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A Syndemic Model of Exchange Sex Among HIV-Positive Men Who Have Sex With Men

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Abstract

Exchange sex is a behavior associated with HIV transmission risk among men who have sex with men (MSM). Few studies have examined exchange sex among HIV-positive MSM. We utilize a syndemic framework to account for co-occurring psychosocial problems that suggest the presence of intertwining epidemics (i.e., syndemics), which have not been examined within the context of exchange sex among HIV-positive MSM. In 2015, MSM were recruited via online sexual networking Web site and app advertisements for Sex Positive![+], a video-based online intervention that aimed to improve health outcomes for men living with HIV. Participants completed surveys every three months for a year. Surveys covered demographics, drug use, exchange sex, intimate partner violence (IPV), and past 2-week depressive symptoms. We conducted three logistic regression models to assess syndemic factors associated with exchange

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Ethical Approval The Institutional Review Board at Public Health Solutions approved all study procedures.

Informed Consent Participants provided consent by clicking a button at the end of an online consent form to indicate that they had read the consent page and agreed to participate. A Certificate of Confidentiality was obtained from the National Institute of Mental Health to protect the privacy of HIV-positive participants enrolled in this study.

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sex in the past 3 months. Of the 722 HIV-positive MSM included in the sample, 59 (8%) reported exchange sex in the past 3 months at 12-month follow-up. HIV-positive MSM who had more syndemic factors had greater odds of exchange sex. Exchange sex was associated with being African-American/Black, age 18–29 years, past and present experiences with IPV, stimulant use, polysubstance use, and depressive symptoms. Exchange sex was associated with multiple psychosocial factors, indicating exchange sex may be part of a syndemic involving substance use, depression, HIV, and IPV. Interventions should address the social and behavioral circumstances that perpetuate environments that can foster multiple negative health outcomes.

Keywords

HIV; Men who have sex with men; Drug use; Syndemic; Sexual orientation

Introduction

Exchange sex (i.e., selling sex for money, drugs, a place to stay, or other survival needs) is a behavior that is associated with some negative health outcomes, including HIV acquisition and transmission (Bacon et al., 2006; Javanbakht, Ragsdale, Shoptaw, & Gorbach, 2019; Oldenburg, Perez-Brumer, Reisner, & Mimiaga, 2015). Most research on exchange sex has focused on women (Walters et al., 2019), while considerably less has been published on sex work among gay, bisexual, and other men who have sex with men (MSM), who are disproportionately impacted by HIV. In 2017, MSM accounted for 70% of new HIV infections; in 2016, 72% of those living with HIV were attributed to male-to-male sexual contact (CDC, 2017). Importantly, MSM who engage in exchange sex face additional risks of acquiring and/or transmitting HIV and are more likely to have a recent sexually transmitted infection (STI) diagnosis, report polydrug use, and report having six or more male anal sex partners in the past 60 days (Bond et al., 2019).

A recent cross-sectional surveillance study sampling MSM in 20 U.S. metropolitan areas reported 7% of MSM engaged in exchange sex (Nerlander et al., 2017), while an online study of MSM found that 12.5% reported past 60-day exchange sex (Bond et al., 2019). Another cross sectional respondent-driven sampling study sampling men who injected drugs found that 15% of heterosexually identified men and 60% of gay and bisexually identified men reported exchange sex, suggesting that MSM who inject drugs may be more likely to exchange sex than those who do not inject drugs (Walters et al., 2018). Sexual identity seems to be an important factor in relation to exchange sex. For example, research has found bisexual men to have a higher prevalence of exchange sex, compared to both heterosexual MSM and gay MSM (Friedman & Dodge, 2016). However, most studies do not disaggregate between gay or bisexual men (Bostwick & Dodge, 2019).

Finally, studies focusing on exchange sex among MSM have shown it to be associated with intimate partner violence (IPV) (Wheeler, Anfinson, Valvert, & Lungo, 2014; Williams, Dangerfield, Kral, Wenger, & Bluthenthal, 2019), African-American/Black and/or Hispanic/Latino race/ethnicity, poverty and/or unstable housing (Javanbakht et al., 2019), injection drug use (Nerlander et al., 2017), and polydrug use and use of certain drugs such as

methamphetamine (Bull, Piper, & Rietmeijer, 2002). In terms of IPV, MSM who experienced IPV were more likely to exchange sex, report drug use, experience depression, be HIV positive, and have engaged in recent condomless anal sex (Buller, Devries, Howard, & Bacchus, 2014; Duncan et al., 2018). In addition, researchers found that MSM who injected drugs experienced IPV at higher rates than MSM who do not inject drugs (Ghanem et al., 2011). All told, the literature suggests that there is a clustering effect of HIV, drug use, IPV, race/ethnicity, and lower annual income among MSM, which may impact rates of exchange sex.

Theoretical Framework: Syndemics

Syndemics, defined as the population-level clustering of two or more health problems, are characterized by reciprocally enhancing, synergistic effects, so that the presence of each factor amplifies the negative effects of the others (Singer, Bulled, Ostrach, & Mendenhall, 2017). Syndemics are most likely to emerge under, and be perpetuated by, conditions of inequality and structural disadvantage (Singer et al., 2017). Therefore, key to the syndemic theory is the interaction between biological diseases and their social environments (Wright, Carnes, & Colón-Diaz, 2016). For this reason, marginalized populations (e.g., the socioeconomically deprived) are particularly vulnerable to syndemic conditions.

The SAVA (substance abuse, violence, and HIV/AIDS) syndemic is likely the most established syndemic in the literature (Parsons, Grov, & Golub, 2012; Parsons et al., 2017; Parsons, Rendina, Moody, Ventuneac, & Grov, 2015; Singer, 1996). For example, both lifetime and recent IPV have been associated with greater HIV incidence among MSM (Buller et al., 2014), and MSM who experience IPV are more likely to engage in risk behaviors (e.g., condomless sex) than those who have not experienced IPV (Buller et al., 2014; Feldman, Díaz, Ream, & El-Bassel, 2007; Stephenson & Finneran, 2017; Stults, Javdani, Greenbaum, Kapadia, & Halkitis, 2016). Highlighting the potential synergy between drug use, violence, and HIV, research has shown that MSM who experience IPV are also more likely to engage in alcohol and/or drug use, including injection drug use, compared to MSM who have not experienced IPV (Buller et al., 2014; Ghanem et al., 2011; Houston & McKirnan, 2007; Stults et al., 2015).

The synergistic co-occurrence of these psychosocial concerns increases risk of negative health outcomes. Research has demonstrated that the SAVA syndemic is positively associated with condomless anal sex (including with partners of unknown or discordant status) (Biello, Colby, Closson, & Mimiaga, 2014; Dyer et al., 2012; Mustanski, Garofalo, Herrick, & Donenberg, 2007; Mustanski et al., 2017; Stall et al., 2003), as well as having multiple anal sex partners (Mustanski et al., 2007). The SAVA syndemic has also been linked to depression among MSM (Dyer et al., 2012), with several studies demonstrating that depression is associated with increased sexual risk behaviors (Fendrich, Avci, Johnson, & Mackesy-Amiti, 2013; Reisner et al., 2009). In addition, child sexual abuse has been identified as a syndemic factor that increases HIV risk (Stall et al., 2003).

Psychosocial syndemics have been positively associated with HIV incidence and prevalence among MSM (Guadamuz et al., 2014; Jie, Ciyong, Xueqing, Hui, & Lingyao, 2012) as well as poor antiretroviral therapy (ART) adherence (Blashill et al., 2015). In addition, research

has demonstrated an association between syndemic conditions, such as depression, substance use, and sexual behaviors, and suboptimal viral suppression among MSM (Friedman et al., 2015; Prabhu et al., 2020).

Although individual syndemic components (e.g., drug use, violence) have been linked to exchange sex among MSM (Baral et al., 2015), there is little research focusing on HIV-positive MSM, exchange sex, and syndemics, especially using national data (Parsons et al., 2017). Furthermore, most research conducted on exchange sex among MSM has not explicitly examined HIV-positive MSM, but rather HIV-negative MSM (Bacon et al., 2006; Weber et al., 2001).

HIV-positive MSM may have experiences related to their HIV status that impacts the likelihood of exchange sex, and it is therefore critical to examine exchange sex among this population. At the same time, the field has yet to agree on the appropriate method for operationalizing syndemics (Tsai & Burns, 2015; Tsai & Venkataramani, 2016). In this exploratory study, we sought to identify associations of exchange sex among HIV-positive MSM, with a focus on syndemics as a theoretical framework, which included experiences with IPV and drug use. We report findings from an online U.S. sample of MSM living with HIV and constructed similar syndemic analyses to a previous study conducted by Stall et al. (2003).

