American Journal of Men's Health
2018, Vol. 12(2) 292–301

DOI: 10.1177/1557988316631964
journals.sagepub.com/home/ajmh
SAGE

A Study of Intimate Partner Violence, Substance Abuse, and Sexual Risk Behaviors Among Gay, Bisexual, and Other Men Who Have Sex With Men in a Sample of Geosocial-Networking Smartphone Application Users

Dustin T. Duncan, ScD[1], William C. Goedel[1], Christopher B. Stults, MS, LMHC[1], William J. Brady, MA[1], Forrest A. Brooks, MS[1], Jermaine S. Blakely, BS[1], and Daniel Hagen, MPH[1]

Abstract

Geosocial-networking smartphone applications ("apps") are widely used by gay, bisexual, and other men who have sex with men (MSM) and facilitate connections between users based on proximity and attraction. MSM have sexual encounters and relationships of varying degrees of emotional and physical intimacy with app-met individuals, potentially placing them at risk for intimate partner violence (IPV). The purpose of the current study was to utilize a geosocial-networking application to investigate relationships between experiences of IPV victimization as it relates to substance use and sexual risk behaviors in a sample of MSM. Participants (n = 175) were recruited by means of broadcast advertisements on an application widely used by MSM (Grindr) to seek sexual partners. Multivariable regression models were fit to examine associations between IPV, substance abuse, and sexual risk behaviors. Lifetime experiences of IPV victimization were common, where 37.7% of respondents reported having experienced at least one form of IPV. While a marginally significant positive association between IPV and substance abuse was detected in multivariable models (p = .095), individual forms of IPV were strongly associated with substance abuse. For example, sexual IPV victimization was associated with an increase in substance abuse in the preceding month (p = .004). Experiences of IPV victimization were associated with higher numbers of partners for both condomless receptive and insertive anal intercourse (p < .05). Given the relatively high prevalence of IPV victimization and its associations with substance abuse and sexual risk behaviors, these findings suggest that IPV screening and prevention programs may reduce substance abuse and sexual risk behaviors in this population.

Keywords

intimate partner violence, IPV, substance use, sexual risk behaviors, HIV, men who have sex with men, MSM

A recent systematic review among gay, bisexual, and other men who have sex with men (MSM) reported that multiple forms of intimate partner violence (IPV) occur at rates similar to or higher than those documented among heterosexual women, but that IPV among MSM is understudied by comparison (Finneran & Stephenson, 2013; Freedner, Freed, Yang, & Austin, 2002). The prevalence rates reported in previous research vary depending on the form of IPV studied (e.g., physical, sexual, or psychological/emotional) and the recall period (e.g., past year vs. lifetime). Lifetime prevalence rates for the experience of any form of IPV range from 29.7% (Waldner-Haugrud, Gratch, & Magruder, 1997) to 78.0% (Pantalone, Schneider, Valentine, & Simoni, 2012). Specifically, lifetime prevalence varies considerably from 13.0% to 38.1% for physical IPV (Rhodes, McCoy, Wilkin, & Wolfson, 2009), from 12.0% to 30.4% (Pantalone et al., 2012) for sexual IPV, and from 5.4% (Tjaden, Thoennes, & Allison,

[1]New York University, New York, NY, USA

Corresponding Author:
Dustin T. Duncan, New York University School of Medicine, Department of Population Health, Spatial Epidemiology Lab, 227 East 30th Street, Room 621, New York, NY 10016, USA.
Email: dustin.duncan@nyumc.org

1999) to 73.2% (Pantalone et al., 2012) for emotional/psychological IPV.

While few studies have examined relationships between experiences of IPV and health behaviors among MSM, there is evidence that supports a relationship between experiences of IPV and the increased use of a variety of substances (Bimbi, Palmadessa, & Parsons, 2008; Finneran & Stephenson, 2013; Hughes, McCabe, Wilsnack, West, & Boyd, 2010; Klitzman, Pope, & Hudson, 2014; Stults, Javdani, Greenbaum, Kapadia, & Halkitis, 2015; Tran et al., 2014; Wu et al., 2015). Welles, Corbin, Rich, Reed, and Raj (2011), for example, reported that MSM experiencing IPV as a victim were more likely to have consumed alcohol to intoxication in the preceding month. IPV victimization has also been reported to be associated with the use of "club drugs" (e.g., ecstasy, cocaine, amphetamines) in MSM (Klitzman et al., 2014; Koblin et al., 2006). In contrast, the relationship between experiences of IPV and sexual risk behaviors among MSM is far less researched, and the few studies that have been conducted have produced mixed results. A study by Houston and McKirnan (2007) reports that experiences of IPV in a sample of MSM were associated with increases in condomless anal intercourse, which confers the highest risk for HIV transmission and acquisition. In contrast, Li, Baker, Korostyshevskiy, Slack, and Plankey (2012) do not detect a significant association between IPV and HIV seroprevalence in another sample of MSM.

