines (Fillmore, 2003; Hyman, 2005; McKim, 2007; Moore, 1977). This study did not have the appropriate data to examine if frequency of injection or length of time of amphetamine use were factors determining the impact of amphetamine injection on sexual risk. The likelihood that Central European participants of the study were new or intermittent amphetamine injectors is unknown and is at least arguable. Amphetamine use by PWIDs in local communities, predominantly of the self-made type, was commonly reported in the years prior to the study by the SEPs in Prague, Budapest and Krakow (Ban, 1993; Sananim, 1998; Wodowski & Zygadlo, 1997), so that long-term amphetamine use among Central European participants of the study was not improbable.

Another possible determinant of the significant regional differences in sex risk findings might be the potency of the different types of amphetamines that were injected by the participants in the study. Study participants were asked whether they injected powder amphetamines or self-made, liquid amphetamines. No clear distinction was made between commercially acquired (and whether imported or local commodities) and home-made crystal, powder and liquid products; nor between the amphetamine analogs that participants might have injected. At the time of this study, very little rigorous ethnographic research about drug use cultures had been accomplished in Central and Eastern Europe (Grund et al., 2010), limiting the potential of the information to be captured by the variables that were developed about amphetamine use for this study.

Finally, findings of this study that suggest the existence of a subculture of preferential amphetamine injectors in the Russian Federation could illuminate the regional differences in heterosexual sex risk among amphetamine injectors. Significantly less likely to inject opiates, younger and more likely to have sex than amphetamine injectors in Central Europe and Ukraine,

the compound risk factors that distinguished them may have engendered the combined psychophysical determinants of their greater risk for sexual transmission of HIV.

Limitations

The original hypothesis proposed for this study was that increased amphetamine injection resulted in increased sexual risk. In the course of data analysis it was found that numbers of responses to key variables in several cities were small, making those data insufficient for analyses as originally planned. Ordinal data were consolidated as dichotomous to permit logistic regression analysis. As a result, frequencies of different types of injection, sex and sex risk behaviors were not analyzed. The hypothesis of the study was adjusted accordingly and a different hypothesis was tested. The findings of this study are the results of examining if amphetamine injection predicted sexual risk.

Disruption of drug user communities at some study locations was particularly challenging to the statistical power of data. Drug user 'round-up" campaigns by police in Krakow and demoralizing operational setbacks in Budapest seriously undermined data collection goals at those locations. Far fewer interviews were completed than the prescribed quota, reducing the power of those individual city samples. Data collection in Budapest was protracted and dependent upon the halting progress of mismanaged staff at the SEP to maintain services to PWIDs. SEP staff in Krakow found SEP participants increasingly distrustful of being questioned, particularly by unfamiliar research interviewers. Arson of the St. Petersburg bus could, similarly, have exacerbated distrust among its participants. Already members of vulnerable communities, the increased likelihood of bias among participants to provide default socially desired responses should be considered a factor of data collection.

On the other hand, adaptations of the method of the study may have mitigated response bias somewhat and should also be taken into account. In Krakow, SEP staff was permitted to conduct research interviews rather than independent interviewers. The familiarity of staff among participants and the validation it received for its advocacy of the rights of its membership during fearful times, several months of which their work went unpaid, could have positively affected participants' perceptions of the value of the study to their community. Interviews in St. Petersburg took place seven months after the SEP vehicle was destroyed. The perseverance of the SEP staff to maintain services to its membership throughout those difficult months may have lent validation of the study to its reception by SEP participants.

The issue of response bias of self-reported data is a constant and important issue of concern for data analysis. Regarding these data specifically, self-reports of high rates of potentially harmful sexual risk behaviors and formerly criminalized STI diagnoses could be considered evidence of participants' efforts to report true-to-life.

Finally, there were some limitations in the design and execution of the study. Variables about amphetamine use were limited in the scope to which they could be informative about the sexual risk behavior that they predicted in Central and Eastern Europe. Interviewers made errors following skip and coding instructions and they were corrected in the process of data cleaning. Only those data that were validated by following skip instructions appropriately were utilized, resulting in the reduction of power of some analyses. Other random errors that may have occurred among the hand-written notations of participants responses on hard-copy questionnaires cannot be known and those data would be lost.

