Published in final edited form as:

Drug Alcohol Depend. 2014 May 1; 138: 103–108. doi:10.1016/j.drugalcdep.2014.02.012.

Gender differences between predictors of HIV status among PWID in Ukraine

K.F. Corsi¹, S. Dvoryak², C. Garver-Apgar¹, J.M. Davis¹, J.T. Brewster¹, O. Lisovska², and R.E. Booth¹

¹Department of Psychiatry, University of Colorado School of Medicine, Denver, CO

²Ukrainian Institute on Public Health Policy, Kiev, Ukraine

Abstract

Background—The HIV epidemic in Ukraine is among the largest in Europe. While traditionally the epidemic has spread through injection risk behavior, sexual transmission is becoming more common. Previous research has found that women in Ukraine have higher rates of HIV and engage in more HIV risk behavior than men. This study extended that work by identifying risk factors that *differentially* predict men and women's HIV status among people who inject drugs (PWID) in Ukraine.

Methods—From July 2010 through July 2013, 2480 sexually active PWID with unknown HIV status were recruited from three cities in Ukraine through street outreach. The average age was 31 years old.

Results—Women, who made up twenty-eight percent of the sample, had higher safe sex self-efficacy ($p<0.01$) and HIV knowledge ($p<0.001$) than men, but scored higher on both the risky injection ($p<0.001$) and risky sex ($p<0.001$) composite scores than men. Risky sex behaviors were associated with women's HIV status more than men's. We also report results identifying predictors of risky injection and sex behaviors.

Conclusions—Gender-specific interventions could address problem of HIV risk among women who inject drugs in a country with a growing HIV epidemic. Our findings suggest specific ways in

© 2014 Elsevier Ireland Ltd. All rights reserved.

Corresponding author: Karen F. Corsi, 1741 Vine St., Denver, CO 80206, Phone. 303-315-0951, Fax. 303-316-7697.

Address for Corsi, Garver-Apgar, Davis, Brewster and Booth: Project Safe, 1741 Vine St., Denver, CO 80206

Address for Lisovska and Dvoryak: Ukrainian Institute on Public Health Policy, Malopidvalna Street 4, App 6, Kyiv, Ukraine 01001

Contributors

Authors Booth, Dvoryak, Brewster and Corsi designed the study and wrote the protocol. Authors Booth, Brewster, Dvoryak and Lisovska implemented the study. Authors Corsi, Booth and Garver-Apgar managed the literature searches and summaries of previous related work. Authors Garver-Apgar, Davis and Corsi undertook the statistical analysis and author Corsi wrote the first draft of the manuscript. All authors contributed to and approved the final manuscript.

Author Disclosures

Conflict of Interest

All authors declare no conflict of interest.

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

which intervention efforts might focus on groups and individuals who are at the highest risk of contracting HIV (or who are already HIV positive) to halt the spread of HIV in Ukraine.

Keywords

Injection drug use; HIV; sex risk; Ukraine; PWID

1. INTRODUCTION

The HIV epidemic in Ukraine remains a growing problem and is among the largest in all of Europe. While much of the epidemic has proliferated through injection risk behavior, sexual transmission is becoming more widespread (UNAIDS 2010; Pylypchuk and Marston, 2008). The number of people who inject drugs (PWID) is estimated at 290,000 and HIV prevalence among PWID is estimated at 21.5% (Degenhardt et al., 2013). The intersecting epidemics of injection drug use and HIV have been growing in Ukraine since researchers identified the problem in the mid-90's (Kruglov et al., 2008; Booth et al., 2004). Due to concurrent pressing political, economic and social issues stemming from the break up of the former Soviet Union, the public health of PWID was not a priority (Cohen, 2010; Hurley, 2010). Since then, research has been concentrated in this region to help stem the tide of HIV transmission for PWID (Booth et al., 2010, 2009, 2006a, 2006b, 2004; Kruglov et al., 2008; Taran et al., 2011; Kyrychenko and Polonets, 2005; Booth, 2009). The HIV epidemic in Ukraine has been characterized by high rates of transmission among PWID, with other risk groups such as men who have sex with men (MSM) and female sex workers (FSWs) increasingly represented (Kruglov et al., 2008; UNAIDS 2010; Baral et al., 2012). It is also very common for people to not know their HIV status in this region, with one study showing that up to 87% of PWID did not know their HIV status prior to the research (Booth et al., 2006b). HIV continues to be a major problem among this vulnerable population, in a region still struggling with profound political change and as such, prevention is of utmost importance.

HIV gender disparities abound among PWID in many regions, including Ukraine (Des Jarlais et al., 2012, 2013). Women who inject drugs are at increased risk for HIV but also experience higher stigma and subsequent reduced participation in programs that may prevent HIV. Also, women drug users may participate in sex work to fund their drug habits and also be at increased risk for violence and abuse by male sex partners. Women also report less condom use and more injection risk behavior, and in many international studies, transmission of HIV among women is associated with sexual factors such as sex work, crack use and sex with a person who injects drugs (Des Jarlais et al., 2012). As is common elsewhere, and especially in low-middle income countries (LMICs), women who inject drugs in Ukraine are at increased risk for HIV infection due to macro and micro level factors (El-Bassel et al., 2012, Platt et al., 2005; Booth et al., 2007; Strathdee et al., 2013; Browne and Wechsberg, 2010; Meyer et al., 2011; Rhodes et al., 2005). Structural issues of gender inequality, stigma, indifference of officials to drug use problems, and violence against women (and PWID in general) from law enforcement abound in Ukraine (Booth et al., 2013, 2007; Burruano et al., 2007). Power differences between men and women, and violence against women can also play an important role in safe sex negotiation (Bandali, 2011; Meyer

et al., 2011; Wechsberg et al., 2013). Microlevel factors that contribute to HIV are intimate partner violence (IPV), poor economic conditions, involvement in the sex trade and relationship dynamics specific to the Ukrainian culture (Burruano et al., 2007; Platt et al. 2005; Booth et al., 2013). Due to these myriad, multilevel factors that contribute to the risk environment in this setting, many researchers are calling for comprehensive prevention approaches that take these multiple contexts into account (Auerbach, et al., 2011).