Method

Participants

Data for this study are from a 12-month, online video-based intervention, Sex Positive![+], which aimed to improve health outcomes for men living with HIV (Hirshfield et al., 2016). To address the low participation of minority MSM in HIV prevention efforts, the study enrolled a more representative sample by race and ethnicity. In the U.S. HIV epidemic, White, Black, and Hispanic MSM account for approximately 93% of new HIV diagnoses (CDC, 2019). The study also aimed to engage MSM living with HIV with high-risk behaviors. For the above reasons, eligible participants for the online intervention had to: (1) be assigned male at birth and identify their current gender as male; (2) be 18 years or older; (3) report their race or ethnicity as White, Black, or Hispanic; (4) self-report an HIV-positive status; (5) self-report a past year detectable viral load or past month suboptimal ART adherence; (6) self-report serodiscordant condom less anal sex with a male partner in the past 6 months; (7) be able to read and respond in English; (8) reside within the U.S. or U.S. territories; (9) be willing to participate in an online intervention study for 1 year; and (10) have a working e-mail address and cell phone number for intervention follow-up.

Participants were recruited between June and December in 2015. The goal of recruitment was to identify individuals online who were willing to be screened for eligibility to participate in a video-based HIV risk reduction intervention. Quota sampling and targeted recruitment was used to increase representation of Black and Latino MSM as well as men between the ages of 18 and 29 years. This age group is underrepresented in other studies of MSM and HIV among those recently diagnosed as having HIV infection, particularly young men of color, and is less likely to be adherent to HIV medications or in care (Singh et al.,

2014). Participants were recruited through social networking Web sites, sexual partnering and dating Web sites (e.g., BGCLive, POZ Personals), online bulletin boards, and geosocial networking applications for sexual partnering. Based on previous research findings (Sullivan et al., 2011), the targeted recruitment strategy included banner advertisements that mirrored the racial and ethnic composition of each subgroup (i.e., creating advertisements with men of color featured). Banner advertisements, e-mail blasts, and study-related postings to online bulletin boards indicated that this was a study for men living with HIV.

Procedure

The institutional review board at Public Health Solutions approved all study procedures. Potential participants accessed the eligibility survey by clicking on an online study banner advertisement or study invitation link. Eligible individuals were directed to the study landing page and registration platform, which included a description of intervention activities and a consent form.

Measures

Outcome Variable: Exchange Sex—Participants were asked at month 12 “In the last 3 months, were you given anything (money, drugs, a place to stay, etc.) in exchange for sex?” (Yes/No).

Sociodemographic Variables—Sociodemographic variables collected at baseline included race/ethnicity, age, education, and annual income. Annual income was categorized as less than $10,999, $10,000–$19,999, $20,000–$39,999, $40,000–$59,999, and $60,000 or more. We also collected sexual identity (hetero-sexual, gay, bisexual, other) information at month 12.

Psychosocial Health Problems—*IPV* IPV was measured differently at month 3 and month 12. At 3-month follow-up, the question measuring lifetime IPV was, “Have you ever experienced emotional or physical abuse from an intimate partner (i.e., boyfriend, girlfriend or partner)? This includes intimidation, threats of harm, or being pushed, shoved, hit or any other behaviors that made you feel not worthwhile as a person or uncomfortable in your relationship.” At 12-month follow-up, to assess whether IPV had occurred during the study period, the following question asked, “In the last 12 months, have you experienced emotional or physical abuse from an intimate partner (i.e., boyfriend, girlfriend or partner)? This includes intimidation, threats of harm, or being pushed, shoved, hit or any other behaviors that made you feel not worthwhile as a person or uncomfortable in your relationship.” These measures were adapted from previous literature (Williams et al., 2015). Participants who answered yes to IPV at month 3, but no to the IPV question asked at month 12 were coded as “past IPV.” Participants who responded yes to both IPV questions were coded as “past and present IPV” in a binary IPV variable that we used for creating the syndemic variable (see below).

We then created a more nuanced categorical IPV variable, which measured whether a participant never experienced IPV, ever experienced IPV, or experienced IPV in the last 12 months as well as having experienced it prior to that (i.e., recent IPV and past IPV).

Substance use variables We created a binary variable for "ever injecting drugs," which was asked at baseline. We also created a polydrug use variable, which combined questions measuring whether participants smoked, snorted, swallowed, or injected the following drugs in the past 90 days (asked at month 12): ketamine, heroin, methadone, synthetics (bath salts, synthetic marijuana), painkillers (OxyContin, Percocet, Vicodin), uppers (amphetamine, Adderall, Dexedrine), downers (Valium, Ativan, Klonopin, Xanax), ecstasy, GHB, hallucinogens (LSD, PCP, peyote, mushrooms), poppers (nitrite inhalants), cocaine, crack, crystal methamphetamine, or any other drugs. Types of drugs used in the last 90 days (asked at month 12) measured were: stimulants (which included amphetamines, Adderall, Dexedrine, cocaine, crack, and crystal), downers (which included GHB (hydroxyl-butyrate), Valium, Ativan, Klonopin, and Xanax), opioids (which included heroin, methadone, OxyContin, Percocet, and Vicodin), hallucinogens (which included ketamine, LSD, PCP, peyote, mushrooms, and ecstasy), poppers, and synthetics (which included bath salts and synthetic marijuana).

Incarceration (asked at baseline) measured whether a participant ever spent one or more nights in a jail, prison, or detention facility.

Current depression symptoms were assessed with the two item Patient Health Questionnaire Depression Scale, with scores greater than 3 indicating a positive screen (Hirshfield et al., 2012; Löwe, Kroenke, & Gräfe, 2005). These questions used in this analysis were asked at month 12.

Childhood sexual abuse The question asked at month 3 was, "before the age of 16, did you ever have an experience where you were pressured, forced, or intimidated into doing something sexually that made you feel uncomfortable or that you did not want to do (e.g., sexual touching, oral or anal sex)?" (Parsons, Bimbi, Koken, & Halkitis, 2005).

Syndemics We constructed a count variable which counted three binary variables for syndemic conditions, IPV (ever experienced or not—collected months 3 and 12), depressive symptoms (yes or no—collected at month 12), and polydrug use (none or one drug vs. two or more drugs—collected at month 12) (Hirshfield et al., 2015). Since previous incarceration and childhood sexual abuse were not significant in bivariate analyses, they were not included in the syndemic variable.

Data Analysis

The goal of the analysis was to explore factors associated with exchange sex among HIV-positive MSM. Of the 1461 individuals who consented and enrolled in this study, 824 answered the exchange sex question at month 12, and 723 provided sufficient data for analysis (i.e., no missing data on the variables of interest). We then excluded one MSM who identified as heterosexual because research indicates that heterosexually identified MSM differ from gay and bisexual MSM and we were unable to control for differences, given the small sample size of heterosexually identified MSM, making the sample size for this analysis 722. Due to small numbers (18 participants) those who responded that they experienced IPV in the last 12 months, but not in the past, were excluded from analyses. We

tested for statistically significant differences using chi-square tests between the independent variables of interest and exchange sex (Table 1).

We constructed three logistic regression models using variables that were significant at the bivariate level. The first model tested syndemic effects, and the two additional models were created to understand the dynamics of drug use and IPV in relation to exchange sex. Table 1 displays the multivariable model that we constructed, which includes a count variable for syndemic conditions. The count variable includes polydrug use (no/yes), depression (no/yes), and IPV (no/yes). Table 2 displays two additional multivariable models, which we constructed to further understand drug use in relation to type of drugs used and polydrug use in relation to exchange sex. Model 1 tests the variable constructed for type of drugs used and model 2 tests the variable for polydrug use (1 drug, 2 drugs, or 3 or more drugs). Both of these additional models allowed for us to look more intricately at IPV (None, Ever—but not within the past 12 months, and Ever—and within the last 12 months); however, we were unable to assess the syndemic variable in these additional models because it was a count variable and only included lifetime IPV.

In all multivariable models, sociodemographic variables such as race/ethnicity, age, and education were included despite significance level in bivariate tests, because previous research has shown these variables to impact health outcomes (Cockerham, 2014). Incarceration was tested in models 1 and 2 (Table 3) but was omitted due to non-significance. Similarly, the types of drugs used that were not significant in multivariable models 1 and 2 (Table 3) were omitted. Multicollinearity was assessed through correlation matrices and variance inflation scores (VIF). When types of drugs and polydrug use were in the same model, multicollinearity was deemed a problem. Therefore, two separate models were created. In the models, VIF scores did not exceed a value of 2.5 for any of the variables, indicating no potential problems with multicollinearity. Goodness of fit was assessed through negative log likelihood and r-squared statistics (Allison, 2012). Analyses were conducted using SAS 9.4 (Cary, N.C.).