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Appendix of Tables

Table 1

Years of Operation of Syringe Exchange Programs in 5 Cities of Central Europe and Ukraine

Locations of Syringe Exchange Programs	Years
Prague, Czech Republic	4
Budapest, Hungary	3
Skopje, FYR Macedonia	3
Krakow, Poland	3
Poltava, Ukraine	2

Note. Years are measured from the start-up of syringe exchange operations to the start-up of data collection for this study.

Table 2

Years of Operation of Syringe Exchange Programs in 5 Cities of the Russian Federation

Locations of Syringe Exchange Programs	Years
Nizhny-Novgorod	<1
Pskov*	1
Rostov-na-Donu	<1
St. Petersburg	3
Volgograd	<1

Note. Years are measured from the start-up of syringe exchange operations to the start-up of data collection for this study.
*The program in Pskov was one of the 4 new programs chosen for this study. It was the only new program in the study that launched operations before 1999 and it did so in August 1998 with the mentorship of the established program in neighboring St. Petersburg.

Table 3

Demographic Characteristics and Health Information about PWIDs Who Participated in Syringe Exchange in the Past 30 Days Compared between Two Regions of Central and Eastern Europe

	Central Europe And Ukraine (n=595)		Russian Federation (n=1076)		Total (n=1671)		
Demographic Characteristics	M	SD	M	SD	M	SD	*p*
Age[a]	27.0	6.4	24.9	6.3	25.9	6.3	<.0001
	n	%	n	%	n	%	
Gender[b]							
Male	453	76%	841	78%	1294	77%	
Female	142	24%	235	22%	377	23%	.3
Health Information[b]							
Ever STI diagnosis	130	23%	268	25%	398	24%	.3
Ever had HIV test[c]	449	79%	837	79%	1286	79%	.8
Know HIV test results[c,d]	423	91%	759	92%	1182	92%	.4
Ever HIV+ test result[e,f]	23	6%	79	11%	102	9%	.01

[a]t-test procedure. [b] Chi-square test procedure. [c]Frequency missing includes "don't know" and "refused to answer" values. [d]Per cents are based on the number of participants who ever had an HIV test. [e]Frequency missing includes "indeterminate," "don't know" and "refused to answer" values. [f]Per cents are based on the number of participants who ever received an HIV test result.

Table 4

Amphetamine Injection and Opiate Injection in the Past 30 Days among PWIDs Who Participated in Syringe Exchange Compared between Two Regions of Central and Eastern Europe

	Central Europe And Ukraine (n=595)		Russian Federation (n=1076)		Total (n=1671)		
Injected Drug Use	n	%	n	%	n	%	*p*
Amphetamines[a]	148	25%	205	19%	353	21%	.005
Opiates[b]	494	90%	819	87%	1313	88%	.09
Opiate injection reported by amphetamine injectors[c]	98	83%	79	41%	177	57%	<.0001

Note: Results based on Chi-square test procedure. Missing values were not included in totals.
[a]amphetamines injectors include participants who reported any powder and/or liquid self-made amphetamine injection; [b]opiates injectors include participants who reported any heroin powder, homemade opiate or opium injection; [c]Per cents are based on the number of participants who reported any amphetamines injection.

Table 5

Heterosexual Penetrative Sex in the Past 30 Days Reported by PWIDs Who Participated in Syringe Exchange Compared between Two Regions of Central and Eastern Europe

	Central Europe And Ukraine (n=595)		Russian Federation (n=1076)		Total (n=1671)		
Penetrative Sex	n	%	n	%	n	%	*p*
With partners of the opposite sex	334	57%	811	78%	1145	70%	<.0001
among amphetamines injectors[a,b]	88	60%	160	79%	248	71%	<.0001

Note: Results based on Chi-square test procedure. Missing values were not included in totals.
[a]amphetamines injectors include participants who reported any powder and/or liquid self-made amphetamine injection.
[b]Per cents are based on the number of participants who reported any amphetamines injection.

