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Latent Class Analysis of HIV Risk Behaviors among Russian Women At-risk for Alcohol-exposed Pregnancies

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Abstract

The number of HIV cases attributed to heterosexual contact and the proportion of women among HIV positive individuals has increased worldwide. Russia is a country with the highest rates of newly diagnosed HIV infections in the region, and the infection spreads beyond traditional risk groups. While young women are affected disproportionately, knowledge of HIV risk behaviors in women in the general population remains limited. The objectives of this study were to identify patterns of behaviors that place women of childbearing age at high risk for HIV transmission and determine whether socio-demographic characteristics and alcohol use are predictive of the risk pattern. A total of 708 non-pregnant women, aged between 18–44 years, who were at risk for an alcohol-exposed pregnancy (AEP) were enrolled in two regions in Russia. Participants completed a structured interview focused on HIV risk behaviors, including risky sexual behavior and alcohol and drug use. Latent class analysis was utilized to examine associations between HIV risk and other demographic and alcohol use characteristics and to identify patterns of risk among women. Three classes were identified. 34.93% of participants were at high risk, combining their risk behaviors, e.g., having multiple sexual partners, with high partner's risk associated with partner's drug use (class I). Despite reporting self-perceived risk for HIV/STI, this class of participants was unlikely to utilize adequate protection (i.e., condom use). The second high risk class included 13.19% of participants who combined their risky sexual behaviors, i.e., multiple sexual partners and having STDs, with partner's risk that included partner's imprisonment and partner's sex with other women (class II). Participants in this class were likely to utilize protection/condoms. Finally, 51.88% of participants were at lower risk, which was associated primarily with their partners' risk,

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Conflict of Interest: The authors declare that they have no other conflicts of interest.

Research Involving Human Participants: The study approval was obtained from the Institutional Review Boards (IRBs) of both participating universities, the St. Petersburg State University and the University of Oklahoma Health Sciences Center. All procedures performed in the study were in accordance with the ethical standards of the IRBs and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent: Informed consent was obtained from all individual participants included in the study

and these participants utilized protection (class III). The odds of being in class I compared with class III were 3.3 (95% CI: [1.06, 10.38]) times higher for those women who had Alcohol Use Disorders Identification Test scores ≥ 8 than those who had lower scores, and were 3.9 (95% CI: [1.69, 8.97]) times higher for those who used alcohol before sex than those who did not. In addition, women who drank more days per week were 1.36 times more likely to be in class II than in class III. The study informs prevention by identifying specific population groups and targets for interventions. Alcohol use is a significant predictor and an overarching factor of HIV risk in women. Since at-risk drinking is common among young Russian women, alcohol risk reduction should be an essential component of HIV prevention efforts.

Introduction

Despite recent advances in Human Immunodeficiency Virus (HIV) treatment and prevention, the spread of HIV has become a major public health concern in Eastern Europe and Central Asia.¹ In addition to socio-political and economic factors, behavioral factors contribute significantly to the rise of new cases,²⁻⁶ and patterns of risk may vary in different populations. A recent report from the World Health Organization (WHO) indicates that Russia has the highest rate of newly diagnosed HIV infections in the European Region.⁷ There is increasing prevalence and incidence of HIV in Russia.⁸⁻¹⁰ Although historically the majority of cases have been attributed to intravenous drug users (IDU), men who have sex with men, and sex workers, heterosexual partners of those who engage in risky behaviors are now also at the forefront of rising infection rates.^{11,12} Since 2000, the proportion of women among new infections has increased from 20% to about 50%, and two-thirds of the newly acquired infections have been attributed to heterosexual contacts.^{9,13,14} There is now a high proportion of HIV infections among Russian women compared with men.¹¹ Young women are disproportionately affected worldwide, and long-term projections of the spread of HIV suggests that the heterosexual transmission will continue to escalate, resulting in increasing risk for women.¹⁵