The risk environment profoundly influences HIV transmission, particularly in the case of Ukraine and Eastern Europe in general (Rhodes and Simic 2005; Strathdee et al., 2010). The environment takes into account the many factors that are outside of the individual's control, such as political, economic and social factors that create conditions for high risk behavior. Laws and policies set the stage for the risk environment and may promote health (for example, by funding harm reduction and health education programs) or harm (for example through laws that promote stigma and discourage health promotion activities (Baral et al., 2013; Strathdee et al., 2010; Poundstone et al., 2004). The strength or weakness of the economy of a region also plays an important role in determining the health of the community, due to factors such as employment and standard of living. At the community level, social norms may promote health behaviors or worsen them through stigma and other cultural or religious beliefs (Baral et al., 2013; Poundstone et al., 2004). Therefore, consideration of the totality of the risk environment is tantamount to understanding what drives the HIV epidemic in each diverse region.

In Ukraine, exogenous social, economic and political factors have provided a perfect risk environment for the HIV epidemic to grow. Economic constraints and difficulties since the breakup of the former Soviet Union have spawned illegal economies where drug markets flourish. Increased poverty and unemployment have led to the development of drug and sex markets (Rhodes and Simic, 2005; Thorne et al., 2010; Strathdee et al., 2010). Furthermore, a weakened public health infrastructure and reduced focus on health as a priority may have led to an increase in infectious diseases including HIV and sexually transmitted infections (STIs; Thorne et al., 2010). On a social level, instability, relocation and a lack of national pride may have led to community fragmentation which precipitated the growing drug trade. Also, in a civil society that has weak social ties, drug use is common and may precipitate risk taking behavior. Political instability may also lead to these feelings of weakened ability to avoid risk and increase vulnerability to engage in illegal activities such as drug use. In a depressed economy and unstable social and political environment, drug use may provide a welcome escape or pleasure (Rhodes and Simic 2005). The conceptual framework of risk environment in Ukraine is described by multilevel factors (economic, social and political) that variably influence the micro (cost of living, employment, social norms, brothels and places where drugs are used) and macro (trade routes, social stability and nationalism, informal economies, laws and drug policies, police practices, corruption) environments, leading to an exploding drug scene and resulting HIV epidemic (Strathdee et al., 2010; Rhodes and Simic 2005). For example, both structural factors stemming from the economic, social and political climate, as well as generalized stigma against, drug users, people with HIV and women in general, all play a role in the HIV epidemic. Also, individual level factors like injection risks and safe sex negotiation are important contributors to the

problem. The research here focuses on those individual risk factors, specifically injection and sex risk behavior.

Sex risk behaviors are increasingly important as the epidemic shifts in Ukraine (UNAIDS, 2010). Women injectors in this region report engaging in high risk sex behaviors including unprotected sex and sex with multiple partners, which are common among PWID and associated with HIV (Vasquez et al., 2013; Booth et al., 2007; Celentano et al., 2008; Strathdee et al., 2001). For women in general, sex risk is known to be an independent predictor of HIV serology (Strathdee and Sherman, 2003; Kral et al., 2001). In earlier studies from Ukraine, being female or having sex with a person who is HIV-positive were found to be predictors of HIV positivity (Booth et al., 2006b, 2007; Taran et al., 2011). Another troubling finding is that HIV infection is high among FSWs and condom use is particularly low (Busza et al., 2011; Kyrychenko and Polonets, 2004). Having sex with an injector is positively associated with increased injection risk behaviors, and both of these sets of risk factors are more common among women injectors in the region (Booth, 1995; Booth et al., 2007).

While much research has shown that women have higher rates of HIV and report more HIV risk behaviors in Ukraine than men, important questions remain about the nature of the association between HIV status and various risk factors for men and women. Possibly, the increased rates of HIV in women are solely a result of increased risk behaviors by women in this region. Another interesting possibility, however, is that certain risk factors are particularly problematic for women. That is, certain risk factors may *disproportionately* impact women's likelihood of becoming HIV-positive. The objective of the current study is to extend earlier work in Ukraine by examining whether certain risk behaviors may *differentially* associate with men and women's HIV status. A secondary objective is to explore such factors as outcomes with the goal of identifying other variables that may predict these unique, gender-dependent risk behaviors.

2. METHODS

Between July, 2010 and June, 2013, 2,480 sexually active drug injectors were recruited and interviewed in three Ukrainian cities (Odessa, Nikolayev and Donetsk). Participants were tested for HIV but only those who were unaware of their HIV status were included in the current analysis. The interview was administered using an audio computer administered self-interview (ACASI) and included an adapted version of the Risk Behavior Assessment (RBA), the HIV Knowledge Questionnaire and a Self-Efficacy measure. Ukrainian NGO staff was trained in the research protocol and conducted the interviews. Drug users were recruited through street outreach by NGO outreach workers, all of whom were former injectors, over a 35-month period. The outreach conducted in this study adapts the central features of the community outreach model (Hughes, 1977; Weibel, 1988) to engage PWID in interventions. Areas were targeted for recruitment based on NGO staff knowledge about where PWID congregate. Recruitment was spread throughout the city to obtain as generalizable a sample as possible. Eligibility criteria included: 18 years or older; self-reported drug injection in past 30 days; and ability to provide informed consent. Recent drug injection was verified through visual inspection for venipuncture. Additionally, participants