Table 6

Not Always Condom Use during Penetrative Sex and Amphetamine Injection In 5 Cities of Central Europe and Ukraine in the Past 30 Days

Sex Partners		Sex Risk		
		OR	95% CI	*p*
Primary partners[a]				
	Amphetamine injection	1.0	0.5, 2.1	1.0
	Age	1.0	0.9, 1.1	.9
	Gender	1.5	0.7, 3.1	.3
Casual partners[b]				
	Amphetamine injection	1.6	0.6, 4.6	.4
	Age	0.9	0.9, 1.0	.07
	Gender[c]	0.3	0.1, 0.9	.03

Note. Injected amphetamines comprise both powder and liquid forms that were reported by participants; OR = odds ratio; CI = confidence interval; sex risk = did not always use condoms when having penetrative sex; gender = male or female. Findings are results of multivariate logistic regression analysis. The validity of logistic regression analyses of data for "sex partner who gave money for sex" and for "sex partner who gave drugs for sex" was questionable; therefore, those findings are not reported here.

[a]n=227. [b]n=82. [c]For data analysis in this study, gender was dichotomized so that male=0 and female=1.

Table 7

Not Always Condom Use during Penetrative Sex, Amphetamine Injection, and History of STIs in 5 Cities of Central Europe and Ukraine in the Past 30 Days

Sex Partners	Sex Risk		
	OR	95% CI	*p*
Primary partners[a]			
Amphetamine injection	1.0	0.5, 2.0	.9
Age	1.0	1.0, 1.1	.9
Gender	1.6	0.7, 3.4	.2
History of STIs	0.9	0.4, 1.9	.8
Casual partners[b]			
Amphetamine injection	1.8	0.6, 5.5	.3
Age	0.9	0.9, 1.0	.1
Gender[c]	0.3	0.1, 0.8	.02
History of STIs	1.7	0.5, 6.5	.4

Note. Injected amphetamines comprise both powder and liquid forms that were reported by participants; OR = odds ratio; CI = confidence interval; sex risk = did not always use condoms when having penetrative sex; gender = male or female. Findings are results of multivariate logistic regression analysis. The validity of logistic regression analyses of data for "sex partner who gave money for sex" and for "sex partner who gave drugs for sex" was questionable; therefore, those findings are not reported here.

[a]n=220. [b]n=79. [c]For data analysis in this study, gender was dichotomized so that male=0 and female=1.

Table 8

Not Always Condom Use during Penetrative Sex, Amphetamine Injection, and HIV Serostatus in 5 Cities of Central Europe and Ukraine in the Past 30 Days

Sex Partners	Sex Risk		
	OR	95% CI	*p*
Primary partners[a]			
Amphetamine injection	1.0	0.4, 2.3	1.0
Age	1.0	0.9, 1.1	.9
Gender	1.7	0.7, 4.0	.3
HIV serostatus	0.2	0.1, 1.1	.07

Note. Injected amphetamines comprise both powder and liquid forms that were reported by participants; OR = odds ratio; CI = confidence interval; sex risk = did not always use condoms when having penetrative sex; gender = male or female. Findings are results of multivariate logistic regression analysis. The validity of logistic regression analyses of data for "casual partner," "sex partner who gave money for sex" and for "sex partner who gave drugs for sex" was questionable; therefore, those findings are not reported here.

[a]n=166.

Table 9

Not Always Condom Use during Penetrative Sex and Amphetamine Injection In 5 Cities of the Russian Federation in the Past 30 Days

Sex Partners		Sex Risk		
		OR	95% CI	*p*
Primary partners[a]				
	Amphetamine injection	1.6	1.0, 2.5	.04
	Age	1.032	1.002, 1.063	.04
	Gender	1.2	0.8, 1.4	.4
Casual partners[b]				
	Amphetamine injection	2.3	1.2, 4.4	.01
	Age	1.0	0.9, 1.0	.7
	Gender	0.7	0.4, 1.3	.2
Partners who gave money for sex[c]				
	Amphetamine injection	1.5	0.3, 7.0	.6
	Age	0.9	0.8, 1.1	.3
	Gender	0.5	0.04, 6.7	.6
Partners who gave drugs for sex[d]				
	Amphetamine injection	1.5	0.3, 9.2	.6
	Age	1.0	0.9, 1.1	1.0
	Gender	0.5	0.1, 3.2	.4

Note. Injected amphetamines comprise both powder and liquid forms that were reported by participants; OR = odds ratio; CI = confidence interval; sex risk = did not always use condoms when having penetrative sex; gender = male or female. Findings are results of multivariate logistic regression analysis.

