HHS Public Access

Author manuscript

Womens Health Issues. Author manuscript; available in PMC 2019 July 01.

Published in final edited form as:

Womens Health Issues. 2018 ; 28(4): 367–374. doi:10.1016/j.whi.2018.04.004.

Associations of Drug Use, Violence, and Depressive Symptoms with Sexual Risk Behaviors Among Women with Alcohol Misuse

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The Author Descriptions page must contain short (< 41 words) descriptions of the affiliations and research interests or areas of expertise for each author for publication with the manuscript if accepted for publication.

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Abstract

Background: Alcohol misuse is associated with increased HIV sexual risk behaviors by women. Drug use, intimate partner violence (IPV), and depressive symptoms frequently co-occur, are well-recognized alcohol misuse comorbidities, and may interact to increase risk behaviors. Using a syndemic framework we examined associations between drug use, IPV, and depressive symptoms and sexual risk behaviors by 400 women with alcohol misuse attending an urban STI clinic.

Methods: Participants completed computer assisted interviews querying drug use, IPV, and depressive symptoms and sexual risk behavior outcomes-- unprotected sex under the influence of alcohol; sex for drugs/money; and number of lifetime sexual partners. We used multivariable analysis to estimate prevalence ratios (PR) for independent and joint associations between drug use, IPV, and depressive symptoms and our outcomes. To investigate synergy between risk factors we calculated the Relative Excess Prevalence due to Interaction for all variable combinations.

Results: In multivariable analysis, drug use, IPV, and depressive symptoms alone and in combination were associated with higher prevalence/count of risk behaviors compared to women with alcohol misuse alone. The greatest prevalence/count occurred when all three were present (unprotected sex under the influence of alcohol [PR: 2.6 (1.3, 4.9)]; sex for money or drugs (PR: 2.6 (1.7, 4.2); number of lifetime partners [PR:3.2 (1.9–5.2]). Drug use, IPV, and depressive symptoms did not interact synergistically to increase sexual risk behavior prevalence.

Conclusions: Higher prevalence of sexual risk behaviors by women with alcohol misuse combined with drug use, IPV, and depressive symptoms supports the need for alcohol interventions addressing these additional comorbidities.

Keywords

depressive symptoms; drug use; HIV/AIDS risk; IPV; risky sex; syndemic

INTRODUCTION

Alcohol misuse or unhealthy alcohol use — including heavy alcohol use, binge drinking, and alcohol use disorder (AUD) — is a significant public health concern with wide ranging social, psychological, and physical consequences (Public Health Service, 2016). Alcohol misuse in women is defined by the National Institute on Alcohol Abuse and Alcoholism (NIAAA) as > 3 drinks on any single day or > 7 drinks per week (NIAAA, 2015). Among women in the United States who consume alcohol, an estimated 13% have > 7 drinks per week (NIAAA, 2015). For women, alcohol use is intertwined with both intrapersonal and interpersonal factors.

Romantic partners, for example, have been found to significantly influence women's heavy episodic drinking (Bartel et al., 2017). In a study of women attending a sexually transmitted infections (STI) clinic, binge drinking was associated with a history of multiple sexual partners, a current STI diagnosis, and engagement in receptive anal sex (Hutton et al., 2008). Anal sex is more likely to be associated with condomless sex compared with vaginal sex and unprotected receptive anal sex is the riskiest sexual behavior for HIV transmission (Baggaley, White & Boily 2010). Unprotected sexual intercourse, multiple sexual partners, and prior history of STIs are several examples of associations between risky sexual behaviors and alcohol use (Kiene et al., 2009; Rehm et al., 2012; Cooper, 2002; Hutton et al., 2008).