agreed to be interviewed for approximately 1 hour and to be tested for HIV (receipt of test results was encouraged but not required). Interviewers made the final determination of eligibility. Because this study was conducted to examine the role of drug-injecting networks, participants were recruited in network waves. That is, “indexes” were required to bring two members of their injecting network, who also met eligibility criteria, for study participation. Injecting networks were not of interest for the current set of analyses. However, we statistically controlled for correlated errors (due to non-independent observations) in our analyses. After eligibility was confirmed, participants were interviewed. Following the interview, participants were provided free HIV testing using the HIV I + II One-Step Test finger-stick rapid HIV test produced by Zer Hitech and approved for use in Ukraine by the Ministry of Health. Participants were compensated the equivalent of US\$5.00 for their time. The research protocol and all instruments were approved by Institutional Review Boards in Colorado and Ukraine.

2.1 Measures

The primary measure that was used was the Risk Behavior Questionnaire (RBQ; 1993) which was modified from the original Risk Behavior Questionnaire (RBA) developed by a NIDA grantee consortium during the Cooperative Agreement in the 1990s as a measure to assess risk and behavior change at follow-up. Reliability and validity assessments of the RBA support its use with this population (Dowling-Guyer et al., 1994; Weatherby et al., 1994). The RBA measures demographics, substance use, HIV drug and sex risk behaviors, prior HIV testing, medical history, work, and income and has been used in our research since 1990 (Booth et al., 2011, Corsi et al., 2009). The RBQ was modified for this study based on a series of focus groups conducted in Ukraine in 2001 (Booth et al., 2003), as well as feedback from Ukrainian NGO staff. We added questions to address injection practices of Ukrainian PWID, such as injecting with drugs from a common container. It was then translated into Russian by an IRB-certified translator. Following initial adaptation, it was reviewed by NGO outreach workers who were former PWID and modified further. Translation accuracy was verified through back-translation by Ukrainians fluent in Russian and English and adjustments were made. The HIV Knowledge Questionnaire is a 62-item self-administered survey (Carey et al. 1997). Reliability analyses show its high internal consistency ($\alpha=.91$) and stability over 1 week ($r=.83$), 2-week ($r=.91$) and 12-week ($r=.90$) intervals. We shortened this measure to contain only 12 items, including items that were most commonly found incorrect in previous research. This abbreviated version was tested in Ukraine in a pilot study and found to be satisfactory. Self-Efficacy for engaging in safe drug and sex behaviors was measured using a modified version of the Cooperative Agreement’s RBA Behaviors and Beliefs Trailer.

2.2 Statistical Analysis

To examine predictors of HIV status, we created two composite measures of risky behavior, each assessing a different category of risk behavior. The first composite variable (i.e., risky injection composite) assessed the number of risky needle behaviors participants reported engaging in over the preceding 30 days. These included “always injecting with other drug users,” “front or back-loading with a dealer or another user,” “using a previously used syringe,” “sharing works,” (i.e., drug preparation materials or paraphernalia), and “using a

common drug preparation.” The second composite variable (i.e. risky sex composite) assessed the number of risky sex behaviors participants reported engaging in over the preceding 30 days. These included, “having sex at least once,” “having sex with multiple partners” (i.e., 2 or more), “having at least one episode of unprotected vaginal or anal sex,” “having sex with a partner who injects drugs,” and “having sex with an HIV+ partner or partner whose HIV status is unknown.” We first compared men and women on these, as well as other predictors relating to demographics, drug use, self-efficacy with regard to safe drug use and safe sex practices, and HIV knowledge. For all univariate tests, we report results of *t* tests for continuous variables (mean age, total times injected in the previous 30 days, mean safe drug-use self efficacy score, mean safe sex self-efficacy score, and the number of correct responses on an HIV knowledge test), and X^2 tests for all categorical variables (Table 1).

We then conducted a regression analysis to identify independent predictors of HIV status and to examine possible gender differences in the degree to which various risk behaviors predict HIV status. To account for the lack of independent observations within network (see Methods section), we used generalized estimating equations in a logistic regression framework with a conservative correlation structure that assumed equal correlation among individuals within a network. In addition to our two central predictors of interest (i.e., risky injection and sex composite variables), we entered the following predictors into the regression model because each one has been shown in this or prior studies with PWID in Ukraine to associate with HIV status in univariate analyses: age, sex, years injecting, times injected in the preceding 30 days, injected stimulants or not, injected opiates or not, injected sedatives or not, married (or living as married) or not, number of risky sexual partners (i.e., partners who inject drugs, are HIV positive or unknown HIV status, and who are themselves having sex with other people), ever been arrested, self efficacy with regard to safe drug use and sexual practices, and HIV knowledge. As well, dummy codes for city were included in the model to control for differences between study sites in rates of HIV status and in risky drug and sexual behavior. Finally, we included all 2-way interactions with each predictor and participant gender. We used a backwards elimination procedure to arrive at a parsimonious model containing significant ($p < 0.05$) terms. Due to multiple terms in the model, we report only additional terms that were significant after applying a conservative, multi-stage testing procedure to adjust alpha (Rice, 1990). Although study site is included in all models as a control variable, we do not report effects of study site, as these were beyond the scope of this gender-focused report. For each resulting term, we report adjusted odds ratios, 95% confidence intervals, and *p*-values. The final model predicting HIV status is in Table 2.

We examined our two composite predictors – risky injection and sex behavior – as outcomes in a secondary, linear mixed-effects model with a similar error correction for correlated observations. Similar control variables were entered into each model, as above, and similar methods of generating each final model were employed (Tables 3 and 4).