Results

Between June 1, 2015, and December 31, 2015, there were 55,722 visits to the study screener survey, which was accessed by clicking on an online study banner ad or invitation link that advertised the study for men living with HIV. Of those, 35,532 left the webpage without completing any survey items and 3718 were identified as duplicates based on IP address. Of the 16,472 completed, unique screener surveys, 2982 were considered eligible to participate in the intervention and a total of 1461 individuals consented and enrolled. Nearly all of the intervention participants were recruited from sexual partnering Web sites or smartphone applications (94.5%). A total of 874 HIV-positive MSM answered the survey question on exchange sex on the 12-month survey. We excluded 151 cases due to missing data or insufficient subgroup size. After exclusions, the analytic sample consisted of 722 HIV-positive MSM, of whom 59 (8%) reported exchange sex in the last three months (Table 1). The racial/ethnic distribution was 16% Hispanic/Latino, 19% African-American/Black, and 65% White. More than a third (39%) reported some college or less and 61% reported a college degree or more education; 28% reported an annual income less than $20,000.

Almost a quarter (22%) were younger than 30, 29% were aged 30–39, and 49% were aged 40 or older. In terms of mental health, 20% reported current depressive symptoms. About a third (30%) reported ever being incarcerated. For IPV, 46% reported ever experiencing IPV, 14% experienced both past IPV and IPV in the last 12 months, and 40% reported never experiencing IPV.

In terms of drug use, 22% reported injecting drugs ever in their lifetime. In the past 90 days, 40% reported no drug use, 25% reported one drug, 12% reported two drugs, and 23% reported using three or more drugs. When assessing different drug types HIV-positive MSM reported using in the past 90 days, we found 32% reported stimulant use, 21% reported downers, 11% reported opioid use, 11% reported hallucinogens, 43% reported poppers, and 1% reported synthetic drugs.

In Table 2, we tested syndemic conditions associated with exchange sex in the last three months in a multivariable model. Results indicated that having two syndemic factors compared to none was associated with a greater odd of exchanging sex (aOR 7.94, 95% CI 1.78–35.46) and having three syndemic factors compared to none was associated with a significantly greater odds of exchanging sex (aOR 23.37, 95% CI 4.95–110.30).

Table 3 displays the two additional models we constructed for HIV-positive MSM. In model 1, Black MSM were significantly more likely than White men to exchange sex (aOR 2.92, 95% CI 1.20–7.08), as were men under age 30 (18–29 aOR 2.24, 95% CI 1.00–5.08, Ref: 40 years or older) and men with lower annual income (less than $10,999 aOR 3.03, 95% CI 1.06–8.69, Ref: $60,000 or more). In addition, HIV-positive MSM who reported past and present IPV were more likely to exchange sex, compared to those with no history of IPV (aOR 6.59, 95% CI 2.74–15.85). Men who reported depressive symptoms in the last 2 weeks (aOR 1.97, 95% CI 1.03–3.77) were more likely to exchange sex, as were men who reported recently using stimulants (aOR 5.89, 95% CI 2.79–12.46).

Similar to model 1, in model 2, Black MSM were significantly more likely than White men to exchange sex (aOR 3.53, 95% CI 1.39–8.97). HIV-positive MSM who reported the past and present IPV were significantly more likely to exchange sex than men with no IPV history (aOR 5.34, 95% CI 2.19–12.98). Other associations with exchange sex included lower income [less than $10,999 (aOR 3.61, 95% CI 1.24–10.54); $10,000–$19,999 (aOR 3.06, 95% CI 1.04–9.02)], reporting depressive symptoms in the last 2 weeks (aOR 2.05, 95% CI 1.06–3.98) and current polydrug use [2 drugs (aOR 3.68, 95% CI 1.07–12.72); 3 or more drugs (aOR 13.91, 95% CI 4.89–39.54)]. Education was not significant in either multivariable model nor was sexual identity.

Discussion

In this study, 8% of HIV-positive MSM reported past 3-month exchange sex. Participants that experienced past and present IPV, used drugs, were African-American/Black, had low annual incomes, reported current depressive symptoms, and were under age 30 had greater odds of exchange sex. These results point to a potential syndemic where harmful structural, psychosocial, and individual conditions—such as racial inequalities, socioeconomic class,

drug use, depression, and age—are interacting with injurious social connections (e.g., experiences of IPV—and physiological outcomes, such as HIV), which impact the likelihood of engagement in exchange sex.

These results align with previous studies on the syndemic of risky sexual behavior (Buttram & Kurtz, 2015; Stall et al., 2003), finding that IPV, drug use and polydrug use, HIV seropositivity, depression, and race/ethnicity are independently associated with exchange sex, which is a behavior that could place people at increased risk of HIV. It is not the act of exchanging sex itself that places MSM at risk, but rather not using a condom while exchanging sex. Condom negotiations can be challenging when exchanging sex due to social and structural conditions, which is one reason why MSM who exchange sex may be at higher risk (Walters et al., 2018). Furthermore, there is increased risk of violence and forced sex for MSM who exchange sex, compared to those who do not exchange sex (Williams et al., 2018). The results also confirm previous findings that Black MSM are more likely to exchange sex (Buttram & Kurtz, 2015) and that the web of drug use, violent victimization, and HIV/AIDS (e.g., SAVA syndemic) is associated with higher rates of exchange sex (Romero-Daza, Weeks, & Singer, 2003; Singer et al., 2006).

In light of the aforementioned findings, we highlight five key findings. First, the association of IPV is significant when participants experienced repeated violence (i.e., past and present violence). Effectively, this means that proximity to time of abuse alone is not significantly associated with exchange sex; rather, it is the cumulative impact of sustained trauma over time. While other studies have shown a relationship between IPV, sexual assault and exchange sex (Henny, Kidder, Stall, & Wolitski, 2007), this study highlights the nuance of multiplicative, lifetime, and/or sustained victimization. This study also adds to the literature because we used temporal controls that took into account the timing of victimization.

Second, this study adds to knowledge about the interplay between drug use and exchange sex. Past studies have found polydrug use to be associated with the syndemic production of HIV (Mimiaga et al., 2015) and that polydrug use is associated with risky sexual behaviors, such as group sex (Hirshfield et al., 2015), condomless sex (Daskalopoulou et al., 2014), and exchange sex (Bond et al., 2019). Studies focusing on type of drugs used have found that stimulant use (Javanbakht et al., 2019) was associated with increased sexual risk. This study adds to this body of literature, suggesting that HIV-positive MSM who use drugs are more likely to exchange sex. This is true for polydrug use, as well as for stimulant use. Stimulant use, in particular, highlights sexual risk among MSM and the importance of including drug use treatment and/or harm reduction approaches in interventions targeting sexual risk behaviors, and potentially targeting types of drugs (e.g., stimulants).

Third, we found that HIV-positive MSM who were Black and HIV-positive MSM with annual incomes lower than $20,000 had greater odds of exchanging sex. Although our study did not directly ask questions about perceived experiences with racial discrimination, these findings gesture to the possibility of racial inequalities impacting exchange sex. Past research has clearly demonstrated how racism and racial segregation have direct impacts on health (Du Bois & Eaton, 1899; Williams, 1999; Williams & Collins, 2001; Williams & Sternthal, 2010) and racial discrimination experienced by Black Americans has been

associated with poor health outcomes (Borrell, Kiefe, Williams, Diez-Roux, & Gordon-Larsen, 2006; Hudson, Puterman, Bib-bins-Domingo, Matthews, & Adler, 2013; Kessler, Mickelson, & Williams, 1999; Krieger & Sidney, 1996; Pouget et al., 2014). These experiences are amplified for Black sexual minority populations (Mays & Cochran, 2001). Furthermore, socioeconomic status has been associated with a myriad of poor health outcomes and seems to be a fundamental cause of disease (Carpiano, Link, & Phelan, 2008; Link & Phelan, 1995; Phelan, Link, Diez-Roux, Kawachi, & Levin, 2004; Phelan, Link, & Tehrani-far, 2010). This study builds on past literature, and given our findings that being Black and having a low annual income were associated with elevated rates of exchange sex, future research might consider exploring experiences with racial discrimination (and how these might interact with socioeconomic status) in relation to exchange sex, explicitly.

Fourth, men under age 30 years had an increased likelihood of engaging in exchange sex, suggesting that emerging adulthood may be a time where MSM youth could be at risk of exchanging sex. Other research points to emerging adulthood (in most studies, age 18–35 years) as a time of critical identity negotiation and socialization (Arnett, 2007). For young MSM, emerging adulthood could pose additional challenges surrounding sexual orientation and identity (Floyd & Bakeman, 2006; Rosario, Schrimshaw, & Hunter, 2004) and syndemic conditions experienced as a young MSM could persist and worsen over time (Halkitis et al., 2015). This study suggests that emerging adults who are HIV-positive MSM were significantly more likely to exchange sex than older HIV-positive MSM. Past research has highlighted how community factors and socioeconomic disadvantages can place some young MSM at increased risk (Bauermeister, Eaton, & Stephenson, 2016), especially young Black MSM (Stevens et al., 2017). Future research and interventions should focus on targeting young MSM (including young HIV-positive MSM) who are most vulnerable by focusing on racial inequalities, as well as exploring neighborhood and community factors. Therefore, we suggest that interventions be multi-level, and include addressing structural inequalities such as poverty, race, and neighborhood disadvantage.