Geosocial-networking smartphone applications (hereafter referred to as "apps") are a unique context to evaluate experiences of IPV in relation to substance abuse and sexual risk behaviors among MSM. At the same time, they might themselves increase the risk of becoming a victim of IPV. Indeed, through the use of global positioning system technology, these new technologies have generated quicker and easier ways for MSM to meet potential partners because users can scan the nearby area, chat with other users, and meet them, often for relatively anonymous sexual encounters (Beymer et al., 2014; Landovitz et al., 2013; Winetrobe, Rice, Bauermeister, Petering, & Holloway, 2014). MSM may enter relationships of varying degrees of emotional and physical intimacy and of varying durations with individuals met on these apps, potentially placing them at risk for IPV and concomitant health issues, such as substance abuse. For example, in the context of a casual sexual encounter, MSM can invite a relative stranger into their home and become a victim of sexual assault. Importantly, previous research reports that MSM often use more than one app and use these apps predominantly to seek casual sexual partners (Goedel & Duncan, 2015), which may increase their exposure to other men and their likelihood of being victimized in a variety of ways. MSM who use apps have been reported to more frequently engage in risk behaviors (e.g., condomless sexual behaviors, substance abuse) compared with those who utilize general online social networking tools (Sanchez, Sineath, Kahle, Tregear, & Sullivan, 2015).

Despite the ubiquity of app use among MSM (Beymer et al., 2014), no studies have examined experiences of IPV among MSM who regularly use apps to meet sexual and/or romantic partners, including the relationship of IPV to substance abuse and sexual risk behaviors. Therefore, the purpose of the current study was to investigate relationships between experiences of IPV, substance abuse, and sexual risk behaviors among a sample of MSM on Grindr, the most commonly used of these apps among MSM (Beymer et al., 2014; Landovitz et al., 2013). In doing so, this study contributes to the existing literature in several important ways. First, data are drawn from a racially/ethnically diverse sample of app-using MSM, whereas some other studies have focused on specific racial/ethnic subpopulations of MSM whose app usage was unknown (Feldman, Díaz, Ream, & El-Bassel, 2008; Tran et al., 2014; Wu et al., 2015). Second, as findings of previous studies examining relationships between experiences of IPV and sexual behaviors are mixed, this study contributes additional evidence about these potentially important associations. In addition, this study evaluates multiple dimensions of IPV victimization, including physical, sexual, financial, and psychological forms of IPV, whereas many other studies have only examined physical and sexual forms of IPV (Finneran & Stephenson, 2013). Finally, by assessing associations between experiences of IPV and two important negative health outcomes among MSM (substance abuse and sexual risk behaviors), this study adds support to previous studies of MSM that suggest that multiple synergistic mental and physical factors disproportionally and adversely impair the health of gay, bisexual, and other MSM (Stall et al., 2003; Stall, Friedman, & Catania, 2008).

Method

Study Sample

This study utilized broadcast advertisements on Grindr to recruit participants. Consistent with previous research (Burrell et al., 2012; Goedel & Duncan, 2015; Rendina, Jimenez, Grov, Ventuneac, & Parsons, 2014), users were shown an advertisement with text encouraging them to click through the advertisement and complete the survey the first time they logged into the application. Advertisements were shown over the course of two 15-hour time periods (5:00 AM-8:00 PM) on two consecutive days in March 2015 in the New York City metropolitan area. This setting was selected specifically because the largest number of Grindr users in the United States and second largest number of Grindr users

worldwide are found there (Rendina et al., 2014). All users were alerted that their completion of the survey would enter them into a lottery to win an iPad Air.

In total, 380 users clicked through the advertisement, 298 users (78.4%) provided informed consent and began the survey, and 175 completed the survey (46.1%). Response rates utilizing broadcast advertisements exclusively for recruitment purposes have previously ranged from 15.2% (Goedel & Duncan, 2015) to 31.9% (Rendina et al., 2014), suggesting that the response rate for this study is better than many existing Grindr studies. The survey contained 43 items and it took an average of 10.67 minutes for a user to complete it ($SD = 8.50$). All respondents reported being at least 18 years old at the time of survey administration. Protocols for this research were approved via institutional review prior to data collection.