3. RESULTS

The study population included 2480 subjects of which 28% were women. The average age was 31 years old. Table 1 shows results of univariate associations. Women were more likely to engage in high risk behaviors than men. Specifically, women were more likely to: use a common container for drug preparation and extraction, front or backload and share drug paraphernalia with other injectors. Despite this, women had significantly greater HIV knowledge than men. On sex risk behaviors, men were more likely to report having sex with multiple partners in the 30 days prior to the interview. However, women were more likely to report unprotected sex and sex with a partner who injected drugs – a finding reported by almost the entire sample of women. Women also reported higher safe-sex self-efficacy than men, yet they were significantly more likely to test HIV positive (Table 1).

Our primary objective was to identify predictors of HIV status that could differentially influence the likelihood that men and women were HIV-positive. The logistic regression model of HIV status did, in fact, reveal a number of interaction terms between participant gender and predictors of HIV, as well as other predictors shown to associate with HIV status regardless of gender (Table 2). In particular, our model provided evidence that the number of risky sex behaviors a participant reported engaging in during the preceding 30 days (as measured by our risky sex behavior composite variable) associates with women's HIV status differently than men's. The model offered some additional evidence that the number of risky injection behaviors reported by participants may similarly associate with men's and women's HIV status differently. To further explore these interactions, we examined our model stratified within gender. Tests of simple effects revealed that, in women, both risky behavior composite variables were significantly related to a positive HIV test (risky injection behavior composite: OR = 1.55, $p < .001$; risky sex behavior composite: OR = 1.80; $p < .001$). By contrast, both behavioral composites were less predictive of men's HIV status (risky injection composite: OR = 1.25; $p < .001$; risky sex behavior composite: OR = 1.0, *ns*). A final interaction effect indicated that the number of risky sex partners negatively predicted women's likelihood of being HIV positive (OR = .41; $p < .01$), whereas it positively predicted men's HIV positive status (OR = 1.30; $p < .05$).

We ran two additional models with our behavioral composite predictors as outcome variables to identify potential characteristics that might associate with these unique, gender-dependent predictors of HIV status. In the model predicting risky injection behaviors (Table 3), we found positive associations with having been arrested, injecting stimulants, and injecting sedatives. Those who scored higher on a measure designed to test self-efficacy with regard to safe injection practices scored lower on the risky injection behavior composite variable. We also observed two interactions with gender. Stratifying by gender, tests of simple effects revealed the following: for men, having been a drug injector for more years did not significantly predict other risky injection behaviors ($p=0.13$), whereas for women, there was a positive association between years injecting and other risky injection behaviors (beta = 0.02, $p < .001$). Similarly, we saw no evidence that men's risky sex behavior predicted their risky injection behaviors ($p=0.17$), whereas women's risky sex behavior significantly predicted their risky injection behavior (beta = 0.15, $p < .01$). In the model predicting risky sex behaviors (Table 4), we found positive associations with being

female, having been arrested, having injected for more years, injecting stimulants, and the number of risky sexual partners. Those who scored higher on the HIV knowledge test scored lower on the risky sex behavior composite variable.

4. DISCUSSION

Findings from this study are of note for HIV prevention among women injectors in the region and beyond. All participants in the study were unaware of their HIV status, thus providing a sample that had not changed their risk behaviors based on that knowledge. Overall, women in this sample were more likely to be HIV-positive, which is in accordance with prior research in the region (Booth et al., 2007; Taran et al. 2011). Women scored significantly higher on safe sex self-efficacy and HIV knowledge scales than men, despite also reporting more high risk behavior (e.g., sharing works, using a common container, front or back loading, sex without a condom, sex with a PWID, and higher scores on sex and injection composite measures). This knowledge/practice gap has been reported in other research with PWID (Corsi et al., 2007). Some reasons for this gap could be related to cultural gender norms; for example women may feel less empowered to engage in safe sex negotiation due to gender inequality and sexism, despite their belief that they are able to do so. Marsh (1996) explains that women in post- Soviet societies such as Ukraine are subject to blatant sexism in a culture that is “still being governed by conservative men whose politics on women, like those of their predecessors, are largely determined by economic and demographic factors and who, while rejecting some aspects of the communist past, are now able to articulate with impunity more extreme patriarchal views...since they no longer have any reason even to pay lip-service to the idealistic Marxist notion of women’s equality” (p. 4). Others have described the “aggressive remasculinization” of the former Soviet republics and the resultant environment of sexism and patriarchy that reduce women’s power (Yakushko, 2005). Men reported greater injection of opiates and sedatives, as well as more frequent and longer time injecting than women, but appear to engage in fewer risk behaviors. Other research has shown a similar pattern of higher risk behavior among women injectors in this region and elsewhere (Platt et al., 2005; Booth et al., 2007).

Our central objective was to identify risk factors that may differentially impact men and women with regard to HIV status. We found that both injection and sex risk behaviors (as identified by the composite risk score on each) were *more* predictive of HIV positivity in women than in men. This suggests that even if men and women engaged in a similar degree of risk behavior, women would still experience higher HIV-positive rates than men. This troubling gender disparity may be a result of the syndemic of substance use, HIV and gender inequality that occurs in this region due to structural and cultural factors (Yakushko, 2005; Burruano et al., 2007). In light of the consistent finding that women tend to engage in more risk behavior than men, our finding that risky behavior particularly impacts women’s HIV status demonstrates an additional reason why women drug injectors are a particularly vulnerable population and why developing successful interventions to reduce risk in women is especially critical to halting the spread of HIV in Ukraine.

