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## Substance Use and Partner Violence among Urban Women Seeking Emergency Care

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### Abstract

Growing evidence suggests intimate partner violence (IPV) and substance misuse are co-occurring problems that disproportionately affect low income urban women seeking care in emergency departments (EDs) and represent leading causes of injuries that result in ED visits. This paper examines temporal bi-directional associations between different types of drug and alcohol use and different types of IPV in a longitudinal study of a representative sample of 241 low income, urban women receiving emergency care from an ED in the Bronx, New York. After adjusting and matching for socio-demographics and potentially confounding multi-level risk and protective covariates, women who reported using heroin in the prior six months at Wave 1 were twice as likely as non-heroin using women to indicate any physical, injurious or sexual IPV at subsequent waves and were 2.7 times more likely to indicate experiencing an injury from IPV at subsequent waves. Crack or cocaine use in the past 6 months at Wave 1 was associated with an increased likelihood of injurious IPV and severe verbal abuse at subsequent waves. Findings also suggested that sexual IPV was significantly associated with subsequent use of crack or cocaine. The multiple bidirectional associations found linking these problems underscore the need for conducting routine screening for IPV and substance misuse among women in low income, urban EDs, and for improving linkages to services that will ultimately reduce the risk of morbidity, disability, and mortality related to these co-occurring problems.

### Keywords

intimate partner violence; women; emergency care; drug use; alcohol use

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Emerging evidence suggests intimate partner violence (IPV) and substance misuse are co-occurring public health threats that disproportionately affect low income urban women seeking emergency care. Between 5% to 40% of women seeking care in emergency departments (EDs) report experiencing physical and/or sexual IPV in the past year (Houry, et al., 2008; Hurly, et al., 2005; MacMillan, et al., 2006; Wathen, et al., 2007). These rates

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are substantially higher than rates found among community-based samples of women, which range between 2%-16% (R Caetano, Nelson, & Cunradi, 2001; M. Straus, 1990; Tjaden & Thoennes, 2000). Moreover, recent cross-sectional studies have found associations between substance use and the experience of IPV among women seeking emergency care (Nabila El-Bassel, Gilbert, & Rajah, 2003; Lipsky, Caetano, Field, & Bazargan, 2005; Lipsky, Caetano, Field, & Larkin, 2005; Wathen, et al., 2007).

Despite growing evidence of the co-occurring epidemics of substance misuse and IPV in EDs, the potential bi-directional relationships between drug and alcohol use and the experience of IPV among women receiving emergency care have not yet been fully explored. Longitudinal research that accounts for a broader range of covariates is needed to yield a more complete understanding of precisely how drug and alcohol use behaviors of both partners co-occur with the experience of IPV among women seeking emergency care. Such research may begin to answer the question of the extent to which the substance involvement of the woman and her partner increase the likelihood of IPV; and the extent to which IPV victimization increases the risk of subsequent substance use as a form of self-medication. It may also be that the relationships between substance use and IPV victimization found among women in EDs are not direct, but are instead indirectly linked to a common set of multi-level risk and protective factors that influence the relationship between substance use and IPV victimization.

Over the past decade, longitudinal research has documented bi-directional relationships between substance use and IPV victimization among women in drug treatment and other non-ED settings (Kilpatrick, Acierno, Resnick, Saunders, & Best, 1997); El-Bassel, Gilbert et al. 2005). Longitudinal research has also established bi-directional relationships between binge drinking and IPV among different populations of women (Carbone-Lopez, Kruttschnitt, & MacMillan, 2006; Chermack, Walton, Fuller, & Blow, 2001; Cunradi, Caetano, & Shafer, 2002; Temple, Weston, Stuart, & Marshall, 2008). This longitudinal research from non-ED populations suggests that women's use of different drugs and alcohol may increase the risk of subsequent IPV, and experiencing IPV may increase the likelihood of subsequent substance use.

While this longitudinal research has identified bi-directional relationships between women's use of different drugs and alcohol and IPV among non-ED populations, the failure to differentiate between types of IPV has precluded a more nuanced understanding of how women's use of different drugs and alcohol are associated with their experiences of different types of IPV over time. Most of these longitudinal studies have used a single outcome of IPV that combines physical and sexual IPV while ignoring psychological or verbal aggression, which is a far more prevalent and often more deleterious form of IPV (Coker, Davis, Arias, Desai, & Sanderson, 2002). Another limitation of this longitudinal research on the relationship between women's substance use and IPV is the failure to control for the male partner's substance use, which is a well-established predictor of IPV (R. Caetano, Cunradi, Clark, & Schafer, 2000; Leonard & Quigley, 1999; Lipsky, Caetano, Field, & Larkin, 2005) as well as multi-level risk and protective covariates that may account for the bi-directional relationships found between women's use of drugs and alcohol and different types of IPV.

To date, no longitudinal studies have examined the temporal associations between using drugs and alcohol and experiencing IPV among low income, urban women seeking emergency care. This study aims to identify temporal associations between different types of substance use and physical, injurious, sexual and/or psychological IPV in a longitudinal study of a representative sample of 241 low income, urban women receiving emergency care. Furthermore, this study seeks to address methodological limitations of previous longitudinal studies with non-ED populations of women by matching and controlling for partner substance use and for a fuller range of multi-level risk and protective factors; and by differentiating by types of substance use and types of IPV, including injurious IPV and verbal abuse, which have not been previously examined in longitudinal research on substance use and IPV. This paper tests two hypotheses.

