Published in final edited form as:

Arch Sex Behav. 2014 January ; 43(1): 61–72. doi:10.1007/s10508-013-0207-9.

The Effects of Sexual Partnerships and Relationship Characteristics on Three Sexual Risk Variables in Young Men Who Have Sex with Men

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Abstract

Young men who have sex with men (YMSM) in the United States are experiencing an alarming increase in HIV incidence. Recent evidence suggests that the majority of new HIV infections in YMSM occur in the context of serious relationships, which underscores the importance of examining predictors of sexual risk behavior in the context of sexual partnerships, including relationship type, sexual partner characteristics, and relationship dynamics. The current study aimed to evaluate relationship and sexual partnership influences on sexual risk behavior in YMSM, including differentiating between multiple sexual risk variables (i.e., any unprotected anal or vaginal intercourse, unprotected insertive anal or vaginal intercourse, and unprotected receptive anal intercourse). More serious/familiar partnerships were associated with more sexual risk across all three risk variables, while wanting a relationship to last was protective against risk across all three risk variables. Some variables were differentially linked to unprotected insertive sex (partner gender) or unprotected receptive sex (partner age, partner race, believing a partner was having sex with others, and partners repeated across waves). Sexual risk behavior in YMSM is inconsistent across sexual partnerships and appears to be determined in no small part by sexual partner characteristics, relationship dynamics, and sexual role (i.e., insertive or receptive partner). These influences are critical in understanding sexual risk in YMSM and provide important targets for intervention.

Keywords

young men who have sex with men; sexual orientation; HIV/AIDS; sexual risk; relationships

INTRODUCTION

Men who have sex with men (MSM) are profoundly impacted by HIV/AIDS in the United States, and MSM accounted for 61% of new HIV infections in 2009 (Prejean et al., 2011). Among youth and young adults aged 13 to 29, young MSM (YMSM) accounted for 69% of new HIV infections in 2009. Evidence suggests that somewhere between 3% and 5% of young men of this age group have had sex with another male (Mustanski, Van Wagenen, Birkett, Eyster, & Corliss, 2012; Savin-Williams, 2006), pointing to a vast disparity in HIV incidence between YMSM and their heterosexual counterparts. Regrettably, very little research has been conducted on HIV risk specifically among YMSM, limiting knowledge of HIV risk factors in this population (Mustanski, Newcomb, Du Bois, Garcia, & Grov, 2011).

Recent evidence suggests that 68% of new HIV infections in MSM occur in the context of serious relationships or main sex partnerships (Sullivan, Salazar, Buchbinder, & Sanchez, 2009) and for YMSM (ages 16–24) this proportion was estimated at 79%. These alarming findings underscore the importance of examining predictors of sexual risk behavior in the context of sexual partnerships in YMSM, including relationship type, sexual partner characteristics, and relationship dynamics. The bulk of the literature on sexual risk in this population has focused on individual risk factors rather than characteristics of the sexual dyad (Karney et al., 2010; Prejean et al., 2011; Zea, Reisen, Poppen, & Bianchi, 2009).

Relationship Status

Extant research indicates that MSM and YMSM are more likely to have unprotected sex with main/steady sexual partners as opposed to casual partners (Crepaz et al., 2000; Dudley, Rostosky, Korfhage, & Zimmerman, 2004; Hays, Kegeles, & Coates, 1997; Prejean et al., 2011; Sullivan et al., 2009). However, the mechanisms behind this elevated transmission risk are not well understood. Some have suggested that certain emotional factors promote unprotected sex in relationships, including a desire to express intimacy, trust, and love (Adam, Sears, & Schellenberg, 2000; Suarez & Miller, 2001), familiarity and closeness to the partner (Zea et al., 2009), and perceiving condom use as interfering with pleasure and intimacy (McLean et al., 1994), but these factors have not been widely explored in the literature.

It also remains unclear why unprotected sex seemingly occurs more frequently in YMSM in main partnerships compared to adult MSM. One possibility is that serial monogamy may be more common among adolescents, thus increasing the likelihood of rapid primary partner turnover (Corbin & Fromme, 2002). A recent longitudinal study found that, during an 18 month follow-up period, 57% of YMSM had at least two serious partnerships, 30% had at least three, and 7% had at least four (Mustanski, Newcomb, & Clerkin, 2011). Alternatively, the serious vs. casual partner dichotomy used to designate relationship type may not adequately capture the complexity of YMSM relationships and the association between relationship status and sexual risk may be more nuanced depending on the type of relationship (e.g., serious partner, casually dating, casual sex partner, etc.). Regardless, while these relationships have important implications for the healthy development of YMSM, they also provide a potential avenue for HIV acquisition insofar as relationships facilitate non-condom use. Given that a substantial number of HIV-positive YMSM are unaware of their serostatus (CDC, 2009), such men with unrecognized infection may be engaging in unprotected sex in their serial monogamous relationships because they misperceive themselves to be at low risk for acquiring or having HIV.

Emotional Aspects of Relationships, Partner Violence, and Concurrency

Emotional aspects of relationships (i.e., feelings of intimacy, trust, and closeness) have been suggested to explain the higher rates of unprotected sex and, subsequently, higher incidence of HIV infections among MSM in relationships or primary partnerships (Davidovich, de Wit, & Stroebe, 2004; Theodore, Duran, Antoni, & Fernandez, 2004; Zea et al., 2009). Such positive emotions in a relationship have been suggested to be an important component in wanting a relationship to last (Fletcher, Simpson, & Thomas, 2000). Mustanski et al. (2011) found that YMSM who were in serious relationships and endorsed wanting their relationship to last were approximately twice as likely to have unprotected sex as those who were less invested in having their relationships last. Conversely, research on single young gay and bisexual men has found that those who endorsed higher motivation for establishing romantic relationships and stronger attitudes towards relationship commitment reported less risky sex than those who were low on these domains (Bauermeister, 2012; Bauermeister, Ventuneac, Pingel, & Parsons, 2012).