Our secondary objective was to identify predictors that are associated with risk behaviors found to be especially predictive of HIV-positive status in women. Such knowledge may

help to focus intervention efforts on individuals or groups of individuals at the highest risk of contracting HIV. For example, having ever been arrested was positively associated with risky injection and risky sex behaviors in both men and women, but because these risk behaviors are particularly indicative of women's HIV status, women who have ever been arrested may benefit from a focused, intervention effort. Similarly, we found associations between stimulant use and both categories of risky behavior. Thus, women stimulant users may particularly benefit from focused intervention efforts.

For men, neither length of time injecting nor risky sex behavior predicted other risky injection behaviors. For women, however, length of time injecting drugs and risky sex behaviors were both significantly associated with risky injection practices. As there may be an element of temporality to injection risk behavior for women, that is, the longer they inject, the higher the risk, it may be especially useful to intervene with younger women injectors or new initiates to halt the continuum of risk behavior and spread of HIV. Risky sexual behaviors and injection practices were more positively associated in women than in men, suggesting that interventions designed to address only one or the other of these broad categories of risky behavior will be less effective for women than for men. Also, because sex risk behaviors may predict injection risk for women, interventions focusing on sex risk behavior are needed (Strathdee et al., 2013).

Finally, we found that the number of risky sex partners a person reports having in the preceding 30 days was positively associated with men's HIV-positive status, but negatively associated with women's HIV-positive status. This is in contrast to the other findings suggesting increased effects of risk behaviors on women's HIV-positive status. Possibly, HIV-positive women change their sexual behavior in certain ways that lead to fewer risky partners, despite not knowing their HIV status. Research designed to explore how behavior changes after learning of HIV status could further investigate this possibility.

4.1. Limitations

There are limitations to the study. Participants were recruited by outreach workers who were former drug injectors, and areas were targeted for recruitment based on their knowledge about where PWID congregated. The sampling plan was designed to access PWID from areas throughout the three cities so that the results would be representative of street-based PWID. Although this approach is preferable to convenience sampling, it is unknown how representative the cohort was. Therefore, it is also impossible to know the number of PWID who refused to participate, although outreach workers reported few refusals. Because of the recruitment approach, the sample likely over-represents PWID willing to spend the time to participate in research and motivated by the modest stipend. Thus, this study may not generalize to all PWID, but to a relatively representative street-recruited sample that is likely more impoverished and in worse health than other PWID in Ukraine. Also, our questionnaires did not distinguish between different types of sex partners, and so it is not possible to draw conclusions about, for example, FSWs who are known to be at higher risk for HIV than men (Baral et al., 2012). Finally, other than HIV test results, the data were based on self-reports, which could be biased due to recall errors and social desirability. Recall error should have been diminished by the brief time period respondents were asked to

remember. As PWID in Ukraine are less familiar with research than PWID in the U.S., it is unclear what influence social desirability had. While social desirability cannot be ruled out, it is unlikely that the main findings were influenced by this. Also, prior studies have shown that self-report from PWID is valid for this research (Booth et al., 1996; Maisto et al., 1960).

4.2. Conclusion

Injection drug use continues to rise unabatedly in Eastern Europe, with the most significant epidemics occurring in the former Soviet republics of Ukraine and Russia. With that rise comes a concurrent health crisis of HIV transmission for PWID, female sex workers (FSW), men who have sex with men (MSM) and sex partners of these high risk groups (Baral et al., 2012). While gains have been made, there still exists a dearth of substance use and HIV treatment options for PWID in Ukraine (Degenhardt et al., 2013). From this study and others (e.g., Booth et al., 2007) it is clear that PWID engage in high rates of risk behaviors – particularly women. However, in the era of HIV research and increased openness about sex, researchers have found ways to approach changing high risk sex practices through women-focused interventions (Wechsberg et al., 2004). This type of intervention, that is also culturally-specific to the region, is needed in Ukraine. Cultural variations, such as injecting with preloaded syringes and gender roles, should be taken into account. The findings presented here underline the importance of addressing this topic and point to innovative programs that could be assessed in future research. For example, programs specifically geared toward women who inject drugs should consider the special circumstances of women who are partnered with other PWID. Their personal and sexual relationships may especially hinder their attempts to change injection and sex risk behaviors. Additionally, social and structural elements (including gender inequality, poor economy and stigma) contribute to high risk environments for drug users in Ukraine and need to be addressed in combined prevention programming.

Acknowledgments

The authors would like to acknowledge the dedicated NGO staff from Odessa, Nikolaev and Donetsk where the study was conducted, and Oksana Lisovska, Project Coordinator. We are also indebted to the subjects who gave their time to participate.

Role of Funding Source

Funding for this study was provided by the National Institute on Drug Abuse, DA-026739. The National Institute on Drug Abuse had no further role in study design; in the collection, analysis and interpretation of data; in the writing of the report; or in the decision to submit the paper for publication.

References

- Auerbach JD, Parkhurst JO, Caceres CF. Addressing social drivers of HIV/AIDS for the long-term response: conceptual and methodological considerations. *Global Public Health*. 2011; 6:S293–S309. [PubMed: 21745027]
- Bandali S. Norms and practices within marriage which shape gender roles, HIV/AIDS risk and risk reduction strategies in Cabo Delgado, Mozambique. *AIDS Care*. 2011; 23:1171–1176. [PubMed: 21476146]
- Baral S, Logie CH, Grosso A, Wirtz AL, Beyrer C. Modified social ecological model: a tool to guide the assessment of the risks and risk contexts of HIV epidemics. *BMC Public Health*. 2013; 13:482–489. [PubMed: 23679953]