Drug use, intimate partner violence (IPV), and depressive symptoms are well-recognized comorbidities of alcohol misuse (La Flair et al., 2012; Stinson et al., 2005; Boden & Fergusson, 2011). Like alcohol misuse, these comorbidities are independently associated with risky sex behaviors for HIV acquisition. Intravenous drug use is a direct method of HIV transmission (Center for Disease Control and Prevention, 2017). Both injection and non-injection drug use can also lead to greater disinhibition, impaired cognition, increased likelihood of multiple sexual partners, and consequently increased HIV risk through engagement in risky sexual behaviors (Browne & Wechsberg, 2010; Stockman, Campbell & Celentano, 2010). IPV is linked to condomless sex, difficulty negotiating condom use, and having multiple partners (Cohen, Deamant, & Barkan, 2000; Hamburger et al., 2004; Senn et al. 2006). Depressive symptoms have also been associated with increased HIV-related risk factors such as negative condom-related attitudes, which influenced greater engagement in unprotected sex and a prior history of STIs (Orr et al., 1994; Laughon et al., 2007; Klein, Elifson, & Sterk, 2008). Klein, Elifson, & Sterk (2008) hypothesized that this relationship between depressive symptoms and risky sexual behaviors may be explained by the hopelessness more women with depression experience, which in turn makes them less willing to engage in healthy protective behaviors against HIV.

Drug use, IPV, and depression are each independently associated with HIV sexual risk behaviors and all are frequently co-morbid with alcohol misuse; yet the possible interaction of these factors on sexual risk behaviors by women with alcohol misuse is not as well-described. Where co-occurring risk factors operate synergistically to produce worse health outcomes than do the risk factors independently, this effect is characterized as syndemic (Singer & Clair, 2003). Identifying a syndemic is critical because it directs interventions to address the risk factors simultaneously to increase intervention effectiveness.

Syndemic models have been widely used in describing the co-occurring epidemics of substance use, violence, and HIV/AIDS (SAVA) on health outcomes (Meyer, Springer, & Altice, 2011). More recent studies have demonstrated the utility of syndemic frameworks to examine psychosocial factors' impact on sexual risk (Koblin et al., 2015; Batchelder et al., 2016; Senn et al., 2010). Fewer studies have examined how syndemic factors may influence HIV risk behaviors in the context of alcohol misuse (Peasant et al., 2015). A number of SAVA studies and studies investigating HIV risk behaviors among women at risk of HIV group alcohol with other psychoactive drugs as a 'substance use' variable (Senn et al., 2010; Surratt et al., 2012 Illangasekare et al., 2013). We contend that collapsing alcohol into a

single variable with other illicit drugs precludes an estimate of the relationship between risky sexual behaviors and alcohol misuse in comparison to polysubstance use. Separating alcohol use from other substances also presents an opportunity to examine if there is an interaction between alcohol misuse with drug use, IPV, and depressive symptoms in a way that influences involvement in risky sexual behaviors. This study's objective was to use a syndemic framework to investigate individual and joint relationships between drug use, IPV, and depressive symptoms on risky sexual behaviors by women at risk for HIV who are also engaged in alcohol misuse.

MATERIALS AND METHODS

Study sample

We analyzed baseline data from a randomized controlled trial (RCT) testing the effectiveness of an alcohol and sexual risk reduction intervention among women attending an urban STI clinic. The study recruited women ≥18 years of age from a Baltimore STI clinic between June 2012 and May 2015. Eligible women reported sexual activity with men in the previous six months, and endorsed any of the following in the prior three months: 1) at least two binge drinking episodes, 2) an average of > 7 drinks per week, or 3) at least two episodes of sex under the influence of alcohol. We collected baseline data through an audio computer administered self-interview (ACASI) that included questions on drug use, alcohol use, depressive symptoms, experience of physical and sexual IPV, number of sexual partners and sexual risk behaviors, and a variety of demographic characteristics including age, race, education, and housing status. This research protocol was approved by the Johns Hopkins University School of Medicine IRB.

The RCT enrolled 439 women. We excluded 39 women who declined to respond to IPV questions (N=1) or who did not meet NIAAA criteria for unhealthy alcohol use (N=17, eligible for the parent study because they reported sex under the influence of alcohol) or who disclosed that they were HIV positive (N=21). Alcohol misuse/unhealthy drinking was determined by self-reported frequency and average quantity of alcohol consumed, and was defined using the NIAAA criteria in the past 6 months (National Institute on Alcohol Abuse and Alcoholism, 2015). The final analytic sample included 400 women.

