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Publication Date

2015

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UNIVERSITY OF CALIFORNIA

Los Angeles

Alcohol use and HIV risk behavior among Black men who have sex with men: Reconsidering
the sexual health consequences of problem drinking

A dissertation submitted in partial satisfaction of the requirements for the degree Doctoral of
Philosophy in Psychology

by

Vincent Casey Allen, Jr.

2016

ABSTRACT OF THE DISSERTATION

Alcohol use and HIV risk behavior among Black men who have sex with men: Reconsidering
the sexual health consequences of problem drinking

by

Vincent Casey Allen, Jr.

Doctorate of Philosophy in Psychology

University of California, Los Angeles, 2016

Professor Lara Allison Ray, Co-Chair

Professor Hector F. Myers, Co-Chair

Black men who have sex with men (MSM) are the most at-risk group for HIV infection. Efforts are needed to understand correlates of HIV risk among this group. Alcohol consumption is highly prevalent among MSM, is associated with condomless sex, and may contribute to HIV risk among Black MSM. This study aimed to: 1) examine the association between alcohol consumption (i.e. drinking before/during sex and levels of alcohol use problems) and condom use during lifetime, past 6 months, and the event level; and 2) test moderators (i.e. sex-related alcohol expectancies, impulsivity, sensation seeking, and partner type) of the relationship between problem drinking and condom use across all three levels of analysis.

Black MSM (N = 116) reported sexual behavior and condom use for lifetime, past 6 months, and the most recent condom and condomless sex events. The Alcohol Use Disorders Identification Test determined problem drinking (i.e. AUDIT scores \geq 8). Ordinal and binary

regression analyses analyzed associations between AUDIT scores, condomless receptive and insertive sex, and hypothesized moderators. AUDIT scores were associated with a greater likelihood of condomless sex (lifetime receptive sex: OR = 1.06, $p < .05$; past 6 months insertive sex: OR = 1.09, $p < .01$). At the event level, there was no greater likelihood of drinking during last condomless sex as compared to last condom sex, $\chi^2(1) = .18$, $p = .39$. The association between problem drinking and lifetime condomless receptive sex was strongest among men with: 1) predominately casual/anonymous sexual partners (OR = 8.54, 95% CI, .74 – 98.12); 2) high levels of impulsivity, OR = 2.52, 95% CI, 1.06 – 6.02. Significant moderation was found for lifetime receptive sex only.

Global patterns of problem drinking were associated with a greater likelihood of risky sexual behavior. Drinking before/during sex was not related to condom use. The association between problem drinking and receptive condomless sex was strongest among men with predominately casual/anonymous sexual partners and high levels of impulsivity. These findings highlight several pathways to sexual risk behavior among Black MSM, as well as important differential risk factors given sexual position.

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University of California, Los Angeles

2016

Dedication

This dissertation is dedicated to the Black gay and bisexual men who inspired this work; those who are living with HIV/AIDS, those who have lost their battle with the illness, and those who are just doing the work of loving themselves. You are fearfully and wonderfully made. Your lives matter.

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Introduction

Since the beginning of the HIV/AIDS epidemic in the U.S., gay and bisexual men have experienced disproportionate rates of HIV/AIDS morbidity and mortality. According to the Centers for Disease Control and Prevention (CDC), men who have sex with men (MSM) accounted for more than half of new HIV infections between 2008 and 2010, despite comprising approximately 2% of the U.S. population (CDC, 2013a). Among MSM, Black MSM are disproportionately affected accounting for 39% of new infections, followed by White (34%) and Hispanic/Latino (23%) MSM (CDC, 2011; 2012). A model based on annual HIV incidence predicted that Black MSM have a 25% chance of being HIV-positive by age 25, and a 60% chance of contracting the virus by age 40 (Stall et al., 2009). Despite the overall stability of HIV incidence among MSM, high HIV prevalence among Black MSM persists and nearly one out of every three (28%) Black MSM are living with HIV (CDC, 2010).

Multiple factors interact to influence risky sexual behavior, such that the identification of correlates of HIV risk behaviors is multifaceted and complex (Brofenbrenner, 1979; Mustanski, Newcomb, Du Bois, Garcia, & Grov, 2011). This is particularly evident among Black MSM for whom racial disparities in HIV persist and risk factors commonly associated with HIV fail to explain such disparities. Although Black MSM have higher rates of HIV and sexually transmitted infections (STIs), they fail to demonstrate higher sexual risk behaviors than MSM from other ethnic groups (Millet, Peterson, Wolitski, & Stall, 2006; Millett, Flores, Peterson, & Bakerman, 2007). Addressing HIV among Black MSM requires thorough exploration of factors that may be contributing to the epidemic across a multi-systemic model. Mustanski et al. (2011) framed their review of HIV correlates and predictors for young MSM utilizing the Brofenbrenner (1979) ecological systems theory. This theory places the individual at the center of a multi-

systemic model where expanding relationships move from the individual level to interpersonal and interrelational community levels, to the societal level. The broadest level of the ecological systems theory is the macrosystem, which is comprised of ideological values and cultural, structural, and societal norms (Bronfenbrenner, 1979). The concept of minority stress is an example of an HIV risk factor at this level. Minority stress describes the cumulative effect of stigma, internalized homophobia, and discrimination experienced by sexual minorities (Bronfenbrenner, 1979; Meyer, 1995; Mustanski et al., 2011). While minority stress has been associated with increased psychological distress (Meyer, 1995), research has only recently begun to explore the effects of minority stress and other structural and institutional variables on sexual risk behaviors.

Within the macrosystem is the mesosystem, which includes the environment or context in which an individual exists and the ways in which these settings influence individual behaviors. In regard to sexual risk-taking, social settings such as bars and clubs commonly provide the opportunity for behaviors influenced by substance use to intersect with sexual partner seeking behaviors. Other mesosystem correlates of sexual risk-taking among MSM include the degree to which men feel connected to gay communities, engagement in sex work, attending commercial sex venues (i.e., bath houses, sex clubs, etc.), as well as the availability and access of sexual partners via the internet (Binson et al., 2001; P.N. Halkitis et al., 2013; P.N. Halkitis & Parson, 2003; Van Beneden et al., 2002; Williams et al., 2003). Such environmental or contextual factors can have a significant role in sexual risk-taking among Black MSM. At the center of the Bronfenbrenner (1979) model is the individual. Person-level factors such as personality traits and mental health are associated with sexual risk-taking among MSM (Mustanski et al., 2011). The multi-systemic nature of HIV supports the need to explore factors that may be contributing to

HIV risk among Black MSM within and across levels. Substance use is one such factor that interacts across levels to put individuals at risk.

Substance use is highly prevalent among MSM and has been identified as a risk factor for HIV (CDC, 2013b). MSM use substances at a greater rate than the general population and have higher rates of substance abuse (Cochran, Ackerman, Mays, & Ross, 2004; R Stall et al., 2001; CDC, 2013c). The use of illicit drugs is associated with risky sexual behavior among MSM, and a literature review by Vosburgh, Mansergh, Sullivan, and Purcell (2012) found methamphetamine, cocaine, and history of injection drug use to be associated with non-condom use¹ during anal intercourse among MSM.

In addition to illicit drug use, alcohol consumption is prevalent among MSM. Alcohol use impairs judgment during sexual intercourse, potentially decreasing the likelihood of condom use (Steele & Josephs, 1990). The impaired judgment characteristic of alcohol use is not unique to MSM. However, given the increased HIV prevalence among MSM, particularly Black MSM, alcohol-induced lapses in judgment regarding condom use have particular implications for the sexual health of such men. Among MSM living with HIV, general alcohol use is associated with decreased health outcomes that make it difficult for the body to combat the virus. Such outcomes include weakening the immune system and decreasing CD4 cells that are essential to fighting the virus and are an important part of the immune system. This is significant because decreases in CD4 cells are indicative of disease progression (Baum et al., 2010). Alcohol use during sex may be particularly problematic among MSM living with HIV due to the increased potential for sexual behavior that can result in HIV transmission to uninfected partners, as well as infection

¹ The CDC has discontinued use of the term “unprotected sex” to refer to non-condom use. Given novel biomedical interventions (e.g. Pre-Exposure Prophylaxis) that mitigate HIV risk, sex without a condom does not mean that sex was associated with heightened HIV risk. Therefore, CDC recommends the use of clearer language to refer to sex without condoms. The use of the terms “non-condom use” and “condomless sex” throughout this paper is intended to be consistent with these recent guidelines by CDC (Madoori, 2014).

with new viral strains. These findings highlight the need to examine the pathways by which alcohol exacerbates and facilitates HIV risk among men who are the most vulnerable, Black MSM.

This paper will, (a) discuss the existing literature on alcohol use and sexual risk among MSM in general, while emphasizing research that has been conducted with Black MSM; (b) examine the role of several moderating variables in the relationship between alcohol use and condom use; and (c) discuss the design and results of the dissertation study that sought to advance knowledge of the relationship between alcohol and sexual risk-taking among Black MSM. The terms “gay” and “bisexual” are intended to describe forms of sexual identification, whereas the use of “MSM” solely describes sexual behavior.

Alcohol use among MSM

Over the past two decades, studies have demonstrated that alcohol use is highly prevalent among MSM, particularly urban men (Bergmark, 1999; Bux, 1996; Knox, Kippax, Crawford, Prestage, & Van De Ven, 1999; Reisner et al., 2010; Stall & Purcell, 2000; Stall & Wiley, 1988). Although more recent studies have reported that MSM are more likely than the general population to use illicit drugs (Cochran, Ackerman, Mays, & Ross, 2004; R Stall et al., 2001), studies are inconsistent in regard to the comparative use of alcohol. The CDC (2013b) suggests that gay and bisexual men are more likely to use alcohol and continue heavy drinking later in life. However, other studies suggest MSM use alcohol at rates comparable to their heterosexual counterparts, and that in treatment situations MSM are less likely to abstain from drinking or to view alcohol abstinence as a treatment goal ((Bux, 1996; National Institute on Alcohol Abuse and Alcoholism, 2004).

Although the comparative rates of alcohol use are inconclusive, alcohol use may serve a unique function in the lives of MSM. Alcohol use among gay and bisexual men can be a reaction to social marginalization (e.g. homophobia, discrimination, violence) resulting from their sexual orientation and may be associated with other mental health issues such as depression, anxiety, and substance use disorders (CDC, 2013b). Historically, gay bars and clubs have played an important role in providing a safe space for gay and bisexual men (Greenwood et al., 2001; Wolitski, Stall, & Valdiserri, 2008). As a result, it has been argued that bar attendance, and the accompanying alcohol consumption, have been integral to men participating in gay communities and culture (Vosburgh et al., 2012). Stall et al. (2001) examined alcohol use among urban MSM and found that affiliation with gay male culture was predictive of frequent heavy alcohol use, alcohol-related problems, frequent drug use, and multiple drug use. These associations suggest that while integration into gay culture provides affirmation and acceptance, aspects of the culture may also be risk-inducing for MSM by encouraging substance use.

Alcohol use among Black MSM

Epidemiological data suggest that Black adults generally use and abuse alcohol at lower rates than the general population. The National Survey on Drug Use and Health examined national rates of substance use. Nearly half (43.2%) of Black adults reported past month alcohol use and 20.6% reported past month binge drinking, compared to the national average of 57.4% and 23.9%, respectively (Substance Abuse and Mental Health Services Administration (SAMHSA), 2013). Similar trends were demonstrated among Black men specifically, such that when compared to men nationally Black men had lower rates of past month alcohol use (54% vs. 62.3%) and binge alcohol use (30.8% vs. 33.8%) (SAMHSA, 2010). While large epidemiological studies indicate that Black men report lower levels of alcohol use than the

national average, smaller cross-sectional studies have documented high rates of alcohol use among Black men as well as significant associations between alcohol use and risk for HIV and STIs (Caetano & Clark, 1998; Grant et al., 2004; Raj et al., 2009; SAMHSA, 2007). Raj et al. (2009) examined the alcohol use of 672 Black heterosexual men, and found that binge drinking was significantly associated with non-condom use as well as HIV and STI infection.

There is a dearth of literature comparing the alcohol use rates of Black MSM to that of their heterosexual counterparts. Therefore, it is unclear the extent to which the alcohol use behaviors of Black MSM differ from that of Black heterosexual men or Black adults in general. Nevertheless, studies of Black MSM indicate high rates of alcohol use, and comparisons across studies suggest that this is largely consistent with the substance use behaviors of MSM communities broadly (Stall et al., 2001). Examining rates of problematic alcohol use, defined as endorsing three or more alcohol-related problems, Stall, et al (2001) found rates as high as 13% among urban Black MSM. Similarly, Reisner et al. (2010) used the CAGE Questionnaire (Ewing, 1984) to assess alcohol use problems among 197 Black MSM in Massachusetts, and discovered that nearly one-third (29%) reported problematic alcohol use. A cross-sectional study of 142 urban Black MSM also found that nearly half (43%) reported hazardous or high risk levels of alcohol use, as assessed by the Alcohol Use Disorders Identification Test (Tobin, Davey-Rothwell, Yang, Siconolfi, & Latkin, 2014).

Although alcohol use is common among MSM, MSM are not at higher risk of developing alcohol use-disorders than men in the general population. Therefore, high rates of alcohol use may reflect a larger culture of substance use among men (Stall et al., 2001). Base rates alone suggest that MSM are most distinguished from their heterosexual counterparts by their illicit drug use, and not their alcohol use patterns (Cochran, Ackerman, Mays, & Ross, 2004; Stall et

al., 2001). However, alcohol used in the context of sex can increase the HIV risk of MSM who experience a greater burden of HIV than their heterosexual counterparts. Therefore, while MSM may not experience a disparity in alcohol use per se, they may be disparately affected by the deleterious results of such use. This is particularly true for Black MSM. Despite lower rates of alcohol use among Black adults in general, Blacks have an increased likelihood of experiencing the consequences of alcohol use, including the physical as well as social (e.g. incarceration) consequences (Harawa et al., 2008). For Black MSM, the potential for HIV risk behavior resulting from alcohol use during sex may be conceptualized as one such consequence.

Stall et al. (2001) argues that an understanding of heavy substance use among MSM requires an understanding of MSM sexual cultures. This is relevant given that alcohol use often facilitates sexual encounters among MSM, and places in which MSM are likely to find sexual partners (e.g. bars, circuit parties) are also places characterized by substance use (McKirnan, Venable, Ostrow, & Hope, 2001). The role of substance use in facilitating sex is of particular concern among communities, such as Black MSM, characterized by high rates of substance use, substance use in the context of sex, and HIV incidence. Addressing HIV prevention among this population requires a comprehensive understanding of Black MSM's alcohol use patterns and the role such use plays in decisions around condom use.

Alcohol consumption and condom use

Although there is support for the role of alcohol use in decreasing the likelihood of condom use during sex, studies of this relationship come from diverse methodologies yielding inconsistent results. Leigh (2002) conducted a meta-analysis of non-MSM specific studies examining the relationship between alcohol use and condom use in event-level studies. Event-level studies assess substance use and sexual behavior surrounding a specific sexual encounter,

such as the most recent encounter (Vosburgh et al., 2012). Event-level assessments may be advantageous in that they strengthen casual inferences by asking about drinking and condom use that occur on the same occasion (Leigh, 2002). Such assessments also capture important contextual details (e.g. substance use, sex position, partner and environmental characteristics) that may be beyond the scope of other assessment methodologies (Vosburgh et al., 2012). The meta-analysis of non-MSM specific studies conducted by Leigh (2002) found that drinking was unrelated to condom use at the event-level, even in recent encounters with new partners.