Limited information is available about the HIV risk behaviors among women to characterize the patterns of the risk. Traditional views of gender roles and assumptions that heterosexual and bisexual men are more likely to bring HIV into the partnership than are women because men are more likely to engage in risky behaviors, including infidelity and substance use, have been changing recently.¹⁶ Reports from Africa indicate that, unlike early reports from Western countries where women's risk was associated with their primary male partner's risky behaviors, women may engage in multiple or concurrent relationships more often than was previously reported.¹⁶ A study of heterosexual women in the general population is crucial to formulating a better causative model to promulgate more effective preventive interventions. Researchers indicate that several factors other than IDU, including risky sexual behaviors, low acceptance of protective measures (i.e. condom use), low perception of vulnerability,¹⁷⁻¹⁹ and risky alcohol use,²⁰ may increase women's risk of contracting HIV in Russia and Eastern Europe. Of the numerous factors that predict dimensions of HIV risk behaviors,^{18,21-25} alcohol misuse is one of the leading factors associated with HIV risk behavior in Russian women.²⁰ Due to the paucity of information about the HIV risk behaviors in the general population in Russia, more research is required to explore the

dimensions of HIV risk, identify the type of effective prevention approaches, and reduce the risk.

To date, limited data are available on the patterns of HIV risk behaviors in Russian women and their partners to characterize the heterogeneity of such behaviors. Studies in other countries identified types of HIV risk behaviors in IDU and illegal opioid users,^{3,26-29} heroin and cocaine users,³⁰ men who have sex with men,⁴ and in a group of heterosexual and marginalized men in Peru.⁶ In line with these studies, the current study provides a person-centered approach, using latent class analysis³¹ (LCA), to analyze the spectrum of HIV risk behaviors for identifying groups of individuals who share similar HIV risk characteristics. LCA allows individuals to be classified into a class, with or without including the effects of covariates.³¹ Studies in other populations have found that alcohol use²⁰ and other demographic (e.g., age, income) and social dimensions (i.e., any arrests) can be predictive of such classes of risk behaviors.³

The objectives of this study were 1) to analyze a broad spectrum of behaviors, including women's own and their partners' risky sexual behaviors, alcohol, and drug use to identify patterns of behaviors that place women at higher risk for HIV transmission in the general population; and, 2) to investigate whether the demographic covariates and women's own and their partners' alcohol use are predictive of the identified HIV risk behavior patterns.

Methods

Sample and data collection

Data on HIV risk behaviors and alcohol use were collected as part of a larger study that was conducted in Russia.³² The study was approved by the St. Petersburg State University and University of Oklahoma Health Sciences Center Institutional Review Boards (IRB#2758, IRB #1590). The parent study was a randomized clinical trial of an intervention for women at risk for an alcohol-exposed pregnancy (AEP; women who combined at-risk drinking with the possibility of becoming pregnant). The inclusion criteria were: fertile (e.g., not surgically sterile) and non-pregnant women of child-bearing age (i.e., 18-44 years), who reported at-risk drinking (four or more drinks on one occasion or eight or more drinks per week) and not using effective contraception methods or having unprotected intercourse at least once in the last 90 days. Participants were recruited for the parent clinical trial from 20 women's health clinics in two regions, a major city (St. Petersburg, SPB) and a more rural area in the central part of Russia (the Nizhniy Novgorod "oblast"/region, NNR). Russia has a well-established OB/GYN health care system, and 96% of women attend clinics.³³ Only details relevant to the current study are presented here; readers interested in further details about the parent study can refer to the original publication.³²

Of 767 women enrolled in the parent study and eligible to participate in the HIV risk survey (HIVR), 45 participants were unavailable to participate in the study (i.e., relocation, and one deceased) or lost to follow-up. Of 722 participants who were located and approached for participation in HIVR, one refused to participate in the HIVR and 13 participants did not show or were unavailable for a recruitment appointment. The final sample was 708 women (363 women in SPB and 345 women in the NNR) who were recruited and completed the

HIVR survey between January 2010 and September 2012. Additional details of parent study are published elsewhere.^{20,32}

Measures

Women participated in face-to-face, 30-to-40-minute structured interviews. The study materials underwent standard translation procedures and were reviewed and pilot-tested by the bilingual project investigators to ensure that the measures were accurate, culturally appropriate, and correctly comprehended by Russian women. Additional details of the parent study were included elsewhere.²⁰ Socio-demographic features such as participants' age, income, marital status, woman's and partner's alcohol use before sex, number of days when alcohol was used during a week, number of drinks per day, and AUDIT were also collected in the parent study that are utilized this study.