Syndemic Risk Factors

Drug Use.—Women were asked how often they used cocaine, amphetamines or stimulants, heroin, benzodiazepines, prescription opioids for non-medical use, and marijuana in the prior six months (e.g. never, once or twice, monthly, weekly, daily or almost daily) (World Health Organization, 2006). We classified women who reported cocaine, amphetamines or stimulants, heroin, benzodiazepines, and/or prescription opioids for non-medical purposes in the prior six months as positive for drug use. Marijuana use was excluded from the drug use variable due to its high prevalence in our sample (57%) and less frequent association with risky sexual behavior compared to other illicit drugs (Hendershot, Magnan, & Bryand, 2010; Kingree, Braithwaite & Woodring, 2000; Andrade, Carroll, & Petry 2013).

Intimate Partner Violence.—In the context of "relationships they had in the prior year", we classified women who responded affirmatively to "Has your partner ever abused you physically?" or "Has your partner ever abused you sexually?" as positive for IPV. This binary measurement of IPV defined as physical or sexual violence is consistent with prior research (Garcia-Moreno et al., 2006; Abramsky et al. 2011).

Depressive Symptoms.—The nine-item Patient Health Questionnaire (PHQ)-9 Scale, which measures depressive symptoms experienced over the prior 2 weeks, was used to quantify depressive symptoms among participants. We classified women with a PHQ-9 score ≥10 as positive for depressive symptoms (Kroenke, Spitzer, & Williams, 2001).

Covariates

Women reported age, race, education level, and housing status. Age was modeled as a continuous variable. Education was dichotomized into a high school diploma or its equivalent versus less than a high school education. Housing status was dichotomized into stable if the participant owned or rented their own house or apartment, and unstable if they lived in someone else's apartment/house, transitional housing, a shelter, or other.

Outcomes

Sexual risk behaviors were examined using three variables: unprotected sex under the influence of alcohol, transactional sex, and number of lifetime sexual partners (Sullivan, Messer & Quinlivan, 2015; Shrier et al., 1997). Unprotected sex under the influence of alcohol was coded affirmatively if the answer to "In the last 90 days, how many days did you have unprotected vaginal or anal sex under the influence of alcohol?" was non-zero. Women who answered "Yes" to "Have you ever had sex for money or drugs?" were classified as having had transactional sex. Finally, participants were asked "How many sexual partners have you had in your whole life?" and answers above 500 were set to 500.

Statistical Analysis

To examine the relationship between potentially syndemic factors, drug use, IPV, and depressive symptoms, we fit a series of logistic models with one syndemic variable as the outcome and the other two syndemic factors as the predictors.

We used multivariable log-binomial models to estimate prevalence ratios for the association between drug use, IPV, and depressive symptoms and prevalence of recent unprotected sex under the influence of alcohol and ever having had sex for drugs or money. When log-binomial models failed to converge, we fit multivariable Poisson models with no offset and a robust variance estimator to approximate the log-binomial model. We used multivariable negative binomial regression models with no offset to estimate prevalence rate ratios for the association between drug use, IPV, and depressive symptoms and number of lifetime sexual partners. We adjusted all estimates of prevalence ratios or prevalence rate ratios for age, education, and housing status.

To describe the independent and combined relationships between drug use, IPV, and depressive symptoms and the sexual risk behaviors of interest, we modeled each possible

three-way combination of the factors separately (8 total possible combinations). To investigate further the interactions of drug use, IPV, and depressive symptoms on risky sexual behaviors, we calculated the Relative Excess Risk due to Interaction (RERI) for each combination of ≥2 of these variables. Due to study design, the RERI is actually a Relative Excess Prevalence due to Interaction (REPI). REPI is a measure of additive interaction (the difference of prevalence differences) as a proportion of baseline prevalence (Hosmer & Lemeshow, 1992; Richardson & Kaufman 2009). A positive REPI indicates greater than additive interaction between ≥2 factors (super-additivity) while a negative REPI indicates less than additive interaction between ≥2 factors (sub-additivity). Additive interaction (versus multiplicative interaction) is arguably most relevant for discussing public health relevance of interactions and for etiologic investigations, because super-additivity translates to the number of excess occurrences of the outcome associated with being exposed to more than one syndemic factor compared to what would be expected if each factor acted independently (Greenland & Poole, 1988; VanderWeele & Robins, 2007). That is, if we assume associations are causal, super-additivity is a measure of the synergistic (or antagonistic) effects of syndemic factors working together.