Relatively few studies have examined the effects of partner violence on HIV risk in young and adult MSM. Experiencing relationship violence (i.e., threats, physical violence, and forced sex) may dissuade YMSM from asserting condom use due to power differentials and/or fear of violence. Despite assumptions that it is women who are more vulnerable to relationship power differentials than men (Gorbach & Holmes, 2003), evidence suggests that a large percentage of YMSM experience physical and sexual partner abuse and these men are more likely to have unprotected sex (Koblin et al., 2006; Mustanski, Garofalo, Herrick, & Donenberg, 2007; Mustanski et al., 2011). Much less attention has been paid to the role that perpetrating partner violence plays in sexual risk behavior, but recent evidence suggests that a large percentage of MSM report being perpetrators of emotional, physical, and sexual violence in their relationships (29.8%, 19.9%, and 8.9%, respectively) (Stephenson, de Voux, & Sullivan, 2011). If experienced partner violence leads to a higher likelihood of unprotected sex, it would follow that perpetrating partner violence would also be associated with sexual risk.

Having concurrent sexual partners (i.e., multiple partners whose encounters overlap with one another) is not uncommon in young and adult MSM (Bohl, Raymond, Arnold, & McFarland, 2009; Gorbach, Drumright, & Holmes, 2005; Mitchell & Petroll, 2013; Parsons, Starks, Gamarel, & Grov, 2012), and evidence suggests that concurrency potentiates the epidemic spread of STIs (Gorbach & Holmes, 2003). One study of young adults found that having concurrent partnerships nearly quadrupled the odds of having an STI (Gorbach et al., 2005). The belief that one's current sexual partner is having sex with others is likely to increase perceived vulnerability to HIV and STIs and a recent study found that YMSM in serious relationships were 32% less likely to have unprotected sex with their partners if they believed their partner was having sex with others (Mustanski et al., 2011). Importantly, sexual concurrency is a dyadic process and either or both members of the dyad may be having sex with others. As such, it is important to consider the effects of both participant and partner concurrency on sexual risk.

Sexual Partner Characteristics

Research has found that HIV-negative MSM use condoms more frequently with partners they perceive as more likely to be HIV-positive (Eaton, Kalichman, O'Connell, & Karchner, 2009; Wei et al., 2011; Xia et al., 2006) and evidence suggests that MSM also make decisions about condom use based on characteristics of their partners that are perceived to be associated with HIV risk. Along these lines, MSM have been found to use condoms more often with their Black partners (compared to all other racial groups) and men who have sex with both men and women (MSMW) have been found to use condoms more frequently with their male partners than their female partners (Clerkin, Newcomb, & Mustanski, 2011; Dodge, Jeffries, & Sandfort, 2008; Mustanski et al., 2011; Raymond & McFarland, 2009; Snowden, Raymond, & McFarland, 2009). One longitudinal study of YMSM found that participants were approximately half as likely to have unprotected sex with their Black partners compared to their partners of other racial groups (Clerkin et al., 2011). Qualitative evidence from a study of Black MSMW suggests that men are less likely to use condoms with their female partners because females are perceived to be less likely to have HIV (Dodge et al., 2008). However, quantitative evidence suggests the opposite--bisexually-active MSM in a large study were more likely to use condoms with their female partners (Jeffries & Dodge, 2007).

Finally, research suggests that having older partners is associated with a higher likelihood of engaging in unprotected sex (Mustanski et al., 2011) as well as a higher likelihood of unrecognized HIV infection (Joseph et al., 2011), particularly among Black YMSM (Newcomb & Mustanski, 2013). Given that prevalence of HIV increases with age and is highest among adults aged 35–54 (CDC, 2012a), YMSM who have sex with older partners

face higher per-sex contact transmission risk (Berry, Raymond, & McFarland, 2007; Joseph et al., 2011). If YMSM are simultaneously more likely to have unprotected sex with their older partners, then sexual partner age is a critical component of sexual risk behavior in YMSM that may be potentiating the elevated HIV transmission risk in this group.

Substance Use in Relationships

Alcohol and drug use are two of the most frequently studied HIV risk factors in young and adult MSM. While findings for the association between alcohol use and sexual risk are mixed, binge drinking and club drug use (i.e., stimulants and hallucinogens) have been consistently linked to sexual risk in YMSM (Drumright, Patterson, & Strathdee, 2006; Mustanski et al., 2011; Vosburgh, Mansergh, Sullivan, & Purcell, 2012). While substance use has been frequently studied as a correlate of sexual risk in YMSM in both epidemiological surveys and longitudinal studies, few have considered substance use as a dyadic construct or a characteristic of the sexual partnership. In fact, evidence suggests that the frequency of alcohol and drug use prior to sex varies substantially over time across sexual partnerships (Newcomb, Clerkin, & Mustanski, 2011) and it is possible that substance use may be more strongly linked to sexual risk in some relationships compared to others. Examining alcohol and drug use as characteristics of the sexual partnership would help to answer this question. Additionally, analyzing substance use prior to sex as a characteristic of the sexual partnership may help to contextualize the relative size of the effects of other predictors of sexual risk. Given that we already know that drug use is consistently linked to sexual risk, including drug use in multivariate models provides a reference point for understanding the relative strength of other effects.