Fifth, we found that HIV-positive MSM who experienced recent depressive symptoms were more likely to have exchanged sex. Previous research has demonstrated an association between exchange sex, depression, and condom less anal sex among MSM (Fendrich et al., 2013; Fletcher, Swendeman, & Reback, 2018); exchange sex, depression, and recent sexually transmitted infection (STI) diagnosis (Bond et al., 2019; Reisner et al., 2009); and exchange sex, depression, and drug use (Stevens et al., 2017). In regard to syndemics, the SAVA syndemic has been linked to depression among Black MSM (Dyer et al., 2012). This study enhances understandings of the SAVA syndemic in relation to exchange sex and depression, suggesting that the SAVA syndemic is also intertwined with depression, exchange sex, race, and age (specifically young MSM).

An important nonsignificant finding to mention is that sexual identity was not associated with exchange sex. This contradicts some of the previous literature on exchange sex. However, sexual identity may not have been significantly associated in this study because of the small numbers of non-gay identified HIV-positive MSM in our sample. For example, only 5% of the sample reported bisexual identity and 1% reported something other than

bisexual, gay, or heterosexual. Future studies should explore sampling a more diverse sample of MSM in relation to sexual identity.

These findings are especially important since many states in the U.S. not only criminalize drug use and exchange sex, but also criminalize HIV. The criminalization of HIV is a practice rooted in social exclusion of certain populations, not rooted in science (Mayer, Sohn, Kippax, & Bras, 2018). For example, there has been no study that empirically demonstrates HIV criminalization laws are associated with HIV prevention (Mykhalovskiy, 2015). As such, experts in the field are critical of the practice (Barré-Sinoussi et al., 2018) and recommend abolishing laws criminalizing disease (Hoppe, 2017).

Some reasons scientists are critical of HIV criminalization are HIV criminalization laws may alter the way in which HIV-positive MSM interact with health care (Patterson et al., 2015). HIV criminalization laws have been associated with lower rates of HIV testing, higher rates of HIV prevalence (Sah, Fitzpatrick, Pandey, & Galvani, 2017), and poorer health outcomes for persons living with HIV (Breslow & Brewster, 2019). This is of particular importance because if someone is retained in care and reaches and maintains an undetectable viral load, they cannot sexually transmit HIV to another person (Eisinger, Dieffenbach, & Fauci, 2019; LeMessurier et al., 2018). Policies should be aimed at linking HIV-positive persons to care and retaining them in care as a means of preventing transmission, rather than criminalizing persons with HIV.

Furthermore, HIV criminalization laws disproportionally target racial (Hoppe, 2015) and sexual minority (Tran, Hatzenbuehler, & Goldstein, 2019) groups. In fact, it is likely that stigma toward sexual minorities underpins HIV criminalization laws (Tran et al., 2019). Future research should consider how HIV criminalization laws impact exchange sex among HIV-positive MSM. Research could also explore structural factors, such as how the intersections of HIV criminalization laws, laws against sexual minorities, and racial segregation might interact with individual behaviors, such as exchange sex.

This study had several limitations. First, participants were recruited online; thus, findings may not be representative of the general population of HIV-positive MSM. The results do not capture those without access to online networking and dating sites/apps and may underestimate the true proportion of HIV-positive MSM who engage in exchange sex. Second, the measure for exchange sex was broad and could have conflated sex work with survival sex. We also are unable to describe the context of exchange sex (e.g., the number, gender, and condom usage of exchange sex partners nor they type of renumeration received for exchanging sex). Third, we were unable to include HIV-positive MSM who had experienced past IPV, but not 12-month IPV, due to the small number of participants in that category. Fourth, the variable for incarceration was defined as one or more nights in jail, prison, or a detention facility. One night in jail may be different than longer amounts of time in jail and/or experiences with solitary confinement. Given this limitation, and the lack of a nuanced understanding of the impact of incarceration, the incarceration variable may have not shown significance because we could have oversampled HIV-positive MSM who only spent one night in jail, for example. Fifth, we used different time frames to construct variables, which may not provide as accurate of information as if asked at one time frame.

Sixth, some of the findings had wide confidence intervals, specifically the variable for syndemics in model one, which could reduce the precision of the estimate effects. Finally, we did not ask questions measuring experiences with racial discrimination, and therefore, we utilized past literature to understand the finding that Black MSM had greater odds of exchanging sex.

However, these results deepen our understanding about exchange sex as part of a syndemic. We are suggesting that exchange sex, drug use, violence, HIV, low socioeconomic status, and mental health (i.e., depression) are occurring in tandem and with a synergistic effect. Further, these findings demonstrate how Black MSM and young MSM are disproportionately impacted. Likely, this is due to structural vulnerabilities (Perlman & Jordan, 2018) and structural violence (Farmer, 2003) embedded within social conditions making Black MSM and young MSM more vulnerable to exchange sex. Given the complexity of risk, and the fact that syndemics are rooted in social inequalities, we suggest that interventions targeting these groups be multi-leveled, and focus on behavioral, biomedical, and structural approaches (Baral et al., 2015; Stein et al., 2019). As an example, Clatts, Goldsamt, Yu, and Colby (2016) developed a community and clinic intervention that took place in tandem for male sex workers in Vietnam. The interventions focused on multiple aspects of men's lives, such as sexual behavior, substance use, and stigma.

Since syndemics theory highlights how biological diseases interact with social environments, including social structures, brief individual interventions, such as targeting condom use should be used (Williams, Bowen, Timpson, Ross, & Atkinson, 2006), but we should also focus on larger structural changes that would alter the risk environments (i.e., the social, physical, economic, and political spaces occupied) for male sex workers (Rhodes, 2009). These interventions should aim at dismantling social hierarchies that create multiplied disadvantages. Decriminalizing the sale of sex (Jackson & Heineman, 2018), drug use (Hughes & Stevens, 2010; Hurley, 2018), and HIV (Hoppe, 2017) could be policy changes that positively alter risk environments for HIV-positive MSM who sell sex, as well as restructure opportunities for them. Interventions should be tailored for HIV-positive men who sell sex, not just HIV-negative men, as their experiences and needs may differ. Interventions targeting HIV-positive MSM could utilize online methods to increase condom use (Hirshfield et al., 2019) and might focus on assisting men to achieve undetectable viral loads, since being undetectable means they cannot transmit HIV (Hirshfield et al., 2018). All interventions should consider intersecting identities, such as sexual identity, as interventions for bisexual HIV-positive MSM would likely look different than interventions for gay identified HIV-positive MSM (Feinstein, Dodge, Korpak, Newcomb, & Mustanski, 2019). Finally, future research and interventions for HIV-positive and HIV-negative MSM might also consider how syndemic factors impact HIV screenings and other areas along the HIV care continuum (Chandler et al., 2019; DiNenno et al., 2017; Rothman, 2003). Multiple screenings, such as IPV and drug use, with HIV screenings or viral load testing, may be a way to disrupt the syndemic by providing a holistic approach to health care. In addition, research looking at questions about HIV screenings within a syndemic framework should also look at how exchange sex factors in.

Conclusion

We found that HIV-positive MSM who reported both past and present IPV, polydrug use, stimulant use, depressive symptoms in the last 2 weeks, were younger, had lower annual income, and were Black had greater odds of exchange sex in the past 3 months. As others have argued, interventions focusing solely on sexual risks do not take into account the numerous factors that lead to poor health outcomes (Pachankis, 2015; Stall et al., 2003; Van den Berg et al., 2017). In regard to this study, we suggest that interventions targeting sexual risk among MSM should not only include messaging about sex, but also aim to tackle personal and interpersonal issues such as depression, drug use, and IPV, as well as larger structural barriers encountered due to racial and economic inequalities. In other words, interventions should not focus solely on individual factors, they should also target social structures and community-level factors that produce syndemic conditions (Pouget & Bennett, 2016). Furthermore, these interventions may be most useful targeting young MSM, particularly young Black MSM.

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References

Allison PD (2012). Logistic regression using SAS: Theory and application. Cary, NC: SAS Institute.

Arnett JJ (2007). Emerging adulthood: What is it, and what is it good for? Child Development Perspectives, 1(2), 68–73.

Bacon O, Lum P, Hahn J, Evans J, Davidson P, Moss A, & Page-Shafer K (2006). Commercial sex work and risk of HIV infection among young drug-injecting men who have sex with men in San Francisco. Sexually Transmitted Diseases, 33(4), 228–234. 10.1097/ol.olq.0000204914.91923.ad. [PubMed: 16565643]

Baral SD, Friedman MR, Geibel S, Rebe K, Bozhinov B, Diouf D, & Cáceres CF (2015). Male sex workers: Practices, contexts, and vulnerabilities for HIV acquisition and transmission. The Lancet, 385(9964), 260–273.