Vosburgh et al. (2012) reviewed the literature on the event-level association between substance use and sexual behavior among MSM. Of the 11 specific substances measured across the 23 studies, only methamphetamine use and binge drinking were consistently associated with sexual risk behavior. Ten of the 23 studies assessed alcohol use that was not binge drinking. Of these 10 studies, six found no association with sexual risk behavior and three studies found only a bivariate association. Only one study demonstrated a significant multivariate association in which alcohol use before sex was actually protective when controlling for drug use before sex.

Results of the association between alcohol and risky sexual behavior are inconsistent and research in this area does not definitively support the hypothesis that there is a direct influence of alcohol on sexual risk behavior (Leigh, 2002; Weinhardt & Carey, 2000). Nevertheless, event-level studies of MSM demonstrate that binge drinking is associated with non-condom use during sex although general alcohol use is not (Vosburgh et al., 2012). Therefore, at the event-level it may not be alcohol consumption in general, but the level of alcohol use that increases sexual risk-taking among MSM (Vosburgh et al., 2012).

Weinhardt and Carey (2000) stated that assessments of sexual behavior relying on a few sexual events for each participant, such as event-level assessments, are problematic because

individual events may or may not be representative of individuals' sexual behavior in general or when they are under the influence of alcohol. Therefore, it may be most advantageous to include various assessment methodologies to truly understand the nuances of the relationship between alcohol and condom use. Additional methods include global and situational-level assessments. Global assessments measure substance use and sexual behavior during a broad period of time and allow for examining consistencies in behavior over time (Leigh & Stall, 1993). However, using such methodologies, drug use and sex do not necessarily occur together, thus weakening causal inferences (Leigh & Stall, 1993). Whereas global-level assessments examine behavior without specific concern for whether substance use and sexual risk behavior occurred simultaneously, situational-level assessments attempt to address this issue. Situational-level assessment measures instances in which substance use and sexual behavior occur together within a specific timeframe.

Meta-analyses of studies with MSM and non-MSM specific studies reveal inconsistent findings regarding the relationship between alcohol consumption and condom use. Furthermore, the generalizability of many of these findings to MSM, or Black MSM specifically, may be limited and several studies of MSM do demonstrate an association between alcohol consumption and condom use. In an online survey of 2,916 mixed HIV-serostatus gay and bisexual men, alcohol and recreational drug use were associated with non-condom use during anal sex (Hirschfield, Remien, Humberstone, Walavalkar, & Chiasson, 2004). Colfax et al. (2004) examined 4,295 HIV-negative MSM and found that binge drinking (i.e. 6 or more alcoholic drinks) before or during sex predicted non-condom use during serodiscordant anal sex. Among HIV-negative MSM with diagnosed alcohol dependence, drinking has been associated with decreased condom use, particularly during receptive anal sex (Irwin & Morgenster, 2005).

Additionally, drinking before sex has been associated with HIV-positive MSM engaging in anal sex without condoms and with unknown serostatus partners (Purcell, Moss, Remien, Woods, & Parson, 2005).

Similar results were reported among samples of Black MSM. Wilton (2008) found that alcohol use before or during sex was predictive of several HIV risk behaviors in a sample of 481 mixed HIV serostatus Black gay and bisexual men. In the study of alcohol problems by Reisner et al. (2010), Black MSM who reported at least one episode of non-condom use during sex with a serodiscordant casual male partner during their last sexual encounter were three times as likely to have a drinking problem. Furthermore, MSM reporting non-condom use during sex with female partners in the prior 12 months were at increased odds for problematic alcohol use (Reisner et al., 2010). Bisexually-identified Black MSM report significantly higher levels of alcohol use and abuse than gay-identified Black MSM (Agronick et al., 2004; Dodge & Sandfort, 2007). As a result, bisexual activity and behavior-incongruent sexual identification may interact to place MSM, particularly non-gay-identified men who have sex with men and women (MSMW), at increased likelihood for alcohol consumption during sexual activity. Operario, Smith, Arnold, and Kegeles (2011) conducted a study of urban non-gay-identified Black MSMW and found that 90% of men reported some substance use before having sex in the past 30 days. Alcohol was the substance most frequently used prior to sex by 71% of the men studied (Operario et al., 2011). Similarly, Wohl et al. (2002) examined 70 heterosexually identified urban Black MSM and found that the majority (64%) reported being under the influence of drugs or alcohol during all episodes of anal sex with male partners (Wohl et al., 2002). The inconsistent condom use and multiple sexual partners characteristic of substance use during

sexual activity presents an increased HIV risk for Black MSM in general, and Black MSMW may represent a subgroup of MSM at increased risk given their unique alcohol use behaviors.

In brief, the literature is mixed in support for a relationship between alcohol and condom use among MSM. This inconsistency in findings illuminates the need for more thorough exploration. Examining these issues at the global, situational, and event levels within a single sample will allow for a better understanding of the relationship between alcohol and condom use across time because the relationship may vary across these levels. Additionally, while all three are informative examination at the event level will likely yield the most causal inferences about the ways in which alcohol affects condom use. Furthermore, investigating potential moderators of the relationship between alcohol and condom use can identify subgroups that are increasingly vulnerable to the effects of alcohol on sexual risk-taking.

The relationship between alcohol and sex among MSM

It is thought that the consumption of alcohol during sex by MSM, particularly among non-gay-identified MSM, may reflect a need to excuse engagement in sexual behavior that is socially unacceptable yet personally desirable (Harawa et al., 2008; Irwin, Morgenster, Parson, Wainberg, & Labouvie, 2006; McKirnan et al., 2001). The Cognitive Escape model contends that among MSM substance use has a significant role in decreasing cognitive dissonance related to engagement in homosexual sex, and provides an “escape” from the awareness of HIV risk (McKirnan, Ostrow, & Hope, 1996; McKirnan et al., 2001). Qualitative studies of MSMW of color have found that for men expressing discomfort around their sexuality, alcohol enabled them to engage in a variety of sexual acts with male partners (Martinez et al., 2011). Such men also reported drinking alcohol while participating in gay-related social (e.g. nightclubs) and

sexual activities in an attempt to decrease their discomfort and to ‘be themselves’ (Martinez et al., 2011).

Harawa et al. (2008) conducted a qualitative study exploring the ways in which non-gay-identified Black MSM understood the role of drugs and alcohol in sex with men. Four domains were identified that described the role of substance use in sexual encounters: drugs as 1) *motivators*; 2) *allowers*; 3) *rationalizers*; and 4) *facilitators*. Substances as *motivators* described instances in which men used sex to gain access to desired substances. This was demonstrated in exchange sex encounters in which men engaged in sex with men solely for the purpose of gaining access to desired drugs, alcohol, money or other material goods. Substances as *allowers* explained the ways in which intoxication allowed men to act on desires for sex with men despite a personal intention to avoid homosexual behavior. The subtheme of substances as *rationalizers* described situations in which men retrospectively excused their homosexual behavior because it resulted from intoxication. Finally, substances as *facilitators* described the ways in which substance use eased access to potential sexual partners. Men described substance use as leading to or encouraging sex, particularly among substance using communities and in the sexually charged environments in which substances use often occurs (Harawa et al., 2008).

While alcohol may be used to deal with men’s discomfort regarding their sexual desires, there are men for whom alcohol is intentionally used to enhance their sexual experiences and to gain a sense of power during the sexual experience (Martinez et al., 2011). A study of substance use among HIV-positive MSM found that nearly all (90%) of the men used drugs to enhance sexual pleasure, and that drug use dulled negative feelings about living with HIV (Semple, Patterson, & Grant, 2002). Although these findings deal with drug use, they likely generalize to substance use broadly and suggest that motivations for alcohol use during sex are multi-faceted.

For MSM, alcohol use during sex may be related to personal sexual enjoyment or a response to societal disapproval of homosexual behavior and stigma associated with HIV. Examining the relationship between alcohol and sex among MSM allows for a more nuanced understanding of the ways in which, and reasons why, alcohol may be related to condom use for such men.

Factors influencing the relationship between alcohol and risky sex

Black MSM are not monolithic, nor are their intentions for consuming alcohol. Numerous factors can explain the role of alcohol in the lives of Black MSM as well as the reasons for which they engage in alcohol use during sexual activity. Understanding these dynamics can help to better characterize Black MSM's motivation for alcohol use and its role in risky sex. The following section discusses possible moderating variables that have been found to significantly influence the relationship between alcohol and condom use, and that may explain or affect the strength of this association.

Alcohol expectancies. In qualitative studies examining reasons for alcohol use, MSM have reported using alcohol to facilitate sexual experiences and increase sexual performance (Martinez et al., 2011). Although people often attribute changes in sexual behavior and desire to alcohol consumption (Apostolopoulos, Sonmez, & Yu, 2002), it is likely that alcohol's perceived influence on sexual behaviors is primarily a result of socially learned expectancies around the anticipated effects of alcohol. Alcohol expectancy theory asserts that behavior during periods of intoxication is guided by prior expectations of the effects of alcohol on behavior (MacAndrew & Edgerton, 1969). This may be especially true for individuals holding strong sex-related alcohol expectancies, believing that alcohol consumption will increase sexual desire and facilitate sexual behavior. To that end, it has been argued that the association between alcohol and sexual behavior is moderated by sex-related alcohol expectancies, such that a particular subgroup of

individuals with strong sex-related alcohol expectancies may increase their sexual risk behavior when drinking (Weinhardt & Carey, 2000). It is likely that MSM have expectations that alcohol use will increase their sexual desires and behavior while also facilitating sexual encounters.

An experimental study of 117 predominately white MSM, 21 to 50 years old, found a direct effect of sex-related alcohol expectancies on risk perception. Participants reporting higher alcohol expectancies were more likely to endorse the positive consequences of being with a new partner, thereby endorsing lower risk perceptions (Maisto, Palfai, Vanable, Heath, & Woolf-King, 2012). Similarly, cross-sectional studies of gay and bisexual men have found sex-related substance use expectancies to be significantly associated with non-condom use (Bimbi et al., 2006), and substance use before sex (Kalichman, Tannenbaum, & Nachimson, 1998). Kalichman et al. (1998) concluded that altering substance use expectancies may be an important HIV prevention strategy for sensation seeking MSM.

The role of substance expectancies have been demonstrated among MSM, yet little has been done to examine sex-related alcohol expectancies among Black MSM specifically. Given differences in rates of alcohol use between Black men and men of other races (SAMHSA, 2010), as well as sociocultural differences in the role of alcohol (Caetano, Clark, & Tam, 1998), studies of sex-related alcohol expectancies among samples of predominately white MSM may not generalize to Black MSM. Therefore, research in this area is needed to assess whether the relationship between alcohol and condom use is moderated by the sex-related alcohol expectancies of Black MSM.

Personality traits. In addition to finding support for the role of sex-related substance use expectancies in risky sexual behavior among MSM, Kalichman et al. (1998) found that sensation seeking accounted for variance in risky sexual behavior over and above substance use before sex.

A pathway was established such that sensation seeking predicted substance use expectancies, and this, in turn, predicted substance use before sex. These and other findings suggest that the association between substance use and risky sex may be less reflective of a direct relationship, and more indicative of underlying personality traits. Risk-related traits such as impulsivity and sensation seeking are individually associated with alcohol use and non-condom use. Therefore, such traits may moderate the association between the two variables (Weinhardt & Carey, 2000).

Sensation seeking among MSM is associated with failure to use condoms (Berg, 2008; Mimiaga et al., 2011; Newcomb, Clerkin, & Mustanski, 2011), and sexual risk-taking, defined as number of casual partners, non-condom use with casual partners, and history of STIs (Adam, Teva, & deWit, 2008). Newcomb et al. (2011) conducted a longitudinal study of sensation seeking and its effect on sexual risk among 114 young (16 to 20 years old) MSM. Sensation seeking moderated the relationship between alcohol and drug use prior to sex and condom use. Specifically, the association between frequency of condom use and substance use prior to sex was strongest among participants with higher levels of sensation seeking.

Among MSM, impulsivity is associated with polysubstance use (Patterson, Semple, Zians, & Strathdee, 2005) as well as risky sexual behaviors such as having anonymous sex (Klein, 2012), and non-condom use (Hays et al., 1997; Semple, Zians, Grant, & Patterson, 2006). Semple et al. (2006) investigated the role of impulsivity in the relationship between methamphetamine use and sexual behavior. Impulsivity was defined as the tendency to act without thinking and without concern for negative consequences, and was measured using a 12-item self-report impulsivity scale developed by Dickman (1990). Examining a sample of methamphetamine-using HIV-positive MSM, a model including high levels of impulsivity predicted more non-condom use. In addition, impulsivity significantly moderated the relationship

such that the relationship between methamphetamine use and non-condom use was strongest among men with higher levels of impulsivity (Semple et al., 2006).

Impulsivity and sensation seeking among MSM act to put men at risk for engaging in substance use during sex as well as sexual risk behavior. The effect of sensation seeking and impulsivity on sexual risk behavior among MSM is of particular concern among young MSM. Impulsivity and risk-taking are increased during adolescence (Spear, 2000). Therefore, young MSM present a particularly vulnerable group to the effects of such personality traits on risky sexual behavior. It is important to note that the high rates of HIV among Black MSM are largely driven by high HIV incidence among young Black MSM ages 13 to 24 (CDC, 2013a). Therefore, it is not only important to understand the role of these personality traits as they relate to the behavior of Black MSM, but an investigation into the role of these personality traits in increasing risk for non-condom use among young Black MSM is warranted.

Bisexual behavior. Sex with women is prevalent among MSM (Greene et al., 2013), and MSM of color are more likely than their white counterparts to report sex with women (Harawa et al., 2008; McKirnan, Stokes, Doll, & Burzette, 1995). The National Behavioral Surveillance Survey found that 14% of Black, 8% of Hispanic, and 4.2% of White MSM reported sex with women in the prior 12 months (Sanchez et al., 2006). This is particularly high given that an estimated 1% of men in the general population ages 15 to 44 reported engaging in bisexual behavior over the past year (Mosher, Chandra, & Jones, 2005).

In research contexts, behaviorally bisexual and homosexual men are often combined into a single category (i.e. MSM) (Knight et al., 2007). However, distinctions between men who have sex with men only (MSMO) and MSMW are important given that the two subgroups are uniquely different. Demographically, MSMW: are older (Greene et al., 2013; Knight et al., 2007)

and more likely to be Black (Greene et al., 2013). Some important economic differences are noted, such that MSMW have lower annual incomes (Gorbach, Murphy, Weiss, Hucks-Ortiz, & Shoptaw, 2009; Greene et al., 2013; Zule, Bobashev, Wechsberg, Costenbader, & Coomes, 2009) and are more likely to report current unemployment and homelessness (Gorbach et al., 2009; Greene et al., 2013; Zule et al., 2009). MSMW are also less educated (Gorbach et al., 2009; Greene et al., 2013) and more likely to report a lifetime history of incarceration (Greene et al., 2013; Zule et al., 2009). Sexual identity also distinguishes MSMW and MSMO, with MSMW being less likely to identify as homosexual, largely identifying as bisexual (Greene et al., 2013).

Substance use also distinguishes the two groups, with MSMW being more likely: 1) to be injection drug users (Dodge, Jeffries, & Sandfort, 2008; Goodenow, Netherland, & Szalacha, 2002; Jeffries & Dodge, 2007); 2) to have used stimulants in the past 30 days (Zule et al., 2009); 3) to report trading sex for money or drugs (Jeffries & Dodge, 2007); 4) to have sex under the influence of substances (Jeffries & Dodge, 2007). MSMW also demonstrate lower intentions to use condoms (Heckman et al., 1995), and weaker peer norms favoring risk avoidance and safe sex (Heckman et al., 1995).