- Baral S, Breyer C, Muessig K, Poteat T, Wirtz AL, Decker MR, Sherman SG, Kerrigan D. Burden of HIV among female sex workers in low-income and middle Income countries: a systematic review and meta-analysis. *Lancet Infect Dis*. 2012; 12:538–549. [PubMed: 22424777]
- Booth RE, Dvoryak S, Sung-Joon M, Brewster JT, Wendt WW, Corsi KF, Strathdee SA. Law enforcement practices associated with HIV infection among injection drug users in Odessa, Ukraine. *AIDS Behav*. 2013; 17:2604–2614. [PubMed: 23754613]
- Booth RE, Mikulich-Gilbertson SK, Brewster JT, Salomonson-Sautel S, Semerik O. Predictors of self-reported HIV infection among drug injectors in Ukraine. *J AIDS*. 2004; 35:82–88.
- Booth RE, Lehman WE, Latkin CS, Dvoryak S, Brewster JT, Royer MS, Sinitsyna L. Individual and network interventions with injection drug users in five Ukraine cities. *Am J Public Health*. 2010; 101:336–343. [PubMed: 20395584]
- Booth RE, Lehman WE, Dvoryak S, Brewster JT, Sinitsyna L. Interventions with injection drug users in Ukraine. *Addiction*. 2009; 104:1864–1873. [PubMed: 19681800]
- Booth RE. Gender differences in high-risk sex behaviors among heterosexual drug injectors and crack smokers. *Am J Drug Alcohol Abuse*. 1995; 21:419–432. [PubMed: 8561095]
- Booth RE. Use of a peer leader intervention model to reduce needle-related risk behaviors among drug injectors in Ukraine. *J Drug Issues*. 2009; 39:1–18. [PubMed: 20057920]
- Booth RE, Lehman WE, Brewster JT, Sinitsyna L, Dvoryak S. Gender differences in sex risk behaviors among Ukraine injection drug users. *J AIDS*. 2007; 46:112–117.
- Booth RE, Kwiatkowski CF, Mikulich-Gilbertson SK, Brewster JT, Salomonsen-Sautel S, Corsi KF, Sinitsyna L, Dvoryak S. Predictors of risky needle use following interventions with drug injectors in Ukraine. *Drug Alcohol Depend*. 2006a; 82:S49–S57. [PubMed: 16769446]
- Booth RE, Kwiatkowski CF, Brewster JT, Sinitsyna L, Dvoryak S. Predictors of HIV sero-status among drug injectors at three Ukraine cities. *AIDS*. 2006b; 20:1–7. [PubMed: 16327312]
- Booth RE, Kennedy JK, Brewster JT, Semerik O. Drug injectors and dealers in Odessa, Ukraine. *J Psychoactive Drugs*. 2003; 35:419–426. [PubMed: 14986870]
- Booth RE, Crowley TJ, Zhang Y. Substance abuse treatment entry, retention, and effectiveness: out-of-treatment opiate injection drug users. *Drug Alcohol Depend*. 1996; 42:11–20. [PubMed: 8889399]
- Browne FA, Wechsberg WM. The intersecting risks of substance use and HIV risk among substance-using South African males and females. *Curr Opin Psychiatry*. 2010; 23:205–209. [PubMed: 20308902]
- Burruano L, Kruglov J, Marcynovskaya V. Gender differences- HIV infection with particular reference to the situation among Ukrainian women. *Acta Dermatovenerol Croat*. 2007; 15:76–79. [PubMed: 17631785]
- Busza JR, Balakireva OM, Teltschik A, Bondar TV, Sereda YV, Meynell C, Sakovych O. Street-based adolescents at high risk of HIV in Ukraine. *J Epidemiol Community Health*. 2011; 65:1166–1170.10.1136/jech.2009.097469 [PubMed: 20864455]
- Carey MP, Morrison-Beedy D, Johnson BT. The HIV-Knowledge Questionnaire: development and evaluation of a reliable, valid, and practical self-administered questionnaire. *AIDS Behav*. 1997; 1:61–74.
- Celentano DD, Latimore AD, Mehta SH. Variations in sexual risks in drug users: emerging themes in a behavioral context. *Curr HIV/AIDS Rep*. 2008; 5:212–218. [PubMed: 18838061]
- Cohen J. Late for the epidemic: HIV/AIDS in Eastern Europe. *Science*. 2010; 329:160–164. [PubMed: 20616262]
- Community Research Branch, National Institute on Drug Abuse. Risk Behavior Assessment. 3. NIDA; Rockville, MD: 1993.
- Corsi KF, Lehman WE, Booth RE. The effect of methadone on positive outcomes for injection drug users. *J Subst Abuse Treat*. 2009; 37:120–126. [PubMed: 19150202]
- Corsi KF, Lehman WE, Min S, Lance SP, Speer N, Booth RE, Shoptaw S. The feasibility of interventions to reduce HIV risk and drug use among heterosexual methamphetamine users. *J AIDS Clin Res Suppl*. 2012; 1:1–10.10.4172/2155-6113.S1-010
- Corsi KF, Winch PJ, Kwiatkowski CF, Booth RE. Childhood factors that precede drug injection: is there a link? *J Child Fam Studies*. 2007; 16:808–818.