[a] n=705. [b] n=226. [c] n=53. [d] n=27.

Table 10

Not Always Condom Use during Penetrative Sex, Amphetamine Injection, and History of STIs in 5 Cities of the Russian Federation in the Past 30 Days

Sex Partners	Sex Risk		
	OR	95% CI	*p*
Primary partners[a]			
Amphetamine injection	1.6	1.0, 2.5	.05
Age	1.0	1.0, 1.1	.07
Gender	1.1	0.8, 1.7	.5
History of STIs	1.4	0.9, 2.1	.1
Casual partners[b]			
Amphetamine injection	2.2	1.2, 4.3	.01
Age	1.0	0.9, 1.0	.6
Gender	0.6	0.3, 1.1	.1
History of STIs	1.8	1.0, 3.2	.07
Partners who gave money for sex[c]			
Amphetamine injection	1.0	0.2, 5.2	1.0
Age	0.9	0.8, 1.0	.2
Gender	0.5	0.0, 8.4	.6
History of STIs	11.1	1.3, 98.6	.03
Partners who gave drugs for sex[d]			
Amphetamine injection	1.4	0.2, 9.0	.7
Age	1.0	0.9, 1.1	.9
Gender	0.4	0.1, 3.2	.4
History of STIs	1.4	0.2, 8.4	.7

Note. Injected amphetamines comprise both powder and liquid forms that were reported by participants; OR = odds ratio; CI = confidence interval; sex risk = did not always use condoms when having penetrative sex; gender = male or female. Findings are results of multivariate logistic regression analysis.

[a]n=704. [b]n=226. [c]n=53. [d]n=27.

Table 11

Not Always Condom Use during Penetrative Sex, Amphetamine Injection, and HIV Serostatus in 5 Cities of the Russian Federation in the Past 30 Days

Sex Partners	Sex Risk		
	OR	95% CI	*p*
Primary partners[a]			
Amphetamine injection	1.6	0.9, 2.7	.08
Age	1.0	1.0, 1.1	.01
Gender	1.1	0.7, 1.8	.6
HIV serostatus	0.3	0.1, 0.5	<.0001
Casual partners[b]			
Amphetamine injection	2.3	1.1, 5.0	.02
Age	1.0	0.9, 1.0	.5
Gender	0.6	0.3, 1.2	.2
HIV serostatus	1.0	0.3, 3.0	1.0
Partners who gave drugs for sex[c]			
Amphetamine injection	2.3	0.2, 31.0	.5
Age	1.0	0.9, 1.2	.9
Gender	0.6	0.1, 7.0	.7
HIV serostatus	0.2	0.0, 6.0	.3

Note. Injected amphetamines comprise both powder and liquid forms that were reported by participants; OR = odds ratio; CI = confidence interval; sex risk = did not always use condoms when having penetrative sex; gender = male or female. Findings are results of multivariate logistic regression analysis. The validity of logistic regression analyses of data for "sex partner who gave money for sex" was questionable; therefore, those findings are not reported here.
[a]n=498. [b]n=153. [c]n=22.

Table 12

Number of Months of SEP Utilization by Amphetamine Injectors and Sexual Risk in the Past 30 Days in 10 Cities of Central and Eastern Europe

Sex Partners	Months of SEP Utilization		
	Months (M)	N	*p*
Primary partners			.7
Not always condom use	10.9	155	
Always condom use	11.9	43	
Casual partners			.2
Not always condom use	16.6	44	
Always condom use	10.9	33	
Partners who gave money for sex			.4
Not always condom use	4.3	3	
Always condom use	12.1	10	

Note. Injected amphetamines comprise both powder and liquid forms that were reported by participants; sex risk = did not always use condoms when having penetrative sex. Findings are the results of one-way analysis of variance with Scheffe's multiple-comparison procedure. Mean separation procedures were not carried out for "sex partners who gave drugs for sex" because the grouped variable had only one level: not always condom use.