Barré-Sinoussi F, Abdool Karim SS, Albert J, Bekker L-G, Beyrer C, Cahn P, & Godfrey-Faussett P (2018). Expert consensus statement on the science of HIV in the context of criminal law. Journal of the International AIDS Society, 21(7), e25161 10.1002/jia2.25161. [PubMed: 30044059]

Bauermeister J, Eaton L, & Stephenson R (2016). A multilevel analysis of neighborhood socioeconomic disadvantage and transactional sex with casual partners among young men who have sex with men living in metro Detroit. Behavioral Medicine, 42(3), 197–204. [PubMed: 27337624]

Biello KB, Colby D, Closson E, & Mimiaga MJ (2014). The syndemic condition of psychosocial problems and HIV risk among male sex workers in Ho Chi Minh City, Vietnam. AIDS and Behavior, 18(7), 1264–1271. 10.1007/s10461-013-0632-8. [PubMed: 24081899]

Blashill AJ, Bedoya CA, Mayer KH, O'Cleirigh C, Pinkston MM, Remmert JE, & Safren SA (2015). Psychosocial syndemics are additively associated with worse ART adherence in HIV-infected individuals. AIDS and Behavior, 19(6), 981–986. [PubMed: 25331267]

Bond KT, Yoon IS, Houang ST, Downing MJ, Grov C, & Hirshfield S (2019). Transactional sex, substance use, and sexual risk: Comparing pay direction for an internet-based US sample of men who have sex with men. Sexuality Research and Social Policy, 16, 255–267. [PubMed: 31814855]

Borrell LN, Kiefe CI, Williams DR, Diez-Roux AV, & Gordon-Larsen P (2006). Self-reported health, perceived racial discrimination, and skin color in African Americans in the CARDIA study. Social Science and Medicine, 63(6), 1415–1427. [PubMed: 16750286]

Bostwick WB, & Dodge B (2019). Introduction to the special section on bisexual health: Can you see us now? Archives of Sexual Behavior, 48(1), 79–87. 10.1007/s10508-018-1370-9. [PubMed: 30535566]

Breslow AS, & Brewster ME (2019). HIV is not a crime: Exploring dual roles of criminalization and discrimination in HIV/AIDS minority stress. Stigma and Health. 10.7916/D8FF591M.

Bull SS, Piper P, & Rietmeijer C (2002). Men who have sex with men and also inject drugs-profiles of risk related to the synergy of sex and drug injection behaviors. Journal of Homosexuality, 42(3), 31–51. [PubMed: 12066991]

Buller AM, Devries KM, Howard LM, & Bacchus LJ (2014). Associations between Intimate partner violence and health among men who have sex with men: A systematic review and meta-analysis. PLoS Medicine, 11(3), e1001609 10.1371/journal.pmed.1001609 [PubMed: 24594975]

Buttram ME, & Kurtz SP (2015). A mixed methods study of health and social disparities among substance-using African American/Black men who have sex with men. Journal of Racial and Ethnic Health Disparities, 2(1), 1–10. [PubMed: 25960944]

Carpiano RM, Link BG, & Phelan JC (2008). Social inequality and health future directions for the fundamental cause explanation In Lareau A& Conley D (Eds.), Social class: How does it work (pp. 232–263). New York, NY: Russell Sage Foundation.

Centers for Disease Control and Prevention. (2017). HIV surveillance report, 2017; vol. 29. http://www.cdc.gov/hiv/library/reports/hiv-survellance.html. Published November 2018. Accessed 15 Mar 2019.

Centers for Disease Control and Prevention. (2019). HIV in the United States and dependent areas. Retrieved from https://www.cdc.gov/hiv/statistics/overview/ataglance.html. Accessed 15 Mar 2019.

Chandler CJ, Bukowski LA, Matthews DD, Hawk ME, Markovic N, Egan JE, & Stall RD (2019). Examining the impact of a psychosocial syndemic on past six-month HIV screening behavior of Black men who have sex with men in the United States: Results from the POWER Study. AIDS and Behavior. 10.1007/s10461-019-02458-z.

Clatts MC, Goldsamt LA, Yu G, & Colby D (2016). Sexually transmissible infection and HIV prevention and treatment for young male sex workers in Vietnam: Findings from the SHEATH intervention. Sexual Health, 13(6), 575–581. [PubMed: 27607764]

Cockerham WC (2014). Medical sociology. New York: Routledge (Wiley Online Library).

Daskalopoulou M, Rodger A, Phillips AN, Sherr L, Speakman A, Collins S, & Fisher M (2014). Recreational drug use, polydrug use, and sexual behaviour in HIV-diagnosed men who have sex with men in the UK: Results from the cross-sectional ASTRA study. The Lancet HIV, 1(1), e22–e31. [PubMed: 26423813]

DiNenno EA, Prejean J, Irwin K, Delaney KP, Bowles K, Martin T, & Hutchinson AB (2017). Recommendations for HIV screening of gay, bisexual, and other men who have sex with men—United States, 2017. MMWR. Morbidity and Mortality Weekly Report, 66(31), 830. [PubMed: 28796758]

Du Bois WEB, & Eaton I (1899). The Philadelphia Negro: A social study. Philedelphia: University of Pennsylvania Press.

Duncan DT, Goedel WC, Stults CB, Brady WJ, Brooks FA, Blakely JS, & Hagen D (2018). 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. American Journal of Men's Health, 12(2), 292–301.

Dyer TP, Shoptaw S, Guadamuz TE, Plankey M, Kao U, Ostrow D, & Stall R (2012). Application of syndemic theory to Black men who have sex with men in the multicenter AIDS Cohort Study. Journal of Urban Health, 89(4), 697–708. 10.1007/s11524-012-9674-x. [PubMed: 22383094]

Eisinger RW, Dieffenbach CW, & Fauci AS (2019). HIV viral load and transmissibility of HIV infection. Journal of the American Medical Association, 321(5), 451–452. 10.1001/jama.2018.21167. [PubMed: 30629090]

Farmer P (2003). Pathologies of power: Health, human rights, and the new war on the poor. North American Dialogue, 6(1), 1–4.

Feinstein BA, Dodge B, Korpak AK, Newcomb ME, & Mustanski B (2019). Improving the health of cisgender men who identify as bisexual: What do they want from interventions? Sexuality Research and Social Policy. 10.1007/s13178-019-0380-2.

Feldman MB, Díaz RM, Ream GL, & El-Bassel NJ (2007). Intimate partner violence and HIV sexual risk behavior among Latino gay and bisexual men. Journal of LGBT Health Research, 3(2), 9–19. [PubMed: 19835037]

Fendrich M, Avci O, Johnson TP, & Mackesy-Amiti ME (2013). Depression, substance use and HIV risk in a probability sample of men who have sex with men. Addictive Behaviors, 38(3), 1715–1718. 10.1016/j.addbeh.2012.09.005. [PubMed: 23254224]

Fletcher JB, Swendeman D, & Reback CJ (2018). Associations between major depressive episode, methamphetamine use disorder severity, and engagement in sexual risk-taking among methamphetamine-using men who have sex with men. AIDS and Behavior, 22(5), 1461–1466. [PubMed: 29164354]

Floyd FJ, & Bakeman R (2006). Coming-out across the life course: Implications of age and historical context. Archives of Sexual Behavior, 35(3), 287–296. [PubMed: 16804747]

Friedman MR, & Dodge BM (2016). The role of syndemic in explaining health disparities among bisexual men: A blueprint for a theoretically informed perspective Understanding the HIV/AIDS epidemic in the United States (pp. 71–98). Cham, Switzerland: Springer.

Friedman MR, Stall R, Plankey M, Wei C, Shoptaw S, Herrick A, & Silvestre AJ (2015). Effects of syndemics on HIV viral load and medication adherence in the multicenter AIDS Cohort Study. AIDS, 29(9), 1087–1096. [PubMed: 25870981]

Ghanem A, Little SJ, Drumright L, Liu L, Morris S, & Garfein RS (2011). High-risk behaviors associated with injection drug use among recently HIV-infected men who have sex with men in San Diego, CA. AIDS and Behavior, 15(7), 1561–1569. 10.1007/s10461-011-9970-6. [PubMed: 21607643]

Guadamuz TE, McCarthy K, Wimonsate W, Thienkrua W, Varangrat A, Chaikummao S, & van Griensven F (2014). Psychosocial health conditions and HIV prevalence and incidence in a cohort of men who have sex with men in Bangkok, Thailand: Evidence of a syndemic effect. AIDS and Behavior, 18(11), 2089–2096. 10.1007/s10461-014-0826-8. [PubMed: 24989128]

Halkitis PN, Kapadia F, Bub KL, Barton S, Moreira AD, & Stults CB (2015). A longitudinal investigation of syndemic conditions among young gay, bisexual, and other MSM: The P18 Cohort Study. AIDS and Behavior, 19(6), 970–980. [PubMed: 25192900]

Henny KD, Kidder DP, Stall R, & Wolitski RJ (2007). Physical and sexual abuse among homeless and unstably housed adults living with HIV: Prevalence and associated risks. AIDS and Behavior, 11(6), 842–853. [PubMed: 17577656]

Hirshfield S, Chiasson MA, Joseph H, Scheinmann R, Johnson WD, Remien RH, & Margolis AD (2012). An online randomized controlled trial evaluating HIV prevention digital media interventions for men who have sex with men. PLoS ONE, 7(10), e46252 10.1371/journal.pone.0046252. [PubMed: 23071551]

Hirshfield S, Downing MJ, Chiasson MA, Yoon IS, Houang ST, Teran RA, & Parsons JT (2019). Evaluation of Sex Positive! A video eHealth intervention for men living with HIV. AIDS and Behavior, 23, 3103–3118. 10.1007/s10461-019-02498-5. [PubMed: 31011912]

Hirshfield S, Downing MJ Jr., Parsons JT, Grov C, Gordon RJ, Houang ST, & Anderson I (2017). Developing a video-based eHealth intervention for HIV-positive gay, bisexual, and other men who have sex with men: Study protocol for a randomized controlled trial. JMIR Research Protocols, 5(2), e125 10.2196/resprot.5554.