Similar differences are demonstrated among Black MSM, such that Black MSMW have elevated levels of interconnected factors including higher internalized homophobia, lower social support, and higher depression than Black MSMO (Dyer et al., 2013). Furthermore, compared to Black MSMO, BMSMW have been found to be: 1) older; 2) less educated; 3) more likely to have lower incomes; 4) more unemployed; 5) less stably housed; and 6) more likely to have been incarcerated (Dyer et al., 2013). The psychosocial differences between Black MSMO and MSMW suggest that Black MSMW may face differentially greater psychosocial burden (Dyer et

al., 2013). These psychosocial distinctions are important given that economic disenfranchisement may drive men to engage in risky behaviors as a means to access money, drugs, or material goods (Dyer et al., 2013). Additionally, factors such as homelessness, unemployment, and incarceration are related to HIV risk among Black MSM (Millett et al., 2012), as are psychological factors such as depression, social support and internalized homophobia (Maulsby et al., 2013a; Reisner et al., 2009). Therefore, understanding psychosocial distinctions between Black MSMO and MSMW can assist in identifying men who are most vulnerable and addressing the most pertinent correlates of HIV risk for each subgroup.

Compared to MSMO, MSMW may be at increased risk for substance use (Dodge, Jeffries, & Sandfort, 2008; Goodenow, Netherland, & Szalacha, 2002; Jeffries & Dodge, 2007; (Zule et al., 2009), sex under the influence of substances (Jeffries & Dodge, 2007), and endorsing peer norms that fail to discourage risky sexual behaviors (Heckman et al., 1995). Black MSMW specifically experience an increased psychosocial burden associated with HIV risk (Dyer et al., 2013; Myers, Javanbakht, Martinez, & Obediah, 2003). Taken together, it is plausible that the relationship between alcohol and condom use may be stronger for Black MSMW than Black MSMO. This was demonstrated by Dyer et al. (2013) who found that Black MSMW were more likely than Black MSMO to have anal intercourse without condoms while under the influence of alcohol. However, additional research is needed to further characterize differences in the alcohol use patterns of Black MSMO and MSMW and the relationship between alcohol use and sexual behavior. This is especially important given that the increased risk factors experienced by Black MSMW do not translate into increased HIV incidence. Black MSMW report lower HIV rates than Black MSMO (Harawa et al., 2013; Montgomery, Mokotoff, Gentry, & Blair, 2003; Wheeler, Lauby, Liu, Van Sluytman, & Murrill, 2008).

Additionally, Black MSMW largely may be less integrated into gay communities than Black MSMO (Harawa et al., 2008), and therefore may be protected from the aspects of gay culture that encourage alcohol consumption. Yet for Black MSMW the role of substance use during sex may function differently with men and women partners (Harawa et al., 2008), and from that of Black MSMO. All these factors must be considered to fully understand the diverse ways in which Black MSM experience their sexuality and substance use. Therefore, examination into the potential moderating role of bisexual behavior (i.e., MSMO vs. MSMW) in the relationship between alcohol and condom use can serve to identify subgroups of Black MSM most at-risk.

Partner characteristics. The relationship between sexual partners may significantly influence the strength of the relationship between alcohol use and condom use. Studies of MSM and non-MSM samples indicate that whether the partner is a new, occasional, or committed partner likely influences the perceived need for condom use (Weinhardt & Carey, 2000). An association between alcohol use during sex and condom use is likely to be attenuated with steady partners (Weinhardt & Carey, 2000), but may be enhanced with casual or anonymous sex partners particularly given that alcohol is often used to facilitate sexual encounters with novel and casual partners (Knight et al., 2007). Partner characteristics such as gender, HIV status, and substance use may also act to influence the likelihood of risky sex as well as the relationship between alcohol and condom use.

The level of control in a relationship and the ability to initiate condom use may differ between men and women sexual partners (Amaro, 1995). Therefore, for MSMW partner gender may be a significant factor in the event-level relationship between alcohol use and condom use. Studies of MSMW are relatively consistent in demonstrating less condom use with female partners, especially during vaginal intercourse, than with male partners (Gorbach et al., 2009).

Operario et al. (2011) examined the effect of gender on condom use among Black MSMW and found that the frequency of condom use differed with male and female sex partners. The majority (71%) of men reported not using condoms during vaginal sex with women, while fewer men engaged in no condom use during insertive (52%) or receptive (34%) anal sex with men (Operario et al., 2011). The differential use of condoms between men and women sex partners may be attenuated by the use of substances. Specifically, the overall lower rates of condom use with women sexual partners may be demonstrated among men sexual partners when substances are involved. Alcohol not only impairs the implementation of protected sexual behaviors, but it may also influence the likelihood of choosing riskier sexual partners (Weinhardt & Carey, 2000). Factors such as the substance use behaviors (Martinez et al., 2011; Reisner et al., 2010) and HIV-status of sexual partners may introduce further complexity to the role substance use during sex as well as the relationship between alcohol use and condom use.

A unique area of concern for Black MSM is the prevalence of transactional sex in which sex is offered or received in exchange for money, drugs, material goods, or something of value (e.g. housing). Exchange sex is prevalent among Black MSM (Harawa, Williams, Ramamurthi, & Bingham, 2006). Wheeler et al. (2008) conducted a study of 1,154 Black MSM in New York and Philadelphia and found nearly half (45%) of men reported participation in exchange sex as the provider or recipient of sex. This is a particular area of risk for Black MSMW who are significantly more likely than Black MSMO to participate in exchange sex, as the providers and recipients of material goods (Dyer et al., 2013). Dyer et al. (2013) found that being Black MSMW was significantly associated with receiving material goods during recent anal intercourse in which condoms were not used. The social marginalization of men who are at increased likelihood for homelessness, incarceration, and unemployment may create

circumstances in which men feel that exchange sex is necessary for daily survival (Gorbach et al., 2009). In such circumstances, men may be willing to engage in risky sexual behaviors if doing so guarantees them access to needed provision. In the study by Wheeler et al. (2008), exchange sex was significantly associated with non-condom use during anal intercourse in the past 3 months. While it is difficult to fully ascertain the relationship between transactional sex and risky sexual behavior (Knight et al., 2007), it is plausible that substance use has a significant role in sex with exchange partners and may act to exacerbate the risk of such encounters among Black MSMW. Research in transactional sex with MSM often examines the role of illicit drugs in the exchange. However, understanding the function alcohol serves in exchange sex for Black MSM is warranted.

Summary

MSM experience disproportionate rates of HIV morbidity and mortality and Black MSM are the most at-risk group for HIV infection (CDC, 2011; 2012). Factors commonly associated with HIV risk fail to adequately explain this racial disparity, indicating that the identification of correlates of HIV risk behaviors is multifaceted and complex (Brofenbrenner, 1979; Mustanski et al., 2011). A complete understanding of sexual risk among Black MSM likely requires exploration of factors that may be contributing to the epidemic within a multi-systemic model. Substance use is one such factor that interacts across system levels to put individuals at risk.

Substance use, alcohol specifically, is highly prevalent among Black MSM. Alcohol use in the context of sex is associated with HIV risk as alcohol use impairs judgment during sexual intercourse, likely reducing the likelihood of condom use (CDC, 2013b; Steele & Josephs, 1990). Understanding predictors of condom use is important because condom use is up to 10,000 times more effective in preventing HIV transmission than non-condom use (Carey et al., 1992).

Although the impaired judgment effect of alcohol use is not unique to MSM, such alcohol-induced lapses in judgment have particular implications for the sexual health of Black MSM and their sexual partners due to elevated HIV rates in this population. However, support for the role of alcohol use in increasing the likelihood of non-condom use during sex is inconsistent. This inconsistency in findings illuminates the need for more thorough exploration of this relationship among Black MSM. Assessment of sexual risk at the event, situational, and global level allows for a more complete understanding of sexual behavior in a way not often examined in the literature.

Black MSM are not monolithic in their sexual behaviors nor in their objectives for substance use. Additional factors may elucidate the role of alcohol in the lives of Black MSM as well as the motivation for engaging in alcohol use during sexual activity. However, little research has engaged in a thorough investigation of the relationship between alcohol and condom use, and associated factors that influence or explain this relationship, with Black MSM. Several specific variables have been posited as potentially influencing the association of this relationship including: binge drinking, sex-related alcohol expectancies, personality traits, partner characteristics, and bisexual behavior. Understanding these factors and their functions as moderating variables allows for better characterization of the nuanced role of alcohol in sexual decision-making. It is important to note that, although often examined separately, these variables are not completely independent of each other. Substance use, sexual behavior, and personality traits interact, likely moderating each other. Combined with issues of race, sexuality, and gender, Black men, MSM particularly, experience intersection along their social identities and psychosocial factors (Dyer et al., 2012; Goff, Leone, Lewis, & Kahn, 2012). This may not fully be captured by independent examination of moderating variables. However, methodological

limitations restrict the degree to which research can fully capture this complexity. Therefore, the practical implications of research that examines the effect of moderators independently must be understood within the intersectionality in which Black MSM live and experience these issues.

Addressing the HIV epidemic among Black MSM warrants understanding factors related to risk among this population. Given the significant role of substance use in sexual cultures among MSM, investigation in this area will help identify individuals who are most vulnerable to sexual risk-taking as a function of alcohol use and the conditions under which their risk is exacerbated or attenuated. The study of alcohol as it relates to sexual risk behavior is important for several reasons. Alcohol is unique from most other substances in that it is legal, socially acceptable, and easily accessible. Alcohol use is also normalized and, in many settings, expected even at high levels (Mutchler, McDavitt, & Gordon, 2013). Additionally, alcohol use is commonly associated with sex and people are more likely to have sex on the days they drink (Alcohol Research Center on HIV, 2014). The prevalence of alcohol use is high among MSM and MSM may use alcohol to facilitate sexual activity (CDC, 2013b). While alcohol may ease engagement in sexual activity, heavy drinking and subsequent intoxication can interfere with sexual communication and decision-making. The ability to clearly discuss and negotiate sexual interests, preferences, behaviors, and condom use is likely to be diminished when intoxicated. This impaired ability may lead to a failure to use condoms. Among men living with HIV, such alcohol-induced impairment in decision-making has the potential for transmitting HIV to uninfected partners. Non-condom use can also result in risk of transmitting, as well as contracting, other STIs which can increase the chances of illness among people living with HIV.

The role of alcohol in the lives of MSM is complex and presents multiple pathways by which to effect HIV morbidity, mortality, and transmission. The current dissertation study sought

to understand the ways in which such pathways between alcohol and sexual risk behavior contribute to the persistence of the HIV epidemic among Black MSM. As an underserved group, the needs of Black MSM often go unmet, particularly as it relates to their mental and physical health. However, addressing the HIV epidemic nationally necessitates a focus on HIV among Black MSM and a comprehensive and culturally sensitive exploration of correlates of risk for these men. Such research can inform the risk-reduction content of HIV/AIDS prevention efforts tailored to meet the unique needs of Black MSM, with the ultimate goal of reducing the disparate rate of HIV among this population.

Dissertation study aims

The goal of this dissertation was to advance the understanding of the relationship between alcohol consumption and condom use among Black MSM. The study battery was designed to evaluate the relationship between alcohol use and risky sexual behavior at three levels: lifetime, past 6 months, and event. In addition to the relationship between alcohol consumption and sexual risk-taking in this population, several empirically-driven moderators were examined. Specific aims were to:

Aim 1. Examine the association between alcohol consumption and condom use among Black MSM during lifetime, past 6 months, and the most recent sex events.

Hypothesis 1a: Alcohol use prior to sex will be associated with a decrease likelihood of condom use and this relationship will be observed during lifetime, past 6 months, and most recent event.

Hypothesis 1b: Problem drinking behaviors will be associated with a decreased likelihood of condom use during lifetime and the past 6 months.

Aim 2. To test empirically-driven moderators of the relationship between alcohol consumption and condom use across all three levels of analysis. Proposed moderators: (a) sex-

related alcohol expectancies, (b) risk-related personality traits (i.e. impulsivity and sensation seeking), and (c) partner type (i.e. casual or primary).

Hypothesis: The relationship between alcohol and condom use will be particularly strong for men: (1) having strong sex-related alcohol expectancies, (2) endorsing high levels of impulsivity and risk-taking, and (3) having mostly casual sexual partners.

Exploratory aim. To investigate differences between MSMO and MSMW on drinking behaviors, condom use, and moderating variables, as well as the association between alcohol consumption and condom use for MSMW during sex with men.

This project explores issues related to alcohol use and risky sexual behavior in a group of underserved Black men. The information learned from this research can inform the development of needed HIV/AIDS interventions for Black MSM, with the ultimate goal of decreasing HIV incidence among this at-risk population.

Methods

Participants

A community sample of 116 Black men were recruited using fliers, print advertisements, and in-person recruitment at community-based organizations targeting the Black gay community. To be eligible, respondents had to: 1) be at least 18-years old; 2) self-identify as Black/African-American; 3) self-identify as a man/male; 4) report at least one episode of condomless sex with a man in the 6 months prior to enrollment; and 5) report regular alcohol consumption (more than once per month) in the 6 months prior to enrollment. Exclusionary criteria included: 1) reporting regular use of illicit drugs (more than once per month) in the past 6 months, not including marijuana; 2) breath alcohol content greater than 0 during laboratory visit; and 3) urine toxicology screen positive for illicit drugs during laboratory visit, not including marijuana.

Procedure

Individuals interested in the study completed an initial screen online, over the telephone, or both during which their eligibility was determined. After this initial telephone interview, eligible individuals were invited to the UCLA Addictions Laboratory and provided their written informed consent to participate in the study. To ensure sobriety during the testing session, participants' breath alcohol content (BrAC) was measured using a Breathalyzer and they completed a urine toxicology screen. Participants then completed a battery of measures, described below. The battery took approximately 90 minutes to complete, with the total visit taking two hours. Participants were compensated \$50 for their time and were provided with either bus tokens or parking accommodations during their visit. As a snowball sampling recruitment technique, upon completion of the study participants had the opportunity to earn an additional \$5 if they shared information about the study via text message. If a participant agreed, there were provided with a pre-written text message from the study team and were instructed to send the message to at least 5 of their acquaintances whom they thought would be eligible to participate in the study.

Measures

Demographic variables assessed included age, race, income, education, employment status, relationship status, sexual orientation, and self-reported HIV status.

Alcohol use. Participants were asked about their frequency of alcohol use 2 hours prior to or during sex over their lifetime and during the past 6 months, and responded using the following options: *all the time*, *most of the time*, *occasionally*, *rarely*, and *never*. Participants also responded *yes* or *no* to drinking 2 hours prior to or during most recent condom and most recent condomless sex events. Drinking before/during sex was used to address Hypothesis 1a. Although

the frequency of drinking before/during sex was assessed, the amount of drinks consumed was not assessed.

The Alcohol Use Disorders Identification Test (AUDIT) examined participant's level of alcohol use problems (Babor, Higgins-Biddle, Saunders, & Monteiro, 2001). The 10-item AUDIT screened for problem drinking. Each item ranged in score from 0 to 4, and total scores of 8 or greater indicated problem drinking. Total AUDIT scores were used to assess relationships between levels of alcohol use problems and condomless sex during lifetime and past 6 months (Aim 1b). AUDIT total scores were dichotomized as problem drinking (total scores of 8 or greater) and no problem drinking (scores of less than 8). The dichotomized variable was used to assess moderation (Aim 2).

The Timeline Followback (TLFB) measured participants' estimates of their alcohol use (Sobell & Sobell, 1992). Participants were presented with a calendar in which they described their daily drinking behavior, including the amount of standard drinks and the type of alcohol consumed, over the past 30 days. TLFB data were coded into total number of drinks, number of drinking days, drinks per drinking day, and binge drinking (*yes/no*). Treatment referrals were provided to participants as requested.