RESULTS

The median age was 30.5 (Q1= 24; Q3 = 44), 88% of participants identified as black, and 69.8% completed at least a high school diploma or its equivalent (Table 1). Thirty-eight percent of women reported drug use (excluding marijuana) in the prior six months, 20.3% reported IPV in the past year, and 26.0% reported moderate to severe depressive symptoms in the past two weeks. Prevalence of risky sexual behaviors was high: 24.8% reported engaging in unprotected sex under the influence of alcohol in the prior three months; 39.0% reported ever having sex for drugs or money; and median lifetime sexual partners was 17.5 (Q1: 10, Q3: 35.5).

Associations between Drug Use, IPV, and Depressive Symptoms

In unadjusted models, reporting drug use was associated with reporting depressive symptoms (OR =2.1, 95% CI = 1.3, 3.3), reporting IPV was associated with depressive symptoms (OR = 2.0, 95% CI = 1.2, 3.4), and reporting drug use was associated with IPV (OR = 1.8, 95% CI = 1.1, 3.0). After adjusting for age, education, and housing status, associations between these factors were slightly attenuated, with the exception of the association between IPV and depressive symptoms which remained the same (Table 2).

Drug Use, IPV, Depressive Symptoms and Unprotected Sex Under the Influence of Alcohol

The baseline prevalence of unprotected sex under the influence of alcohol among women with alcohol misuse was 17%. The prevalence increased in the presence of IPV, drug use, and/or depressive symptoms. In multivariable analysis, drug use alone (prevalence ratio = 2.0, 95% CI = 1.2, 3.3), in combination with IPV (prevalence ratio= 2.4, 95% CI = 1.3, 4.6), and in combination with both IPV and depressive symptoms (prevalence ratio= 2.6, 95% CI = 1.7, 4.2) was associated with an increased prevalence of unprotected sex under the influence of alcohol compared to alcohol misuse alone. Depressive symptoms alone (prevalence ratio = 1.7, 95% CI = 0.9, 3.2) and IPV alone (prevalence ratio =1.5, 95% CI =

0.8, 3.2) were not significantly associated with higher prevalence of unprotected sex under the influence of alcohol. Similarly, the combination of drug use and depressive symptoms (prevalence ratio = 1.6, 95% CI = 0.8, 3.2) and IPV and depressive symptoms (prevalence ratio = 2.0, 95% CI = 0.8, 4.8) were also not significantly associated with higher prevalence of unprotected sex under the influence of alcohol.

Drug Use, IPV, and Depressive Symptoms and Sex for Drugs or Money

The prevalence of lifetime exchange of sex for drugs or money among women with alcohol misuse alone was 18.1%. The prevalence increased with the presence of drug use, IPV, and depressive symptoms. In multivariable analysis, drug use alone (prevalence ratio = 2.3 (95% CI=1.6, 3.3), in combination with IPV (prevalence ratio= 2.8, 95% CI = 1.8, 4.3) and in combination with both IPV and depressive symptoms (prevalence ratio= 2.6, 95% CI = 1.7, 4.2) was associated with an increased prevalence of sex for money or drugs compared to alcohol misuse alone. Depressive symptoms alone (prevalence ratio = 2.1, 95% CI = 1.3, 3.3) and IPV alone (prevalence ratio =1.9, 95% CI = 1.1, 3.1) were also associated with higher prevalence of sex for money or drugs. Similarly, the combination of drug use and depressive symptoms (prevalence ratio = 2.2, 95% CI = 1.5, 3.4) and IPV and depressive symptoms (prevalence ratio = 2.7, 95% CI = 1.7, 4.5) were also associated with higher prevalence of sex for money or drugs.