Hirshfield S, Schrimshaw EW, Stall RD, Margolis AD, Downing MJ Jr., & Chiasson MA (2015). Drug use, sexual risk, and syndemic production among men who have sex with men who engage in

group sexual encounters. American Journal of Public Health, 105(9), 1849–1858. [PubMed: 25713951]

Hirshfield S, Teran RA, Downing MJ Jr., Chiasson MA, Tieu H-V, Dize L, & Gaydos CA (2018). Quantification of HIV-1 RNA among men who have sex with men using an at home self-collected dried blood spot specimen: Feasibility study. JMIR Public Health and Surveillance, 4(4), e10847 10.2196/10847. [PubMed: 30389648]

Hoppe TA (2015). Disparate risks of conviction under Michigan's felony HIV disclosure law: An observational analysis of convictions and HIV diagnoses, 1992–2010. Punishment and Society, 17(1), 73–93. 10.1177/1462474514561711.

Hoppe T (2017). Punishing disease: HIV and the criminalization of sickness. Oakland, CA: University of California Press.

Houston E, & McKirnan DJ (2007). Intimate partner abuse among gay and bisexual men: Risk correlates and health outcomes. Journal of Urban Health, 84(5), 681–690. [PubMed: 17610158]

Hudson DL, Puterman E, Bibbins-Domingo K, Matthews KA, & Adler NE (2013). Race, life course socioeconomic position, racial discrimination, depressive symptoms and self-rated health. Social Science and Medicine, 97, 7–14. [PubMed: 24161083]

Hughes CE, & Stevens A (2010). What can we learn from the Portuguese decriminalization of illicit drugs? British Journal of Criminology, 50(6), 999–1022. 10.1093/bjc/azq038.

Hurley R (2018). Illicit drug use should not be a crime, says Royal College of Physicians. British Medical Journal (Online), 361, k1832 10.1136/bmj.k1832.

Jackson CA, & Heineman J (2018). Repeal FOSTA and decriminalize sex work. Contexts, 17(3), 74–75. 10.1177/1536504218792534.

Javanbakht M, Ragsdale A, Shoptaw S, & Gorbach PM (2019). Transactional sex among men who have sex with men: Differences by substance use and HIV status. Journal of Urban Health, 96, 429–441. 10.1007/s11524-018-0309-8. [PubMed: 30136249]

Jie W, Ciyong L, Xueqing D, Hui W, & Lingyao H (2012). A syndemic of psychosocial problems places the MSM (men who have sex with men) population at greater risk of HIV infection. PLoS ONE, 7(3), e32312 10.1371/journal.pone.0032312. [PubMed: 22479319]

Kessler RC, Mickelson KD, & Williams DR (1999). The prevalence, distribution, and mental health correlates of perceived discrimination in the United States. Journal of Health and Social Behavior, 40(3), 208–230. [PubMed: 10513145]

Krieger N, & Sidney S (1996). Racial discrimination and blood pressure: the CARDIA Study of young black and white adults. American Journal of Public Health, 86(10), 1370–1378. [PubMed: 8876504]

LeMessurier J, Traversy G, Varsaneux O, Weekes M, Avey MT, Niragira O, & Rodin R (2018). Risk of sexual transmission of human immunodeficiency virus with antiretroviral therapy, suppressed viral load and condom use: A systematic review. Canadian Medical Association Journal, 190(46), E1350–E1360. 10.1503/cmaj.180311. [PubMed: 30455270]

Link BG, & Phelan J (1995). Social conditions as fundamental causes of disease. Journal of Health and Social Behavior. 10.2307/2626958.

Löwe B, Kroenke K, & Gräfe K (2005). Detecting and monitoring depression with a two-item questionnaire (PHQ-2). Journal of Psychosomatic Research, 58(2), 163–171. [PubMed: 15820844]

Mayer KH, Sohn A, Kippax S, & Bras M (2018). Addressing HIV criminalization: Science confronts ignorance and bias. Journal of the International AIDS Society, 21(7), e25163 10.1002/jia2.25163. [PubMed: 30044056]

Mays VM, & Cochran SD (2001). Mental health correlates of perceived discrimination among lesbian, gay, and bisexual adults in the United States. American Journal of Public Health, 91(11), 1869–1876. [PubMed: 11684618]

Mimiaga MJ, O'Cleirigh C, Biello KB, Robertson AM, Safren SA, Coates TJ, & Stall RD (2015). The effect of psychosocial syndemic production on 4-year HIV incidence and risk behavior in a large cohort of sexually active men who have sex with men. Journal of Acquired Immune Deficiency Syndromes, 68(3), 329–336. [PubMed: 25501609]

Mustanski B, Garofalo R, Herrick A, & Donenberg G (2007). Psychosocial health problems increase risk for HIV among urban young men who have sex with men: Preliminary evidence of a

syndemic in need of attention. Annals of Behavioral Medicine, 34(1), 37–45. 10.1080/08836610701495268. [PubMed: 17688395]

Mustanski B, Phillips G, Ryan DT, Swann G, Kuhns L, & Garofalo R (2017). prospective effects of a syndemic on HIV and STI incidence and risk behaviors in a cohort of young men who have sex with men. AIDS and Behavior, 21(3), 845–857. 10.1007/s10461-016-1607-3. [PubMed: 27844298]

Mykhalovskiy E (2015). The public health implications of HIV criminalization: Past, current, and future research directions. Critical Public Health, 25(4), 373–385. 10.1080/09581596.2015.1052731.

Nerlander LM, Hess KL, Sionean C, Rose C, Thorson A, Broz D, & Paz-Bailey G (2017). Exchange sex and HIV infection among men who have sex with men: 20 US cities, 2011. AIDS and Behavior, 8, 2283–2294. 10.1007/s10461-016-1450-6.

Oldenburg CE, Perez-Brumer AG, Reisner SL, & Mimiaga MJ (2015). Transactional sex and the HIV epidemic among men who have sex with men (MSM): Results from a systematic review and meta-analysis. AIDS and Behavior, 12, 2177–2183. 10.1007/s10461-015-1010-5.

Pachankis JE (2015). A transdiagnostic minority stress treatment approach for gay and bisexual men's syndemic health conditions. Archives of Sexual Behavior, 44(7), 1843–1860. [PubMed: 26123065]

Parsons JT, Bimbi DS, Koken JA, & Halkitis PN (2005). Factors related to childhood sexual abuse among gay/bisexual male Internet escorts. Journal of Child Sexual Abuse, 14(2), 1–23.

Parsons JT, Grov C, & Golub SA (2012). Sexual compulsivity, co-occurring psychosocial health problems, and HIV risk among gay and bisexual men: Further evidence of a syndemic. American Journal of Public Health, 102(1), 156–162. 10.2105/Ajph.2011.300284. [PubMed: 22095358]

Parsons JT, Millar BM, Moody RL, Starks TJ, Rendina HJ, & Grov C (2017). Syndemic conditions and HIV transmission risk behavior among HIV-negative gay and bisexual men in a US national sample. Health Psychology, 36(7), 695–703. [PubMed: 28541070]

Parsons JT, Rendina HJ, Moody RL, Ventuneac A, & Grov C (2015). Syndemic production and sexual compulsivity/hyper sexuality in highly sexually active gay and bisexual men: Further evidence for a three group conceptualization. Archives of Sexual Behavior, 44(7), 1903–1913. [PubMed: 26081246]

Patterson SE, Milloy MJ, Ogilvie G, Greene S, Nicholson V, Vonn M, & Kaida A (2015). The impact of criminalization of HIV non-disclosure on the healthcare engagement of women living with HIV in Canada: A comprehensive review of the evidence. Journal of the International AIDS Society, 18(1), 20572 10.7448/ias.18.1.20572. [PubMed: 26701080]

Perlman DC, & Jordan AE (2018). The syndemic of opioid misuse, overdose, HCV, and HIV: Structural-level causes and interventions. Current HIV/AIDS Reports, 15, 96–112. [PubMed: 29460225]

Phelan JC, Link BG, Diez-Roux A, Kawachi I, & Levin B (2004). "Fundamental causes" of social inequalities in mortality: A test of the theory. Journal of Health and Social Behavior, 45(3), 265–285. [PubMed: 15595507]

Phelan JC, Link BG, & Tehranifar P (2010). Social conditions as fundamental causes of health inequalities theory, evidence, and policy implications. Journal of Health and Social Behavior, 51(1 suppl), S28–S40. [PubMed: 20943581]

Pouget ER, & Bennett AS (2016). A syndemic approach to understanding HIV/AIDS among people who inject drugs in the US In Wright ER & Carnes N (Eds.), Understanding the HIV/AIDS epidemic in the United States (pp. 195–216). Cham, Switzerland: Springer International Publishing.