Alcohol expectancies. The 13-item Sex-Related Alcohol Expectancies scale (SRAES) measured the degree to which participants believed that alcohol consumption effected their sexual behavior and decision making (Dermen & Cooper, 1994). Items were preceded by the stem "*After a few drinks of alcohol...*" and assessed the variety of ways in which participants may think their sexual behavior is changed during alcohol consumption (e.g. *I am less nervous about sex*). Responses to each item ranged on a scale from 1 (*strongly disagree*) to 6 (*strongly agree*). The measure contained 3 subscales: enhancement of sexual experience, increased sexual

risk-taking, and disinhibition of sexual behavior (Dermen & Cooper, 1994). Higher scores indicated stronger sex-related alcohol expectancies, or greater belief that alcohol use significantly effects sexual behavior.

The Drinking Expectancy Questionnaire for MSM (DEQ-MSM) was developed to be culturally sensitive to the role of alcohol expectancies among MSM (Mullens, Young, Dunne, & Norton, 2011). The 10-item DEQ-MSM ($\alpha=.77$) was comprised of 3 factors: cognitive impairment ($\alpha=.78$), sexual activity ($\alpha=.84$), and social and emotional functioning ($\alpha=.69$). Participants were prompted “*Please rate these statements based on your beliefs about alcohol*”, and respond to each item using a 5-point scale (*strongly disagree* to *strongly agree*). Higher scores indicated greater drinking expectancies. Although the DEQ-MSM exhibited similarities to the types of drinking expectancies demonstrated among the general population, the use of a measure validated for MSM allowed for greater consistency between the domains assessed and the culture of alcohol use among MSM.

Risk-related personality traits. Impulsivity and sensation seeking were evaluated using two measures of these constructs. The Delay Discounting Task (DDT) was administered as a measure of impulsive decision-making. In this task, participants were asked to make a series of 27 hypothetical choices by choosing between small immediate monetary rewards and larger delayed monetary rewards. The stimuli came from a previously validated measure of discounting (Kirby, Petry, & Bickel, 1999), and participants were instructed to respond as if the rewards (i.e., money) were real. Higher DDT scores indicated greater devaluing of later rewards, thus greater delay discounting (Odum, 2011).

The Impulsivity and Sensation Seeking Scale (ImpSS) measured both impulsivity and sensation seeking. The 19-item ImpSS assessed a preference for change and uncertainty as well

as a propensity to act without planning or thinking (McDaniel & Mahan III, 2008). Participants responded *true* (1) or *false* (0) to statements reflecting impulsivity (e.g. *I am an impulsive person*) and sensation seeking (e.g. *I like wild uninhibited parties*) (Zuckerman, Kuhlman, Joireman, Teta, & Kraft, 1993).

Sexual behavior. To assess sex practices, participants were asked about sexual behavior during their lifetime, past 6 months, and most recent condom and condomless sex event levels. For lifetime, participants were asked about their sexual behavior without respect to a given time-period (e.g. *How often do you use condoms?*). Similar items assessed sexual behavior in the past 6 months (e.g. *During the past 6 months, how often did you use condoms?*). Event-level items examined sexual behavior during the most recent sexual episodes with condoms (e.g. *The last time you used a condom during sex, were you drinking alcohol?*) and without condoms (e.g. *The last time you did not use a condom during sex, were you drinking alcohol?*). Such an assessment of sexual behavior along these three levels has been used previously in the measurement of high-risk sexual behavior and allows for greater understanding of the nuance of sexual patterns across time (Bryan, Ray, & Cooper, 2007). Further description of measures by aim and level of analyses is available in **Table 1**.

Given the differential risk associated with sexual position during sex with men (CDC, 2014), items assessed participants' sexual behavior as both the insertive and receptive partner. Participants were asked about the frequency of: condom use, drug use 2 hours prior to or during sex, partner substance use 2 hours prior to or during sex, as well as their relationship to their sexual partners (e.g. *committed, anonymous*) across the three levels. Response options for each item included: *all the time, most of the time, occasionally, rarely, and never*. These assessment methodologies were adapted from large-scale epidemiological studies of MSM and Black MSM

(HIV Prevention Trials Network, 2014). Given the relatively low HIV risk associated with oral sex (CDC, 2013c), such behavior was not assessed.

Statistical plan

Descriptive and frequency statistics provided an understanding of the demographic characteristics of the sample, and Spearman correlations examined associations between predictors, moderators, and outcomes. Chi-square and t-tests examined differences in the endorsement of several outcomes by sexual position (i.e. receptive and insertive sex). To test the main aims, ordinal logistic regression tested the odds of engaging in condomless sex given participants' alcohol consumption and problem drinking behaviors (i.e. AUDIT total score) during lifetime and past 6 months. Additionally, to test event-level associations binary logistic regression analyzed the odds of drinking during last condomless sex compared to last condom sex. Moderation was tested across all three levels of analysis. Ordinal logistic regression examined moderators for lifetime and the past 6 months, such that condomless sex was predicted by problem drinking (i.e. $AUDIT \geq 8$), the hypothesized moderator, and their interaction (e.g. $condomless = AUDIT \text{ Partner type } AUDIT * \text{Partner type}$). Binary logistic regression tested whether the odds of drinking during last condom sex were greater given the proposed moderators. Due to the low frequency of participants endorsing using condoms *never*, the *rarely* and *never* categories of condom use variables were combined into one category (i.e. *rarely/never*).

Age and years of education demonstrated significant bivariate associations with condom use and therefore were analyzed as covariates in the main analyses. Additionally, illicit drug use before/during sex during lifetime, past 6 months, and the most recent event was analyzed as a covariate for corresponding lifetime, past 6 months, and event condom use variables. Age, years

of education, and illicit drug use before/during sex failed to demonstrate significance within the models. The only exception was that illicit drug use significantly predicted past 6 months condomless receptive sex in all analyses. Unadjusted odds ratios (UOR), that did not include any covariates, were also examined. For all significant UOR, AOR are also presented. For insignificant findings and exploratory analyses, only UOR are presented. Additionally, post-hoc a familywise Bonferroni correction for multiple comparisons was calculated for the primary aims given the large number of analyses (i.e. 13) conducted for each outcome. This resulted in a corrected p value of .004 (99.6% CI). Given that the Bonferroni correction is very conservative, uncorrected p values are presented for findings significant at .05 and correct p values are reported for findings significant at .004. For insignificant findings and exploratory analyses, only uncorrected p values are reported.

Power analysis

The use of ordinal logistic regression analyses with categorical outcomes complicated power analytic strategies. Strategies for computing power with ordinal logistic regression amounts to little more than educated guessing, and do not have the same sophistication and validity demonstrated with continuous outcomes. In such cases, a sample size of at least 100, or 10 observations per predictor, is recommended to ensure adequate power to demonstrate significant effect sizes (Long, 1997). Therefore, this study sought to recruit a sample size of at least 100. Such a sample size is consistent with the recommendations of Long (1997) for categorical outcomes, reflective of the sample sizes of literature in this area, and is adequate to demonstrate significant associations.

Results

Sample

A community sample of 116 self-identified Black MSM were recruited for this study. When asked how participants heard about the study, Craigslist (40.8%) and a friend or text message (26.7%) were the most cited referral sources. The majority (74.5%) of participants participated in the snowball sampling referral opportunity. For further description regarding study recruitment, see Figure 1.

Of the 116 participants, 14 were removed from final data analyses; 5 due to concerns over data validity and 9 who tested positive from drugs other than marijuana during the study visit. This resulted in a final sample of 102 participants. All participants provided a BrAC of 0.00 g/dl, with the exception of one participant who provided a BrAC of .030 g/dl. Given the participant's low level of BrAC, and the fact that no significant cognitive impairment is associated with a BrAC at this level (Moskowitz & Fiorentino, 2000), the participant was not removed from the final analyses.

Demographics

Participants ranged in age from 20 to 63, with an average age of 35.2. The majority of participants were single (61.8%), employed at least part-time (61.4%), and had an annual income less than \$40,000 (75.5%), with a high school diploma, its equivalent, or less (52.9%). Nearly one-third (27.7%) of participants were HIV-positive, assessed via self-report (full demographic characteristics found in Table 2). The sample reported an average of 9.1 drinking days in the past month and 5.1 drinks per drinking day. The majority (74.5%) of men reported binge drinking in the past month (i.e. 5 or more drinks in a setting). Half (52%) of men endorsed problem drinking, scoring 8 or higher on the AUDIT. In addition to alcohol, the substance most endorsed by the

sample was marijuana (67.6%) with very few participants endorsing other illicit drug use in the past month (7.8%).

Drinking alcohol 2 hours prior to or during sex was less common with 66.6% of participants engaging in such behavior *occasionally* (i.e. 50% of the time) or less. Additionally, slightly more than half of participants reported using condoms *most of the time* or *all the time* during receptive (53.3%) and insertive (53.5%) sex. For lifetime sexual behavior, the majority of men (86.3%) endorsed both receptive and insertive sex, while few men reported exclusively receptive sex (2%) or insertive sex (10.8%). Similarly, almost half (46.1%) reported both receptive and insertive sex during the past 6 months, while fewer men reported receptive (12.7%) or insertive (31.4%) sex only. There were no significant differences on drinking behaviors or condom use for those reporting receptive and/or insertive sex during lifetime or the past 6 months. Similarly, no differences were found when comparing lifetime to past 6 months' sexual behavior. Although during the past 6 months men reported significantly more sexual partners as the insertive partner (3.81) than when the receptive partner (1.68), $t(101) = -4.02, p < .01$ (for further information regarding sexual behavior see Table 3). Men reported moderate levels of sex-related alcohol expectancies ($M = 34.9, SD = 13.7$), sensation seeking ($M = 9.7, SD = 4.3$), and delay discounting, $M = .09, SD = .10$ (Table 4).

Bivariate associations

Spearman's correlations were conducted to examine associations between hypothesized predictors, moderators, and condom use. AUDIT scores were positively correlated with lifetime condomless receptive ($r_s = .24, p < .05$) and past 6 months condomless insertive sex, $r_s = .25, p < .05$. Among the proposed moderators, SRAES total score and the Sexual Risk subscale were both positively correlated with lifetime condomless receptive ($r_s = .25, p < .05$; $r_s = .27, p < .01$) and

insertive sex ($r_s = .21, p < .05$; $r_s = .25, p < .05$), as well as past 6 months condomless receptive sex, $r_s = .26, p < .05$; $r_s = .30, p < .05$. Few of the other proposed moderators demonstrated significant associations with the outcomes. AUDIT total scores exhibited medium to large positive correlations with SRAES total score and its subscales, and DEQ-MSM total score and its subscales. (Table 5). Demographic variables associated with condom use included age, relationship status, and years of education (Table 6).

Aim 1: Association between alcohol consumption and condom use across levels

Ordinal logistic regressions were conducted to predict the odds of engaging in condomless sex. Specifically, odds ratios demonstrated the likelihood of moving from using condoms *all the time* to using condoms *rarely/never* (i.e. the likelihood of being in a higher risk category). This was done for both receptive and insertive sex for lifetime and the past 6 months (Tables 7 and 8). All analyses met the test of proportional odds assumption

Lifetime. Initial models examined whether the frequency of drinking 2 hours before or during sex was associated with a greater likelihood of condomless sex. There was not a significant association between drinking before/during sex and condomless receptive ($\chi^2(1) = 1.66, p = .20$) or insertive sex, $\chi^2(1) = .00, p = .98$. Next, models assessed the relationship between levels of alcohol use problems, as defined by the AUDIT total scores, and condomless sex. There was a significant association such that a one unit increase in AUDIT scores was associated with a 6% greater odds of lifetime condomless receptive sex, UOR = 1.06, 95% CI, 1.01 to 1.12, $p < .05$; AOR = 1.07, 95% CI, 1.07 to 1.00, $p < .05$. Additionally, there was a trend toward significance for lifetime insertive sex such that a one unit increase in AUDIT scores was associated with 5% greater odds of engaging in condomless insertive sex, UOR = 1.05, 95% CI, 1.05 to 1.10, $p = .07$; AOR = 1.03, 95% CI .98 to 1.09, $p = .26$. An examination of predicted

probabilities revealed that as AUDIT scores moved from one standard deviation below to one standard deviation above the mean, the likelihood of using condoms *rarely/never* increased from 20% to 38%. Conversely, the likelihood of using condoms *all the time* decreased from 14% to 6% (Figure 2).

Past 6 months. Consistent with lifetime associations, there was not a significant relationship between the frequency of drinking alcohol before/during sex in the past 6 months and condomless receptive ($\chi^2(1) = .05, p = .82$) or insertive sex ($\chi^2(1) = .17, p = .68$) in the past 6 months. There was a significant association with AUDIT scores, such that one unit increase in AUDIT scores was associated with a 9% increase in the likelihood of condomless insertive sex in the past 6 months, UOR = 1.09, 95% CI, 1.03 to 1.15, $p < .01$; AOR = 1.11, 99.6% CI, 1.01 to 1.22, $p < .004$. As AUDIT scores increased from one standard deviation below to above the mean, the likelihood of using condoms *rarely/never* during insertive sex in the past 6 months increased (17% to 41%) while using condoms *all the time* decreased, 22% to 7% (Figure 2). This finding remained significant after the Bonferroni correction.

Event. Binary logistic regression examined the likelihood of drinking during last condomless sex as compared to last condom sex. There was not a greater likelihood of drinking during last condomless sex, UOR = 1.13, 95% CI, .64 to 2.01, $p = .67$.

Summary of Aim 1. Neither the frequency of drinking before/during sex nor drinking during last sex lead to increased risk for condomless sex. Yet, there was support for broader associations such that the endorsement of higher levels of alcohol use problems was associated with a greater likelihood of condomless sex, a finding demonstrated for receptive sex (lifetime) and insertive sex (past 6 months).

Aim 2: Moderation

Several hypothesized moderators were examined to identify the ways in which they affected the strength of the relationship between problem drinking (i.e. total scores of 8 or greater on the AUDIT) and condom use across the three levels of analysis (i.e. lifetime, past 6 months, and event). Proposed moderators were: partner type (i.e. casual or primary); risk-related personality traits (i.e. impulsivity and sensation seeking); and sex-related alcohol expectancies (Tables 7 and 8).

Lifetime. The relationship between problem drinking and condomless receptive sex was significantly moderated by partner type, such that the association was strongest among men with predominately *casual/anonymous* partners as compared to men with *committed partners/boyfriends*, UOR = 8.54, 95% CI, .74 to 98.12, $p < .01$; AOR = 10.50, 95% CI, .79 to 139.75, $p < .05$. Specifically, men with problem drinking who endorsed having predominately *casual* or *anonymous* partners were more likely than men who endorsed predominately *committed partners/boyfriends* to use condoms *rarely/never*: 53%, 48%, and 15%, respectively. The likelihood of condom use did not significantly differ between casual and anonymous partners, nor did condom use differ by partner type among men with no problem drinking (i.e. AUDIT total scores less than 8) (Figure 3).

The association between problem drinking and lifetime condomless receptive sex was also significantly moderated by delay discounting, a measure of impulsivity, such that the association was strongest among men with high levels of impulsivity, UOR = 8.54, 95% CI, .74 to 98.12, $p < .01$; AOR = 10.50, 95% CI, .79 to 139.75, $p < .05$. Condom use remained stable among those without problem drinking regardless of delay discounting. Conversely, among those with problem drinking, the likelihood of using condoms *rarely/never* increased as delay

discounting increased from one standard deviation below the mean (20%) to one standard deviation above, 60% (Figure 4).

