Published in final edited form as:

Health Educ Behav. 2012 June ; 39(3): 303–314. doi:10.1177/1090198111413917.

Sexual Agreement Classifications for Gay and Bisexual Men and Implications for Harm Reduction HIV-Prevention

J. Michael Wilkerson, Derek J. Smolenski, Richard Morgan, and B.R. Simon Rosser

School of Public Health, Division of Epidemiology and Community Health, University of Minnesota

Introduction

Gay and bisexual men (GBM) increase their risk of HIV/STI infection when they engage in unprotected anal intercourse with a male partner (UAIMP) whose HIV-status is unknown or different than their own (Center for Disease Control and Prevention, 2009a, 2009b). For this reason, HIV-prevention educators implementing interventions often encourage GBM to clarify sexual intentions, including condom use, before engaging in sexual activity with a non-primary sex partner. These conversations serve as pre-sexual agreements, which, in this study, are defined as discussions between men prior to sexual engagement about anticipated sexual acts, condom use, and substance use. The structure and content of these discussions, however, can vary within a defined population such as GBM, and it is unknown to what extent this variation is associated with the distribution of sexual risk behavior among GBM. Classifying GBM based on how they discuss their sexual intentions and use of substances during sex can address this gap in knowledge and inform the approach educators take when crafting intervention messages.

Pre-sexual agreements, negotiated to reduce the likelihood of contracting HIV/STIs and dependent on the HIV-status of the persons involved (Gaies, Sacco, & Becker, 1995; Kippax et al., 1997), are associated with a reduced likelihood of engaging in UAIMP when the agreement is to use condoms for anal intercourse (Horvath, Oakes, & Rosser, 2008). However, to be successful, these agreements require the disclosure of one's HIV-status. HIV serodisclosure is context-dependent and occurs most often when an individual's fear of rejection is low and their self-efficacy and sense of personal responsibility for others' health is high (Gorbach et al., 2004; Harawa, Williams, Ramamurthi, & Bingham, 2006; Parsons et al., 2005; Rutledge, 2009; Serovich, Oliver, Smith, & Mason, 2005; Sheon & Crosby, 2004). The dependence of a pre-sexual agreement on disclosure suggests that a pre-sexual agreement, like disclosure, fluctuates with changing context.

When establishing a sexual relationship with a primary sex partner, GBM often negotiate relationship boundaries, including whether or not sex with non-primary partners is allowed. GBM might choose to engage in unprotected anal intercourse with primary or non-primary partners in part because the absence of condoms symbolizes partner trust and can increase feelings of intimacy (Davidovich, de Wit, & Stroebe, 2004), because condoms decrease sensation, and because the fear of HIV-infection is diminished (Adams, Husbands, Murray, & Maxwell, 2005). While GBM often insist on condoms with non-primary sex partners, unless commitment to the agreement remains high, the likelihood of engaging in unprotected anal intercourse increases with the passing of time (Neilands, Chakravarty, Darbes, Beougher, & Hoff, 2010; Prestage et al., 2008; Prestage et al., 2006).

Correspondence concerning this article should be addressed to J. Michael Wilkerson, PhD, MPH, CHES, University of Minnesota School of Public Health, Division of Epidemiology and Community Health, 1300 S. 2nd Street, Suite 300, Minneapolis, MN 55454. wilke177@umn.edu.

While commitment to an agreement is an important aspect of an agreement's effectiveness, contextual factors, such as substance use, can negate a priori intentions. Individuals intoxicated when making pre-sexual agreements or when having sex are more likely to engage in UAIMP, increasing their risk of HIV-exposure (Bimbi et al., 2006; Celentano et al., 2006; Koblin et al., 2007; Mimiaga et al., 2010; Mor, Davidovich, McFarlane, & Feldshtein, 2008; Schönnesson et al., 2008; Shoptaw et al., 2009; Wilson, Cook, McGaskey, Rowe, & Dennis, 2008). In spite of intended pre-sexual agreements, substance use, whether or not it was premeditated, could diminish any protective effect of agreements (Parsons et al., 2005).

Previous work on agreements and substance use during sex shows variability among GBM. In light of this, applying a harm reduction framework – often used for substance use interventions – to HIV-prevention seems appropriate. The harm reduction approach matches an intervention message to an individual's willingness to make a desired behavior change. Kippax and Race (2003) framed harm reduction as a social public health movement that promotes individual agency in order to protect the health of individuals and their community.

In recent years, HIV-prevention researchers have applied harm reduction to intentional anal intercourse without a condom between GBM, a behavior sometimes referred to as barebacking (Goodroad, Kirksey, & Butensky, 2000; Parsons, 2005). A number of strategies have emerged from individuals in the community that aim to reduce risk, but that are not aligned with broader health messages about always using condoms or being monogamous. These behaviors include negotiating with a sex partner when condoms will be used (negotiated safety), withdrawing the penis before ejaculation (withdrawal), determine sexual position based on HIV-status or viral load (strategic positioning), and selecting sexual partners based on HIV-status (serosorting). While condoms offer the best protection from acquiring HIV when engaging in anal intercourse, alternative harm reduction strategies have shown some protective effect. In particular, compared to men who reported always using condoms, men reporting negotiated safety and strategic positioning had a reduced risk of seroconversion. Serosorting also evidenced some benefit, but of a lesser degree than negotiated safety and strategic positioning. Withdrawal did not have a discernible impact (Jin et al., 2009). When combined with advice to reduce the number of serodiscordant or unknown sex partners and to reduce the frequency of combining substance use and sex, HIV-prevention educators become better equipped to discuss harm reduction strategies with GBM (Hart & Elford, 2010).