H<sub>1</sub>: Use of different illicit drugs and binge drinking at Wave 1 increases the subsequent likelihood of experiencing different types of IPV at subsequent Wave 2 (6-month follow-up) and/or Wave 3 (12-month follow-up), after adjusting for socio-demographics, multi-level risk and protective covariates described below, and the baseline indicator of IPV outcome using modified Poisson regression and propensity score weighting.

H<sub>2</sub>: The experience of different types of IPV at Wave 1 increases the likelihood of subsequent use of different drugs and binge drinking at Waves 2 and/or 3 among a sample of 241 low income urban female ED patients, after adjusting for the same socio-demographics, multi-level risk and protective covariates, and baseline indicator of substance use outcome using modified Poisson regression and propensity score weighting.

## Theoretical Framework

The ecological perspective can serve as a comprehensive viewpoint for conceptualizing the multi-level risk and protective factors that are associated with drug use and IPV victimization among women (Cash & Wilke, 2003; Fagan & Wexler, 1987). While some of these risk and protective factors may clearly influence the initiation and progression of substance misuse and experiences of IPV, other factors, like psychological distress, may both lead to and result from these co-occurring problems. According to this perspective, the co-occurring problems of substance use and experiencing IPV are associated with risk and protective factors that operate at multi-levels which for this study include: individual factors (i.e., homelessness, incarceration history, childhood sexual abuse, psychological distress, avoidant coping, active coping), interpersonal factors (i.e., partner illicit drug use, partner binge drinking, financial dependence, sexual relationship power), and community-level factors (i.e., unmet service needs and social support). The multi-level risk and protective factors selected for this study have been informed by previous research and by Social Cognitive Theory (SCT). According to SCT, both drug use and IPV are learned behaviors that are modeled and positively or negatively reinforced by family, friends, and community-level factors. The multi-level protective factors derived from SCT, such as coping skills and social support, have been used extensively in substance abuse treatments (Bandura, 1994) and IPV prevention (Blackburn, 1995; Dobash, Dobash, Cavanagh, & Lewis, 1996). Functioning is explained in terms of a triadic reciprocity in which behavioral, cognitive, and

other personal factors and perceived community-level factors all operate as interacting factors within the multi-level ecological framework.

## Method

### Sampling

Data for this study were collected in a New York City hospital ED in the Bronx that served a catchment area of 1.1 million residents in 2002 of whom 90% identified as Latino or African American and almost one-third lived below poverty level. Participants were recruited during randomly selected 6-hour blocks of time between August 2001 and April 2003. In 2002, during the enrollment period, a total of 18,045 unduplicated female patients aged 18 and older visited the ED (unpublished data from the ED's 2002 records). A total of 215 blocks of time were selected, including 9 am-3 pm (7 blocks, 3%), 3 pm to 9 pm (118 blocks, 55%), 9 pm to 3 am (77 blocks, 36%) and 3 am to 9 am (13 blocks, 6%). Among the selected blocks, 29% occurred on a weekend. The probability of a specific block being selected was adjusted to match the proportion of patients seen in the ED (according to ED census data from the previous year) based on the day of the week and the time of day. Of 6,422 female patients admitted to the ED during the selected time blocks, 1,251 were approached and 452 refused to participate. A representative sample of 799 women participated in the screening interview; of the women in this sample, 396 met study eligibility criteria. The majority of the 799 women screened self-identified as Latina (49%) or African-American (44%). About half had a high school diploma (53%) and were employed in the past 6 months (46%). Of these eligible women, 241 (61%) participated in the longitudinal study.

Trained female research assistants (RAs), fluent in Spanish and English, attempted to approach every woman who was admitted to the ED during the designated time blocks prior to or immediately following medical care. The RAs introduced the study to potential participants who, if interested, were asked to provide informed consent prior to completing a face-to-face screening interview in a private room. Arrangements were made with ED staff so that participants would not lose their positions in the treatment queue.

Eligibility criteria for this study included: (1) being a female over the age of 18; (2) being admitted to the ED during a time block selected for inclusion in the study and (3) having had a sexual relationship within the past year with a male partner described as a boyfriend, ex-boyfriend, spouse, ex-spouse, father of her children, or a regular non-paying sexual partner. Women admitted for psychiatric emergencies and women who demonstrated severe cognitive/psychological impairments were excluded because of their inability to give informed consent. For moderate or severe triage ED patients who required hospitalization, screening interviews were conducted within two weeks of their hospitalization. Women who met eligibility criteria were asked to enroll in the study, and those who agreed completed informed consent and a baseline interview within ten days of the screening interview. Study protocols were approved by the institutional review boards of the research institution and the study site.

**Study Procedures**—Eligible participants were assessed with repeated measures at Baseline (Wave 1), 6-month follow-up (Wave 2) and at 12-month follow-up (Wave 3). For

all three assessments, trained female RAs administered face-to-face structured interviews in a private room. Of the 241 participants who completed the baseline interview (Wave 1), 193 (80%) completed the six-month follow-up interview (Wave 2) and 185 (77%) completed the 12-month interview (Wave 3). Longitudinal data for this study are drawn from all three waves.

## Measurement

Self-reported data from the repeated assessment of the longitudinal study included socio-demographics, substance use, IPV, and multi-level risk and protective covariates selected by previous research and theory described earlier.

*Socio-demographics and relationship characteristics* included: age, ethnicity, level of education, marital status, employment status in the past six months, and average monthly income over the past year. Relationship characteristics included: length and type of relationship and number of intimate partners in the past year, and primary partner's age, ethnicity, income, education, and employment status in the baseline assessment.