- Degenhardt, L.; Mathers, BM.; Wirtz, AL.; Wolfe, D.; Kamarulzaman, A.; Carrieri, MP.; Strathdee, SA.; Malinowska-Sempruch, K.; Kazatchkine, M.; Breyer, C. What has been achieved in HIV prevention, treatment and care for people who inject drugs, 2010-2012? A review of the six highest burden countries. *Int J Drug Policy*. 2013. <http://dx.doi.org/10.1016/j.drug.po.2013.08.004>
- Des Jarlais DC, Boltaev A, Feelemyer J, Bramson H, Aratesh K, Phillips BW, Hagan H. Gender disparities in HIV infection among persons who inject drugs in Central Asia: a systematic review and meta-analysis. *Drug Alcohol Depend*. 2013; 132:S7–S12. [PubMed: 23891035]
- Des Jarlais DC, Feelemyer J, Modi SN, Aratesh K, Hagan H. Are females who inject drugs at higher risk for HIV infection than males who inject drugs: an international systematic review of high seroprevalence rates. *Drug Alcohol Depend*. 2012; 124:95–107. [PubMed: 22257753]
- Dowling-Guyer S, Johnson ME, Fisher DG, et al. Reliability of drug users' self-reported HIV risk behaviors and validity of self-reported recent drug use. *Assessment*. 1994; 1:383–392.
- El-Bassel N, Wechsberg WM, Shaw SA. Dual HIV risk and vulnerabilities among women who use or inject drugs: no single prevention strategy is the answer. *Curr Opin HIV AIDS*. 2012; 7:326–331. [PubMed: 22498480]
- Hughes, PH. *Behind the Wall of Respect*. University of Chicago Press; Chicago: 1977.
- Hurley R. The worst HIV epidemic in Europe. *BMJ*. 2010; 341:124–126.
- Kral AH, Bluthenthal RN, Lorvick J, Gee L, Bacchetti P, Edlin BR. Sexual transmission of HIV-1 among injection drug users in San Francisco, USA: risk-factor analysis. *Lancet*. 2001; 357:1397–1401. [PubMed: 11356437]
- Kruglov YV, Kobysheva YV, Salyuk T, Varetska O, Shakarishvili A, Saldanha VP. The most severe HIV epidemic in Europe: Ukraine's national prevalence estimates for 2007. *Sex Transm Infect*. 2008; 84(Suppl 1):i37–i41. [PubMed: 18647864]
- Kyrychenko P, Polonets V. High HIV risk profile among female commercial sex workers in Vinnitsa, Ukraine. *Sex Transm Infect*. 2005; 81:187–188. [PubMed: 15800111]
- Maisto S, McKay J, Conners G. Self-reported issues in substance abuse: state of the art and future directions. *Behav Assess*. 1960; 121:117–134.
- Marsh, R. Introduction: Women's studies and women's issues in Russia, Ukraine and post-Soviet states. In: Marsh, R., editor. *Women in Russia and Ukraine* New York. Cambridge University Press; New York: 1996. p. 1-30.
- Meyer JP, Springer SA, Altice FL. Substance abuse, violence, and HIV in women: a literature review of the syndemic. *J Women's Health*. 2011; 20:991–1006.
- Needle R, Fisher DG, Weatherby N, Chitwood D, Brown B, Cesari H, Booth R, Williams ML, Watters J, Andersen M, Braunstein M. Reliability of self-reported HIV risk behaviors of drug users. *Psychol Addict Behav*. 1995; 9:242–250. [10.1037/0893-164X.9.4.242](https://doi.org/10.1037/0893-164X.9.4.242)
- Platt L, Rhodes T, Lowndes CM, Madden P, Sarang A, Mikhailova L, Renton A, Pevzner Y, Sullivan K, Khutorsky M. Impact of gender and sex work on sexual and injecting risk behaviors and their association with HIV positivity among injecting drug users in an HIV epidemic in Togliatti City, Russian Federation. *Sex Trans Dis*. 2005; 32:605–612.
- Poundstone KE, Strathdee SA, Celentano DD. The social epidemiology of human immunodeficiency virus/acquired immunodeficiency syndrome. *Epidemiol Rev*. 2004; 26:22–35. [PubMed: 15234945]
- Pylypchuk R, Marston C. Factors associated with sexual risk behavior among young people in Ukraine. *Cent Eur J Public Health*. 2008; 16:165–174. [PubMed: 19256284]
- Rice WR. A consensus combined p-value test and the family-wide significance of component tests. *Biometrics*. 1990; 46:303–308.
- Rhodes T, Simic M. Transition and the HIV risk environment. *BMJ*. 2005; 331:220–223. [PubMed: 16037463]
- Rhodes T, Singer M, Bourgois P, Friedman SR, Strathdee SA. The social structural production of HIV risk among injecting drug users. *Soc Sci Med*. 2005; 61:1026–1044. [PubMed: 15955404]
- Strathdee SA, Galai N, Safaiean M, Celentano DD, Vlahov D, Johnson L, Nelson KE. Sex differences in risk factors for HIV seroconversion among injection drug users. *Arch Intern Med*. 2001; 161:1281–1288. [PubMed: 11371255]