Measures

Experiences of Intimate Partner Violence Victimization. Participants were asked to select from a list of six yes-no statements on experiences with IPV in their lifetime, including physical IPV ("I have been physically abused [i.e., hit, kicked, or physically harmed] by an intimate sexual partner"), sexual IPV ("I have been sexually abused [i.e., raped or forced to have sex against my will] by an intimate sexual partner"), emotional IPV ("I have been emotionally abused [i.e., verbally attacked, put down] by an intimate sexual partner"), financial IPV ("I have been financially abused [i.e., had my bank accounts controlled] by an intimate sexual partner"), isolation IPV ("I have been isolated from others by an intimate sexual partner"), and intimidation IPV ("I have been intimidated by or made afraid of an intimate sexual partner"). In addition, the reported experiences of IPV victimization (any vs. none), the primary predictor variable), were recoded as one binary variable. These items were adapted from prior work assessing IPV in MSM (Houston & McKirnan, 2007).

The last four items (emotional, financial, isolation, intimidation) were also grouped as psychological IPV. To confirm that responses to these four items collectively capture the construct "psychological IPV," a single factor confirmatory factor analysis was conducted. To account for the fact that item responses were binary, a logit model with maximum likelihood estimation with robust standard errors (MLR) was employed using M*plus*. The single factor model fit the data well, as indicated by a nonsignificant chi-square test of model fit, $\chi^2(7) = 1.23$, $p = .990$. In addition, all four items loaded strongly and highly significantly on the psychological IPV latent factor, suggesting that taken together, these items operate as a good measure of psychological IPV. Standardized factor loadings are reported in Table 1.

Table 1. Standardized Factor Loadings for Psychological IPV, From a Single-Factor Confirmatory Factor Analysis Using MLR Estimation.

IPV item	Standard loading (*p*)
Emotional	.906 (<.001)
Financial	.587 (.002)
Isolation	.750 (<.001)
Intimidation	.572 (<.001)

Note. IPV = intimate partner violence.

Substance Abuse. Past month alcohol use was assessed in one item asking on how many days the individual had consumed five or more alcoholic drinks in a row in the past 30 days, with options including 0 days, 1 or 2 days, 1 day, 2 or 3 days, 4 to 5 days, 6 to 9 days, 10 to 19 days, and 20 or more days throughout the preceding month. Recent alcohol use (irrespective of the frequency) was coded as a dichotomous variable (0 days vs. 1 or more days). Past month drug use was assessed in one item: "During the past 30 days, have you used any of the following substances recreationally?" Participants were asked to select from a list including marijuana, cocaine, methamphetamine, ecstasy, GHB (gamma-hydroxybutyric acid), crack cocaine, heroin, LSD (lysergic acid diethylamide), mushrooms, ketamine, poppers, stimulants (e.g. amphetamine), erectile enhancers (e.g., sildenafil), and prescription painkillers (e.g., oxycodone) to indicate their recent drug use. Recent drug use was dichotomized (any vs. none) for all drugs (excluding marijuana) and for all drugs (including marijuana).

Sexual Risk Behaviors. Sexual behaviors in the past 3 months were assessed in eight items. First, participants indicated the total number of partners with whom they had receptive anal intercourse (RAI), with how many of these partners condoms had not been used (condomless receptive anal intercourse), and how many of these partners had been met on apps. Second, participants indicated the total number of partners with whom they had insertive anal intercourse (IAI), with how many of these partners condoms had not been used (condomless insertive anal intercourse), and how many of these partners had been met on apps. Finally, participants indicated the total number of partners with whom they had any type of oral sex and how many of these partners had been met on apps.

Other Variables. Age was measured in years and categorized as 18 to 24 years old, 25 to 30 years old, 31 to 40 years, 41 to 50 years old, and 51 to 60 years old. Race/ethnicity was categorized as White, Black/African American, Hispanic/Latino, Asian/Pacific Islander, and multiracial/other. Sexual orientation was categorized as gay, bisexual, straight, or other. Educational attainment was

categorized as having completed less than 12th grade, high school (or equivalent), some college, having obtained a 4-year college/university degree, or having obtained a master's degree or higher. Individual income in the past year was categorized as less than $25,000; $25,000 to $49,999; $50,000 to $74,999; and $75,000 or higher.

Data Analysis

Descriptive statistics were computed for sample demographics as well as for the prevalence of experiences of IPV, substance abuse, and sexual risk behaviors. After this, bivariable associations between IPV and (a) substance abuse and (b) sexual risk behaviors were assessed. Subsequently, multivariable regression models were fit to examine relationships between IPV, substance abuse, and sexual risk behaviors while controlling for age, race/ethnicity, sexual orientation, education, and income. Specifically, logistic regression models were used to evaluate associations between IPV and substance abuse, whereas negative binomial regression models were used to evaluate associations between IPV and sexual risk behaviors while controlling for the sociodemographic characteristics. As for the former, logistic regression (yielding odds ratios [*OR*s]) was used because recent alcohol and drug use were coded as dichotomous outcome variables. For the latter, negative binomial regression models (yielding incidence rate ratios [IRRs]) were used because the numbers of partners for each of the sexual risk behaviors were count variables, and were overdispersed with regard to the mean and variance and the distribution of residuals was close to normality (Hilbe, 2011). Statistical significance was determined at a significance level of $p < .05$. All analyses were conducted in IBM SPSS Version 21.0 (IBM Corporation, Armonk, New York).