*Illicit drug use* was assessed with The Drug Use and Risk Behavior Questionnaire to provide frequency counts of using alcohol, heroin, crack, cocaine, marijuana and/or other drugs during the previous six months. Internal consistency was assessed with 800 subjects and yielded alpha reliability of .80 (N El-Bassel, Ivanoff, Schilling, Gilbert, & Safyer, 1995). A variable was created to assess "hard drugs" – use of crack, cocaine or heroin - which has been used in prior research on drug use (Testa, Livingston, & Leonard, 2003). For all evaluations testing  $H_2$ , the outcome of self-reported use of a particular drug or binge drinking in the previous six months at Waves 2 and/or 3 is coded as a 1, and no use at Waves 2 and 3 is coded as a 0. In this evaluation, we controlled for the indicator of the particular substance from Wave 1.

*Intimate partner violence* was assessed using the Revised Conflict Tactics Scale (CTS2) (M. A. Straus, Hamby, Boney-McCoy, & Sugarman, 1996). The CTS2 provides four subscales measuring sexual, physical, injury-related and verbal abuse within the past six months (M. A. Straus, et al., 1996). These three subscales of physical, injurious and sexual abuse provide an overall prevalence of "any IPV" for this paper. Verbal abuse was assessed using the severe verbal aggression subscale of the CTS2. IPV was assessed across intimate sexual partners identified by participant. For each item in the CTS2, participants were asked how frequently their partners perpetrated a type of IPV upon her. Internal consistency of the CTS2 subscales range between .79 to .95 (M. A. Straus, et al., 1996). For all evaluations testing  $H_1$ , if a participant indicated that she experienced a particular type of IPV in the prior six months at Waves 2 and/or 3, her response is coded as a 1; no report of such type of IPV at Waves 2 and 3 is coded as a 0.

*Covariates* –In addition to the socio-demographics and multi-level risk and protective factors described below, we included a baseline indicator of the outcome variable used to test  $H_1$  and  $H_2$  as a covariate. All covariates are drawn from Wave 1.

*Childhood sexual abuse* was measured using the Childhood Sexual Abuse Interview (CSAI) (Finkelhor, 1979; Sgroi, 1982). Participants were coded as being sexually abused prior to the age of 16 if they answered “yes” to the question of whether an incident was unwanted or forced, or if the incident was perpetrated by someone five or more years older than them.

*Psychological distress* was assessed with The Brief Symptom Inventory (BSI) (Derogatis, 1993; Derogatis & Savitz, 1999). It has good internal consistency, ranging between .71 -.74 among a wide range of populations (Derogatis & Melisaratos, 1983).

*Incarceration* was assessed by asking whether participants had been convicted of crime and incarcerated in prison at any time in the past. *Homelessness* was assessed by asking participants whether they had been homeless at any time within the past six months.

*Coping skills* were assessed with The Brief COPE Inventory a 28-item scale that assesses use of different coping and self-regulatory skills in the past 90 days. It found to have an internal consistency of .68 with drug-using women (Carver, 1997).

*Partner alcohol and drug use* was assessed with the Characteristics of Main Partner Scale (N. El-Bassel, et al., 2001) (CMPS): The CMPS assesses the partner’s use of different drugs and binge drinking (defined as having five or more drinks in a six-hour period) within the previous six months. This scale collected data on up to two intimate partners for each assessment.

*Relationship financial dependency* was assessed by asking participants how much did they contribute to household expenses, and how much did their partners contribute to household expenses? A financial dependency ratio ranging from 0 to 100% was created by dividing the partner’s share of expenses over the total expenses.

*Relationship power and decision-making* was assessed with the 23-item Sexual Relationship Power Scale (SRPS) (Pulerwitz, Gortmaker, & DeJong, 2000) which measures power in intimate relationships. The SRPS has been found to have a high internal consistency with low income women with a chronbachs alpha of .84 (Pulerwitz, et al., 2000).

*Perceived social support* was assessed with the Multidimensional Scale of Perceived Social Support (Zimet, Dahlem, Zimet, & Farley, 1988) (MSPSS), a 12-item instrument designed to measure perceived social support from family and friends, The MSPSS has been found to have a high internal consistency, with a chronbachs alpha of .91 (Zimet, et al., 1988).

*Perceived unmet service needs* was assessed with a modified version of the Treatment Services Review (McLellan, Alterman, Cacciola, & Metzger, 1992) (TSR): to assess need for and utilization of different services to address IPV and other co-occurring problems during the past 6 months (McLellan, et al., 1992). Participants were asked whether they had used any of these services within the past six months. If participants indicated that they had not used a service, they were asked if they had needed such a service within the past six months. A continuous-count score of unmet service needs was derived from totaling the number of services that participants indicated that they had needed, but had not received in the prior six months.

## Data Analysis

Multiple imputation (MI) (Little & Rubin, 1987; Schafer, 1997) via the MICE (Multivariate Imputation by Chained Equations) module in Stata9 was used to handle missing data (Royston, 2004; Rubin, 1987; Schafer, 1997; van Buren, Boshuizen, & Knook, 1999). MI has been recommended as a method to use for handling missing outcome data in order to reduce the likelihood of bias resulting from differential attrition or non-ignorable non-response (Carpenter & Kenward, 2008; Kenward & Carpenter, 2007; Little & Rubin, 1987; Schafer, 1997). Because each missing value is replaced with several imputed values, MI generates more appropriate standard errors unlike single imputation methods. MI uses the information that is observed or measured for a participant at all previous assessments—as well as observed data across participants—to predict values for variables where that individual's information is missing, which reduces the likelihood of bias arising from a participant missing one or a few assessment timepoints. Attrition analyses were conducted to assess whether participants and dropouts differ and whether variables on which they differ interact with the socio-demographics and covariates to affect outcome measures. Identified variables were included in MI models to better minimize the effects of such non-ignorable non-response. Prevalence rates from imputed values for IPV and substance use variables using a combined set from five different imputed sets were compared to actual values obtained from retained participants at Wave 2 and Wave 3. The rates for all IPV and substance use outcomes were similar (less than 5% difference for all variables) using the combined imputed value data set that included all participants (n=241) and using the actual values from retained participants at 6-months (n=193, 80%) and at 12 months (n=185, 77%). We conducted a sensitivity analyses to compare results of the multivariate analyses to test the study hypotheses with actual outcome data versus imputed outcome data and found that the results were also very similar but the imputed data tended to yield slightly more conservative estimates than the actual data.