Drug Use, IPV, and Depressive Symptoms and Lifetime Sexual Partners

Among women with alcohol misuse alone, the median number of lifetime partners was 15. IPV alone was not associated with a greater number of lifetime sexual partners (prevalence rate ratio = 1.0, CI = 0.7, 1.6) and appeared to attenuate the association between depression and number of lifetime sexual partners (prevalence rate ratio decreased from 2.2 to 1.6 for depression alone versus depression and IPV). There was no statistically significant association between drug use alone and lifetime sexual partners (prevalence rate ratio 1.3, 95% CI = 1.0, 1.7). The combination of drug use and depressive symptoms (prevalence rate ratio = 1.8, 95% CI = 1.2, 2.7) and the combination of drug use and IPV (prevalence rate ratio = 2.7, 95% CI = 1.6, 4.3) were associated with higher number of lifetime sexual partners. All 3 factors were associated with a greater number of lifetime sexual partners (prevalence rate ratio = 3.2, CI = 1.9, 5.2).

Relative Excess Prevalence Due to Interactions (REPIs)

Among women without drug use, IPV, or depressive symptoms, the prevalence of unprotected sex under the influence of alcohol was 17%; prevalence of engaging in sex for drugs or money in the triply unexposed group was 18%; and average lifetime sexual partners were 28 (Median 15, Q1 7; Q3 25). There were positive REPIs between drug use and IPV on the prevalence rate of lifetime sexual partners (REPI=1.3, 95% CI: −2.0, 4.7) and between all 3 factors on the prevalence rate of lifetime sexual partners (REPI=0.7, 95% CI: −4.6, 5.9). However, none of the REPIs were statistically significant. All other REPIs were negative, implying sub-additive interaction (Table 4).

DISCUSSION

Alcohol use frequently co-occurs with drug use, IPV, and depressive symptoms; all these variables have been independently associated with sexual risk behaviors. In this study, we examined the independent and syndemic effects of drug use, IPV, and depressive symptoms on sexual risk behaviors by women with alcohol misuse attending an STI clinic. First, a high proportion of women (~ 20%) with unhealthy alcohol use reported unprotected sex under the influence of alcohol, lifetime transactional sex, and an average of 15 lifetime sexual partners. This compares to a nationally reported median of 2 lifetime sexual partners for black women and a 12-month 4.43% prevalence of transactional sex (Adimora et al., 2011). Second, among women with alcohol misuse, drug use, IPV, and/or depressive symptoms frequently co-occurred, and were associated with an increased prevalence of sexual risk behaviors alone and in combination. These results reinforce the importance of screening for and treating each of these frequently co-morbid factors among women with alcohol misuse. Importantly, drug use, IPV, and depressive symptoms did not synergistically worsen sexual risk outcomes. On the other hand, unless each of these factors are addressed, sexual risk reduction interventions among women with alcohol misuse may be incomplete and therefore less effective.

Consistent with prior studies, drug use, IPV, and depressive symptoms alone and in combination were associated with higher prevalence of reported sexual risk behaviors by this sample of women (Cole, Logan, & Shannon, 2007; Cavanaugh, Hansen, & Sullivan, 2010; Majer et al., 2014). In an earlier study investigating the syndemic effects of drug use, violence, depression, and financial hardship on women with and at-risk for HIV, the number of syndemic factors was incrementally associated with more sexual risk behaviors (unprotected and transactional sex) and, in particular, drug use and violence were together associated with greater sexual risk behaviors (Batchelder et al., 2016). Our study extends this previous work to women with alcohol misuse.

Drug use in particular was associated with an increased prevalence of sexual risk behaviors among women with alcohol misuse. It was associated with twice the prevalence of sex under the influence of alcohol and exchange of sex for money or drugs. These associations occurred among those with drug use alone and in combination with IPV and depressive symptoms. This underscores the importance of distinguishing alcohol use alone versus polysubstance use when evaluating sexual risk behaviors among women. The mechanisms through which alcohol and other drugs increase sexual risk behaviors may differ, which has implications for interventions. For example, a recent literature review examining the effects of substance administration on HIV sexual risk behavior suggests cocaine may have a different drug risk profile than alcohol in regards to self-reported sexual arousal and thus sexual risk behavior (Berry & Johnson, 2018).