Sexual Roles

Sexual partnership and relationship factors may be differentially associated with varying sexual risk behaviors (i.e., unprotected insertive or receptive anal sex), but this has received little attention in the literature. The majority of studies that have considered differences in sexual risk by sexual role have focused on the effect of substance use on either unprotected insertive anal intercourse or unprotected receptive anal intercourse. One large cross-sectional study ($N = 3,492$) of YMSM aged 15 to 22 found that certain drugs were associated with increased odds of unprotected receptive anal sex whereas others were associated with increased odds of unprotected insertive anal sex (Celentano et al., 2006). In this study, being under the influence of marijuana during sex was associated with increased odds of engaging in unprotected receptive anal sex only. Being under the influence of alcohol, amphetamines, or cocaine was associated with increased odds of both unprotected receptive and insertive anal sex. It remains unclear if sexual partnership characteristics are differentially associated with these two risk variables.

Current Study

Data for the current study were taken from three waves of an ongoing longitudinal study of YMSM (ages 16–20 at baseline), spanning an 18-month reporting period. We hypothesized that being in a serious relationship would be associated with a higher rate of sexual risk compared to all other relationship types and that having previously had sex with a partner would be associated with an increased rate of sexual risk. We also predicted that wanting a relationship to last, experiencing and perpetrating intimate partner violence, and having concurrent sexual partners (both participant and sexual partner concurrency) would be associated with a higher rate of sexual risk. In terms of characteristics of the sexual partner, we hypothesized that there would be a higher rate of sexual risk with female, non-Black, HIV-negative, and older partners. We anticipated that drug use prior to sex would be associated with increased likelihood of sexual risk but that alcohol use prior to sex would

not be associated with risk. Finally, we explored whether any of the above mentioned effects of relationship and sexual partnership characteristics would be differentially associated with unprotected insertive or receptive sex.

METHOD

Data for the current study were taken from Crew 450, an ongoing longitudinal study designed to analyze the prevalence, course, and predictors of a syndemic of psychosocial health issues linked to HIV among YMSM in Chicago and surrounding areas. Participants were eligible to enroll in the study if they met the following criteria: (1) between 16 and 20 years of age at baseline; (2) birth sex male; (3) spoke English; (4) had a previous sexual encounter with a man or identified as gay or bisexual; and (5) were available for follow-up for 2 years. A modified form of respondent driven sampling (RDS) (Heckathorn, 1997) was used to recruit participants. Following recommendations outlined by Jenkins (2012), a larger initial convenience sample was utilized due to difficulties maintaining referral chains in the less insular social networks of YMSM compared to other populations (e.g., injection drug users). This approach has been used successfully in our previous work with YMSM (Mustanski et al., 2011; Newcomb et al., 2011). The initial convenience sample (i.e., “seeds”) ($N = 172$; 38.1%) was recruited from the community through targeted in-person outreach at venues frequented by YMSM as well as school organizational outreach, flyers posted in community settings frequented by the target population, and through geo-social network applications (i.e., Grindr and Jackd).

Data were taken from the first three waves of data collection or an 18-month reporting window. At the time of analysis, all participants had completed the baseline assessment ($N = 451$), 365 had completed the 6-month follow-up, and 281 had completed the 1-year follow-up. Accounting for the fact that not all participants were yet eligible to complete all follow-up assessments, the study had 86.3% and 81.9% retention rates at 6- and 12-month follow-up waves, respectively. Participants were paid \$45 for completing each of the three waves. All data were collected using computer-assisted self-interview technology with audio instructions. The protocol was approved by the Institutional Review Boards (IRBs) with a waiver of parental permission under 45 CFR 46.408(c) (for more information on relevant IRB issues in this study, see Mustanski, 2011). Participants provided written informed consent/assent, and mechanisms to protect participant confidentiality were utilized (i.e., a federal certificate of confidentiality).

At each of the three time points, participants were asked to report on their 3 most recent sexual relationships during the past 6 months, resulting in a maximum of 9 possible partnerships per participant. Partner and relationship characteristics (including sexual risk behavior) were collected for each sexual relationship. At each of the three waves of data collection, 89.8% ($N = 405$), 83.0% ($N = 303$), and 82.9% ($N = 233$), respectively, reported having any sexual partner during the previous six months. A total of 899, 638, and 471 sexual partners were reported at each assessment, respectively, which represents an average of 2.22, 2.11, and 2.02 sexual partners per participant in each reporting period. After removing the 23 participants that reported no sexual partners during any of the assessment periods, 428 unique participants were eligible for further analyses. Mean age of the analytic sample was 19.0 years ($SD = 1.3$). The majority of the sample was racial/ethnic minorities: 53.7% Black, 19.4% Hispanic/Latino, 18.0% White, and 8.9% other. Thirty-two (7.1%) were HIV-positive at baseline. A total of 2008 sexual partnerships were eligible for analyses with participant characteristics reported in Table 1.

Measures

Demographic characteristics—The demographic questionnaire assessed participant age, race/ethnicity, self-reported sexual orientation, and self-reported socioeconomic status.

HIV status—Participant HIV status was assessed with rapid OraQuick HIV test. All preliminary reactive results were confirmed via intravenous blood draw or OraSure oral fluid HIV test kit. A Western Blot test served as confirmation of their HIV status. Participants who self-reported an HIV-positive serostatus at baseline did not receive HIV testing if they produced documentation of a previous HIV-positive diagnosis (e.g., medications, lab report).