Results

Sociodemographic Characteristics

Sociodemographic characteristics of the sample are reported in Table 2. Almost 40% ($n = 66$) were between 18 and 24 years old. The sample was racially and ethnically diverse: Almost 40% ($n = 69$) were White, approximately 30% ($n = 50$) were Hispanic, and approximately 15% were Black ($n = 25$). Just over half (55%, $n = 96$) graduated from college and 40% ($n = 70$) had an annual income of less than $25,000. Almost 85% ($n = 146$) reported identifying as gay.

Prevalence of Substance Abuse and Sexual Risk Behaviors

Self-reported substance abuse reported in the sample is described in Table 3. Almost 65% ($n = 111$) reported binge drinking on five or more alcoholic drinks in a row on at least one day in the previous month. Marijuana (34.9%, $n = 61$) and inhalant nitrites (17.1%, $n = 30$) were the most commonly used drugs in the past month. Table 4 describes the sexual risk behaviors reported by the respondents. The average number of partners in the previous 3 months varied by sexual behavior and, importantly, by whether the partners were met on apps or not. For example, the mean total number of RAI partners in the prior 3 months was 2.46 ($SD = 4.09$; median = 1.00; interquartile range = 3.00), whereas the mean number of RAI partners met on apps in the past 3 months was 1.75 ($SD = 3.24$; median = 1.00; interquartile range = 2.00).

Table 2. Sample Demographics.

	% (*n*)
Age group	
18 to 25 years	38.2 (66)
26 to 30 years	18.5 (32)
31 to 40 years	28.3 (49)
41 to 50 years	10.4 (18)
51 to 60 years	4.6 (8)
Race/ethnicity	
White/Caucasian	39.9 (69)
Black/African American	14.5 (25)
Hispanic/Latino	28.9 (50)
Asian/Pacific Islander	9.2 (16)
Multiracial/other	7.5 (13)
Sexual orientation	
Gay	84.9 (146)
Bisexual	10.5 (18)
Other	4.6 (8)
Education	
High school diploma or less	11.5 (20)
Some college	32.9 (57)
Bachelor's degree or higher	55.5 (96)
Annual income (past year)	
Less than $25,000	40.2 (70)
$25,000 to $49,999	29.9 (52)
$50,000 to $74,999	13.2 (23)
$75,000 or higher	16.7 (29)

Prevalence of Intimate Partner Violence

Descriptive statistics for IPV variables are displayed in Table 5. Prevalence rates for experiences of IPV victimization varied by form, where 24% ($n = 42$) reported having been a victim of emotional IPV in their lifetime, followed by 11.4% ($n = 20$) reporting having been a victim of sexual IPV. The least commonly reported form of IPV was financial IPV, with a prevalence of 4.6% ($n = 8$). Overall, over one third (37.7%, $n = 66$) of respondents reported having been the victim of at least one form of IPV in their lifetimes.

Table 3. Substance Use Behaviors.

	% (*n*)
Past month alcohol use	
>Five drinks on 0 days	36.2 (63)
>Five drinks on 1 or more days	63.8 (111)
Past month drug use	
Marijuana	34.9 (61)
Cocaine	9.1 (16)
Methamphetamine	2.9 (5)
Ecstasy	4.6 (8)
GHB (gamma-hydroxybutyric acid)	2.9 (5)
Heroin	0.6 (1)
LSD (lysergic acid diethylamide)	1.1 (2)
Ketamine	2.9 (5)
Inhalant nitrites	17.1 (30)
Prescription stimulants	5.1 (9)
Prescription erectile enhancers	8.0 (14)
Prescription painkillers	6.3 (11)

Table 4. Recent Sexual Behaviors.

	M (*SD*)	*Mdn* (IQR)
Number of partners for receptive anal intercourse	2.46 (4.09)	1.00 (3.00)
Number of partners for condomless receptive anal intercourse	1.76 (2.35)	0.00 (1.00)
Number of app-met receptive anal intercourse partners	1.07 (2.45)	1.00 (2.00)
Number of partners for insertive anal intercourse	3.48 (8.62)	1.00 (3.00)
Number of partners for condomless insertive anal intercourse	2.59 (6.92)	0.00 (1.00)
Number of app-met insertive anal intercourse partners	1.46 (6.27)	1.00 (3.00)
Number of partners for oral sex	6.85 (11.85)	4.00 (6.00)
Number of app-met partners for oral sex	5.46 (11.41)	3.00 (5.00)

Note. IQR = interquartile range.