Contrary to expectation, our study also demonstrated that women with alcohol misuse and IPV had fewer partners than women without IPV. Women in abusive relationships may be less likely to engage with additional sex partners. Also, neither depressive symptoms nor IPV symptoms alone were significantly associated with unprotected sex under the influence of alcohol compared with alcohol use only. Prior studies have been mixed regarding an

association between depressive symptoms and sexual risk behaviors (Sikkema et al. 2011; Jackson et al. 2015; Tross et al. 2015). Given that unadjusted prevalence of this outcome was higher among those with depressive symptoms or IPV and point estimates and confidence intervals were in the direction of a positive association, further research, with larger sample sizes, could clarify whether depressive symptoms or IPV increase the prevalence of unprotected sex under the influence of alcohol, over and above alcohol use alone.

A strength of our study beyond others that have applied a syndemic framework to look at HIV risk is that we formally estimated the magnitude of and test for synergy between hypothesized syndemic factors and that we separately examined drug and alcohol use. In our study although drug use, IPV, and depression were commonly co-occurring, having more than one was not consistently associated with a higher prevalence of sexual risk behaviors than one might expect if each factor acted independently. That is, we did not find strong evidence that drug use, IPV, and depressive symptoms act synergistically to increase prevalence of sexual risk behaviors by women with alcohol misuse. We did find weak evidence suggesting possible synergy between drug use and IPV with respect to the number of lifetime sexual partners. However, this will need to be examined in a larger sample.

The potential synergy between drug use and IPV on the number of lifetime sexual partners reported in this study is supported by prior research. IPV is associated with the development of drug use disorders and women with recent drug use are more likely to report IPV (Choudhary, Coben, & Bossarte, 2008; Gilbert et al., 2012). One study described IPV-related posttraumatic stress as significantly and positively associated with drug and alcohol misuse, suggesting IPV-related posttraumatic stress as a mediator between IPV types and problematic substance use (Sullivan et al. 2009). Violence has been independently associated with more inconsistent condom use, lower age of first consensual sex, a higher number of lifetime sexual partners, and a greater number of drinks in the past month (Loeb et al., 2002; Senn et al. 2008). Examining the collective effect of drug use, IPV-related PTSD, depression, and unhealthy drinking on sexual risk behavior, a prior study described condom negotiation as a mediator of the association between the number of syndemic factors a woman experienced and unprotected sex (Peasant et al., 2015). If drug use and IPV interact synergistically to increase sexual risk taking, reducing the prevalence of even one of the two syndemic risk factors could have a substantial impact on reducing HIV risk among women with alcohol misuse.

There are several limitations to this study. This secondary analysis is cross-sectional and neither causality nor directionality of the associations can be inferred. Also, the time frames for our independent and dependent variables varied, with measurements of depressive symptoms in the prior two weeks, drug use in the prior six months, and IPV in the prior year. Thus associations must be interpreted broadly, within this context. Our IPV definition only considered physical or sexual abuse by a partner in the prior year. It did not include adverse childhood experiences or sexual abuse by a non-partner, nor did it account for the duration of abuse. Physical abuse and sexual abuse were not differentiated in the IPV definition. There may be nuanced differences in the impact of physical or sexual abuse on the associations between IPV and risky sexual behaviors observed in our study. Drug use did not distinguish between different methods of ingestion, which could have offered further insight

into the relationship between substance use patterns and sexual risk behaviors. Furthermore, measurement of drug use, IPV, depressive symptoms, and sexual risk behaviors including the number of sexual partners relied on participant self-report and are subject to recall bias. Finally, our sample consisted of women with unhealthy alcohol use recruited from an urban STI clinic and thus our results may not generalizable to all women or to women in other parts of the United States.

IMPLICATIONS FOR POLICY AND/OR PRACTICE

Our findings provide implications for interventions aimed at reducing alcohol-related sexual harms. When screening for alcohol use, providers should include screening for the presence of comorbidities that are associated with sexual risk behaviors. To maximally increase the effectiveness of sexual risk reduction among women with alcohol misuse, drug use, IPV, and depressive symptoms will also need to be addressed, and if present, addressed individually.