Propensity score matching is a well-established method of estimating treatment effects in observational studies when selection bias is present by selects groups that are similar on average with respect to all the covariate values (Connors, Speroff, & Dawson, 1996; AF Connors, et al., 1996; Dehejia & Wahba, 1999, 2000; P. R. Rosenbaum & Rubin, 1983, 1985; Stenestrand & Wallentin, 2001). Propensity scores were calculated using attributes for observed covariates and independent variables at Wave 1 and outcome variables at Waves 2 and 3. The degree to which all covariates are balanced on average across the matched groups (abused vs. non-abused women) is assessed to evaluate the adequacy of the model used to estimate the propensity score. Propensity score weighting was used to reweight treatment and comparison observations so as to make them more representative of the population of interest. The matching procedure was performed by PSMATCH2 (a shareware module in Stata9) (Leuven & Sianesi, 2003). The diagnostics of balance on all covariates were conducted for matched groups (Berger, Hill, & Waldfogel, 2005).

After selecting a final sample of participants using propensity score matching, modified Poisson regression analyses were conducted to test each hypothesis. The covariates for testing both study hypotheses included multi-level risk and protective factors described earlier and socio-demographics at Wave 1. For testing  $H_1$  independent variables included

use of crack or cocaine, heroin, any hard drug, marijuana, any illicit drug use and binge drinking in the prior 6 months measured at Wave 1. Outcome variables included the experience of different types of IPV, which was assessed from data collected at Waves 2 and 3. For H<sub>2</sub>, the independent variables include the experience of different types of IPV at Wave 1, and the outcome variables include substance use variables assessed at Waves 2 and 3.

## Results

### Socio-demographic Characteristics

The age of participants ranged from 18 to 61, with a mean of 32.8 year (SE=10.08). The large majority identified as Latina (49.4%, n=110) or African American (43.6%); the remainder of participants were white or other ethnicities (7%). About half of the sample (52.7%) graduated from high school or had earned a GED. Less than half of the women (46.1%) were employed (full or part-time). Two-thirds (66.8%) were single, never married, 17% were married, and 16.2% were divorced, separated, or widowed. The average of length of relationship with their main intimate partners was 5.7 years (SD=6.5). About one-tenth (12%) of women indicated that they had had a sexual relationship with more than one intimate partner in the prior six months.

**Multi-level Risk and Protective Factors**—As shown in Table 1, about four in ten women reported a history of childhood sexual abuse. Almost one-quarter (23.2%) reported a history of incarceration, and 15.8% had experienced homelessness within the past month. Four in ten women (40.3%) reported that their intimate partners had used illicit drugs within the past six months, and 36.9% reported that their binge drinking. Participants reported that their partners on average contributed 43% of their household expenses. Almost half of the sample (46.5%) reported that they had needed, but had not received, a service such as counseling, drug treatment, or financial assistance within the previous six months. The mean scores and standard deviations are reported for the BSI measuring psychological distress, the active and avoidant coping scales, the Sexual Relationship Power Scale and for the MSPSS measuring social support.

### Prevalence of drug and alcohol use within the previous six months, over three waves

As shown in Table 2, about four in ten women (43.2%) reported using illicit drugs within the previous six months, with one-third (33.2%) reporting marijuana use, 12.9% reporting crack or cocaine use, and 7.5% reporting heroin use at Wave 1. Reports of any drug use dropped to 33% at Wave 3, with the biggest decrease in the use of marijuana. Use of heroin, crack or cocaine, and hard drugs stayed more constant from Wave 1 to Wave 3.

### Prevalence of experiencing IPV in the prior six months, over the three waves

At Wave 1, slightly more than four in ten women (43%) reported experiencing physical, injurious and/or sexual IPV on the CTS2 subscales within the previous six months (see Table 2) with 29.5% reporting physical IPV, 18.3% injurious IPV, 28.2% reporting sexual IPV, and 28% reporting severe verbal abuse on the subscales of the Revised Conflict Tactics scale. Rates of all types of IPV declined in Waves 2 and 3 by 4 to 15 percentage points.