Associations Between IPV, Substance Use, and Sexual Risk Behaviors

Multivariable associations (adjusted for age, race/ethnicity, sexual orientation, education, and income) between IPV and substance use behaviors are reported in Table 6. In multivariable models, a marginal association between IPV and illicit drug use was identified; those with at least one instance of IPV were 1.78 times (95% confidence interval [CI 0.97, 1.06]; $p = .095$) more likely to engage in illicit drug use (including marijuana).

Table 5. Intimate Partner Violence (IPV) Prevalence Rates.

	% (*n*)
Overall experiences of IPV	
Reported no experiences of IPV	62.3 (109)
Reported any experience of IPV	37.7 (66)
Individual forms of IPV	
Physical IPV	10.3 (18)
Sexual IPV	11.4 (20)
Emotional IPV	24.0 (42)
Financial IPV	4.6 (8)
Isolation IPV	5.1 (9)
Intimidation IPV	9.7 (17)

Associations between IPV and sexual risk behaviors are reported in Table 7. With regard to the numbers of partners with whom they had RAI, having experienced any form of IPV victimization was associated with a higher total number of partners (IRR = 1.72; 95% CI [1.10, 2.68]; $p = .017$) and a higher number of partners with whom condoms were not used (IRR = 1.80; 95% CI [1.03, 3.14]; $p = .040$). Similarly, for the numbers of partners with whom the respondent had IAI, having experienced any form of IPV victimization was associated with a higher number of partners with whom condoms were not used (IRR = 1.61; 95% CI [1.00, 2.58]; $p = .049$). In addition, having experienced any form of IPV victimization was associated with a higher total number of partners for oral sex (IRR = 1.47; 95% CI [1.07, 2.02]; $p = .017$) and a higher number of app-met partners for oral sex (IRR = 1.63; 95% CI [1.13, 2.33]; $p = .008$).

Focusing specifically on the composite variable of psychological IPV also revealed many associations with sexual risk behaviors (results reported in Table 8). There were no significant associations between this composite variable and substance abuse. In multivariable models related to the numbers of partners with whom the respondent was the receptive partner, experiencing psychological IPV victimization was associated with a higher total number of partners (IRR = 1.83; 95% CI [1.15, 2.91]; $p = .010$) and a higher number of partners with whom condoms were not used (IRR = 1.88; 95% CI [1.07, 3.37]; $p = .029$). In multivariable models related to the numbers of partners with whom the respondent was the insertive partner, experiencing any psychological IPV victimization was associated with a higher number of partners (IRR = 1.78; 95% CI [1.10, 2.89]; $p = .019$), a higher number of partners with whom condoms were not used (IRR = 2.00; 95% CI [1.05, 3.78]; $p = .034$), and a higher number of app-met partners (IRR = 2.17; 95% CI [1.22, 3.86]; $p = .009$). In addition, experiencing psychological IPV victimization was associated with a higher total number of partners for oral sex (IRR = 1.64; 95% CI [1.19, 2.27]; $p = .003$) and a higher number of app-met

Table 6. Unadjusted and Adjusted Associations Between Lifetime Experiences of Any Form of IPV Predicting Substance Abuse Behaviors, Using Logistic Regression.

	Reported IPV (unadjusted)	Reported IPV (adjusted)
	OR [95% CI]	*OR* [95% CI]
Drank five or more drinks in a row within a few hours, past 30 days	1.10 [0.58, 2.08]	0.90 [0.42, 1.91]
Used recreational drugs (including marijuana), past 30 days	2.11 [1.13, 3.93]*	1.78 [0.97, 1.06]†
Used recreational drugs (not including marijuana), past 30 days	1.82 [0.96, 3.48]†	1.71 [0.85, 3.45]
Used marijuana, past 30 days	1.89 [1.00, 3.57]*	1.60 [0.78, 3.23]

Note. IPV = intimate partner violence; *OR* = odds ratio; CI = confidence interval. Adjusted for age, race/ethnicity, sexual orientation, education, and income.
*$p < .05$. †$p < .10$.

Table 7. Unadjusted and Adjusted Associations Between Lifetime Experiences of Any Form of IPV Predicting Sexual Risk Behaviors, Using Negative Binomial Regression.