Sexual risk behavior—The HIV-Risk Assessment for Sexual Partnerships (H-RASP) (Mustanski, Starks, & Newcomb, in press) is a computerized self-administered interview designed to assess sexual behavior and associated situational/contextual variables at the level of the sexual partnership. The sexual risk behavior outcome variables used in analyses were: (1) total number of unprotected anal or vaginal intercourse acts within each partnership (total UAVI), (2) total number of insertive unprotected anal or vaginal intercourse acts within each partnership (insertive UAVI), and (3) total number of receptive unprotected anal intercourse acts within each partnership (receptive UAI). Each outcome was calculated by multiplying the total number of sex acts by the frequency of condom use during these sexual encounters (always = 0%, more than half the time = 25%, half the time = 50%, less than half the time = 75%, never = 100%). All outcomes were winsorized at three SDs from the mean to reduce the effects of outliers.

Relationship status—The H-RASP prompted participants to identify the relationship status of each sexual partnership reported by categorizing it into one of the following categories: serious relationship, casually dating but not serious, sleeping with but not dating, one night stand, or stranger or anonymous partner. The response options were then dummy coded into four separate dichotomous variables with “serious relationship” as the reference.

Initials were provided for each partner at each wave of data collection. If initials matched those of a partner at a previous wave, we further investigated if demographic characteristics of the partner also matched. In those cases where there was a match in initials and demographic characteristics of partners across waves, we coded the partner as a repeat partner.

Relationship characteristics—The H-RASP administered the following three items that were adapted from the Sexual Relationship Power Scale (Pulerwitz, Gortmaker, & DeJong, 2000) to assess emotional aspects of relationships and concurrency in partnerships: (1) I really wanted my relationship with this person to last (0 = strongly disagree to 3 = strongly agree), (2) my partner was having sex with someone else (0 = strongly disagree to 3 = strongly agree), and (3) I was having sex with someone else (0 = No, 1 = Yes).

The prevalence of relationship violence and forced sex within each partnership was assessed in reference to both partner- and participant-initiated violence. Physical violence was defined as “hit, slapped, punched, or hurt in a physical way” and forced sex was defined as “having sex when you didn’t want to (including physical and non-physical pressure, such as pushing, arguing or threatening).” Participants response options were either yes (1) or no (0) to assess whether either of these forms of relationship violence had ever occurred. Participant-initiated forced sex was not included in analysis due to the low prevalence rate (0.4%).

Sexual partner characteristics—The H-RASP also assessed sexual partner characteristics for each sexual partnership reported by participants. Self-reported sexual partner characteristics included gender (0 = female born, 1 = male born), age difference centered at “same age” (−2 = more than 2 years younger to 3 = 5 or more years older), and perceived HIV status (0 = negative/unknown, 1 = positive).

Substance use—Frequency of alcohol and drug use with partners prior to sex was assessed with the following item: “How frequently did you [drink alcohol/use drugs] before having vaginal, anal, or oral sex with partner X?” Participants responded on a 5-point Likert scale (0 = “never” to 4 = “always”).

Analyses

All analyses were conducted using hierarchical linear modeling (HLM) 7.0 statistical software and procedures outlined by Raudenbush and Bryk (2002). Sexual partnership data (Level 1) were nested within participants (Level 2) and HLM is well suited to account for the dependencies in data that contain this type of multilevel structure. At Level 1, HLM estimates the within-participant effects of sexual partnership and relationship characteristics on sexual risk. At Level 2, HLM allows for the analysis of the main effects of differences between participants (i.e., age and race) on sexual risk.

Maximum likelihood estimation was used to model the frequency of each of the sexual risk variables using a Poisson distribution that accounted for overdispersion. Estimates were made from the population-average model using robust SEs. Because receptive anal sex acts were limited to just male born partners, an analytic sample of 410 participants and 1835 partnerships was used for modeling this outcome.

RESULTS

HIV-positive participants ($N = 32$) were excluded from primary analyses as predictors of sexual risk behavior may differ between HIV-positive and HIV-negative YMSM. Across all sexual partnerships, HIV-negative YMSM reported an average of 3.97 ($SD = 13.49$) episodes of total UAVI, 1.76 ($SD = 7.91$) episodes of insertive UAVI, and 2.16 ($SD = 8.09$) episodes of receptive UAI. The intraclass correlations (ICC) for each of these outcome variables are shown in Table 2. Table 3 shows the frequency of sexual partnership and relationship characteristics across all sexual partnerships for HIV-negative YMSM in this sample.

We ran three separate multivariate models in HLM predicting the frequency of each of the three sexual risk outcome variables (i.e., total UAVI, insertive UAVI, receptive UAI) in a given sexual partnership and the results of each model are summarized in Table 4. Results for all effects are presented using the event-rate ratio (ERR), which provides an estimate of the change in the event-rate of the outcome variable for each one unit increase in the independent variable. An $ERR > 1$ indicates an increase in the event-rate of the outcome while an $ERR < 1$ indicates a decrease. Participant race was not associated with sexual risk, with the exception that Hispanic/Latino participants reported significantly less receptive UAI compared to White participants ($ERR = 0.66, p < .05$). Participant age was associated with a significantly higher rate of total UAVI ($ERR = 1.20, p < .01$) and insertive UAVI ($ERR = 1.33, p < .001$). Participant age was associated with an increased rate of receptive UAI at the statistical trend level ($ERR = 1.16, p = .066$).

In the first multivariate model, we examined sexual partnership and relationship characteristics as predictors of total UAVI. Being in a serious relationship was significantly associated with a higher rate of total UAVI compared to all other relationship types (see Fig.