HIV Risk Survey (HIVR)—The survey designed for this study, utilized an adoptive design for an in-depth assessment of women's and their partners' HIV risk and protective behaviors. HIVR consisted of six sections: HIV knowledge and attitudes surrounding HIV, HIV status, perception of risk, the woman's risk behaviors, risk in regard to partners' behaviors such as sexual risk, drug use and imprisonment, and receptivity to preventive measures. The survey is described in detail elsewhere.²⁰

A list and descriptions of the HIV risk indicators included in the latent class models are presented in Table 1. Thirteen underlying HIV risk items related to women's and partner's sexual behavior and partner's drug use and imprisonment were utilized. Women's risk items included: a) whether they were diagnosed with HIV and/or any sexually transmitted diseases (STD) by a healthcare provider during lifetime; b) HIV/STI risk perception; c) whether they had 2 or more sexual partners in the last 12 months; d) condom use frequency during sex in the past 3 months, and; e) whether condoms were used correctly. Partners' risk items included: a) sex with a male partner/s; b) any STD-related symptoms or any STD diagnoses in the past 3 months; d) imprisoned during lifetime; e) tested positive for HIV; f) using any drugs during lifetime; g) ever injecting any drugs, and; h) sexual contact with other women during the time of the current relationship. A woman's HIV/STI risk perception was based on various answer codes about the woman's feeling of being at risk for getting HIV/STI because of something that happened in the last 3 months and/or in the past (ten 5-point Likert scale-based questions). The condom use frequency item was based on the answer codes to the questions of condom use for vaginal, anal, and oral types of sex (5-point Likert scale-based questions from 'never use' to 'used always'). The correct condom use item was based on the answers to five questions related to the frequency of correct condom use, and the answers were recoded into binary by a median cutoff.

Alcohol Use—The present study utilized self-reported measures of alcohol use, including the average number of drinks per day, and women's and partners' alcohol use before sex. A standard drink was defined as 14 g (0.6 fluid ounces of pure alcohol).³⁴ Participants completed the Alcohol Use Disorders Identification Test (AUDIT), a 10-item psychometrically sound scale developed by the World Health Organization and evaluated in several countries, including Russia.³⁵ The AUDIT covers various domains of alcohol use,

drinking behavior, and alcohol-related functional problems.³⁵ AUDIT scores range from 0 (Never) to 40 (alcohol dependence). Additional details on the study methods were included elsewhere.³⁶

Data Analyses

Latent class analysis (LCA) technique utilizes the multiple observed indicators to identify the underlying classes that represent the heterogeneity of the unobserved patterns.³¹ These types of models outweigh the use of traditional logistic regression approaches in the sense that the traditional approaches do not utilize multiple response indicators. LCA groups individuals who share similar indicators into the same class and differentiates individuals from the other classes.³⁷ LCA does not assume linearity, normality, and homogeneity of variances as opposed to the traditional methods.³⁸ LCA has been extensively used to identify underlying profiles alcohol and substance abuse^{26,27,39,40} and HIV risk behavior studies^{25,28,41}. Similar to these studies, our study also utilized LCA to analyze the spectrum of HIV risk behaviors for identifying groups of individuals who share similar HIV risk characteristics.

A series of LCA models were run to identify the best number of latent classes that fit the data using Mplus version 7.1.⁴² These LCA models were compared using Akaike Information Criteria (AIC)⁴³ and Bayesian Information Criteria (BIC).⁴⁴ The LCA models were fit with an increasing number of classes, that is, each higher class model was compared with the model with one less class. Lower AIC and BIC values indicate a better model fit; therefore, the model with the lowest values is usually the most desirable.⁴³ All models were estimated with the use of the Maximum Likelihood method. Log likelihood ratio tests were performed to compare the models with different classes. After the final model with the optimal number of classes was identified, the latent classes were labeled and regressed on the number of other demographic and alcohol use variables via multinomial regression within Mplus. To manage missing data, full information maximum likelihood (FIML) estimation was implemented within Mplus. FIML assumes that the data are missing at random (MAR).⁴⁵ Thus, it was not necessary to exclude any data based on missing observations for HIV risk indicators.

To evaluate the effects of social-demographic and alcohol use factors on the HIV risk latent classes, participants' age, income, marital status, woman's and partner's alcohol use before sex, number of days when alcohol was used during a week, number of drinks per day, and AUDIT score were considered the predictors.