	Reported IPV (unadjusted)	Reported IPV (adjusted)
	IRR [95% CI]	IRR [95% CI]
Number of RAI partners	1.46 [0.94, 2.28]†	1.72 [1.10, 2.68]*
Number of CRAI partners	1.39 [0.78, 2.47]	1.80 [1.03, 3.14]*
Number of app-met RAI partners	1.27 [0.76, 2.10]	1.46 [0.87, 2.43]
Number of IAI partners	1.50 [0.95, 2.38]†	1.61 [1.00, 2.58]*
Number of CIAI partners	2.61 [1.43, 4.76]*	2.10 [1.12, 3.93]*
Number of app-met IAI partners	2.00 [1.18, 3.40]*	1.92 [1.09, 3.37]*
Number of oral sex partners	1.47 [1.08, 2.00]*	1.47 [1.07, 2.02]*
Number of app-met oral sex partners	1.72 [1.20, 2.46]*	1.63 [1.13, 2.33]*

Note. IPV = intimate partner violence; RAI = receptive anal intercourse; CRAI = condomless receptive anal intercourse; IAI = insertive anal intercourse; CIAI = condomless insertive anal intercourse; IRR = incident rate ratio; CI = confidence interval. Adjusted for age, race/ethnicity, sexual orientation, education, and income.
*$p < .05$. †$p < .10$.

Table 8. Unadjusted and Adjusted Associations Between Lifetime Experiences of Psychological IPV Predicting Sexual Risk Behaviors, Using Negative Binomial Regression.

	Reported psychological IPV (unadjusted)	Reported psychological IPV (adjusted)
	IRR [95% CI]	IRR [95% CI]
Number of RAI partners	1.51 [0.95, 2.39]†	1.83 [1.15, 2.91]*
Number of CRAI partners	1.45 [0.80, 2.64]	1.90 [1.07, 3.37]*
Number of app-met RAI partners	1.24 [0.73, 2.11]	1.52 [0.89, 2.58]
Number of IAI partners	1.81 [1.12, 2.90]*	1.78 [1.10, 2.89]*
Number of CIAI partners	2.96 [1.60, 5.45]*	2.00 [1.05, 3.78]*
Number of app-met IAI partners	2.40 [1.40, 4.13]*	2.17 [1.22, 3.86]*
Number of oral sex partners	1.65 [1.20, 2.27]*	1.64 [1.19, 2.27]*
Number of app-met oral sex partners	1.94 [1.34, 2.81]*	1.82 [1.26, 2.63]*

Note. IPV = intimate partner violence; RAI = receptive anal intercourse; CRAI = condomless receptive anal intercourse; IAI = insertive anal intercourse; CIAI = condomless insertive anal intercourse; IRR = incident rate ratio; CI = confidence interval. Adjusted for age, race/ethnicity, sexual orientation, education, and income.
*$p < .05$. †$p < .10$.

partners for oral sex (IRR = 1.82; 95% CI [1.26, 2.63]; $p = .001$).

Furthermore, individual IPV experiences were also associated with high odds substance abuse and sexual risk behaviors (detailed results not reported but available on request). For instance, physical IPV was associated high odds of substance abuse (excluding marijuana use) in the prior 30 days (*OR* = 2.08; 95% CI [1.03, 9.22]; $p = .044$). Sexual IPV was associated with higher odds of substance abuse (excluding marijuana use) in the prior 30 days (*OR* = 3.36; 95% CI [1.11, 10.18]; $p = .032$). Likewise, intimidation IPV was also associated with higher odds of any substance abuse (including marijuana use) in the prior 30 days (*OR* = 4.09; 95% CI [1.04, 16.07]; $p = .044$).

Physical IPV was specifically associated with a higher total number of partners with whom the participant had RAI (IRR = 3.02; 95% CI [1.32, 6.91]; $p = .009$). Emotional IPV was positively associated with several sexual behaviors, including the number of partners with whom the participant had IAI (IRR = 1.87; 95% CI [1.10, 3.15]; $p = .020$), IAI without a condom (IRR = 2.29; 95% CI [1.13, 4.63]; $p = .021$), and oral sex (IRR = 1.83; 95% CI [1.29, 2.61]; $p = 001$), as well as with the number of app-met partners for oral sex in the previous 3 months (IRR = 1.86; 95% CI [1.24, 2.79]; $p = .003$). Isolation IPV was associated with a higher total number of partners for RAI (IRR = 4.24; 95% CI [1.63, 11.04]; $p = .003$), RAI without a condom (IRR = 4.23; 95% CI [1.21, 14.74]; $p = .023$), and a higher number of partners for RAI whom respondents met through an app (IRR = 5.18; 95% CI [1.81, 14.84]; $p = .002$). Likewise, intimidation IPV was positively associated with the number of partners for RAI (IRR = 3.44; 95% CI [1.81, 6.55]; $p < .001$), RAI without a condom (IRR = 3.45; 95% CI [1.64, 7.11]; $p = .001$), and a higher number of partners for RAI whom respondents met through an app (IRR = 2.25; 95% CI [1.05, 4.79]; $p = .036$).