### Hypothesis 1: Substance use increases the likelihood of subsequent IPV

The findings presented in Table 3 are the adjusted relative risk ratios (RRs) for experiencing IPV at subsequent Waves 2 and/or 3, contingent on report of substance use at Wave 1 and after adjusting for covariates (socio-demographics and multi-level risk and protective factors) and baseline indicator of substance use reported at Wave 1 using propensity score matching and modified Poisson regression. No significant associations were found between report of any drug use in the past six months at Wave 1 and subsequent experience of any type of IPV at Waves 2 and/or 3. Marijuana use within the previous six months at Wave 1 was also not associated with subsequent reports of any type of IPV at subsequent Waves 2 and/or 3. Women who reported using heroin within the previous six months at Wave 1 were twice as likely as non-heroin using women to report any IPV (RR=2.1, CI=1.2, 3.6) and were 2.7 times more likely to report that they had sustained an injury from IPV (CI=1.1, 6.5) at subsequent waves. Women who reported crack or cocaine use within the previous six months at Wave 1 were 2.4 times more likely to report injurious IPV (CI=1.2, 4.74) and twice as likely to report severe verbal abuse (RR=2.01, CI=1.2, 3.3) at subsequent waves compared to women who did not report use of crack or cocaine within the previous six months. Similarly, use of hard drugs increased the subsequent likelihood of the experience of all types of IPV, including any IPV (RR=1.6, CI=1.1, 2.4), physical IPV (RR=1.7, CI=1.1, 2.6), injurious IPV (RR=3.0, CI=1.4, 6.4), and severe verbal abuse (RR=1.9, CI=1.1, 3.5). Marginal support was also found for an increased likelihood of sexual IPV (RR=1.9, CI=0.96, 3.9,  $p=.065$ ) at subsequent waves for hard drug use at Wave 1.

No significant associations were found between binge drinking reported at Wave 1 and any of the IPV outcomes at subsequent waves. These findings show support for  $H_1$  that substance use at Wave 1 increases the subsequent likelihood of different types of IPV at Waves 2 and 3 for use of heroin, crack, cocaine, and hard drugs, but not for marijuana use or binge drinking.

The unadjusted relative risk ratios for experiencing IPV at subsequent Wave 2 and/or 3 were calculated and compared to the adjusted analyses. The significant unadjusted associations found for using crack cocaine and hard drugs at Wave 1 and different types of IPV at subsequent waves were similar to the adjusted analyses. However, the unadjusted analyses found significant associations between any illicit drug use at Wave 1 and subsequent experience of different types of IPV at Waves 2 and/or 3. Marijuana use at Wave 1 significantly increased the likelihood of reporting physical IPV and severe psychological IPV.

### Hypothesis 2: Experience of IPV increases the likelihood of subsequent substance use

No support was found for associations between experiencing any IPV at Wave 1 and subsequent use of any illicit drug, marijuana, heroin, crack, cocaine, and/or hard drug. Marginal support was found for an increased likelihood of any IPV (RR=1.5, CI=0.93, 3.13,  $p=.096$ ) at subsequent waves for binge drinking reported at Wave 1 (Table 4). Similarly, no significant associations were found between a report of experiencing physical IPV at Wave 1 and subsequent use of any illicit drug, marijuana, heroin, crack, cocaine, and/or hard drugs. Marginal support was found for an increased likelihood for binge drinking (RR=1.4

CI=0.97, 2.02,  $p=.072$ ) at subsequent waves for IPV reported at Wave 1. Contrary to expectations, women who reported injurious IPV at Wave 1 were less likely to report subsequent use of any illicit drug (RR=0.68, CI=0.46, 0.99) and marijuana (RR=0.53, CI=0.31, 0.93), compared to women who did not report such injurious IPV at Wave 1. No significant associations were found for injurious IPV reported at Wave 1 and use of heroin, crack, cocaine, or hard drug at subsequent waves. However, women who reported experiencing sexual IPV at Wave 1 were more than three times as likely to report use of crack or cocaine (RR=3.3, CI=1.1, 9.5) and more than twice as likely to report use of hard drugs (RR=2.4, CI=1.2, 4.8) at subsequent waves, compared to women who did not report sexual IPV at Wave 1. Severe verbal abuse reported at Wave 1 was not significantly associated with subsequent use of any illicit drugs, marijuana, heroin, crack, cocaine, hard drugs, or binge drinking. These findings show support for the hypothesis that experience of IPV at Wave 1 increases the likelihood of subsequent substance use at Waves 2 and 3 for sexual IPV, but not for any other type of IPV; with the exception that marginal support was found for physical IPV and any IPV increasing the likelihood of subsequent binge drinking.

The unadjusted relative risk ratios for use of different drugs and alcohol at subsequent Waves 2 and/or 3 contingent on report of different types of IPV at Wave 1 yielded similar but significant associations between experiencing any IPV, physical IPV, and injurious IPV at Wave 1 and binge drinking at subsequent waves. Unadjusted analyses also found significant associations between injurious IPV at Wave 1 and subsequent crack cocaine use as well as between severe verbal abuse at Wave 1 and subsequent marijuana use.

## Discussion

This is perhaps the first study with prospective data to estimate the effects of substance use on subsequent experiences of IPV, as well as the effects of IPV victimization on subsequent substance use, among a representative sample of low income, urban women receiving emergency care. After adjusting for socio-demographics, multi-level risk and protective factors, and baseline indicator of the outcome variable, this study found that different types of substance use led to different types of IPV, in support of H<sub>1</sub>. Some associations were also found for sexual IPV leading to crack cocaine use and hard drug use, in support of H<sub>2</sub>.

This study addresses some of the methodological limitations of previous longitudinal research on the relationship between substance use and the experience of IPV among women by controlling for baseline indicator of the outcome variable, and by adjusting and matching for socio-demographics, partner substance use, and other potentially confounding multi-level risk and protective factors identified by previous research and theory. By differentiating both by type of substance use and type of IPV, this study also improves on earlier studies which have combined different types of IPV into one variable, or have employed singular drug use or drug dependency variables. The findings for both study hypotheses suggest that the temporal relationships between substance use and the experience of IPV among this representative sample of low-income urban women seeking emergency care are complex, varying substantially by type of IPV and type of substance use. If this longitudinal investigation only examined the bi-directional relationships between any illicit drug use and any IPV, there would be no support for either study hypothesis. The study

findings suggest that there is support for both study hypotheses when estimating the effect of different types of substance use on the likelihood of subsequent different types of IPV and vice versa, underscoring the importance of differentiating both type of IPV and type of substance use when examining these bi-directional relationships. The use of propensity score weighting and modified Poisson regression to adjust for baseline indicators of outcomes and a fuller range of potentially confounding factors represents a methodological advance over previous longitudinal research.