Results

Participants' Characteristics

A description of the participants' demographic characteristics ($n = 708$) is included in Table 2. The mean age of the participants was 29.04 years ($SD = 6.55$). The participants were primarily Russian (98.16%), 85.22% lived in a variety of urban locations (from small towns to a metropolitan area), and most were employed (78.24%). The majority of participants were married or living with a partner (69.77%), and about half had higher education

(46.47%). Approximately 30% of the participants had AUDIT 8, which is a typical cut-off indicating alcohol use problems (Table 2). Further, 59% of women reported using alcohol before sex, and 65% of women reported that their partners used alcohol before sex as well. Monthly income was categorized into 3 groups: 10,000 Russian rubles (equivalent of \$326), 56.01% of the sample; 10,001 to 25,000 rubles, 32.09% (equivalent of \$327-\$814), and 24,001 Russian rubles (\$815), 12%. The government statistics indicated that the average income per person in a month was between 15,543 and 23,221 in 2008 – 2012.^{46,47} The “minimum subsistence” level was between 4,593 and 6,510 rubles per person in a month in 2008 –2012.⁴⁸

Model selection

The model fit indices, including the AIC, BIC, and sample size-adjusted BIC, are presented in Table 3. Five classes from LCA were estimated, and the fit indices were compared. Among all of these models, the 3-class LCA indicated a better fit based on AIC and adjusted BIC; as such, it was chosen for interpretability, practical utility, and concerns of parsimony. All subsequent analyses were performed on the 3-class model. The latent classes were subjectively labeled based on the probabilities of each item within the latent classes, and latent classes were regressed on other covariates throughout the rest of the paper.

HIV risk classes

The item probabilities and proportions of each class for a 3-class model obtained using LCA are presented in Table 4. Class I was comprised of 34.93% of women in the sample, followed by 13.19% in class II, and 51.88% in class III. Class I consisted of individuals with high probabilities of having multiple sexual partners, self-perceived risk for HIV and STDs, and partner's drug use. The probabilities of self-perceived HIV/STDs risk and partner's drug use were higher in this class than those in any other classes. The probability of correct condom use was lower in class I than in class II and class III. Notably, the frequency of condom use was similar in all classes. Similar to class I, class II consisted of participants with higher probabilities of having multiple sexual partners and being diagnosed with an STD. Perception of HIV/STD risk was quite high, although it was lower than in class I. In contrast, class II participants were more likely to report partner's imprisonment and partner's having sex with other women. Class II participants were more likely to report correct condom use than were class I and III participants. Class III participants were less likely to report multiple partners, had lower probabilities of having an STD, and had lower HIV/STI self-risk perception. In addition, class III had relatively low probabilities of any women's behavioral risk indicators. The participants in this class had higher probability of correct condom use than class I participants (Table 4). The probability of their partner's having sex with other women was lower than in class II. Class III was categorized as representing low risk for HIV. Other two classes also represent risk groups, but on different domain of the indicators as described above.

Predictors of Latent Class Membership

The results (odds ratios and 95% confidence intervals) from a multinomial regression model on the latent classes are presented in Table 5. This analysis identified income, the AUDIT score, women's alcohol consumption before sex, and the number of standard drinks per day

as significant predictors of the latent classes (Table 5). These results were adjusted for each other in the model and all other predictors shown in Table 5. Class I participants had higher odds of having a higher AUDIT score ($OR = 1.16$, 95 % CI: [1.02, 1.33], $p = 0.023$), lower odds of having an income level between \$326 and \$815 ($OR = 0.036$, 95 % CI: [0.01, 0.14], $p < 0.001$), and higher odds of women's alcohol use before sex, than class III participants. Class II participants had higher odds of having a higher AUDIT score ($OR = 1.23$, 95 % CI: [1.03, 1.46], $p = 0.02$) and higher odds of being older ($OR = 1.20$, 95 % CI: [1.04, 1.37], $p = 0.01$) than did class III participants. Moreover, class I participants had higher odds of being younger ($OR = 0.87$, 95 % CI: [0.79, 0.96], $p = 0.005$), and had lower odds of having income between \$326 and \$815 than did class II participants ($OR = 0.04$, 95 % CI: [0.01, 0.33], $p = 0.003$). Marital status (married vs. separated/divorced) was found to be marginally significant when comparing classes II vs. III ($OR = 0.156$, 95 % CI: [0.02, 0.1.15, $p = 0.07$). Married participants tended to fall into class II.