Discussion

In this study, relationships between experiences of IPV victimization, substance abuse, and sexual risk behaviors were examined in a sample of geosocial-networking app-using MSM. This study demonstrates that IPV victimization is prevalent in this sample, where 37.7% reported having experienced at least one form of IPV victimization in their lifetimes. IPV victimization was associated with higher odds of more frequent substance abuse and sexual risk behaviors.

Recent research has made use of web-based online survey methods (Stephenson & Finneran, 2013) and social networking websites (Stephenson, de Voux, & Sullivan, 2011; Stephenson, Khosropour, & Sullivan, 2010) to assess experiences of IPV among MSM, but this is the first study to leverage a geosocial-networking smartphone application to investigate patterns of IPV among MSM. This distinction is important because the use of apps is highly prevalent among MSM, thereby facilitating relationships of varying degrees of emotional and physical intimacy and of varying durations, which potentially place MSM at additional risk of experiencing IPV, as well as of engaging in riskier sexual behaviors (Sanchez et al., 2015). Therefore, this study adds to previous research (Goedel & Duncan, 2015) by supporting the feasibility of using apps as a tool for both sample recruitment and data collection. Future studies examining IPV, substance use, and sexual risk behaviors among MSM may benefit greatly by utilizing this sampling method.

Although there are no standard measures of IPV, these findings are comparable to those reported in previous research. For example, among a sample of young MSM in New York City, IPV was associated with higher odds of two or more instances of alcohol use to intoxication, two or more instances of marijuana use, two or more instances of stimulant use, and two or more instances of other substance use during the preceding month (Stults, Javdani, Greenbaum, Kapadia, et al., 2015). Stall et al. (2003) reported that experiences of IPV were independently associated with polydrug use in a sample of MSM in Chicago, Los Angeles, New York, and San Francisco. Houston and McKirnan (2007) noted that abused men in the Chicago area were more likely to report frequent use of substances before or during sex. Other studies identified a relationship between IPV and drug use in other samples of MSM (Bimbi et al., 2008; Hughes et al., 2010; Klitzman et al., 2014; Koblin et al., 2006; Nieves-Rosa, Carballo-Dieguez, & Dolezal, 2000; Stults, Javdani, Greenbaum, Kapadia, et al., 2015; Tran et al., 2014; Wu et al., 2015).

The findings of this study also support previous research demonstrating the relationship between experiences of IPV and sexual risk behaviors in MSM (Buller, Devries, Howard, & Bacchus, 2014; Feldman et al., 2008; Kalichman et al., 2001; Relf, 2001; Relf, Huang, Campbell, & Catania, 2004; Siemieniuk et al., 2013). For example, in a sample of MSM in Chicago, Mustanski, Newcomb, and Clerkin (2011) identified higher frequencies of condomless anal intercourse in relationships where partners were being forced to have sex. In addition, another study of MSM, also in the Chicago area, reported that abused men were more likely to report having engaged in condomless sex in the previous 6 months (Houston & McKirnan, 2007).

There are several pathways through which experiences of IPV victimization might be related to substance abuse and sexual risk behaviors. For example, alcohol and illicit drugs could be used so as to cope with abusive relationship dynamics. Previous research has demonstrated that

MSM exposed to any form of violence have increased odds of reporting depression-like symptoms (Buller et al., 2014). Similarly, violent relationship dynamics may make it more difficult for MSM to negotiate safer sex practices (e.g., condom use). Conversely, sexual encounters with app users frequently occur in relative anonymity, possible making forced or coerced condomless intercourse more likely.

Future Research Directions

Given the high prevalence rates and meaningful associations described in this study, further studies of IPV experiences among MSM are warranted. Research involving larger sample sizes and defined clinical outcomes would advance the field by informing researchers and clinicians about predictors and correlates of IPV in this population. Future studies should include objective measures such as clinically confirmed STIs along with urine or blood tests to objectively evaluate substance abuse. Also, future studies with larger samples would be able to examine subgroup effects that may be helpful in designing interventions and clinical guidelines for recognizing and preventing and recognizing IPV. For example, studies could examine racial/ethnic differences in the prevalence of IPV victimization and perpetration as well as their associations with substance abuse and sexual risk behaviors. Additionally, researchers should consider including measures to assess the cost of care and hospitalization rates due to IPV, substance abuse, and sexual risk behaviors. Finally, longitudinal studies may strengthen the ability to establish causality underlying the associations between IPV, substance abuse, and sexual risk behaviors.