- Strathdee S, Sherman S. The role of sexual transmission of HIV infection among injection and non-injection drug users. *J Urban Health*. 2003; 80:7–14.
- Strathdee SA, Hallett TB, Bobrova N, Rhodes T, Booth RE, Abdool R, Hankins CA. HIV and risk environment for injecting drug users: the past, present and future. *Lancet*. 2010; 376:268–284. [PubMed: 20650523]
- Strathdee SA, Wechsberg WM, Kerrigan DL, Patterson TL. HIV prevention among women in low- and middle-income countries: intervening upon context of heightened HIV risk. *Annu Rev Public Health*. 2013; 34:301–316. [PubMed: 23297666]
- Taran YS, Johnston LG, Pohorila NB, Saliuk TO. Correlates of HIV risk among injection drug users in sixteen Ukrainian cities. *AIDS Behav*. 2011; 15:65–74. [PubMed: 20878228]
- Thorne C, Ferencic N, Malyuta R, Mimica J, Niemiec T. Central Asia: hotspot in the worldwide HIV epidemic. *Lancet Infect Dis*. 2010; 10:479–488. [PubMed: 20610330]
- UNAIDS. *AIDS Epidemic Update: November 2009*. UNAIDS; New York: 2010.
- Vasquez C, Nikolaenko S, Yatsishin S, Lesnikova D, Cox D, Pankowich J, Rosenes R, Wobeser W, Cooper C. St. Petersburg-CIHR Canadian HIV Trials Network Collaboration. Gender disparities in HIV risk behavior and access to health care in St. Petersburg, Russia. *AIDS Patient Care STDS*. 2013; 27:304–310. [PubMed: 23651108]
- Weatherby NL, Needle R, Cesar H, et al. Validity of self-reported drug use among injection drug users and crack smokers recruited through street outreach. *Eval Program Plan*. 1994; 17:347–355.
- Wechsberg WM, Myers B, Reed E, Carney T, Emanuel AN, Browne FA. Substance use, gender inequity, violence and sexual risk among couples in Cape Town. *Cult Health Sexuality*. 2013; 15:1221–1236.
- Wechsberg WM, Zule WA, Bobashev G. Efficacy of a woman-focused intervention to reduce HIV risk and increase self-sufficiency among African American crack abusers. *Am J Public Health*. 2004; 94:1165–1173. [PubMed: 15226138]
- Wiebel, WW. Combining ethnographic and epidemiological methods in targeted AIDS interventions: The Chicago Model. In: Battjes, RJ.; Pickens, RW., editors. *Needle Sharing Among Intravenous Drug Users: National and International Perspectives*. Vol. 80. U.S. Government Printing Office, National Institute on Drug Abuse Monograph; Washington, D.C.: 1988. p. 137-150.
- Yakushko O. Ambivalent sexism and relationship patterns among women and men in Ukraine. *Sex Roles*. 2005; 53:589–596.

Table 1

Demographics

	Total	Men	Women	<i>p</i>
Demographics				
Age (mean)	31	31	31	
Married or living as married	38%	33%	51%	***
Ever arrested	63%	69%	47%	***
Drug use				
Years Injecting (mean)	11.2	11.8	9.6	***
Times Injected (mean)	31	32	29	*
Injected Stimulants	47%	44%	55%	***
Injected Opiates	81%	84%	72%	***
Injected Sedatives	25%	27%	18%	***
Health				
Positive HIV Serology	29%	26%	34%	**
Attitudes/Knowledge				
Safe drug use self-efficacy (mean)	2.64	2.64	2.64	
Safe sex self-efficacy (mean)	3.21	3.20	3.23	*
HIV knowledge (mean # correct /12)	8.6	8.5	9.1	***
Needle Risk Behaviors				
	Total	Men	Women	<i>p</i>
Always inject with others	46%	45%	49%	+
Used common container	39%	36%	46%	***
Front or back loaded works	77%	75%	84%	***
Shared cooker, cotton, or water	33%	29%	44%	***
Used a previously used syringe	16%	16%	18%	
Thought to be a safe injector (all or most of the time)	66%	65%	69%	
Needle/Drug Use Risk Composite (mean)	2.1	2.0	2.4	***
Sex Risk Behaviors				
	Total	Men	Women	<i>p</i>
Had sex with multiple partners (2 or more)	23%	26%	16%	***
Had vaginal or anal sex without a condom	53%	52%	57%	*
Had sex with an IDU partner	57%	43%	92%	***
Had sex with an HIV+ partner	23%	23%	24%	
Sex Behavior Risk Composite (mean)	2.6	2.4	2.9	***

p < .001;

**
p < .01;

*
p < .05;

+
p < .1

Table 2

Final logistic regression model of selected variables and interaction effects associated with HIV+ status (among sexually active individuals who are unaware of their HIV status; N = 2475)

Predictor	Adjusted OR	95% CI	p-value
Sex = women	1.50	.12 – 19.3	.75
Older age	1.05	1.02 – 1.07	<.01
Years injecting	1.02	.99 – 1.04	.13
Injected stimulants	0.70	.55 - .88	<.01
HIV knowledge score	1.09	1.03 – 1.14	<.01
Risky injection composite	1.23	1.10 – 1.37	<.001
Number of risky sex partners	1.24	.96 – 1.59	.10
Risky sexual behavior composite	1.00	.85 – 1.17	.96
Sex = women * number of risky sex partners	0.33	.18 - .63	<.001
Sex = women * risky injection composite	1.20	.98 – 1.47	.08
Sex = women * risky sexual behavior composite	1.85	1.34 – 2.55	<.001

Table 3

Final linear regression model of selected variables and interaction effects associated with risky injection composite (N = 2475)

Predictor	Adjusted beta	95% CI	p-value
Intercept	2.84	2.39 – 3.29	
Sex = women	-0.29	-0.66 – 0.08	.14
Ever arrested	0.18	0.08 – 0.27	<.001
Years injecting	-0.006	-0.012 – 0.00	.07
Injected stimulants	0.22	0.12 – 0.32	<.001
Injected sedatives	0.29	0.18 – 0.39	<.001
Safe drug use self efficacy	-0.54	-0.69 - -0.38	<.001
Risky sexual behavior composite	0.03	-0.02 – 0.09	.22
Sex = women * years injecting	0.03	0.02 – 0.04	<.001
Sex = women * risky sexual behavior composite	0.14	0.02 – 0.26	0.02

Table 4

Final linear regression model of selected variables associated with risky sexual behavior composite (N = 2475)

Predictor	Adjusted beta	95% CI	p-value
Intercept	1.90	1.72 – 2.08	
Sex = women	0.37	0.23 – 0.50	<.001
Ever arrested	0.11	0.03 – 0.18	<.01
Years injecting	0.02	0.01 – 0.02	<.001
Injected stimulants	0.09	0.02 – 0.16	0.01
HIV knowledge	-0.03	-0.04 – -0.01	.001
Number of risky sexual partners	0.96	0.90 – 1.03	<.001