The first hypothesis – that drug use leads to IPV victimization – is supported for use of heroin, crack, cocaine, and hard drugs with different types of IPV. The finding that a woman's use of heroin increases the odds of her experiencing any IPV and injurious IPV is contrary to findings from a meta-analytic review (Moore, et al., 2008) which suggests that women's heroin use is not associated with IPV. The first hypothesis is also supported for crack and cocaine use and subsequent injurious IPV and severe verbal abuse, consistent with previous longitudinal research (N. El-Bassel, L. Gilbert, E. Wu, H. Go, & J. Hill, 2005; Moore, et al., 2008). The finding that women's use of hard drugs also increased the likelihood of experiencing subsequent IPV of all types is also consistent with previous longitudinal research (Kilpatrick, et al., 1997; Testa, et al., 2003). The strong associations linking use of heroin, crack, cocaine, and hard drugs to subsequent injurious IPV is particularly worthy of note, given that these drug-involved women sought emergency care at Wave 1. Previous research examining the relationship between women's drug use and IPV has not separated out the effect of substance use on injurious IPV from physical or sexual IPV. These study findings suggest that use of heroin and/or crack or cocaine may heighten the risk of more potentially life-threatening injurious IPV.

Multiple mechanisms may explain how women's heroin and/or crack or cocaine use increases the likelihood of injurious IPV. Crack or cocaine may increase paranoia, jealousy, and the irritability of both partners, as well as distort their perceptions of relationship conflict, preventing them from recognizing early warnings of potential IPV and impairing their judgment; all of which increase the likelihood of a violent interaction (N. El-Bassel, et al., 2005; L. Gilbert, et al., 2000; Louisa Gilbert, N El-Bassel, V Rajah, A Foleno, & V Frye, 2001; M. Rosenbaum, 1981; C.E. Sterk, 1999). Social expectancy effects may further allow partners to resort to IPV if they are under the influence of these drugs, knowing that they may be excused for their violent behaviors (Burke, Thieman, Gielen, O'Campo, & McDonnell, 2005). Male partners may further feel entitled to abuse drug-involved women, particularly crack-using women, because of their low social status (Louisa Gilbert, et al., 2001; M. Rosenbaum, 1981; C.E. Sterk, 1999). Finally, arguments over procuring, sharing, and using crack, cocaine or heroin may trigger IPV. If one or both partners are going through withdrawal from heroin, these arguments are particularly likely to escalate into physical IPV (Burke, et al., 2005; N. El-Bassel, Gilbert, & Wu, 2003; L Gilbert, N El-Bassel, V Rajah, A Foleno, & V Frye, 2001).

Contrary to previous research (Carbone-Lopez, et al., 2006; Chermack, et al., 2001; Cunradi, et al., 2002; Temple, et al., 2008), there was no support for the first hypothesis for binge drinking or illicit drug use leading to experiencing of IPV. The lack of relationship between binge drinking and IPV is perplexing and may represent a unique attribute of our community

based sample of women receiving emergency care as previous studies that have found significant associations have mostly been conducted with substance abuse treatment samples. The differences between the unadjusted and adjusted analyses between any illicit drug use and experiencing subsequent suggest that the selected covariates (such as socio-demographics, multi-level risk and protective factors, and baseline indicator of IPV) may have attenuated the effect of using any illicit drug on subsequent IPV.

The evaluations testing the second hypothesis – that different types of IPV victimization increase the odds of subsequent substance use – were more mixed. The strongest support for this hypothesis was for sexual IPV. Women who reported experiencing sexual IPV at Wave 1 were more than three times as likely to report crack cocaine use, and more than twice as likely to report hard drug use, than were women without such IPV. While studies have found that crack or cocaine use is a strong predictor of subsequent IPV (N. El-Bassel, et al., 2005; Moore, et al., 2008), few have found support for the reverse direction. Some qualitative research, however, suggests that women who have experienced sexual abuse tend to use crack cocaine when having sex as a way of disassociating from sexual traumatic memories (N. El-Bassel, Gilbert, Rajah, Folen, & Frye, 2000; Fullilove, et al., 1993; C.E. Sterk, 1999; C. E. Sterk, Elifson, & German, 2000). The differences in the unadjusted and adjusted analyses suggest that the selected covariates may have reduced the effect of these types of IPV at Wave 1 on subsequent substance use.

The finding that injurious IPV reported at Wave 1 decreased the likelihood of subsequent use of marijuana and any illicit drug use was unexpected. It is possible that this finding represents a spurious association. Yet it could also suggest that women who are injured from IPV may be more likely to reach a critical point at which they are willing to take steps to end the violence in the relationship. If this is true, the timing of a brief intervention and referrals while still in the ED, for women who present with IPV-related injuries, may be optimal for interrupting IPV that is fueled by substance use. Contrary to some previous study findings (Nabila El-Bassel, Louisa Gilbert, Elwin Wu, Hyun Go, & Jennifer Hill, 2005), women's marijuana use did not increase the subsequent likelihood of any type of IPV.