Study Implications

The results of this study have significant implications for both research and practice. They suggest that health and social work professionals—including primary care providers, gay-related organizations, and HIV/STI testing sites—should incorporate assessments of IPV in their standard care protocols for MSM. This appears crucial because previous research has reported that MSM may be reluctant to seek help from agencies that are traditionally used by women who are victims of IPV and that these agencies may not be prepared to assist men or regard them as a priority (Merrill & Wolfe, 2000). Providers at locations that serve MSM should be informed about the potential for co-occurrence of IPV with substance use and sexual risk behaviors. Moreover, this study, along with previous research, suggests that utilizing apps may be an effective method of sampling MSM to investigate sensitive issues that may be difficult to assess otherwise due to scheduling or budgetary constraints, or reporting bias.

Given the relatively high prevalence of IPV victimization and its associations with substance abuse and sexual risk behaviors, these findings suggest that IPV screening and prevention programs may reduce substance abuse and sexual risk behaviors in the population. It may be possible to deliver IPV awareness information and prevention interventions on apps like Grindr through short broadcast advertisements.

Study Limitations

The above findings should be considered in light of their limitations. First, generalizability may be limited, as this study was conducted among MSM in New York City on one particular geosocial-networking application (i.e., Grindr). Given that this is a relatively small nonprobability sample (n = 175) with a relatively low to moderate response rate (46.1%), the sample is likely biased to a certain degree by self-selection. While this response rate is higher than in previous studies using Grindr (Goedel & Duncan, 2015; Rendina et al., 2014), there is, on the other hand, some evidence that respondents recruited through apps are more likely than those using general social-networking sites to report substance abuse and condomless anal intercourse (Sanchez et al., 2015). However, New York City is home to nearly one fifth of Grindr users in the United States (Rendina et al., 2014) and this is the first study to examine relationships between experiences of IPV, substance abuse, and sexual risk behaviors among any sample of MSM who use geosocial-networking applications. Still, differences may exist between the application-using population in New York City and elsewhere, which may limit the generalizability of this study. Specifically, app use, IPV, and risk behaviors among MSM in less urban areas might be different. Likewise, the generalizability of this study may have been limited by only using one geosocial-networking application for recruitment, as differences among users of different apps may exist. Notably, the response rate in this study was higher than in other Grindr studies. Perhaps this is due to the use of an incentive. As discussed previously, all participants were made aware that their completion of the survey enrolled them in a lottery to win a new iPad Air. Alternatively, this might be due to the brevity of the survey used, allowing for more complete responses in a short amount of time.

Moreover, some of this study's findings, should be interpreted with caution because percentages of IPV prevalence may be affected by subjective conceptualizations of IPV (Stephenson & Finneran, 2013). For example, measures that include items assessing various discreet behaviors, rather than participants' global perceptions of abuse, might provide higher estimates of IPV prevalence (Stults, Javdani, Greenbaum, Barton, et al., 2015). On the

other hand, misclassification of substance abuse and sexual risk behaviors due to reporting bias is likely to be low because the questionnaire was administered anonymously using smartphones and tablets.

Finally, residual confounding might be a concern. This relatively short survey, which was intentionally limited to about 43 items to increase response rates, might have missed important confounding variables (e.g., childhood maltreatment and depressive symptoms) that could not be controlled for in the multivariable regression models. Additionally, the measures of IPV victimization used in the survey were relatively crude and may not capture the frequency, duration, and severity of these experiences; nor did these measures evaluate the number of partners who victimized the respondent. In addition, they focused solely on victimization, rather than both on victimization and perpetration. The recruiting window (5:00 AM to 8:00 PM) may have missed MSM who use the app in the evening, who might exhibit difference behaviors related to substance abuse and sexual risk (Goedel & Duncan, 2015). Finally, this is a cross-sectional analysis and as such, the study design precludes any causal inference.

Conclusion

This study, which is the first of its kind, suggests that IPV is positively associated with both substance abuse and sexual risk behaviors in a sample of geosocial-networking app-using MSM. IPV screening and prevention programs could result in reductions in both substance abuse and sexual risk behaviors among MSM.

Acknowledgments

Dustin T. Duncan and William C. Goedel contributed equally. We thank the participants of the study who contributed to this project.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: Dustin T. Duncan was supported by his New York University School of Medicine Start-Up Research Fund to work on this project. This work was supported by an individual research grant from the New York University College of Arts and Science Dean's Undergraduate Research Fund (Principal Investigator: William C. Goedel).

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