CONCLUSIONS

In conclusion, this study provides valuable insight into how drug use, IPV, and depressive symptoms may independently and jointly contribute to sexual risk behaviors by women with alcohol misuse. Given their high frequency of co-occurrence, health care practitioners should consider screening women with alcohol misuse for current drug use, IPV, and depressive symptoms and target care and resources in a way that mitigates the likelihood or harm of sexual risk-taking behaviors.

Acknowledgments

Disclosures: This work is funded by R01-AA 018632 (Chander, Hutton, McCaul, Lesko) K23MH105–284 (Monroe); U01AA020793 (Lesko) U24AA0200801 (Chander, Hutton, McCaul); K23AA020316 (Alvanzo). The funding source was not involved in study design; in the collection, analysis and interpretation of data; in the writing of the report; and in the decision to submit the article for publication.

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Table 1.

Characteristics of 400 women ≥18 years of age with alcohol misuse who attended an urban sexually transmitted infections clinic

Characteristic	n (%)
Age, years	
18–25	103 (25.8)
25–34	132 (33.0)
35–44	73 (18.3)
45–54	74 (18.5)
55–64	16 (4.0)
≥ 65	2 (0.5)
Race	
Black	353 (88.3)
White	20 (5.0)
Asian	0 (0)
Bi/Multi-racial	22 (5.5)
Other	6 (1.5)
Less than high school education	121 (31.1)
Stable housing	209 (52.3)
Drug use in the past 6 months	
Any drug use (excluding marijuana)	153 (38.3)
Marijuana	227 (56.8)
Cocaine	64 (16.0)
Amphetamines or other stimulants	45 (11.3)
Heroin	43 (10.8)
Benzodiazepines	32 (8.0)
Prescription opioids	99 (24.8)
Depressive Symptoms	104 (26.0)
Intimate partner violence in the prior year	81 (20.3)
Unprotected sex under influence of alcohol in prior 3 months	99 (24.8)
Sex for drugs or money	156 (39.0)
Median lifetime sexual partners (Q1, Q3)	17.5 (10, 35.5).

Table 2.

Crude and adjusted* prevalence odds ratios for association between depressive symptoms, drug use, and intimate partner violence among 400 women with alcohol misuse from an urban sexually transmitted infections clinic

	Unadjusted Odds Ratios (95% CI)		
	Depressive Symptoms [a]	**Drug Use** [b]	**Intimate partner violence** [c]
Depressive Symptoms	1.0	2.1^^ (1.3, 3.3)	2.0^^ (1.2, 3.4)
Drug Use	–	1.0	1.8^ (1.1, 3.0)
Intimate partner violence	–	–	1.0
	Adjusted Odds Ratios (95% CI)		
	Depressive Symptoms	Drug Use	Intimate partner violence
Depressive Symptoms	1.0	1.7^ (1.0, 2.8)	2.0^^ (1.2, 3.5)
Drug Use	–	1.0	1.7^ (1.0, 2.9)
Intimate partner violence	–	–	1.0

*Adjusted for age, education, and housing status

^Indicates P <0.05

^^Indicates P <0.01

[a]Depressive symptoms defined by score >10 on Patient Health Questionnaire (PHQ)-9 screening tool for depressive symptoms in the past 2 weeks

[b]Drug used defined as any use of cocaine, amphetamines or stimulants, heroin, benzodiazepines, and/or prescription opioids for non-medical purposes in the prior six months

[c]Intimate partner violence defined as any physical or sexual abuse experienced in relationships in the prior year

Table 3.