Discussion

The present study utilized latent class analysis (LCA) approach over traditional methods to identify the HIV risk categories using multiple HIV risk indicators and examined the association between these classes and alcohol use and socio-demographic characteristics among 708 women at risk for alcohol-exposed pregnancies (AEP) aged between 18–44 years who completed HIV surveys in the St. Petersburg (N=363) and the Nizhny Novgorod Region (N=345) as part of a larger FASD prevention clinical trial in Russia. About 34.93% of the women in the sample were at class I followed by about 13.19% in class II, and 51.88 % at class III. Almost all of the indicators contributed to the separation of the class membership. In general, participants in the Class I were separated by the high probabilities of having multiple sexual partners, self-perceived risk for HIV and STDs, and partner's drug use. The items such as higher probabilities of having multiple sexual partners and being diagnosed with an STD separated the **Class II** from other ones. Moreover, the third class was separated by less likelihood to report multiple partners, had lower probabilities of having an STD, and had lower HIV/STI self-risk perception. Following recent discussions on gender and women's vulnerability to HIV/AIDS¹⁶, both women's and their partners' HIV risk indicators were considered for identifying HIV risk patterns among young at-risk drinking Russian women. The LCA allowed us to reduce the dimensions of multivariate HIV risk indicators into three underlying classes and examine associations between these classes and socio-demographic characteristics and alcohol use. The identified classes represent different patterns of risk behaviors in the general population that place women at a risk for HIV transmission.

Unlike early U.S. and Western European studies, which described women to be in primarily monogamous relationships, less likely to engage in risky sexual behaviors than men, and be at risk because of the main partner's drug use and sex with other partners,¹⁶ our study indicates that both women's and their partners' risk behaviors are major risk contributors in Russia. In our study sample of at-risk drinking women, approximately half of participants (48.12%) were at elevated risk for HIV transmission when combining their own and their partner's risk. These participants fell in two distinct risk pattern classes. Although both risk patterns were associated with women's and partners' risk, the risk patterns differed. Class I

participants (34.93% of the sample) were primarily at risk due to having multiple partners and their partner's drug use. Despite relatively high probability of STDs and high self-perceived HIV/STI risk, correct condom use in these women was unlikely. Similarly, class II participants (13.19% of the sample) combined having multiple sexual partners with their partners' risk behaviors. Distinct characteristics of class II were an even higher probability of STDs in women, partners' having sex with other women, and partner's imprisonment. Although prevalence of partner's imprisonment was relatively low in the study sample in general (3.74%), partner's imprisonment was distinctly associated with class II. In contrast to class I, self-perception of high risk in class II women was associated with high probability of correct condom use. Finally, 51.88% of women were at low risk (class III). This class was distinct by lower probabilities of women's and their partners' behavioral risk. Despite this lower risk, correct condom use was more likely among class III women than among class I women. Notably, frequency of condom use, which has been often utilized as a target in prevention programs⁴⁹⁻⁵¹, was not a significant contributor to the patterns of risk in this population, and higher risk perception was not associated with higher probability of correct condom use. The results of the present study are consistent with reports from recent research in Africa and Asia that describe women at risk not only due to their partners' risk, but also because of their own risk behaviors, such as having multiple sexual partners.⁵²⁻⁵⁵

In line with research in other in North and South American populations,^{3,4,6,26-28,30} our findings suggest that HIV risk behaviors represent heterogeneous classes within a population. Participants who were younger, reported higher alcohol use, were married, and had low income were at higher risk. The results of the present study on the critical role of alcohol misuse in the HIV risk in this population are consistent with previous reports^{17,18,56-59} and with results from our previous research that investigated the direct and mediating effects of risky drinking and alcohol use before sex on the HIV/STI risk and identified alcohol use as predictor of HIV risk in Russian women.²⁰ Our results are consistent with other studies that examined sexual behaviors,³ substance abuse,¹⁹ alcohol use, and HIV risk.²⁰ In our sample, partner's lifetime drug use (24% of the participants' partners) significantly contributed to risk class I. However, partners' IDU did not contribute to the risk classes in this sample because only a small of proportion of participants (0.71%) reported their partners engaging in injection drug use in their lifetime.