1), including casually dating but not serious ($ERR = 0.21, p < .001$), sleeping with but not dating ($ERR = 0.16, p < .001$), one night stand ($ERR = 0.05, p < .001$), and stranger or anonymous person ($ERR = 0.03, p < .001$). Having a repeat partner from previous waves of data collection was associated with a higher rate of total UAVI ($ERR = 1.65, p < .01$) and wanting a relationship to last was associated with a significantly lower rate of total UAVI ($ERR = 0.81, p < .001$). In terms of partner violence, sexual partner-initiated physical violence was associated with increased total UAVI ($ERR = 1.52, p < .05$), but partner-initiated forced sex was not ($ERR = 1.05$). Believing one's partner was having sex with others (partner sexual concurrency) was associated with a lower rate of total UAVI ($ERR = 0.86, p < .01$), but a participant's own sexual concurrency was not associated with total UAVI ($ERR = 0.91$). All other sexual partnership and relationship characteristics were not associated with rate of total UAVI, including participant-initiated physical violence ($ERR = 1.07$), sexual partner race (i.e., Black vs. other; $ERR = 0.82$) sexual partner gender ($ERR = 0.95$), sexual partner age ($ERR = 1.05$), sexual partner HIV status ($ERR = 1.15$), frequency of alcohol use prior to sex ($ERR = 1.10$), and frequency of drug use prior to sex ($ERR = 0.86$).

Two additional models were analyzed next that evaluated insertive UAVI and receptive UAI as the sexual risk outcome variables (see Table 4). Two of the previously described effects were consistent across all three outcome variables, including those of relationship status and wanting a relationship to last, but several other sexual partnership and relationship characteristics had differential associations with the three sexual risk variables. Male partners were associated with a lower rate of insertive UAVI compared to females ($ERR = 0.50, p < .05$). Finally, the effects of having a repeat partner from previous waves, believing a partner was having sex with others, and partner-initiated violence all became non-significant when insertive UAVI was the outcome variable, but the direction of these effects was consistent.

When analyzing receptive UAI as the outcome variable, the sample was restricted to only male partners and sexual partner gender was removed as a predictor (see Table 4). In this model, having older sexual partners ($ERR = 1.22, p < .001$) and partner-initiated physical violence ($ERR = 1.61, p < .01$) were both associated with a higher rate of receptive UAI. Additionally, having a Black partner ($ERR = 0.71, p < .05$) and believing a partner was having sex with others ($ERR = 0.87, p < .01$) were both significantly associated with a lower rate of receptive UAI.

We conducted a follow-up analysis among our 32 HIV-positive participants to examine the influence of sexual partner's perceived HIV status on sexual risk behavior in these youth. These models included participant age, race, and if the participant knew their positive status prior to enrolling in the study as Level 2 covariates. Analyses revealed that our HIV-positive participants had approximately one fourth the rate of total UAVI with their perceived HIV-negative/unknown partners compared to their perceived HIV-positive partners though this effect only trended towards significance ($ERR = 0.23, p = .063$). On average, these youth had approximately 2.46 UAVI acts with their HIV-negative/unknown status partners compared to an average of 10.81 UAVI acts with their HIV-positive partners. HIV-positive participants had almost one fifth the rate of insertive UAVI with their perceived HIV-negative/unknown partners compared to their perceived HIV-positive partners ($ERR = 0.21, p < .01$). These youth reported an average of 1.07 insertive UAVI acts with their HIV-negative/unknown status partners compared to an average of 3.15 insertive UAVI acts with their HIV-positive partners. HIV-positive participants had approximately one third the rate of receptive UAI with their perceived HIV-negative/unknown partners compared to their perceived HIV-positive partners, but this was not statistically significant ($ERR = 0.37$). These youth reported an average of 1.45 receptive UAI acts with their HIV-negative/known

status partners compared to an average of 6.07 receptive UAI acts with their HIV-positive partners.

Several additional analyses were conducted to check for the robustness of model results. To test for the effects of dependency of repeated partnerships across waves, we removed partnerships that were repeated at Waves 2 and 3 from the dataset and re-estimated the original multivariate model with total UAVI as the outcome variable. Deleting this 10% of cases caused several changes in p -values. The effects of believing a partner was having sex with others (ERR = 1.01) and partner-initiated physical violence (ERR = 1.08) became non-significant. The following predictors became significantly associated with a higher rate of total UAVI: partner-initiated forced sex (ERR = 2.01, $p < .001$), participant-initiated physical violence (ERR = 1.59, $p < .05$), and alcohol use prior to sex (ERR = 1.22, $p < .05$). Next, we deleted all female sexual partnerships from the model as sexual encounters with females may differ in terms of perceived risk. The only difference found was that partner age became a significant predictor (ERR = 1.12, $p < .05$). The event rate ratios of these effects were similar despite changes in p -values.

DISCUSSION

The current study expanded on previous research on the influence of relationship and sexual partnership characteristics on sexual risk in YMSM, including replicating previous findings and presenting novel analyses. A number of sexual partnership characteristics were associated with sexual risk in our sample. Some of these predictors were consistent across all outcome variables (relationship status and wanting a relationship to last) while many others were differentially associated with unprotected insertive and receptive sex. Our findings provide valuable and more nuanced information that contextualizes the unique factors that place YMSM at risk for HIV infection and these findings have important implications for future research and prevention strategies.

Relationship Status

Consistent with hypotheses and previous research (see Mustanski et al., 2011), being in a serious relationship was associated with an increased rate of unprotected sex and the rate of unprotected sex was 79%–97% lower in all other relationship types, including casual dating partners (79% lower), casual sex partners (84% lower), one night stands (95% lower), and unknown/anonymous partners (97% lower). In fact, the rate of unprotected sex appeared to increase incrementally as the likelihood that partners were familiar and/or more intimate with one another increased; unknown/anonymous partnerships had the lowest risk, followed by one night stands, casual sex partners, casual dating partners, and serious partners. Moreover, these effects were consistent across all outcomes, including total UAVI, insertive UAVI, and receptive UAI, indicating that the effect of relationship type on sexual risk does not differ by sexual role.