Pouget ER, West BS, Tempalski B, Cooper HL, Hall HI, Hu X, & Friedman SR (2014). Persistent racial/ethnic disparities in AIDS diagnosis rates among people who inject drugs in US metropolitan areas, 1993–2007. Public Health Reports, 129(3), 267–279. [PubMed: 24791025]

Prabhu S, McFall AM, Mehta SH, Srikrishnan AK, Kumar MS, Anand S, & Solomon SS (2020). Psychosocial barriers to viral suppression in a community-based sample of human immunodeficiency virus–infected men who have sex with men and people who inject drugs in India. Clinical Infectious Diseases, 70, 304–313. 10.1093/cid/ciz175. [PubMed: 30840989]

Reisner SL, Mimiaga MJ, Skeer M, Bright D, Cranston K, Isenberg D, & Mayer KH (2009). Clinically significant depressive symptoms as a risk factor for HIV infection among black MSM in Massachusetts. AIDS and Behavior, 13(4), 798–810. 10.1007/s10461-009-9571-9. [PubMed: 19462228]

Rhodes T (2009). Risk environments and drug harms: A social science for harm reduction approach. Risk Environment and Drug Harms, 20(3), 193–201. 10.1016/j.drugpo.2008.10.003.

Romero-Daza N, Weeks M, & Singer M (2003). "Nobody gives a damn if I live or die": Violence, drugs, and street-level prostitution in inner-city Hartford, Connecticut. Medical Anthropology, 22(3), 233–259. [PubMed: 12893541]

Rosario M, Schrimshaw EW, & Hunter J (2004). Ethnic/racial differences in the coming-out process of lesbian, gay, and bisexual youths: A comparison of sexual identity development over time. Cultural Diversity and Ethnic Minority Psychology, 10(3), 215–228. [PubMed: 15311975]

Rothman RE (2003). Preventive care in the emergency department: Should emergency departments conduct routine HIV screening? A systematic review. Academic Emergency Medicine, 10(3), 278–285. 10.1197/aemj.10.3.278. [PubMed: 12615596]

Sah P, Fitzpatrick MC, Pandey A, & Galvani AP (2017). HIV criminalization exacerbates subpar diagnosis and treatment across the United States: Response to the 'Association of HIV diagnosis rates and laws criminalizing HIV exposure in the United States'. AIDS, 31(17), 2437–2439. [PubMed: 29068837]

Singer M (1996). A dose of drugs, a touch of violence, a case of AIDS: Conceptualizing the SAVA syndemic. Free Inquiry in Creative Sociology, 24(2), 99–110.

Singer M, Bulled N, Ostrach B, & Mendenhall E (2017). Syndemics and the biosocial conception of health. The Lancet, 389(10072), 941–950.

Singer MC, Erickson PI, Badiane L, Diaz R, Ortiz D, Abraham T, & Nicolaysen AM (2006). Syndemics, sex and the city: Understanding sexually transmitted diseases in social and cultural context. Social Science and Medicine, 63(8), 2010–2021. [PubMed: 16782250]

Singh S, Bradley H, Hu X, Skarbinski J, Hall HI, & Lansky A (2014). Men living with diagnosed HIV who have sex with men: Progress along the continuum of HIV care–United States, 2010. Morbidity and Mortality Weekly Report, 63(38), 829–833. [PubMed: 25254559]

Stall R, Mills TC, Williamson J, Hart T, Greenwood G, Paul J, & Catania JA (2003). Association of co-occurring psychosocial health problems and increased vulnerability to HIV/AIDS among urban men who have sex with men. American Journal of Public Health, 93(6), 939–942. [PubMed: 12773359]

Stein R, Xu S, Williams W, Marano M, Eke A, Finlayson T, & Wejnert C (2019). Factors associated with HIV antiretroviral therapy among men who have sex with men in 20 US cities, 2014. Journal of Urban Health, 96, 868–877. 10.1007/s11524-019-00386-w. [PubMed: 31512032]

Stephenson R, & Finneran C (2017). Receipt and perpetration of intimate partner violence and condomless anal intercourse among gay and bisexual men in Atlanta. AIDS and Behavior, 21(8), 2253–2260. [PubMed: 28176169]

Stevens R, Icard L, Jemmott JB, O'Leary A, Rutledge S, Hsu J, & Stephens-Shields A (2017). Risky trade: Individual and neighborhood-level socio-demographics associated with transactional sex among urban African American MSM. Journal of Urban Health, 94(5), 676–682. [PubMed: 28766241]

Stults CB, Javdani S, Greenbaum CA, Kapadia F, & Halkitis PN (2015). Intimate partner violence and substance use risk among young men who have sex with men: The P18 Cohort Study. Drug and Alcohol Dependence, 154, 54–62. [PubMed: 26130334]

Stults CB, Javdani S, Greenbaum CA, Kapadia F, & Halkitis PN (2016). Intimate partner violence and sex among young men who have sex with men. Journal of Adolescent Health, 58(2), 215–222. [PubMed: 26802993]

Sullivan PS, Khosropour CM, Luisi N, Amsden M, Coggia T, Wingood GM, & DiClemente RJ (2011). Bias in online recruitment and retention of racial and ethnic minority men who have sex with men. Journal of Medical Internet Research, 13(2), e38. [PubMed: 21571632]

Tran NK, Hatzenbuehler ML, & Goldstein ND (2019). Potential relationship between HIV criminalization and structural stigma related to sexual orientation in the United States. Journal of

Acquired Immune Deficiency Syndromes, 80(5), e106–e108. 10.1097/qai.0000000000001961. [PubMed: 30664076]

Tsai AC, & Burns BF (2015). Syndemics of psychosocial problems and HIV risk: A systematic review of empirical tests of the disease interaction concept. Social Science and Medicine, 139, 26–35. [PubMed: 26150065]

Tsai AC, & Venkataramani AS (2016). Syndemics and health disparities: A methodological note. AIDS and Behavior, 20(2), 423–430. 10.1007/s10461-015-1260-2. [PubMed: 26662266]

Van den Berg JJ, Fernández MI, Fava JL, Operario D, Rudy BJ, & Wilson PA (2017). Using syndemics theory to investigate risk and protective factors associated with condomless sex among youth living with HIV in 17 US cities. AIDS and Behavior, 21(3), 833–844. [PubMed: 27624727]

Walters SM, Rivera AV, Reilly KH, Anderson BJ, Bolden B, Wogayehu A, … Braunstein S (2018). Exchange sex among persons who inject drugs in the New York metropolitan area: The importance of local context, gender and sexual identity. AIDS and Behavior, 22(9), 2773–2787. [PubMed: 29468492]

Weber AE, Craib KJ, Chan K, Martindale S, Miller ML, Schechter MT, & Hogg RS (2001). Sex trade involvement and rates of human immunodeficiency virus positivity among young gay and bisexual men. International Journal of Epidemiology, 30(6), 1449–1454. [PubMed: 11821362]

Wheeler J, Anfinson K, Valvert D, & Lungo S (2014). Is violence associated with increased risk behavior among MSM? Evidence from a population-based survey conducted across nine cities in Central America. Global Health Action, 7, 1–12. 10.3402/gha.v7.24814.