The following hypothesized moderators failed to significantly moderate the association between problem drinking and lifetime condomless sex: sensation seeking (receptive sex: $\chi^2(1) = 1.52, p = .22$), insertive sex: $\chi^2(1) = .12, p = .73$); and sex-related alcohol expectancies (receptive sex: $\chi^2(1) = .47, p = .49$), insertive sex: $\chi^2(1) = .09, p = .77$). None of the hypothesized moderators demonstrated significant associations during the past 6 months or the most recent condom/condomless events.

Summary of Aim 2. The relationship between problem drinking and condomless sex was strongest among men who had predominately casual and anonymous sexual partners and endorsed higher levels of impulsive decision-making. These associations were largely associated with lifetime receptive sex, and failed to be demonstrated during the past 6 months or the event level. The differences in findings between receptive and insertive sex provide further evidence to differential pathways to risk given sexual positioning.

Exploratory Aim: MSMO vs. MSMW

An exploratory aim was to examine differences between men who have sex with men only (MSMO) and men who have sex with men and women (MSMW). Over half (58.8%) of men reported having had vaginal sex with women in their lifetime, while less men reported having sex with women in the past 6 months (11.8%) or past month, 8.7% (Table 1). Given the low endorsement of sex with women in the past 6 months, MSMW were defined based on lifetime vaginal sex with women, main effects and moderators were only examined for lifetime vaginal sex, (Table 9).

There were no significant differences between MSMO (41.2%), and MSMW on any of the hypothesized moderators, drinking behaviors, or condom use with men. MSMW reported greater rates of consistent condom use with women than men. Specifically, MSMW were more likely to use condoms *all the time* with women than men when comparing vaginal sex to receptive ($\chi^2(1) = 13.33, p < .01$) and insertive ($\chi^2(1) = 10.13, p < .01$) sex with men.

Similar to the findings of sex with men, drinking 2 hours prior to or during vaginal sex was not associated with condomless vaginal sex, $\chi^2(1) = 1.20, p = .27$. However, a one unit increase in AUDIT scores was associated with an 8% increase in the odds of condomless vaginal sex, UOR = 1.08, 95% CI, 1.01 to 1.12, $p < .05$. As AUDIT scores moved from one standard deviation below to one standard deviation above the mean, the likelihood of using condoms *rarely/never* during vaginal sex increased from 24% to 50%, while the likelihood of using condoms *all the time* decreased from 55% to 28% (Figure 5).

Hypothesized moderators were also examined. Delay discounting was the only significant moderator of the association between problem drinking and condomless vaginal sex, UOR = 6.82, 95% CI, 1.87 to 24.93, $p < .01$. As delay discounting scores moved from one standard deviation below to above the mean, the likelihood of using condoms *rarely/never* increased among those with problem drinking from 25% to 74%, whereas it decreased among those with no problem drinking from 31% to 8% (Figure 6).

Summary of exploratory aim. No significant differences were demonstrated between MSMO and MSMW. MSMW reported greater consistency in the use of protected sexual behaviors with women in comparison to men sexual partners. The general associations between alcohol and condom use were similar between men and women, such that drinking in the context sex was not associated with risk whereas general problem drinking behaviors were associated

with a greater likelihood of risky sexual behavior with women, as was found with men. This association was strengthened among those with impulsive decision-making, a finding also demonstrated with men partners. Taken together, these findings suggest that the association between problem drinking and condomless sex was relatively stable regardless of partner gender.

Post-hoc analyses

Although not hypothesized, additional analyses were conducted in an effort to better understand the associations between problem drinking and condomless sex. Additional empirically supported moderators of the association between problem drinking and condomless sex were tested for lifetime and the most recent event: relationship status, gay-identification, age, and HIV status (Table 9).

The association between problem drinking and condomless sex was significantly moderated by relationship status, such that the association was attenuated among men in relationships for receptive (UOR = .16, 95% CI, .03 to .84, $p < .05$) and insertive sex, UOR = .21, 95% CI, .04 to 1.01, $p < .05$. Among individuals with no problem drinking, condom use was relatively stable regardless of relationship status. However, for individuals with problem drinking, those who were single were more likely to than those in a relationship to use condoms *rarely/never* for receptive (52% vs. 14%) and insertive sex, 43% vs. 16% (Figure 7).

The relationship between problem drinking and condomless receptive sex was moderated by age, UOR = 1.09, 95% CI, 1.01 to 1.19, $p < .05$. Condom use increased with age among men without problem drinking but decreased as age increased among men with problem drinking (**Figure 8**). Additionally, sexual orientation moderated the association between problem drinking and condomless insertive, such that gay-identification attenuated the relationship, UOR = .06, 95% CI, .01 to .40, $p < .01$. Among men with no problem drinking, gay-identified men (i.e.

identified as *gay, homosexual, or same-gender loving*) were more likely than non-gay-identified men (i.e. identified as *bisexual* or “*other*”) to report using condoms *rarely/never* during insertive sex (31% vs. 8%). Conversely, the likelihood of using condoms *rarely/never* during insertive sex was greater among non-gay-identified men (56%) than gay-identified men (29%) with problem drinking (**Figure 9**). HIV status did not significant moderate the association between problem drinking and condomless sex.

Main effects

,Main effects were tested for hypothesized moderators that were insignificant in moderation analyses: sex-related alcohol expectancies and sensation seeking. Additionally, the main effect of HIV status was examined (Table 9).

The Sexual Risk subscale of the SRAES had a significant main effect such that an increase in subscale scores (i.e. subjective effect of alcohol on the ability to engage in protected sexual behaviors) was associated with an increase in the odds of engaging in condomless receptive (UOR= 1.09, 95% CI, 1.00 – 1.18, $p < .05$) and insertive sex, UOR = 1.09, 95% CI, 1.01 – 1.18, $p < .05$ (Figure 10).

Subscales of the DEQ-MSM also exhibited main effects on insertive sex. Specifically, increases in scores on the Cognitive Impairment subscale (i.e. subjective difficulties with decision making and concentration resulting from drinking) were related to an increased likelihood of condomless insertive sex, OR = 1.10, 95% CI, 1.00 – 1.20, $p < .05$. This association was similar for the Social/Emotional Facilitation subscale (i.e. the subjective effects of drinking on subjective mood and connectedness to others), OR = 1.19, 95% CI, 1.02 – 1.38, $p < .05$ (Figure 11). Sensation seeking, as measured by the ImpSS did not independently predict

condomless receptive ($\chi^2(1) = .00, p = .97$) or insertive sex, $\chi^2(1) = .09, p = .76$. There was no main effect of HIV status on condomless sex.

Summary of follow-up analyses: The association between problem drinking and condomless sex was strongest among: 1) single men; 2) non-gay-identified men; and 3) older men. Additionally, expectancies that alcohol would influence sexual behavior significantly affected the likelihood of condomless sex, particularly for insertive sex. No differences were demonstrated by HIV status. The associations by sexual position suggest significantly differing psychosocial correlates of risk given sexual position.

Discussion

This study aimed to advance the understanding of the relationship between alcohol consumption and condom use among Black MSM by evaluating this association across three levels: lifetime, past 6 months, and the event. In addition, several empirically-driven moderators were examined. The results revealed pathways by which Black MSM may be vulnerable to engaging in sexual risk behavior given their alcohol use, and identified subgroups of men for whom the association between problem drinking and sexual risk behavior is particularly strong. Understanding pathways to sexual risk for Black MSM can inform efforts to address the sexual health needs of this community.

Half of the men in this study reported problem drinking, as defined by a score of 8 or greater in the AUDIT. This finding is relatively high in comparison to studies of Black MSM reporting levels of problem drinking ranging from 30% to 43% (Eaton, Cherry, Cain, & Pope, 2011; Koblin et al., 2013; Reisner et al., 2010; Tobin et al., 2014). Increased rates of problem drinking in the present study may reflect methodological differences in the definition and

assessment of problem and hazardous drinking across studies. Nevertheless, the frequency of problem drinking is noteworthy.

It was hypothesized that alcohol use prior to sex would decrease the likelihood of condom use for lifetime, past 6 months, and most recent sex events. Although the frequency of drinking alcohol two hours prior to or during sex did not predict condomless sex, endorsement of problem drinking behaviors (i.e. AUDIT total scores) was associated with a greater likelihood of engaging in condomless sex. Men did not confer additional risk by drinking in the context of sex, rather general patterns of problem drinking behaviors acted to put men at risk of engaging in condomless sex. These findings are reflected in literature suggesting that substance use prior to sex is not associated with condom use nor is it the strongest predictor of sexual risk (Leigh, 2002; Newcomb, Ryan, Garofalo, & Mustanski, 2014; Vosburgh et al., 2012; Weinhardt & Carey, 2000). Conversely, similar associations between patterns of problem drinking and condom use broadly have been found among Black, and other, MSM (Deiss et al., 2013; Reisner et al., 2010).

Examining risk behaviors by sexual role (i.e. receptive and insertive partner) is important given the increased risk of HIV/STI transmission for receptive partners during anal sex (CDC, 2014). A strength of the current study is the ability to speak to such differences. Problem drinking behaviors predicted condomless sex for lifetime receptive and past 6 months insertive sex. There are several important considerations in contextualizing these findings. The majority (86.3%) of men reported both receptive and insertive sex, and there were no significant differences in alcohol consumption or condom use between being the receptive and being the insertive partner. While sexual role is often an important factor in motivating condom use among MSM (Newcomb et al., 2014), men in the current study did not appear to make such distinctions.

MSM may intentionally use alcohol to enhance sexual pleasure or to ease physical pain specifically related to being the receptive partner (Collier, Sandfort, Reddy, & Lane, 2014). Although the frequency of alcohol use before/during sex failed to significantly predict condom use in the present study, it is interesting to consider the ways in which intentional alcohol use to facilitate sexual enjoyment may, over time, increase the overall frequency of alcohol use and contribute to the development of problem drinking and/or alcohol dependence. Contrary to what was hypothesized, event-level analyses revealed that participants were not more likely to report drinking during last condomless sex, as compared to last condom sex. This finding supports the notion that there is not a strong association between drinking and condomless sex at the event-level, rather general drinking behaviors are more predictive of engagement in sexual risk (Leigh, 2002; Vosburgh et al., 2012; Weinhardt & Carey, 2000).

Several variables were hypothesized to moderate the relationship between alcohol consumption and condom use across the three levels of analyses. Hypothesized moderators included: sexual partners characteristics (i.e. relationship status and partner type), risk-related personality traits (i.e. impulsivity and sensation seeking), and sex-related alcohol expectancies. As hypothesized, the relationship with sexual partners significantly moderated the relationship between problem drinking and condomless sex, such that single men with problem drinking exhibited the most condomless sex. This finding was significant for both receptive and insertive sex, demonstrating the importance of relationship status in understanding condom use among MSM without respect to sexual positioning. Relatedly, the association between problem drinking and condomless sex was enhanced with casual and anonymous sex partners and attenuated with steady partners, consistent with literature in this area (Vanable et al., 2004; Weinhardt & Carey, 2000). These findings reveal that single men with problem drinking who engaged in receptive

sex with casual and/or anonymous partners were least likely to use condoms and were most at risk for infection with HIV and other STIs. It is likely that drinking behaviors that are used to facilitate sex with new and less familiar partners may also be problem drinking behaviors that put men at risk for engaging in condomless sex (Knight et al., 2007). Moreover, given that HIV-positive MSM often choose to not disclose their serostatus to non-committed partners (Ciccarone et al., 2003), this poses a significant risk for men with problem drinking who have predominantly casual or anonymous sexual partners.

An unexpected result was that condom use was highest among men in relationships. This is contrary to findings that MSM are less likely to use condoms consistently in the context of a serious relationship, and that being in a relationship is associated with significantly higher rates of condomless sex compared to all other partner types (Perry N Halkitis, Wilton, Parsons, & Hoff, 2004; Mustanski et al., 2011; Newcomb et al., 2014; Sullivan, Salazar, Buchbinder, & Sanchez, 2009). Conversely, in the present study being in a committed relationship appeared to be protective even for men with problem drinking. Such inconsistent findings may be related to the ways in which condom negotiation within MSM relationships may differ by race, with Black MSM couples being more likely than White MSM couples to use condoms consistently (Campbell et al., 2014). Condom use among Black MSM couples may be an expression of the respect men have for their partners as well as a result of knowledge of the high incidence of HIV among Black MSM (Campbell et al., 2014). Therefore, the current findings provide further evidence to the limitations of generalizing findings of general MSM studies to Black MSM, specifically given that the role of condom use in Black MSM relationships may differ from that of other MSM.

Risk-related personality traits were also hypothesized to significantly moderate the association between problem drinking and condomless sex. Sensation seeking failed to significantly moderate the association. However, impulsivity, as measured by delay discounting, did moderate the association between drinking and condomless sex, such that the likelihood of condomless sex increased as impulsivity increased among those with problem drinking. This is consistent with findings describing the role of general risk-related personality traits (Hays et al., 1997; Klein, 2012; Semple et al., 2006), and delay discounting specifically (MacKillop et al., 2014), in exacerbating the association between substance use and sexual risk behaviors. Risk-inducing personality traits such as impulsivity may underlie the association between problem drinking and condomless sex. Given that impulsivity is especially high during adolescence and young adulthood, the moderation results for delay discounting are particularly relevant to understanding the high HIV incidence among young Black MSM (Spear, 2000).

No significant moderation was demonstrated the past 6 months or event levels of analyses. This may be the result of the smaller number of men endorsing receptive (58%) and insertive (77.5%) sex in the past 6 months as compared to the overwhelming majority of men endorsing lifetime receptive (88.2%) and insertive (97.1%) sex. A larger sample size may have yielded more significant results. A methodological consideration is that lifetime analyses revealed general behavior patterns whereas the past 6 months was a more time-constricted time period. As a result, past 6 months analyses may have been significantly affected by extraneous variables (e.g. course of life issues) that could affect individuals' sexual behavior, and may be less reflective of individuals' general behavior.

In addition to considering the proposed variables for their role as moderators of the relationship between alcohol and condomless sex, it was important to examine main effects of

these variables on condom use. An assessment of sex-related alcohol expectancies found that endorsing the belief that alcohol impeded protected sexual behavior increased the likelihood of lifetime and past 6 months condomless receptive sex. Similarly, expecting that alcohol increased 1) difficulties with decision making and concentration as well as 2) mood and connectedness to others each independently predicted the likelihood of lifetime condomless insertive sex. These findings demonstrated the increased risk associated with simply expecting that alcohol use would impair the implementation of protected sexual behaviors.

Receptive sex was predominately associated with psychopathology, while insertive sex was largely associated with alcohol expectancies. These differences between receptive and insertive sex provide further evidence to differential pathways to risk given sexual positioning, as well as the need for examining condom use by sexual role. Examination of main effects revealed important variables predicting sexual risk behavior that provides a holistic understanding of correlates of sexual risk behavior for Black MSM.

An exploratory aim was to examine bisexual behavior and differences between MSMW and MSMO on the outcomes of interest. Although much of the literature suggests high prevalence of recent sex with women among Black MSM, as well as an increased substance use and sexual risk behavior among Black MSMW (Dyer et al., 2013; Harawa et al., 2008; McKirnan et al., 1995; Sanchez et al., 2006), this was not reflected in the current study. More than half the sample reported lifetime sex with a woman, but few men reported recent (i.e. past year) sex with women and there were no significant differences between MSMW and MSMO on drinking behaviors or condom use. MSMW were also more likely to use condoms consistently with women as compared to men partners, inconsistent with literature revealing that MSMW engage in less protected sexual behaviors with women (Gorbach et al., 2009; Operario

et al., 2011). Associations between drinking behaviors and condom use with women were largely consistent with that of men, indicating that the association between problem drinking behaviors and condomless sex persisted regardless of partner gender. However, these results should be interpreted with caution as they reflect lifetime, and not recent, sex with women.