This study has several limitations that should be addressed in future research. Both experience of IPV and substance use measures rely on self-report and were not corroborated with biological data or medical reports. The non-response rate limits the ability to generalize from the study findings. In addition, the exclusion of women who were admitted due to psychiatric emergencies may have underestimated the rate of IPV and substance use, both of which are associated with mental health problems. Consistent with previous longitudinal research on IPV (Coker, et al., 2007; Nabila El-Bassel, et al., 2005), the rates of IPV declined from Wave 1 to 3. This decline may be indicative of a natural process in which the cycle of abuse reaches a point where women either exit the relationship or take steps to end the abuse. Alternatively, the decline in IPV may have been influenced by participation in our study or other outside interventions. This study did routinely provide referrals to services and hotline numbers for women reporting IPV at baseline and follow-up assessments. This minimal intervention may have biased the natural observations of IPV that would have occurred over time without such intervention. The generalizability of study findings to women receiving emergency care in other hospitals in New York is limited given that data

were only collected from one hospital in the Bronx. Although including a fuller range of multi-level risk and protective covariates strengthens our ability to obtain more accurate estimates of the bi-directional associations, the number of covariates with propensity score weighting may have also decreased power to detect statistical associations with some outcomes that lost significance from the unadjusted to adjusted analyses. Future studies would benefit from larger sample sizes that provide sufficient power while accounting for multiple comparisons, which will decrease the likelihood of Type I errors given the number of outcomes used to test hypotheses for this type of study. Finally, research suggests most cases of IPV involve mutual IPV (Moore, et al., 2008; Stalans & Ritchie, 2008; Temple, et al., 2008); the failure to discern between cases where the woman was both a victim and a perpetrator of IPV, and cases in which she was only a victim, hinders the ability to interpret the study findings and to draw practice implications.

Notwithstanding these limitations, several implications for policy, practice and future research may be drawn from these study findings. The findings highlight the importance of differentiating by both type of substance use and type of IPV in examining bi-directional relationships between women's substance use and their experiences of different types of IPV. The study findings suggest that use of composite variables in examining the co-occurring problems of substance use and IPV may obscure the possible presence of relationships between specific types of substance use and IPV. These findings suggest screening tools for IPV and substance use designed for ED settings should assess for different types of IPV and substance use. Furthermore, the range of findings in support of both study hypotheses suggest the potential efficacy of integrated interventions or treatments that synergistically address the specific mechanisms linking substance use and IPV victimization among low income, urban women in EDs as indicated by prior intervention research (L Gilbert, et al., 2006). The study findings underscore the need for policies and programs that will support integrated services for women who are experiencing the co-occurring problems of substance use and IPV. Expanding access to such integrated services for low income urban women seeking emergency care will ultimately reduce their risks of morbidity, mortality, and disability related to IPV and substance abuse.

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**Table 1**Descriptive Statistics for Multi-level Risk and Protective Covariates ( $N=241$ )

<b>Multi-level factors</b>	<b><i>N</i> (%) or Mean (SD)</b>
<b>Individual Level</b>	
Homeless in the past 6 months	38 (15.8%)
Incarcerated ever	56 (23.2%)
Childhood sexual abuse	99 (41.1%)
Psychological Distress (BSI, 0–4)	Mean=0.86 (SD =0.81)
Active coping (0–3)	Mean=1.79 (SD =0.74)
Avoidant coping (0–3)	Mean=0.99 (SD =0.77)
<b>Interpersonal Level</b>	
Partner illicit drug use in the past 6 months	97 (40.3%)
Partner binge drinking in the past 6 months	89 (36.9%)
Financial dependence (0%–100%)	Mean=42% (SD =37%)
Sexual relationship power scale (1–4)	Mean=2.75 (SD =0.48)
<b>Perceived Community Level</b>	
Unmet service need in the past 6 months	112 (46.5%)
Perceived social support (MSPSS, 1–7)	Mean=5.22 (SD =1.26)

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**Table 2**

Longitudinal Prevalence Rates of Substance use and IPV using Imputed Data Set (N=241)

<b>Outcome</b>	<b>Wave 1</b>	<b>Wave 2</b>	<b>Wave 3</b>	<b>Waves 2 &amp; 3</b>
Any illicit drug use	43%	35%	33%	47%
Heroin	7%	9%	8%	14%
Crack / Cocaine	13%	10%	9%	16%
Marijuana	33%	25%	24%	35%
Any hard drug use	17%	16%	17%	21%
Any binge drinking	24%	26%	20%	37%
Any physical/ injurious/ sexual IPV	43%	39%	28%	49%
Physical IPV	29%	28%	19%	36%
Injurious IPV	18%	19%	14%	26%
Sexual IPV	28%	19%	15%	27%
Severe verbal abuse	28%	24%	23%	35%

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Effects of Substance Use at Wave 1 on IPV at Waves 2 and/or 3: Relative Risk Ratios and 95% Confidence Intervals