Williams DR (1999). Race, socioeconomic status, and health the added effects of racism and discrimination. Annals of the New York Academy of Sciences, 896(1), 173–188. 10.1111/j.1749-6632.1999.tb08114.x. [PubMed: 10681897]

Williams ML, Bowen AM, Timpson SC, Ross MW, & Atkinson JS (2006). HIV prevention and street–based male sex workers: An evaluation of brief interventions. AIDS Education and Prevention, 18(3), 204–215. [PubMed: 16774463]

Williams DR, & Collins C (2001). Racial residential segregation: A fundamental cause of racial disparities in health. Public Health Reports, 116(5), 404–416. [PubMed: 12042604]

Williams JE, Dangerfield DT, Kral AH, Wenger LD, & Bluthenthal RN (2019). Correlates of sexual coercion among people who inject drugs (PWID) in Los Angeles and San Francisco, CA. Journal of Urban Health, 96, 469–476. [PubMed: 29616449]

Williams DR, & Sternthal M (2010). Understanding racial-ethnic disparities in health sociological contributions. Journal of Health and Social Behavior, 51(1 suppl), S15–S27. [PubMed: 20943580]

Williams JK, Wilton L, Magnus M, Lei W, Jing W, Penniman Dyer T, & Cummings V (2015). Relation of childhood sexual abuse, intimate partner violence, and depression to risk factors for HIV among black men who have sex with men in 6 US cities. American Journal of Public Health, 105(12), 2473–2481. 10.2105/AJPH.2015.302878. [PubMed: 26469666]

Wright ER, Carnes N, & Colón-Diaz M (2016). Understanding the HIV/AIDS epidemic in the United States—The role of syndemics in shaping the public's health In Wright ER & Carnes N (Eds.), Understanding the HIV/AIDS epidemic in the United States (pp. 1–17). Cham, Switzerland: Springer International Publishing.

Table 1

Demographic characteristics and drug use by self-reported exchange sex in the past 3 months

Characteristic	Total sample (*n* = 722)	No exchange sex (*n* = 663)	Exchange sex (*n* = 59)	x^2 test statistic
Age group				6.12 *
18–29 years	158 (22)	140(21)	18 (31)	
30–39 years	210(29)	189 (29)	21 (36)	
40 years or older	354 (49)	334 (50)	20 (34)	
Race/ethnicity				
White	471 (65)	437(66)	34 (58)	2.09
African-American/Black	135 (19)	123 (19)	12 (20)	
Hispanic	116 (16)	103 (15)	13 (22)	
Education				1.97
Some college or less	281 (39)	253 (38)	28 (47)	
College degree or more	441 (61)	410(62)	31 (53)	
Annual income				30.57 ***
Less than $10, 999	86 (12)	69 (10)	17 (29)	
$10,000-$ 19, 999	117(16)	101 (15)	16 (27)	
$20,000-$39, 999	178 (25)	171 (26)	7(12)	
$40,000-$59, 999	137 (19)	125 (19)	12 (20)	
$60,000 or more	204 (28)	197 (30)	7(12)	
Sexual identity				0.65
Gay	675 (94)	621 (94)	54 (92)	
Bisexual	34 (5)	30 (5)	4(7)	
Something else	10(1)	9(1)	1 (2)	
Intimate partner violence (IPV)[a]				47.42 ***
None	288 (40)	278 (42)	10(17)	
Past IPV	335 (46)	311 (47)	24 (41)	
Past and present IPV	99 (14)	74(11)	25 (42)	
Incarceration (Ever)				
No	494 (69)	459 (70)	35 (59)	3.06

Characteristic	Total sample (*n* = 722)	No exchange sex (*n* = 663)	Exchange sex (*n* = 59)	x^2 test statistic
Yes	218 (30)	194 (30)	24 (41)	
Ever injected drugs				23.84 ***
No	562 (78)	531 (80)	31 (53)	
Yes	160 (22)	132 (20)	28 (47)	
Polysubstance use (past 90 days)				74.75 ***
No drugs	289 (40)	283 (43)	6(10)	
1 drug	181 (25)	175 (26)	6(10)	
2 drugs	84(12)	77 (12)	7(12)	
3 or more drugs	168 (23)	128 (19)	40 (68)	
Individual drug use (past 90 days)				
Stimulants [b]	229 (32)	184 (28)	45 (76)	58.89 ***
Downers [c]	154 (21.0)	124(19)	30 (51)	33.36 ***
Opioids [d]	76(11)	62 (9)	14 (24)	11.89 ***
Hallucinogens [e]	76(11)	62 (9)	14 (24)	11.89 ***
Poppers	313 (43)	275 (41)	38 (64)	11.60 ***
Synthetics	8(1)	8(1)	0 (0.0)	-
Depressive symptoms [f]				17.62 ***
No	579 (80)	544(82)	35 (59)	
Yes	143 (20)	119 (18)	24 (41)	
Syndemics				59.38 ***
0 factors	114(16)	112(17)	2(3)	
1 factor	278 (39)	269 (41)	9(15)	
2 factors	258 (36)	231 (35)	27 (46)	
3 factors	72(10)	51(8)	21 (36)	

NOTE Column percentages presented. Cells with dashes were not analyzed due to low cell counts

* $p < .05$,

** $p < .01$,

***$p < .001$

[a]IPV was constructed using a question asking about past IPV at month 3 and about IPV in the last 12 months at 12 months

[b]Stimulants included amphetamines, Adderall, Dexedrine, cocaine, crack, and crystal

[c]Downers included GHB, Valium, Ativan, Klonopin, and Xanax

[d]Opioids included heroin, methadone, OxyContin, Percocet, and Vicodin

[e]Hallucinogens included ketamine, LSD, PCP, peyote, mushrooms, and ecstasy

[f]Past 2-week symptoms of depression obtained from the Patient Health Questionnaire-2

Table 2

Syndemics model estimating past 3-month exchange sex (n = 722)

Characteristic	AOR (95% CI)
Age group	
18–29 years	2.16 (1.00–4.65)*
30–39 years	1.68 (0.84–3.35)
40 years or older	Ref
Race/ethnicity	
White	Ref
African-American/Black	1.67 (0.75–3.70)
Hispanic	1.36 (0.63–2.92)
Education	
Some college or less	0.80 (0.43–1.50)
College degree or more	Ref
Annual income	
Less than $10, 999	4.03 (1.46–11.09) **
$10,000-$ 19, 999	2.76 (1.03–7.60)*
$20,000-$39, 999	0.79 (0.26–2.46)
$40,000-$59, 999	2.20 (0.80–6.04)
$60,000 or more	Ref
Syndemics	
0 factors	Ref
1 factor	2.06 (0.43–9.90)
2 factors	7.94(1.78–35.46) **
3 factors	23.37 (4.95–110.30) ***
Study arm	
Control	Ref
Intervention	0.72 (0.40–1.28)

NOTE AOR, adjusted odds ratio; CI, confidence interval; multivariable model adjusted for all variables in the table; syndemic variable was constructed using binary variables for depression, IPV, and polysubstance use

LL = 333, Max-rescaled R-square = 0.23

** $p < .01$,

*** $p < .001$

Table 3

Multivariable logistic regression models estimating past 3-month exchange sex (n = 722)

	Model 1[a] AOR (95% CI)	**Model 2[b]**
Race/ethnicity		
African-American/Black	2.92 (1.20–7.08) *	3.53 (1.39–8.97) **
Hispanic	1.75 (0.77–3.95)	1.91 (0.84–4.34)
White	Ref	Ref
Age group		
18–29 years	2.24 (1.00–5.08) *	2.09 (0.91—4.78)
30–39 years	1.92 (0.92–4.01)	2.06 (0.97–4.36)
40 years or older	Ref	Ref
Education		
Some college or less	1.14(0.59–2.21)	1.12(0.57–2.17)
College degree or more	Ref	Ref
Annual income		
Less than $10,999	3.03 (1.06–8.69) *	3.61 (1.24–10.54) *
$10,000-$19,999	2.64 (0.92–7.53)	3.06(1.04–9.02) *
$20,000-$39,999	0.61 (0.18–2.03)	0.65 (0.19–2.19)
$40,000-$59,999	1.95 (0.67–5.66)	1.99 (0.68–5.82)
$60,000 or more	Ref	Ref
Intimate partner violence (IPV)		
No	Ref	Ref
Past IPV	1.71 (0.74–3.96)	1.36 (0.57–3.20)
Past and present IPV	6.59 (2.74–15.85) ***	5.34 (2.19–12.98) ***
Ever injected drugs	1.86 (0.92–3.75)	1.86 (0.91–3.79)
Past 90-day drug use		
Stimulants	5.89 (2.79–12.46) ***	-
Opioids	1.72 (0.79–3.75)	-
Polysubstance use		
No drugs	-	Ref

	Model 1[a] AOR (95% CI)	Model 2[b]
1 drug	-	2.01(0.57–7.06)
2 drugs	-	3.68 (1.07–12.72)*
3 or more drugs	-	13.91 (4.89–39.54)***
Depressive symptoms[e]		
No	Ref	Ref
Yes	1.97(1.03–3.77)*	2.05 (1.06–3.98)*
Study arm		
Control	Ref	Ref
Intervention	0.78 (0.41–1.47)	0.87 (0.46–1.64)

AOR, adjusted odds ratio; CI, confidence interval; multivariable models adjusted for all variables in the table unless otherwise indicated; dashes indicate variables not included in final models. IPV was constructed using a question asking about past IPV at month 3 and about IPV in the last 12 months at 12 months

*$p < .05$,

**$p < .01$,

***$p < .001$

[a]LL = 292, Max-rescaled *R*-square = 0.34

[b]LL = 282, Max-rescaled *R*-square = 0.37

[e]Past 2-week symptoms of depression obtained from the Patient Health Questionnaire-2