Limitations

This study has a few limitations that should be considered. The examination of risk behaviors by sexual position and across levels of analyses allowed for assessing differential risk pathways. However, a sample size of 102 may not have provided the power needed to detect medium or smaller effects. This was demonstrated by many of the odds ratios being of similar magnitude, although some were significant and others were not depending on the sample size available for a particular analysis. Additionally, the cross-sectional nature of this study allowed for demonstrating significant associations, but limited the ability to draw causal inferences. Measuring the frequency of drinking before/during sex without assessing the amount of drinks consumed limits the ability to examine the ways in which the association between drinking before/during sex and condom use may differ by the amount of alcohol consumed.

In addition to methodological considerations, the nature of the sample should be considered. The sample reported relatively low rates of risk behaviors, including little recent illicit drug use other than marijuana and high rates of condom use. As a result, these findings may not generalize to Black MSM illicit substance users for whom associations between problem drinking and risky sexual behavior are likely to be exacerbated by other substance use (Mimiaga et al., 2010; Reisner et al., 2010). Nor do these findings generalize to Black MSM who engage in predominately condomless sex, such as men who prefer “barebacking.” Social desirability may have also discouraged participants from disclosing sensitive information

regarding their engagement in risk behaviors. If this was the case, then the current findings are potentially an underreport, rather than an overestimation, of risk-taking among these men.

Conclusions and future directions

The goal of this study was to contribute to the literature on the relationship between alcohol consumption and condom use among Black MSM. The findings demonstrated the ways in which Black MSM may have a greater likelihood of sexual risk behavior given drinking patterns. The relationship between alcohol and sexual risk behaviors was a global one in which general patterns of problem drinking predicted sexual risk rather than drinking in the context of sex. Furthermore, the likelihood of men with problem drinking engaging in condomless sex increased if they were single, the less familiar they were with their sexual partners, and the more impulsive they were. Increased likelihood of risk was also demonstrated when being the receptive partner and when insertive partners expected their alcohol use to influence their sexual behavior. Reducing HIV incidence among Black MSM requires knowledge of sexual risk factors, such as alcohol use, that can inform interventions to address such vulnerabilities among this population.

There continues to be a need for effective, comprehensive, and culturally relevant HIV and substance use interventions for Black MSM (Maulsby et al., 2013b; Reisner et al., 2010; Tobin et al., 2014). The findings of this study highlight an important theme of consideration (i.e. alcohol use) in the creation and implementation of such interventions. Reflecting important findings of the current study, interventions for Black MSM may benefit by addressing several areas: 1) informing Black MSM of the general associations between levels of alcohol use problems and risky sex, rather than emphasizing event level associations; 2) challenging commonly held expectancies that alcohol exacerbates sexual risk; and 3) providing skills for

reducing general patterns of problem drinking that may also reduce associated sexual risk behaviors.

Several areas of the current study can be expounded upon through future research. As HIV prevention efforts evolve to include more biomedical interventions, there will be a need to understand the role of biomedical interventions in the relationship between substance use and sexual risk behavior. Nine men in this study reported use of Pre-Exposure Prophylaxis and the majority (87.5%) of HIV-positive men reported currently receiving antiretroviral treatment. While biomedical treatments significantly lower the risk of HIV/STI transmission and infection, substance use can weaken the immune system and result in non-compliance that compromises the effectiveness of such treatment (Baum et al., 2010; Grodensky, Golin, Ochtera, & Turner, 2012). As novel prevention methods are made available, it will be important to understand associations between substance use, medication adherence, and sexual risk taking.

Research investigating the disparate rates of HIV among Black MSM largely examines correlates of risk behavior. The field may be equally served by seeking to understand what motivates protected behaviors among Black MSM, particularly young Black MSM. A large number ($n = 70$) of men were ineligible for the current study due to not engaging in condomless sex with a man in the past 6 months. It is likely that many of these individuals were in fact having sex with men and used condoms consistently, rendering them ineligible for the study. Understanding what motivates such men to engage in protected behaviors consistently can generate knowledge of what aspects of HIV prevention are most effective for Black MSM. Such work can begin to provide a needed shift from prioritizing investigation of risk and pathology to identifying the strengths of Black MSM and capitalizing on such assets to address HIV prevalence among this community.

Appendix

Table 1. Measures

	Variable	Assessment		
		Lifetime	Past 6 months	Event
<i>Outcome</i>	Condomless sex	Frequency of condom use, assessed for both insertive and receptive (<i>all the time – rarely/never</i>)	Frequency of condom use in past 6 months, assessed for both insertive and receptive (<i>all the time – rarely/never</i>)	Assessment of last condom sex and last condomless sex
<i>Aim 1: Association between alcohol use and condomless sex</i>	1a. Drinking 2 hours before and/or during sex	Frequency of drinking before/during sex (<i>all the time – rarely/never</i>)	Frequency of drinking before/during sex in the past 6 months, assessed for insertive and receptive (<i>all the time – rarely/never</i>)	Drinking during last condom and last condomless sex (Yes/no)
	1b. Levels of alcohol use problems	AUDIT total score	AUDIT total score	NA
<i>Aim 2: Moderators</i>	<i>Predictor</i> : Problem drinking	AUDIT categorical (8 or greater indicates problem drinking)	AUDIT categorical (8 or greater indicates problem drinking)	Drinking during last condom/condomless sex
	Partner type (<i>partner/boyfriend, casual, anonymous</i>)	Primary relationship to the majority (more than half) of your sexual partners	Primary relationship to the majority (more than half) of sexual partners, assessed for insertive and receptive	Relationship to your partner, assessed for both last condom and last condomless sex
	Sex-related alcohol expectancies		Sex-Related Alcohol Expectancies Scale Drinking Expectancies Questionnaire-MSM Scale	
	Impulsivity/sensation seeking		Impulsivity and Sensation Seeking Scale Delay Discounting Task	

Figure 1. Recruitment flow sheet

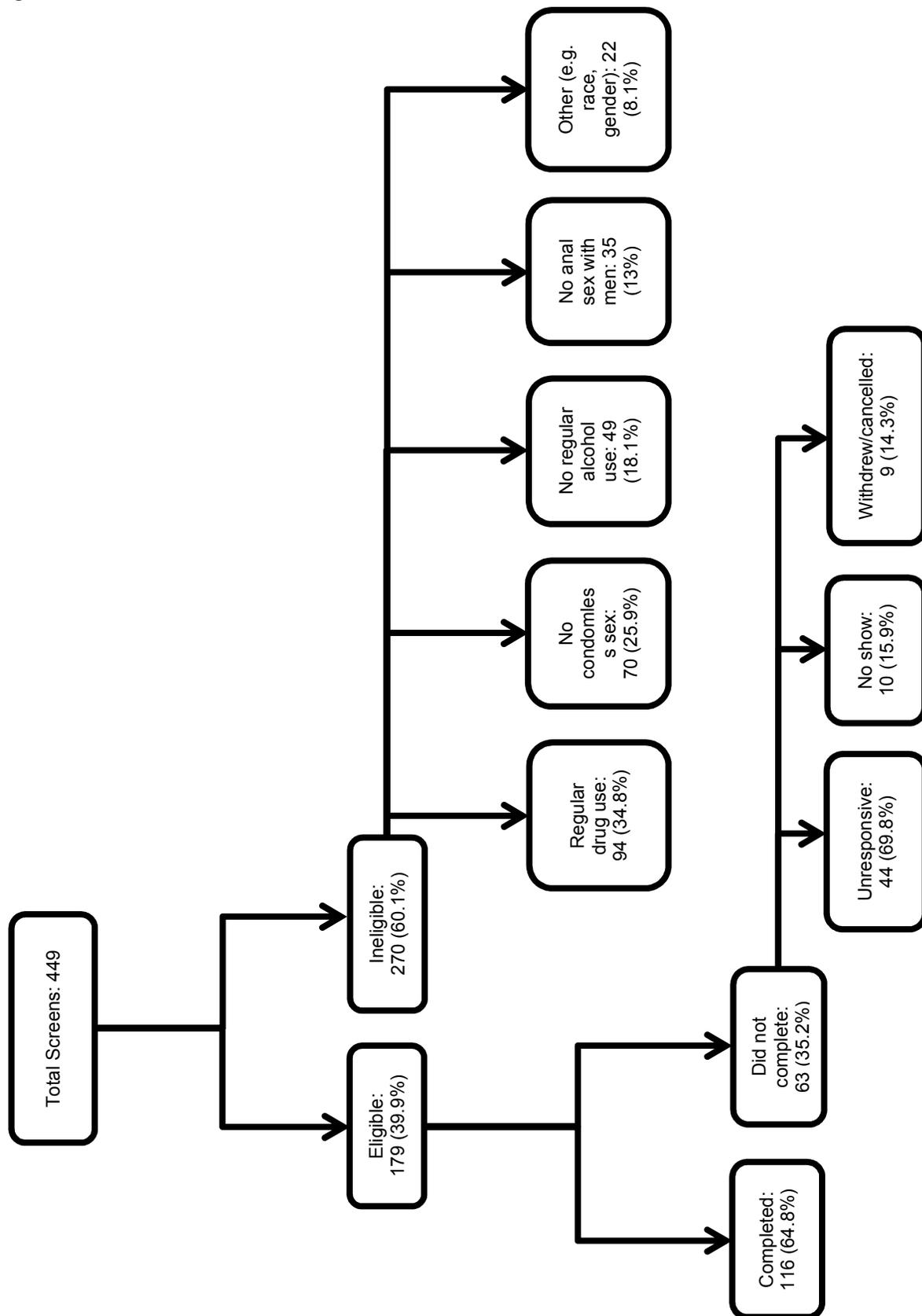


Table 2. Demographic characteristics (N=102)

Variable	M (SD)/n (%)
Age	35.2 (10.1)
Sexual orientation	
Gay/homosexual/same-gender-loving	77 (75.5%)
Bisexual	23 (22.5%)
Other	2 (2%)
In a committed relationship	
No	63 (61.8%)
Yes	39 (38.2%)
Education	
≤ High school diploma/equivalent	54 (52.9%)
> High school diploma/equivalent	47 (46.1%)
Employment status	
Employed	62 (61.4%)
Unemployed	39 (38.6%)
Income	
≤ \$39,999	75 (75.7%)
≥ \$40,000	24 (24.2%)
HIV status (self-report)	
Unknown	5 (5%)
Negative	68 (67.3%)
Positive	28 (27.7%)
Illicit drug use (past month)	
No	94 (92.2%)
Yes	8 (7.8%)
Binge drinking (past month)	
No	26 (25.5%)
Yes	76 (74.5%)
Sex with women, past month	
No	84 (91.3%)
Yes	8 (8.7%)
Vaginal sex, past 6 months	
No	90 (88.2%)
Yes	12 (11.8%)
Vaginal sex, lifetime	
No	42 (41.2%)
Yes	60 (58.8%)

Table 3. Condom and substance use, lifetime and past 6 months (N=102)

Variable	Total, M (SD)/ n (%)	Receptive sex, M (SD)/ n (%)	Insertive sex, M (SD)/ n (%)	χ^2 (DF)/ t(DF)	<i>p</i>
Alcohol use (past month)					
Total drinking days	9.1 (6.6)	8.81 (6.22)	8.97 (6.67)	.24 (98)	.82
Total drinks	45.3 (45.8)	43.88 (44.12)	44.11 (43.87)	.05 (98)	.96
Drinks per drinking day	5.1 (3.7)	4.90 (3.46)	5.05 (3.62)	.41 (98)	.68
Alcohol Use Disorders Identification Test					
AUDIT Total Score	9.3 (7.3)	9.61 (7.62)	9.41 (7.38)	-.26 (98)	.79
< 8, no problem drinking	53 (52%)	46 (51.1%)	52 (52.5%)	.04 (1)	.85
≥8, problem drinking	49 (48%)	44 (48.9%)	47 (47.5%)		
<i>Lifetime</i>					
Anal sex	102 (100%)	90 (88.2%)	99 (97.1%)	1.39 (1)	.32
Condom use					
All the time		9 (10%)	12 (12.1%)		
Most of the time		39 (43.3%)	41 (41.4%)	.25 (3)	.97
Occasionally		15 (16.7%)	17 (17.2%)		
Rarely/Never		27 (30%)	29 (29.3%)		
Alcohol before/during sex					
Half the time or less	68 (66.7%)	61 (67.8%)	66 (66.7%)	.03 (1)	.87
More than half the time	34 (33.3%)	29 (32.2%)	33 (33.3%)		
<i>Past 6 months</i>					
Anal sex	96 (94.1%)	60 (58.8%)	79 (77.5%)	.07 (1)	.49
Number of partners	5.35 (6.97)	1.68 (3.62)	3.81 (6.08)	-4.02 (101)	.00**
Condom use					
All the time		9 (15%)	11 (13.9%)		
Most of the time		24 (40%)	29 (36.7%)	.37 (3)	.95
Occasionally		10 (16.7%)	16 (20.3%)		
Rarely/Never		17 (28.3%)	23 (29.1%)		
Alcohol during sex					
Half the time or less		41 (68.3%)	42 (59.2%)	1.18 (1)	.28
More than half the time		19 (31.7%)	29 (40.8%)		

** $p \leq 0.01$

Table 4. Proposed moderators

Variable	α	Range	M (SD)
Sex-Related Alcohol Expectancies	.90	0 – 63	34.93 (13.67)
Sexual Enhancement	.90	0 – 25	15.58 (6.10)
Sexual Risk	.81	0 – 20	9.47 (5.27)
Disinhibition	.81	0 – 20	9.88 (4.94)
Drinking Expectancies Questionnaire for MSM	.86	3 – 50	26.12 (9.75)
Cognitive Impairment	.76	0 – 20	10.88 (4.78)
Sexual Activity	.81	0 – 20	9.82 (4.2)
Social and Emotional Facilitation	.82	0 – 10	5.41 (2.66)
Impulsive Sensation Seeking	.78	1 - 19	9.74 (4.32)
Delay Discounting Task	.94	0 – 2.5	.09 (.10)

Table 5. Bivariate associations between predictor, moderators, and outcomes

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Alcohol Use Disorders Identification Test	--														
2. Sex-Related Alcohol Expectancies	.40**	--													
3. Sexual Enhancement	.29**	.82**	--												
4. Sexual Risk	.31**	.84**	.53**	--											
5. Disinhibition	.47**	.85**	.56**	.61**	--										
6. Drinking Expectancies Questionnaire for MSM	.45**	.77**	.68**	.57**	.69**	--									
7. Cognitive Impairment	.39**	.67**	.47**	.64**	.6**	.81**	--								
8. Sexual Activity	.32**	.62**	.68**	.35**	.53**	.82**	.41**	--							
9. Social/Emotional Facilitation	.44*	.49**	.48**	.32**	.46**	.79**	.5**	.62**	--						
10. Impulsivity and Sensation Seeking	.16	.12	.16	.06	.12	.14	.17	.04	.09	--					
11. Delay Discounting Task	.12	.08	.05	.11	.03	.05	-.02	.11	.11	-.05	--				
12. Receptive (lifetime)	.24*	.25*	.09	.27**	.22*	.16	.10	.18	.16	.03	.23*	--			
13. Insertive (lifetime)	.14	.21*	.09	.25*	.17	.18	.21*	.09	.22*	-.01	.19	.63**	--		
14. Receptive (6 months)	.19	.26*	.13	.30*	.10	.10	.09	.11	.11	-.09	.11	.58**	.46**	--	
15. Insertive (6 months)	.25*	.08	.01	.17	.02	.13	.14	.04	.18	.05	.12	.36**	.58**	.55**	--