Table 3

Substance Use-Wave 1	Experiences of Different Types of IPV at Waves 2 and/or 3 (N=241)											
	Any IPV		Physical IPV		Injurious IPV		Sexual IPV		Severe verbal abuse			
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted		
Any drug	1.18 [0.91, 1.54]	1.15 [0.83, 1.58]	1.53* [1.05, 2.24]	1.39 [0.89, 2.18]	1.79* [1.03, 3.10]	1.65 [0.67, 4.09]	1.09 [0.70, 1.69]	0.98 [0.60, 1.60]	1.75* [1.13, 2.73]	1.15 [0.75, 1.78]		
Heroin	1.43 [0.92, 2.23]	2.10** [1.22, 3.60]	1.56 [0.94, 2.57]	1.73 [0.67, 4.46]	1.49 [0.74, 2.98]	2.71* [1.14, 6.45]	1.38 [0.62, 3.07]	3.12 [0.93, 10.42]	1.05 [0.52, 2.10]	1.51 [0.75, 3.05]		
Crack / Cocaine	1.31 [0.94, 1.81]	1.32 [0.87, 2.01]	1.62* [0.76, 2.41]	1.33 [0.84, 2.10]	1.79* [1.02, 3.14]	2.35* [1.16, 4.74]	1.11 [0.60, 2.07]	1.76 [0.88, 3.53]	1.61* [1.09, 2.40]	2.01** [1.22, 3.30]		
Marijuana	1.12 [0.85, 1.88]	0.94 [0.71, 1.24]	1.49* [1.03, 2.17]	1.14 [0.80, 1.61]	1.68 [0.99, 2.86]	1.24 [0.68, 2.27]	0.95 [0.60, 1.51]	0.74 [0.43, 1.29]	1.75* [1.09, 2.83]	1.11 [0.72, 1.70]		
Hard drug	1.40* [1.04, 1.88]	1.60* [1.08, 2.36]	1.70** [1.19, 2.42]	1.65* [1.05, 2.58]	1.79* [1.04, 3.10]	3.02** [1.41, 6.44]	1.16 [0.62, 2.19]	1.93 [0.96, 3.90]	1.40 [0.92, 2.13]	1.91* [1.05, 3.46]		
Binge drinking	1.19 [0.86, 1.63]	1.02 [0.72, 1.45]	1.20 [0.80, 1.82]	0.93 [0.63, 1.39]	1.33 [0.76, 2.32]	1.22 [0.66, 2.25]	1.40 [0.89, 2.22]	1.33 [0.81, 2.18]	1.43 [0.97, 2.09]	1.21 [0.79, 1.86]		

\*\*\* p<.01,

\* p<.05

Adjusted covariates included in the propensity score weighting and final models are: socio-demographics (age, ethnicity, education, employment, marital status), individual-level (homelessness, incarceration, childhood sexual abuse, psychological distress, active coping, avoidant coping), interpersonal-level (partner illicit drug use, partner binge drinking, financial dependency, sexual relationship power scale), perceived community-level (unmet need, perceived social support), baseline IPV (physical/injurious/sexual IPV, severe verbal abuse). Unadjusted covariates included in the bivariate models are unweighted.

**Table 4**

Effects of IPV at Wave 1 on Substance Use at Subsequent Waves: Relative Risk Ratios and 95% Confidence Intervals

IPV at wave1	Different Types of Substance Use at Waves 2 and/or 3 (N=241)											
	Any illicit drug		Heroin		Crack / Cocaine		Marijuana		Hard drug		Binge drinking	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
Any IPV	1.14 [0.86, 1.53]	1.04 [0.72, 1.51]	1.43 [0.61, 3.37]	1.73 [0.57, 5.21]	1.43 [0.73, 2.81]	1.09 [0.29, 4.06]	1.16 [0.81, 1.66]	1.02 [0.67, 1.55]	1.57 [0.81, 3.05]	1.61 [0.79, 3.26]	1.65* [1.13, 2.41]	1.46 [0.93, 2.27]
Physical IPV	1.13 [0.84, 1.51]	0.90 [0.65, 1.26]	1.54 [0.56, 4.19]	1.02 [0.26, 4.04]	1.25 [0.64, 2.46]	0.80 [0.29, 2.21]	1.19 [0.82, 1.72]	1.14 [0.81, 1.60]	1.47 [0.69, 3.13]	1.07 [0.46, 2.45]	1.57* [1.09, 2.27]	1.40 [0.97, 2.02]
Injurious IPV	0.91 [0.60, 1.37]	0.68* [0.46, 0.99]	1.50 [0.67, 3.38]	2.42 [0.15, 38.29]	1.99* [1.04, 3.83]	1.11 [0.26, 4.67]	0.74 [0.43, 1.27]	0.53* [0.31, 0.93]	1.74 [0.94, 3.20]	0.98 [0.54, 1.79]	1.48* [1.00, 2.19]	1.13 [0.70, 1.83]
Sexual IPV	1.05 [0.76, 1.45]	1.06 [0.69, 1.61]	1.09 [0.47, 2.50]	1.86 [0.60, 5.75]	2.07 [0.99, 4.33]	3.27* [1.13, 9.48]	1.02 [0.69, 1.51]	0.90 [0.58, 1.41]	1.54 [0.89, 2.70]	2.36* [1.16, 4.80]	1.36 [0.92, 1.99]	1.30 [0.80, 2.10]
Severe verbal abuse	1.27 [0.96, 1.69]	0.86 [0.66, 1.13]	0.86 [0.37, 1.97]	1.14 [0.42, 3.07]	1.39 [0.72, 2.72]	0.90 [0.36, 2.25]	1.53* [1.05, 2.21]	0.90 [0.52, 1.55]	1.02 [0.52, 2.02]	0.75 [0.37, 1.53]	1.28 [0.87, 1.88]	0.76 [0.53, 1.08]

\*\* p<.01,

\* p<.05

Adjusted covariates included in the propensity score weighting and final models are: socio-demographics (age, ethnicity, education, employment, marital status), individual-level (homelessness, incarceration, childhood sexual abuse, psychological distress, active coping, avoidant coping), interpersonal-level (partner illicit drug use, partner binge drinking, financial dependency, sexual relationship power scale), perceived community-level (unmet need, perceived social support), baseline substance use (illicit drug use, binge drinking). Unadjusted covariates included in the bivariate models are unweighted.