Adjusted* association between depressive symptoms, drug use, and intimate partner violence and risky sexual behaviors of 400 women with alcohol misuse from an urban sexually transmitted infections clinic

Depressive Symptoms	Drug Use	Intimate partner violence	N (%) of women	Unprotected Sex under the influence of Alcohol Prevalence Ratio (95% CI)		Sex for Money or Drugs Prevalence Ratio (95% CI)		Lifetime Sexual Partners Prevalence Rate Ratio(95% CI)	
				Prevalence (N,%)	Prevalence Ratio (95% CI)	Prevalence (N,%)	Prevalence Ratio (95% CI)	Median (Q1, Q3)	Prevalence Rate Ratio (95% CI)
–	–	–	171 (42.8)	29 (17.0)	Reference	31 (18.1)	Reference	15 (7, 25)	Reference
+	–	–	37 (9.25)	10 (27.0)	1.7 (0.9, 3.2)	17 (45.9)	2.1^^ (1.3, 3.3)	20 (14,50)	2.2^^ (1.5, 3.2)
–	+	–	76 (19.0)	24 (31.5)	2.0^^ (1.2, 3.3)	41 (53.9)	2.3^^ (1.6, 3.3)	20 (11.5,50)	1.3 (1.0, 1.7)
–	–	+	27 (6.8)	7 (25.9)	1.5 (0.8, 3.2)	11 (40.7)	1.9^^ (1.1, 3.1)	12 (8,20)	1.0 (0.7, 1.6)
+	+	–	35 (8.8)	9 (25.7)	1.6 (0.8, 3.2)	20 (57.1)	2.2^^ (1.5, 3.4)	21 (11,50)	1.8^^ (1.2, 2.7)
+	–	+	12 (3.0)	4 (33.3)	2.0 (0.8, 4.8)	7 (58.3)	2.7^^ (1.7, 4.5)	22.5 (12,30)	1.6 (.9, 3.0)
–	+	+	22 (5.5)	8 (36.4)	2.4^^ (1.3, 4.6)	15 (68.2)	2.8^^ (1.8, 4.3)	35.5 (20,80)	2.7^^ (1.6, 4.3)
+	+	+	20 (5.0)	8 (40.0)	2.6^^ (1.3, 4.9)	14 (70.0)	2.6^^ (1.7, 4.2)	27.5 (14.5,80)	3.2^^ (1.9, 5.2)

*Adjusted for age, education, and housing status

^Indicates P <0.05

^^Indicates P <0.01

[a]Depressive symptoms defined by score >10 on Patient Health Questionnaire (PHQ)-9 screening tool for depressive symptoms in the past 2 weeks

[b]Drug used defined as any use of cocaine, amphetamines or stimulants, heroin, benzodiazepines and/or prescription opioids for non-medical purposes in the prior six months

[c]Intimate partner violence defined as any physical or sexual abuse experienced in relationships in the prior year

Table 4.

Adjusted* relative excess prevalence due to interactio (REPI)** for risky sexual behaviors among 4 women with alcohol misuse use from an urban sexually transmitted infections clinic

Depressive Symptoms	Drug Use	Intimate partner violence	Unprotected Sex under the influence of Alcohol (95% CI)	Sex for Money or Drugs (95% CI)	Lifetime Sexual Partners (95% CI)
+	+	−	−1.1 (−4.2, 2.0)	−1.1 (−4.5, 2.2)	−0.7 (−2.9, 1.6)
+	−	+	−0.2 (−4.4, 4.0)	−0.3 (−4.7, 4.1)	−0.6 (−3.0, 1.9)
−	+	+	−0.2 (−4.5, 4.2)	−0.4 (−4.5, 3.8)	1.3 (−2.0, 4.7)
+	+	+	−0.7 (−5.9, 4.5)	−1.6 (−6.1, 2.9)	0.7 (−4.6, 5.9)

*Adjusted for age, education, and housing status

**A positive REPI indicates greater than additive interaction between ≥2 factors (super-additivity) and a negative REPI indicates less than additive interaction between ≥2 factors (sub-additivity)

[a]Depressive symptoms defined by score >10 on Patient Health Questionnaire (PHQ)-9 screening tool for depressive symptoms in the past 2 weeks

[b]Drug used defined as any use of cocaine, amphetamines or stimulants, heroin, benzodiazepines and/or prescription opioids for non-medical purposes in the prior six months

[c]Intimate partner violence defined as any physical or sexual abuse experienced in relationships in the prior year