Note: Spearman's correlation

* $p \leq 0.05$

** $p \leq 0.01$

Table 6. Bivariate associations between demographic variables and outcomes

	1	2	3	4	5	6	7	8	9	10	11
1. Age	--										
2. Sexual identity	.00	--									
3. Relationship	-.12	.07	--								
4. Years in school	-.23	-.07	.11	--							
5. Employment status	.22*	-.13	.11	-.40**	--						
6. Income	-.04	.11	.08	.29**	-.32**	--					
7. HIV status	-.29**	.05	.11	.17	-.20*	.27**	--				
8. Receptive sex (lifetime)	.12	-.12	-.26*	-.11	-.06	-.05	-.09	--			
9. Insertive sex (lifetime)	.27**	-.08	-.15	-.20*	.06	-.12	-.04	.63**	--		
10. Receptive sex (6 months)	.09	-.04	-.19	-.04	.01	-.11	-.11	.58**	.46**	--	
11. Insertive sex (6 months)	.14	.03	-.04	-.01	.16	-.08	.01	.36**	.58**	.55**	--

Note: Spearman's correlation

* $p < 0.05$

** $p < 0.01$

Table 7. Primary aims (unadjusted odds ratios)

Variable	Lifetime		Past 6 months		Event
	Receptive, n = 90	Insertive, n = 99	Receptive, n = 60	Insertive, n = 79	N = 102
<i>Aim 1: Association between alcohol use and condomless sex</i>					
1a. Drinking before/during sex	NS	NS	NS	NS	NS
1b. Levels of alcohol use problems	1.06 (1.01 – 1.12)*	1.05 (1.00 – 1.10), $p = .07$	NS	1.09 (1.00 – 1.19)+	--
<i>Aim 2: Moderators</i>					
SRAES total	NS	NS	NS	NS	NS
Sexual Enhancement	NS	NS	NS	NS	NS
Sexual Risk	NS	NS	NS	NS	NS
Disinhibition	NS	NS	NS	NS	NS
DEQ-MSM total	NS	NS	NS	NS	NS
Cognitive Impairment	NS	NS	NS	NS	NS
Sexual Activity	NS	NS	NS	NS	NS
Social and Emotional Facilitation	NS	NS	NS	NS	NS
Impulsivity/Sensation Seeking	NS	NS	NS	NS	NS
Delay Discounting	2.52 (1.06 – 6.02)*	NS	NS	NS	NS
Partner type	8.54 (.74 – 98.12)**	NS	NS	NS	NS

* $p < .05$ (95% CI)

** $p < .01$, (95% CI)

+ $p < .004$, (99.6 CI), Familywise Bonferroni correction

Note: Bonferroni corrects for 13 tests conducted per outcome

Table 8. Primary aims (adjusted odds ratios)

Variable	Lifetime		Past 6 months		Event
	Receptive, n = 90	Insertive, n = 99	Receptive, n = 60	Insertive, n = 79	N = 102
<i>Aim 1: Association between alcohol use and condomless sex</i>					
1a. Drinking before/during sex	NS	NS	NS	NS	NS
1b. Levels of alcohol use problems	1.07 (1.07 – 1.00)*	NS	NS	1.11 (1.01 – 1.22)+	--
<i>Aim 2: Moderators</i>					
SRAES total	NS	NS	NS	NS	NS
Sexual Enhancement	NS	NS	NS	NS	NS
Sexual Risk	NS, $p = .06$	NS	NS	NS	NS
Disinhibition	NS	NS	NS	NS	NS
DEQ-MSM total	NS	NS	NS	NS	NS
Cognitive Impairment	NS	NS	NS	NS	NS
Sexual Activity	NS	NS	NS	NS	NS
Social and Emotional Facilitation	NS	NS	NS	NS	NS
Impulsivity/Sensation Seeking	NS	NS	NS	NS	NS
Delay Discounting	3.12 (1.18 – 8.25)*	NS	NS	NS	NS
Partner type	10.50 (.79 – 139.75)*	NS	NS	NS	NS

* $p < .05$ (95% CI)

** $p < .01$, (95% CI)

+ $p < .004$, (99.6 CI), Familywise Bonferroni correction

Note: Bonferroni corrects for 13 tests conducted per outcome

Figure 2. Associations between AUDIT total scores and condom use

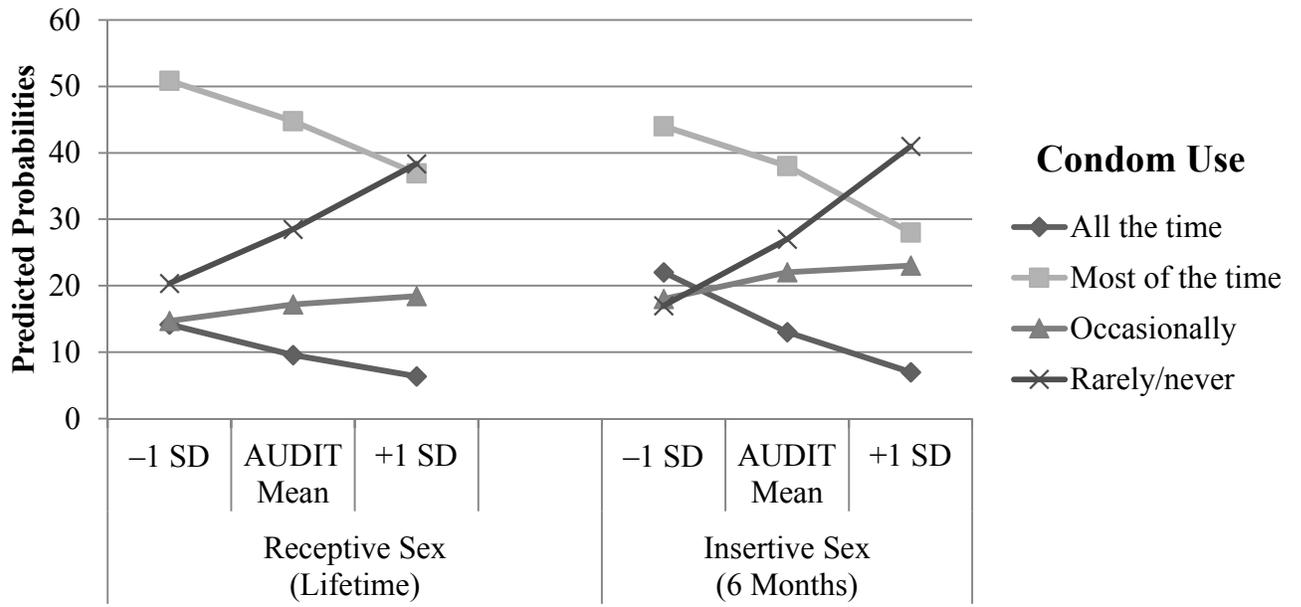


Figure 3. Association between problem drinking and receptive sex (lifetime), moderated by partner type

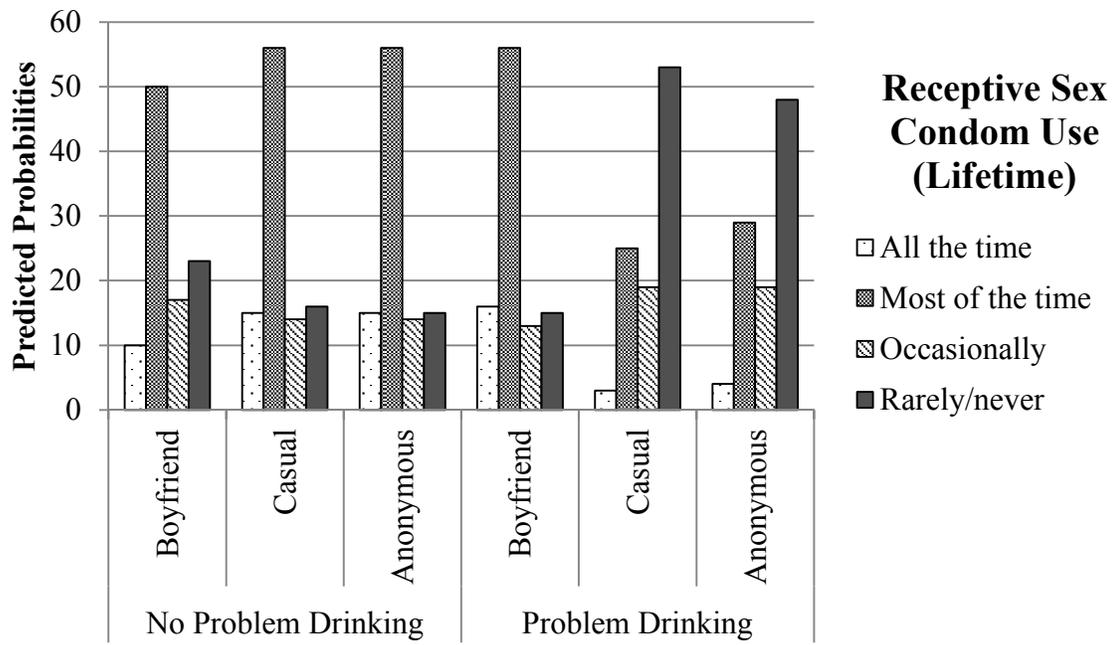


Figure 4. Associations between problem drinking and receptive sex (lifetime), moderated by delay discounting

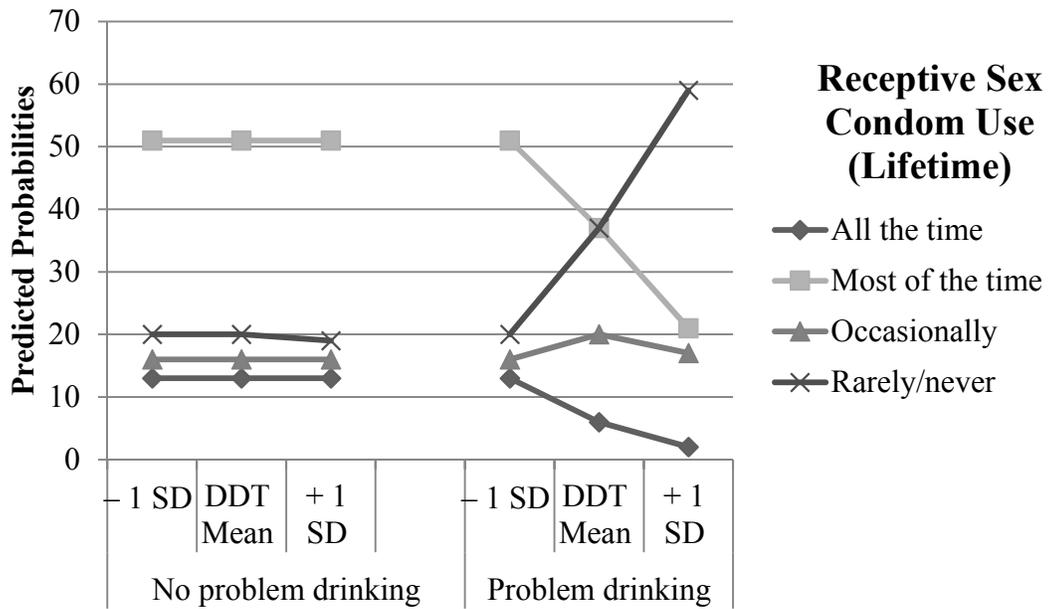


Table 9. Exploratory and follow-up analyses (unadjusted odds ratios)

Variable	Lifetime			Event N = 102
	Vaginal sex, n = 60	Receptive, n = 90	Insertive, n = 99	
<i>Exploratory aim: Association between alcohol use and condomless vaginal sex</i>				
Drinking before/during sex	NS	--	--	--
Levels of alcohol use problems	1.08 (1.01 – 1.17)*	--	--	--
<i>Post-hoc moderators</i>				
Delay Discounting	6.82 (1.87 – 24.93)**	--	--	--
Relationship status (partnered)	NS	.16 (.03 - .84)*	.21 (.04 – 1.01)*	NS
Gay-identified	NS	NS	.06 (.01 - .40)**	NS
Age	NS	1.09 (1.01 – 1.19)*	NS	NS
HIV status	NS	NS	NS	NS
<i>Post-hoc main effects</i>				
SRAES total	NS	NS	NS	--
Sexual Enhancement	NS	NS	NS	--
Sexual Risk	NS	1.09 (1.00 – 1.18)*	1.09 (1.01 – 1.18)*	--
Disinhibition	NS	NS	NS	--
DEQ-MSM total	NS	NS	NS	--
Cognitive Impairment	NS	NS	1.10 (1.00 – 1.20)*	--
Sexual Activity	NS	NS	NS	--
Social and Emotional Facilitation	NS	NS	1.19 (1.02 – 1.38)*	--
Impulsivity/Sensation Seeking	NS	NS	NS	--
HIV status	NS	NS	NS	--

* $p < .05$ (95% CI)

** $p < .01$, (95% CI)

Figure 5. Association between AUDIT scores and condomless vaginal sex (lifetime)

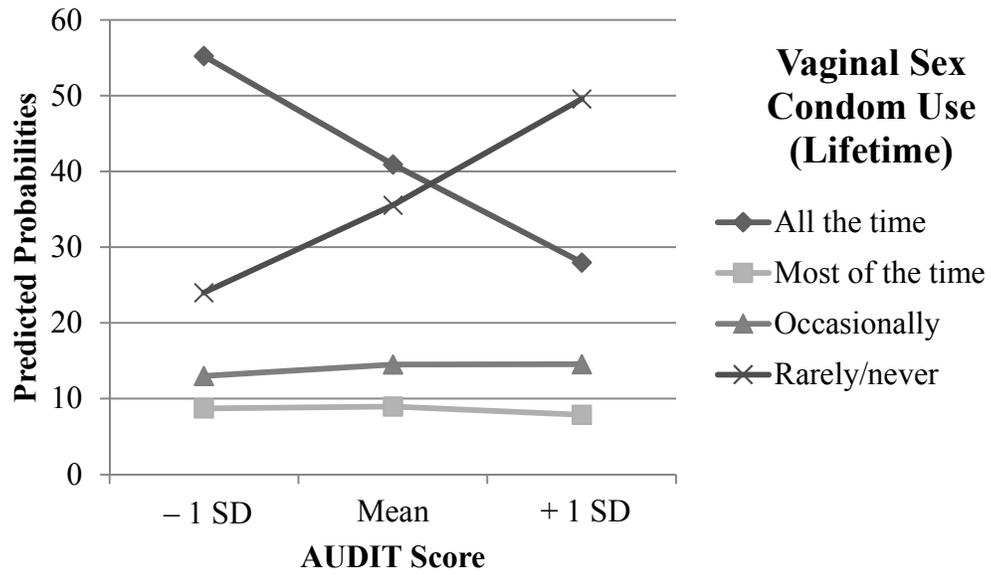


Figure 6. Association between problem drinking and condomless vaginal sex (lifetime), moderated by delay discounting