The present study provided important information about HIV risk and alcohol use behaviors and indicated that prevention approaches need to integrate aspects of both sexual and alcohol behaviors. Different prevention strategies must be developed to address the patterns of HIV risk behaviors. It is critical to reduce the risk, particularly in women who are at the highest transmission risk in the general population (class 1). In line with other studies on HIV prevention in women, prevention of HIV transmission in this group of women should target both young women's and their partners' risk and address alcohol use.⁶⁰ Prevention programs for this population group can build on the women's high risk perception and use effective prevention approaches to reduce at-risk drinking and increase utilization of HIV/STP prevention, e.g., HIV testing and pre-exposure prophylaxis (PrEP).

The present study adds an additional layer to the literature on the use of latent class analysis technique, which utilizes the multiple HIV risk indicators to identify the underlying classes

that represent the heterogeneity of the unobserved risk patterns. These types of models outweigh the use of traditional logistic regression approaches that do not use the benefit of multiple indicators and might miss any heterogeneity in the patterns. Another strength of the study was a large sample size and that participants were recruited from women's health clinics that successfully serve the majority of women in the general population.²⁰ Therefore a representative sample could be recruited. In addition, the parent study recruited at-risk drinking women who were heterosexually active, and many of them were at risk for unplanned pregnancies. That allowed for a description of the risk patterns in women who are at a higher risk for contracting HIV in the general population – which is especially important in developing targeted prevention measures. However, homeless and migrant women who are likely to be at risk might not have been captured by the study because of their limited access to women's health clinics. In addition, results may not be generalizable to other populations, as the present study captured individuals that represented the stratum of at-risk alcohol users and did not include women who drank less or abstained from alcohol. In addition, the study utilized self-reports about women and their partners' HIV status and alcohol use. Under-reporting is possible; therefore, the results may be subject to self-report biases and estimates reported in this study may be lower than the true incidence in the general population. Direct measures of HIV status and alcohol use are desired for future research. Finally, the study data were collected at one time point. Therefore, causality of the association of the HIV risk behaviors with alcohol use and socio-demographic factors cannot be established.

In summary, the present study adds to the existing literature on heterogeneity of HIV risk in women in the general population. The results provide critical evidence that prevention of HIV transmission in Russian women must address women's and their partners' risk factors. Since alcohol use is identified as a significant predictor of HIV risk in this population, interventions to prevent HIV risk should focus on alcohol use as well as sexual risks in Russia.

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Table 1
HIV binary risk indicators included in latent class models

Variable Name	Description	Variable codes
STD	Any sexually transmitted infections diagnosed by a healthcare provider at least once during lifetime	0 → No 1 → Yes
HIV/STI risk perception	Woman's self-estimated risk for getting STI or HIV because of current situation or something that happened in the past	0 → No self-estimated risk 1 → High risk self-estimated risk
Number of partners	Number of sexual partners in the last 12 months	0 → None or 1 partner 1 → Two and more partners
Condom use frequency	Condom use frequency in vaginal/anal/oral sex among those who report using any condoms	0 → Never 1 → used
Correct condom use	Correct condom use among those who report using condoms	0 → No 1 → Yes
Partner's homosexual contact	Partner's homosexual contact	0 → No 1 → Yes
Partner had STD symptoms		0 → No 1 → Yes
Partner diagnosed with STD	Partner diagnosed with STD	0 → No 1 → Yes
Partner imprisoned		0 → No 1 → Yes
Partner diagnosed with HIV positive		0 → No 1 → Yes
Partner's drug use	Partner had used any drug in lifetime	0 → No 1 → Yes
Partner injected any drug		0 → No 1 → Yes
Partner had sex with other women		0 → No 1 → Yes