Emotional Aspects of Relationships, Partner Violence, and Concurrency

Several other aspects of YMSM relationships were associated with sexual risk behavior, including wanting the relationship to last, intimate partner violence, and partner sexual concurrency. Contrary to hypotheses, wanting a relationship to last was associated with a significantly lower rate of all three risk variables and this finding was opposite to a previous finding linking this variable to a higher rate of sexual risk among YMSM in serious relationships (Mustanski et al., 2011). Unlike this prior study, we assessed the desire for a continued relationship for all sexual partnerships, not just those considered serious. In this way, our findings were consistent with recent research which found that single young gay and bisexual men who report a stronger commitment to establishing romantic relationships

were less likely to have unprotected sex (Bauermeister, 2012; Bauermeister et al., 2012). Perhaps YMSM who are more relationship-oriented are also more likely to want to protect themselves and their partners early on in relationships in order to build trust and intimacy. Further research is needed to examine whether this effect changes over time as length of relationship increases. Understanding the mechanisms behind these conflicting findings, including further investigation of whether emotional factors influence sexual risk behavior differentially across relationship types, may help with the development of intervention strategies to promote safer sex within sexual partner dyads.

Consistent with expectations, partner-initiated physical violence was linked to a significantly higher rate of sexual risk for total UAVI and receptive UAI (but not insertive UAI). However, partner-initiated forced sex was not associated any of the risk variables. Of note, partner-initiated forced sex only occurred in less than 1% of sexual partnerships, which may have limited power to detect these effects. Being the victim of violence in sexual relationships may establish a power differential between members of the dyad in which the victim subsequently feels less able to advocate for condom use. Furthermore, it is likely that YMSM are not able to make a choice about condom use during forced sex. Developing strategies for helping YMSM cope with intimate partner violence by either terminating violent relationships or minimizing the negative impact of violence through harm reduction strategies (e.g., attempts to engage in lower risk sexual activities during forced sex) may help to reduce the impact of violence on unprotected sex in these types of relationships.

Finally, believing a partner was having sex with others (partner sexual concurrency) was associated with a lower rate of both total UAVI and receptive UAI but was not associated with insertive UAI. This finding confirms hypotheses and previous findings: YMSM who believe or know their partners are having sex with others likely perceive these sexual partners to be at higher risk for having or acquiring HIV or STIs. As such, it makes sense that YMSM would be more likely to protect themselves when having sex with these partners. Conversely, a participant's own sexual concurrency was not associated with sexual risk. This indicates that YMSM who are having sex with multiple partners concurrently may not be consistent in their condom use across these sexual partnerships (which is corroborated by the lower ICCs for the three outcome variables) and they instead rely on characteristics of their sexual partners and aspects of their relationships with these partners to inform decisions about condom use.

Sexual Partner Characteristics

Several sexual partner characteristics were significantly associated with sexual risk in the current analyses. The links between sexual partner gender, race, and sexual risk behavior indicate that YMSM may make decisions about condom use based on certain demographic characteristics that are thought to be indicators of likelihood of being HIV-positive. Consistent with previous research (Clerkin et al., 2011; Newcomb & Mustanski, 2013; Raymond & McFarland, 2009), participants had significantly less receptive UAI with Black partners. This indicates that YMSM may be aware of the higher prevalence of HIV among Black MSM and therefore they perceive their Black partners to be more likely to be HIV-positive. Furthermore, it makes sense that partner race would be more strongly linked to receptive than insertive sex, as receptive UAI is the riskiest sex act in terms of HIV infection (CDC, 2012b). Consistent with previous qualitative evidence (Dodge et al., 2008), insertive UAI occurred at higher rates with female partners, but the association between partner gender and total UAVI was not significant in the current analyses. The inclusion of receptive anal sex acts (which can only occur with male partners) in the total UAVI outcome variable may dampen the effect of partner gender on sexual risk, and this may help to explain previous null findings (Jeffries & Dodge, 2007; Mustanski et al., 2011). Taken together,

these findings add to the burgeoning literature indicating that YMSM make choices about condom use based on perceived riskiness of their sexual partners.

The current analyses found that sex with HIV-positive partners was associated with less receptive UAI but was not associated with total UAI or insertive UAI. Again, receptive UAI is the riskiest sex act in terms of HIV infection (CDC, 2012b), which indicates that YMSM may be selectively having unprotected sex in situations they believe to be less risky. Our follow-up analysis of this same effect among the 32 HIV-positive YMSM in the current study corroborated this finding. When having sex with HIV-negative/unknown status partners (i.e., serodiscordant partners), our HIV-positive participants had less significantly insertive UAI (higher transmission risk) compared to occasions of sex with their HIV-positive partners, but partner HIV status was not associated with receptive UAI (lower transmission risk). These findings suggest that HIV-positive YMSM may also be utilizing seroadaptive behaviors to minimize their risk of transmitting HIV to their partners. Importantly, this follow-up analysis was conducted with a small number of HIV-positive YMSM and must be interpreted with caution. These preliminary findings warrant further attention in order to more precisely describe the risk behaviors of HIV-positive YMSM with their negative and positive partners.

Finally, having older partners was only associated with a higher rate of receptive UAI. While several previous studies have reported a link between having older partners and sexual risk in YMSM (Bingham et al., 2003; Joseph et al., 2011; Mustanski et al., 2011), to our knowledge no previous investigations have distinguished between unprotected insertive and receptive sex in analyses. This is a particularly important finding as receptive UAI is the most efficient way to acquire HIV from sexual behavior (CDC, 2012b). Given that older partners are more likely to be HIV-positive (Berry, Raymond, & McFarland, 2007; CDC, 2012a; Joseph et al., 2011), the fact that YMSM are more likely to have receptive UAI with older partners is concerning and may be contributing to their elevated HIV incidence. More research is needed to identify the mechanisms linking older partners to sexual risk in this population, including the potential role of power differentials, economic dependence, and sexual coercion.