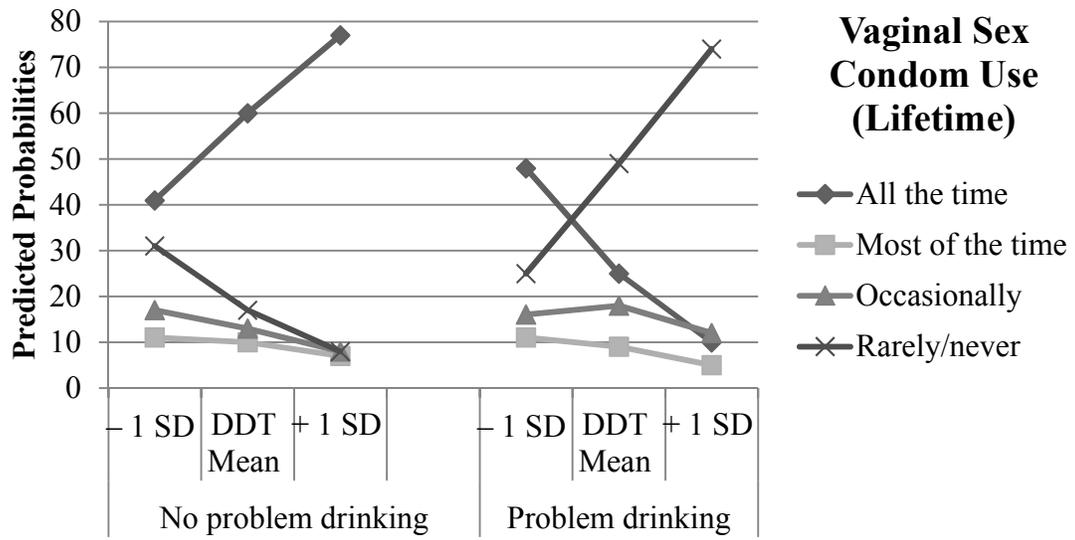


Figure 7. Association between problem drinking and condomless sex (lifetime), moderated by relationship status

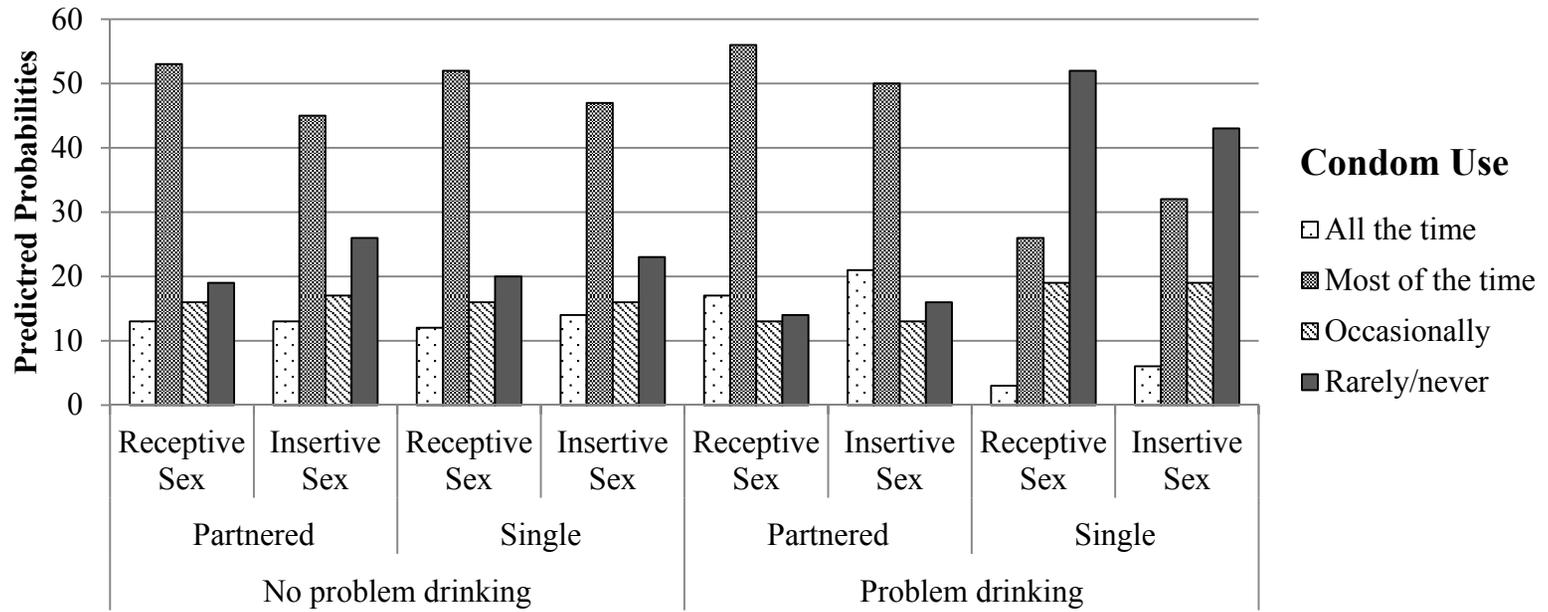


Figure 8. Association between problem drinking and condomless receptive sex (lifetime), moderated by age

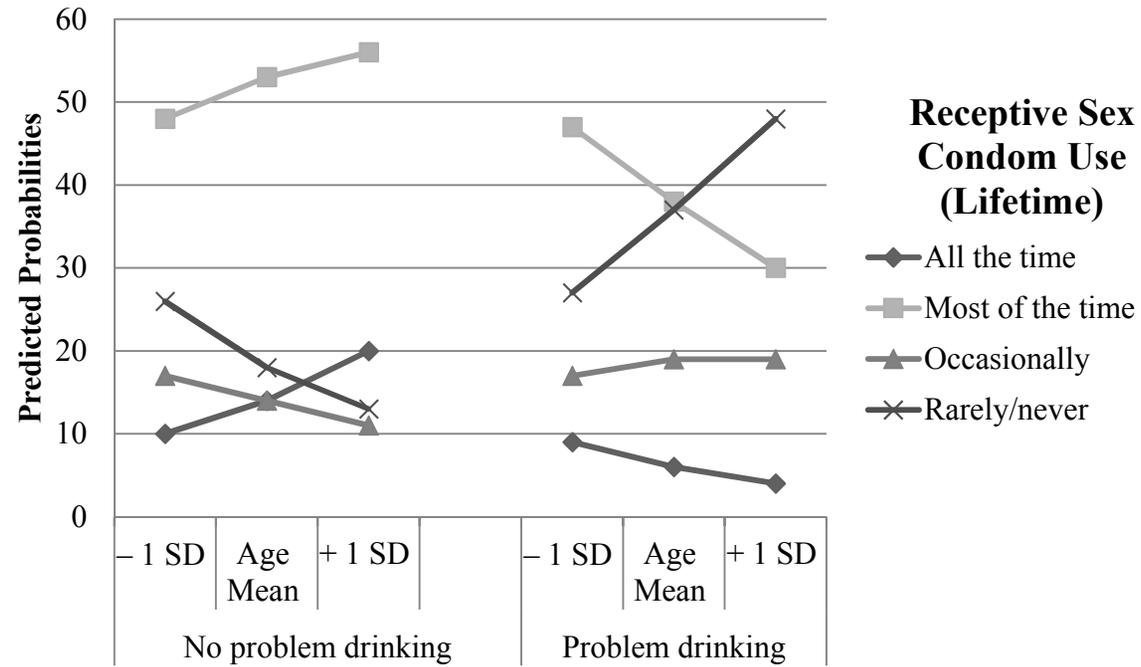


Figure 9. Association between problem drinking and condomless insertive sex (lifetime), moderated by sexual identification

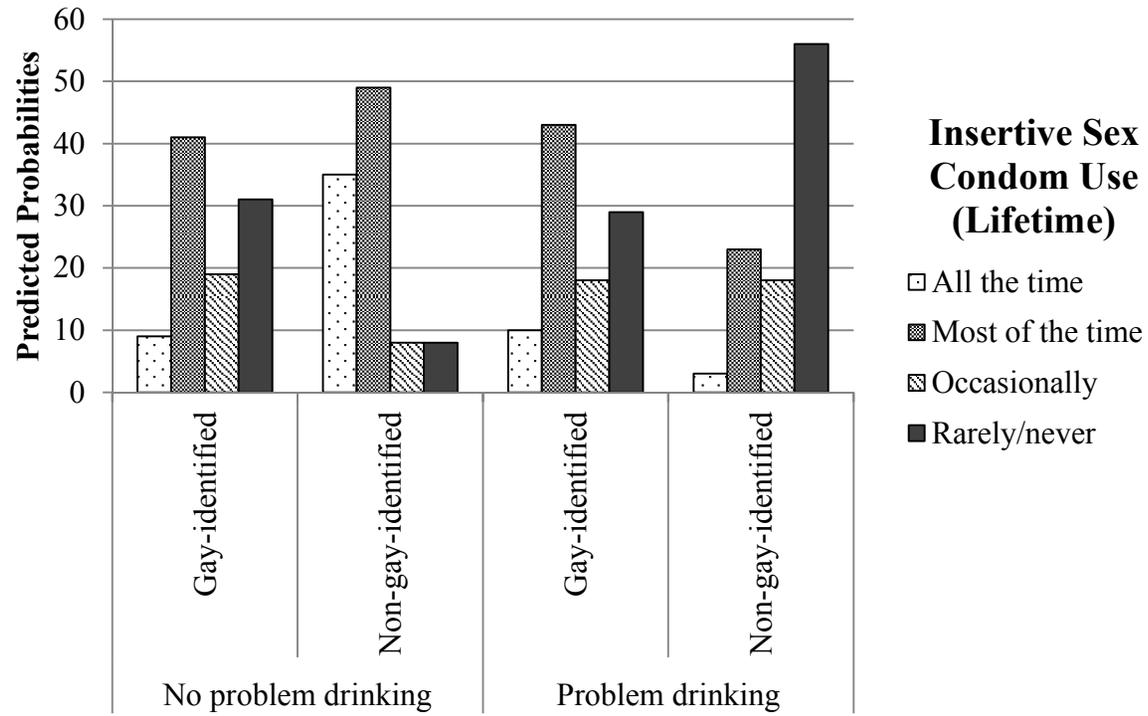


Table 10. Main effects of alcohol expectancies on condomless receptive sex (lifetime)

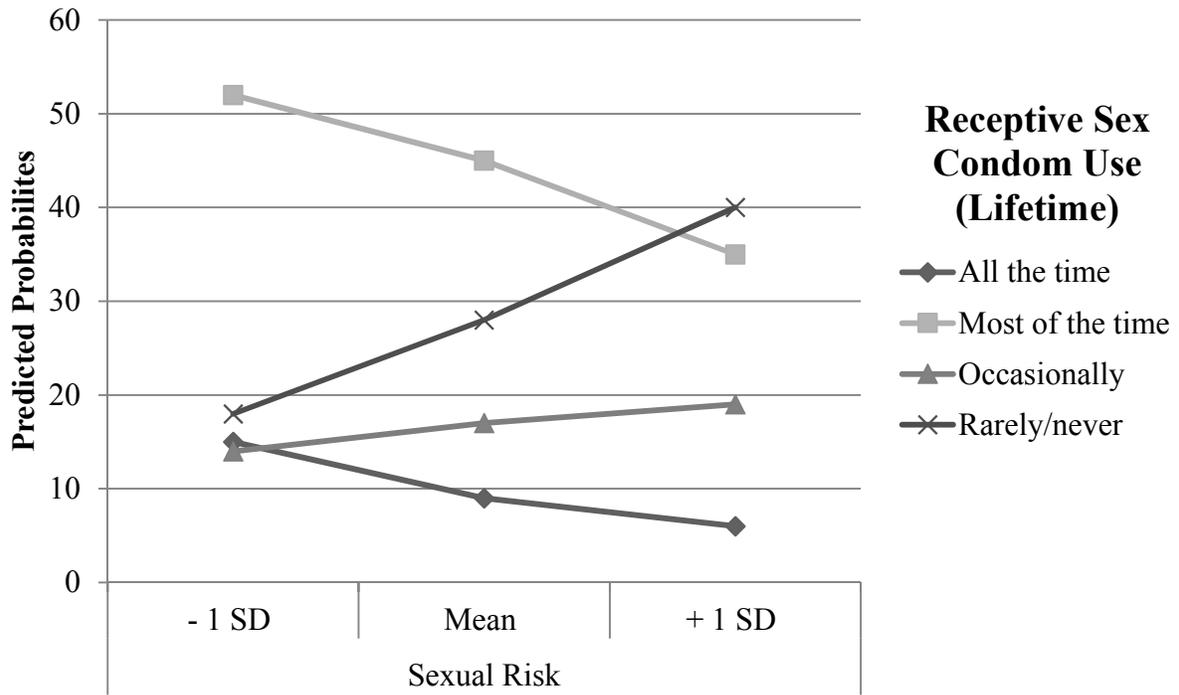
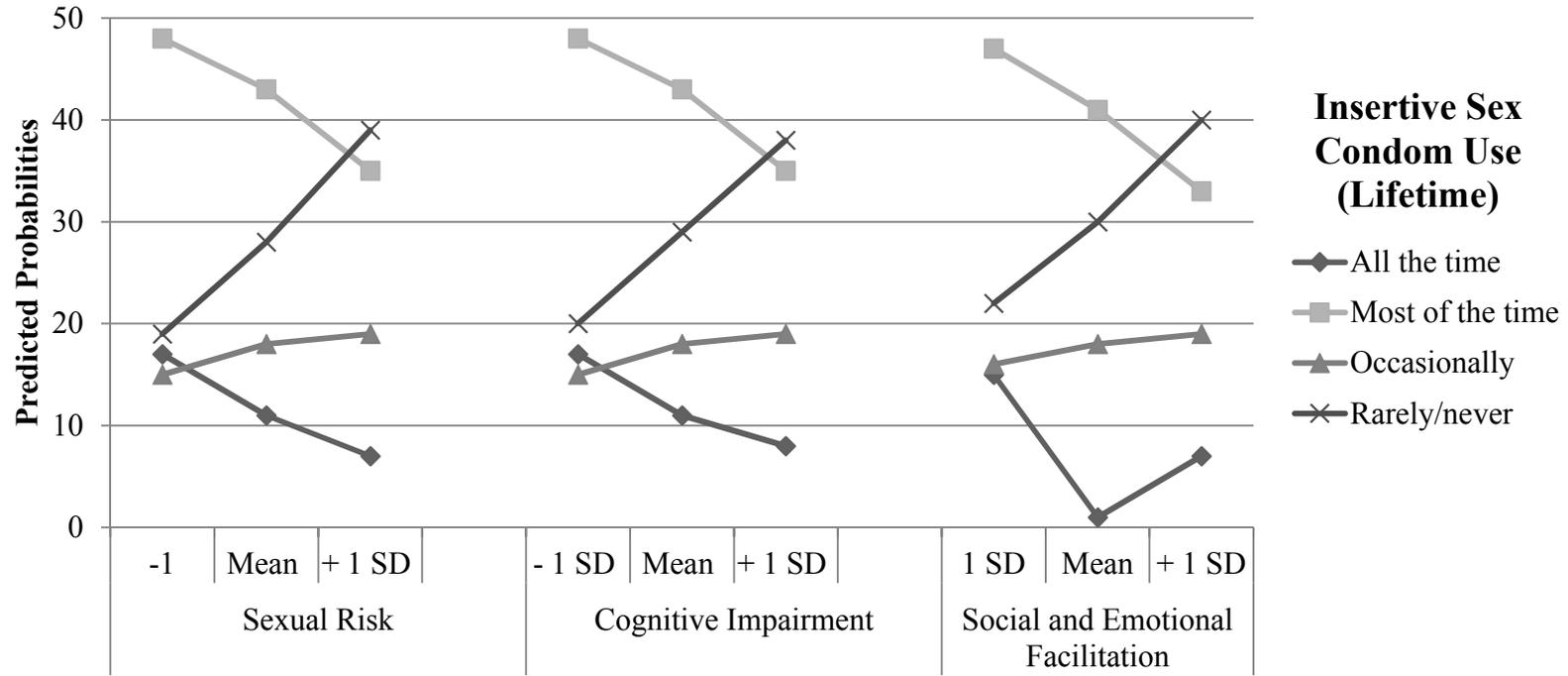


Table 11. Main effects of alcohol expectancies on condomless insertive sex (lifetime)



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