Table 2
Demographic characteristics of the sample

Participants' characteristics (<i>n</i> = 708)	% or Mean (<i>SD</i>)
Age (years), mean (<i>SD</i>)	29.04 (6.55)
Education	
School not completed	0.42%
School diploma	5.37%
Advanced middle level education	31.36%
Higher education not completed	16.38%
Higher education	46.47%
Russian	98.16%
Marital status	
Single	21.75%
Married/living together	69.77%
Divorced/windowed/separated	8.34%
Employed	78.24%
Home location	
Urban inner city (50,000+ people)	56.21%
Towns 2,500 to less than 50,000	29.09%
Rural and small towns to less than 2,500	14.69%
Income/per person (reported in Russian rubles), an equivalent of ^a :	
< \$326	56.02%
\$326 - \$815	32.09%
\$815 and above	11.89%
AUDIT, mean (<i>SD</i>)	6.74 (4.53)
AUDIT 8	29.99%
Mean number of Standard Drinks (SDs) per drinking day during the 90 days prior to interview ^b	3.1 (1.57)
Woman's alcohol use before sex	59.6%
Women's any drug use lifetime	24.86%
Women's drug use in past 12 months	7.49%
Women's drug use in past 3 months	0.71%
Women's injection drug use lifetime	0.00%
Partner's alcohol use before sex	64.69%
Partner's drug use lifetime	23.86%
Partner's injection drug use lifetime	0.836%
Partners imprisoned	3.74%

Note: AUDIT = Alcohol Use Disorders Identification Test (scores range from 0 to 40).

^aExchange rates were average 30.64 (29.91 to 31.37) rubles per dollar between January, 2010 and September, 2012; poverty level was 6510 rubles (equivalent of \$212.47)⁴⁸

^bOne standard drink (SD) = 14 grams (0.6 ounces) of absolute ethanol

Table 3
Model fit indices for models with varying number of classes from LCA and one-factor model for Russian women at-risk for AEP

Criteria	2-class LCA	3-class LCA	4-class LCA	5-class LCA
AIC	5514.01	5465.72	5453.18	5452.82
BIC	5702.35	5762.28	5868.36	5986.63
aBIC	5568.11	5555.89	5579.42	5615.13
loglikelihood	-2697.01	-2667.86	-2635.59	-2609.41

Table 4
Latent class probability of 3-class LCA model with covariates for the sample of HIV trial*

HIV risk indicators	Class I	Class II	Class III
Number of partners	0.909	0.955	0.367
STD	0.361	0.642	0.06
Condom frequency (used)	0.156	0.12	0.118
Correct condom use (yes)	0.194	0.324	0.283
HIV/STI risk perception	0.357	0.244	0.068
Partner had STD symptoms	0.046	0	0.007
Partner diagnosed with STD	0.052	0	0.003
Partner's homosexual contact	0	0	0.006
Partner imprisoned	0.03	0.112	0.024
Partner diagnosed with HIV positive	0.012	0	0
Partner's drug use	0.627	0	0.068
Partner injected any drug	0.025	0.004	0
Partner had sex with other women	0.238	0.484	0.251
	34.93% of the sample	13.19% of the sample	51.88% of the sample

* Note: horizontal gray bars are the bar plot of the probabilities shown in the table.

Table 5
Results from LCA with covariates as predictors of class membership for the sample in HIV trial (n =708)

Predictors	I vs. II			I vs. III			II vs. III		
	OR	95% CI	p-value	OR	95% CI	p-value	OR	95% CI	p-value
AUDIT Score	0.95	0.78-1.14	0.573	1.163	1.02-1.33	0.023	1.229	1.03-1.46	0.02
Age	0.87	0.79-0.96	0.005	1.038	0.96-1.13	0.371	1.196	1.04-1.37	0.01
Income (\$326-\$815)	0.04	0.00-0.33	0.003	0.036	0.01-0.14	<0.001	0.984	0.10-10.07	0.99
Income (> \$815)	0.59	0.03-10.27	0.718	0.43	0.13-1.39	0.158	0.728	0.03-15.53	0.84
Marital Status (Married)	1.23	0.12-12.97	0.863	0.192	0.06-0.65	0.008	0.156	0.02-1.15	0.07
Marital Status (Living together, but not married)	1.55	0.25-9.81	0.639	1.065	0.41-2.76	0.897	0.685	0.12-3.95	0.67
Woman's alcohol use before sex	1.14	0.21-6.27	0.877	4.167	1.55-11.17	0.005	3.643	0.61-21.73	0.16
Partner's alcohol use before sex	2.8	0.28-28.41	0.385	1.485	0.51-4.31	0.466	0.531	0.08-3.64	0.52
# drinks per day	0.67	0.39-1.15	0.147	0.835	0.61-1.15	0.266	1.251	0.71-2.19	0.435

* OR = odds ratio; CI = confidence interval