Substance Use Prior to Sex

Consistent with previous research examining substance use as a characteristic of the sexual partnership (Mustanski et al., 2011), frequency of alcohol and drug use prior to sex were not the strongest predictors of sexual risk in this sample. In fact, neither alcohol use nor drug use prior to sex was associated with any of the sexual risk variables, and this finding contradicts a large body of previous research (see Drumright et al., 2006; Mustanski et al., 2011; Vosburgh et al., 2012). Of note, the presence of a large number of other independent variables in multivariate models can affect the direction and significance of effects, particularly when the effect of interest occurs at a low base rate in the data. Alcohol and drug use prior to sex both occurred at low rates in this sample (see Table 2), which may be due to the fact that the majority of the sample was Black YMSM, who are significantly less likely to drink and use drugs (Groer, Bimbi, Nanin, & Parsons, 2006; Newcomb, Heinz, & Mustanski, 2012). When independent variables occur at low base rates, power to detect effects is limited. Future research examining substance use as a characteristic of the sexual partnership should focus on racial differences in these effects using samples with more variability in substance use. Regardless, this finding indicates that substance use may not be the strongest predictor of sexual risk in YMSM.

Future Research and Limitations

Future research is needed to identify the mechanisms linking many of these partnership and relationship factors to sexual risk behavior, including both qualitative research and quantitative mediation analyses. For example, given that YMSM are more likely to have unprotected sex when in relationships, it remains unclear whether this is a result of trust, a desire for greater intimacy, or other emotional dynamics within these relationships. Additionally, it appears that YMSM make decisions about condom use depending on whether they are having insertive or receptive sex. In some situations, insertive UAI may be more likely than receptive UAI due to the elevated transmission risk associated with receptive sex (e.g., seroadaptive behaviors). Alternatively, receptive UAI may be more likely than insertive UAI in other situations, such as those that relate to power differentials between partners (e.g., sex with older partners). Understanding the mechanisms behind these effects will aid in developing more effective HIV prevention content that targets specific sexual risk behaviors and related experiences that are salient to YMSM.

The findings and implications of the current study must be considered in the context of several important limitations. The data presented in this article were taken from a study of YMSM in which enrollment and data collection is ongoing. As such, we were not able to include follow-up data from all participants who completed baseline surveys as this data have not yet been collected. HLM takes advantage of all available data when running analyses and is able to make estimates with incomplete data, but it is possible that results may change somewhat as participant enrollment continues. Additionally, the sample was largely composed of racial/ethnic minority YMSM (i.e., 53.7% Black and 19.4% Hispanic/Latino) and our results cannot be generalized to the YMSM community as a whole. Finally, there are some limitations with regard to measurement. We relied on the use of a single member of the dyad to report on relationship characteristics and the frequency of unprotected sex within the dyad. Furthermore, several of the independent variables measured in this study were single items measured on Likert scales (e.g., perceived HIV status of partners, frequency of alcohol and drug use prior to sex). Both of these measurement issues may increase the likelihood of bias in reporting.

Conclusions

Taken together, our findings indicate that various sexual partnership and relationship characteristics contribute to sexual risk in YMSM and multivariate analyses show that many of these variables contribute unique variance to sexual risk behavior when considered alongside one another. Furthermore, certain sexual partnership characteristics appear to be differentially associated with sexual risk when split into unprotected insertive and receptive sex. Sexual risk behavior in YMSM is inconsistent across sexual partnerships and appears to be determined in no small part by sexual partner characteristics, relationship dynamics, and the sexual role (i.e., insertive or receptive) adopted during sexual behavior. Given this complexity, prevention efforts must strive to provide tailored intervention content to YMSM based on their particular behavioral profiles in order to provide relevant and effective prevention messages.

Acknowledgments

This study was supported by a grant from the National Institute on Drug Abuse (R01DA025548). The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institute on Drug Abuse or the National Institutes of Health.

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Figure 1. Mean Number of UAVI Acts with Sexual Partnerships Across Relationship Types. NOTE: This figure describes the mean number of UAVI acts across relationship types in HIV-negative participants only. UAVI = unprotected anal or vaginal intercourse. Vertical lines within each bar represent the 95% confidence interval.

Table 1Participant Demographic Characteristics at Baseline (Analytic Sample; $N = 428$)

	Mean	SD
Age	19.0	1.3
	N	%
Race		
Black/African American	230	53.7
Hispanic/Latino	83	19.4
White	77	18.0
Other	38	8.9
Sexual Orientation		
Gay/Mostly Gay	311	72.7
Bisexual	95	22.2
Heterosexual (behaviorally bisexual)	14	3.3
Other	8	1.9
Self-reported SES		
Upper class	28	6.5
Middle class	314	73.4
Lower class	86	20.1
HIV Status		
Positive	32	7.4
Negative	396	92.5

Note: *SD* = standard deviation, *SES* = socioeconomic status

Table 2

Intraclass Correlations (ICC) for Sexual Risk Outcome Variables

Outcome	Variance Across Participants (%)	Variance Within Participants, Across Partnerships (%)
Total Unprotected Sex (Total UAI)	16.8	83.2
Unprotected Insertive Sex (Insertive UAI)	35.6	64.4
Unprotected Receptive Sex (Receptive UAI)	28.1	71.9

Table 3**Summary of Partner and Relationship Characteristics Across All Sexual Partnerships**

	Mean	SD	%
<i>Partner Characteristics</i>			
Partner age difference (ordinal)	0.84	1.42	
Male partner			91
Partner HIV-positive			2
Race			
White			24
Black			46
Hispanic/Latino			21
Other			9
<i>Relationship Characteristics</i>			
Relationship status			
Serious			30
Casually dating but not serious			20
Sleeping with by not dating			25
One night stand			21
Stranger or anonymous person			3
Wanted relationship with partner to last (ordinal)	1.40	1.12	
Partner sexual concurrency (ordinal)	1.69	1.08	
Participant sexual concurrency			39
Partner repeated from a prior 6-month wave			10
<i>Substance Use</i>			
Alcohol use prior to sex (ordinal)	0.58	1.10	
Drug use prior to sex (ordinal)	0.35	0.87	
<i>Relationship Violence/Forced Sex</i>			
Partner hit, slapped, punched, or hurt you			6
Partner forced you to have sex when didn't want to			1
Participant hit, slapped, or punched partner			5
<i>Sexual Risk Behavior</i>			
Unprotected anal/vaginal sex acts (insertive & receptive)	3.97	13.49	
Unprotected insertive sex acts	1.76	7.91	
Unprotected receptive anal sex acts	2.16	8.09	

NOTE: These descriptive statistics summarize partner and relationship characteristics across all sexual partners of the HIV-negative participants who were the focus of primary analyses.

Table 4
Multivariate Analyses of the Effects of Partner and Relationship Characteristics on Sexual Risk Behavior

Fixed Effects	Total Unprotected Sex			Unprotected Insertive Sex			Unprotected Receptive Sex		
	ERR	95% CI	p-value	ERR	95% CI	p-value	ERR	95% CI	p-value
Intercept	9.70	5.92 – 15.92	* <.001	6.20	3.15 – 12.19	* <.001	4.91	3.45 – 7.00	* <.001
Participant Age	1.20	1.06 – 1.36	*0.004	1.33	1.16 – 1.51	* <.001	1.16	0.99 – 1.36	0.066
Participant race – White (reference)	--	--	--	--	--	--	--	--	--
Black/African American	0.80	0.54 – 1.19	0.264	0.88	0.51 – 1.53	0.652	0.73	0.47 – 1.14	0.164
Hispanic/Latino	0.82	0.59 – 1.16	0.268	1.08	0.71 – 1.64	0.709	0.66	0.46 – 0.97	*0.032
Other	0.97	0.48 – 1.98	0.938	0.57	0.32 – 1.02	0.059	1.16	0.53 – 2.51	0.715
Serious relationship (reference)	--	--	--	--	--	--	--	--	--
Casually dating but not serious	0.21	0.16 – 0.27	* <.001	0.20	0.14 – 0.29	* <.001	0.22	0.16 – 0.30	* <.001
Sleeping with but not dating	0.16	0.12 – 0.21	* <.001	0.15	0.11 – 0.21	* <.001	0.17	0.12 – 0.25	* <.001
One night stand	0.05	0.04 – 0.07	* <.001	0.04	0.03 – 0.06	* <.001	0.05	0.04 – 0.08	* <.001
Stranger or anonymous person	0.03	0.02 – 0.05	* <.001	0.03	0.02 – 0.06	* <.001	0.04	0.02 – 0.07	* <.001
Repeat partner	1.65	1.18 – 1.35	*0.003	1.58	0.90 – 2.76	0.112	1.58	1.18 – 2.11	*0.002
Wanted relationship to last	0.81	0.73 – 0.89	* <.001	0.80	0.73 – 0.88	* <.001	0.83	0.74 – 0.94	*0.003
Partner having sex with others	0.86	0.78 – 0.96	*0.005	0.89	0.76 – 1.06	0.192	0.87	0.78 – 0.96	*0.007
Participants having sex with others	0.91	0.69 – 1.20	0.518	1.14	0.76 – 1.70	0.526	0.84	0.64 – 1.11	0.216
Partner-initiated physical violence	1.52	1.08 – 2.15	*0.016	1.44	0.86 – 2.39	0.162	1.61	1.16 – 2.24	*0.004
Partner-initiated forced sex	1.05	0.45 – 2.45	0.916	1.17	0.37 – 3.75	0.785	0.91	0.42 – 1.96	0.805
Participant-initiated physical violence	1.11	0.73 – 1.70	0.625	0.97	0.57 – 1.63	0.897	1.32	0.87 – 2.02	0.191
Partner Gender (male)	0.88	0.57 – 1.35	0.555	0.50	0.27 – 0.93	*0.027	--	--	--
Partner Age (centered at 'same age')	1.09	0.99 – 1.20	0.088	0.96	0.86 – 1.07	0.486	1.22	1.08 – 1.37	* <.001
Partner Race (Black)	0.82	0.64 – 1.06	0.125	0.91	0.63 – 1.31	0.609	0.71	0.51 – 0.99	*0.043
Partner HIV status (HIV positive)	0.72	0.48 – 1.07	0.103	0.95	0.61 – 1.50	0.841	0.55	0.32 – 0.94	*0.028
Alcohol use prior to sex	1.01	0.80 – 1.28	0.902	1.11	0.91 – 1.35	0.290	1.03	0.75 – 1.43	0.851
Drug use prior to sex	0.86	0.68 – 1.09	0.216	0.82	0.63 – 1.06	0.125	0.88	0.58 – 1.34	0.544

NOTE: These effects describe the influence of sexual partnership and relationship characteristics on sexual risk in HIV-negative participants only. ERR = event-rate ratio. CI = confidence interval.

* Asterisks denote significant effects at $p < .05$.