To implement a harm reduction approach on more than the individual level, it will be necessary to classify GBM based on their agreement patterns and to tailor intervention messages to men in each class; tailoring prevention messages will increase the likelihood that GBM will reflect on the message and modify their behavior (Herbst et al., 2005; Kippax & Kinder, 2002). However, a classification scheme is currently missing from the HIV-prevention literature. Thus, using data from the *Structural Factors to Lower Alcohol-Related HIV Risk Project*, this investigation sought to answer three research questions. First, how can we classify GBM based on their pre-sexual agreements with non-primary sex partners? Second, how do men in each classification differ? Third, does substance use during sex affect the association between agreement patterns and risk behavior? Based on the answers to these questions, implications for HIV-prevention are discussed.

Methods

Study Design

In 2008, we began a four-wave prospective, matched sample study of 16 U.S. metropolitan statistical areas (MSAs) with different legislation on homosexuality (eight MSAs supportive of gay rights, e.g., pro-MSAs, and eight MSAs not supportive of gay rights, e.g., anti-MSAs). The purpose of this study was to assess the extent to which a community's acceptance of homosexuality influences GBM's substance use and risky sexual behavior. Two legal experts on state legislation ranked all MSAs regarding recognition of same sex relationships, gay adoption, anti-discrimination in employment, and recognition of hate crimes independently. Pro- and anti-MSAs were pair-matched on size, demographic composition, and region of country. MSAs were excluded if they were so large that there was no credible pair matches or if the MSA stretched beyond one state, e.g., New York, Los Angeles, and Chicago. San Francisco was also excluded because of its unique gay history.

Data for this analysis came from wave one and included men recruited between June 18, 2008 and October 1, 2008 from two of the nation's largest gay websites. Banner advertisements directed interested persons to a webpage hosted on a dedicated university server with appropriate encryption to ensure data security. The webpage included information about the study procedures and a link to the eligibility screener. Of the men who clicked on the banner advertisement, (n=3370), 56% met eligibility requirements: having prior sexual experience with a man, being 18 years or older, and reporting a residential zip code in a MSA under study. Of the men who met eligibility requirements, 1725 enrolled in the study ($n_{\text{pro}}=1038$, $n_{\text{anti}}=687$). This analysis focused on data relevant to the last sexual encounter within the 90 days prior to the survey. We restricted the sample to the 1188 men who reported sexual activity with a non-primary sex partner met online in the specified time period.

Participants were asked a variable number of items depending on responses and skip patterns. The mean survey completion time was 71 minutes. Participants were compensated \$30 for their time. A Certificate of Confidentiality was obtained from the National Institutes of Health. The Institutional Review Board of the researchers' home institution approved study procedures.

Measures

Pre-sexual agreements—Participants were provided a list of six items developed by the study team that described content one might address prior to a new sexual encounter. Participants were asked to check all items applicable to their last sexual encounter with a non-primary sex partner met online. Items included an agreement to have anal sex, to not have anal sex, to use a condom during anal sex, to have anal sex without a condom (bareback), to use drugs before having sex, or to have drug-free sex. While additional reliability and validity testing is needed before these items should be treated as a scale, for the purposes of this analysis we were comfortable using the items because they were collecting data on manifest behaviors typically assessed by HIV-behavioral researchers (Schroder, Carey, & Venable, 2003).

Substance use at last sex—Participants were asked to report their own intoxication at last intercourse ("I was drunk (on alcohol)," and, "I was high (on drugs)"). Parallel items were asked about their last non-primary sex partner's intoxication. These questions provided four dichotomous variables relevant to substance use, which we collapsed into two categories: both sober during sex (n=908) and one or both using substances during sex (n=280).

Sexual risk behavior—A sexual behavior battery investigated sexual risk behavior at last intercourse. If participants indicated they engaged in receptive or insertive anal sex, they received additional questions about condom use (yes/no). We coded participants' responses as engaging in unprotected receptive or insertive anal sex (URAS/UIAS) if they indicated condoms were not used (yes/no). Participants with a URAS or UIAS code were also coded as engaging in UAIMP (yes/no).

Other measures—Demographic variables included age, education, race/ethnicity, long-term relationship status (91+ days), and HIV-serostatus. We also asked about the HIV-status of their last non-primary sex partner. Participants' sexual orientation was determined by responses to one question in which they were asked to identify as gay/homosexual, bisexual, heterosexual, or other (with a space to write in their response). "Outness," defined in the survey as "the degree to which you are out of the closet or open about being sexually attracted to or having sex with men," was measured as a five-point Likert-type item (1=not out at all, 5=out to all or almost all people I know) and treated continuously.

Data Analysis

Because of our interest in identifying agreement patterns, we used a latent class analysis (Vermunt & Magidson, 2002). Latent class analysis is a person-centered modeling technique used to identify distinct response patterns within a defined item set. It is similar to cluster analysis but is an improvement in that the model solution is identified under maximum likelihood, and the optimal solution can be explicitly tested. Latent classes were identified using *Mplus, version 5.1* (Muthén & Muthén, 1998–2009). For each model, we used the Akaike information criterion (AIC) (Akaike, 1987), the sample-size-adjusted Bayesian information criterion (SABIC) (Rissanen, 1978), entropy, and the Lo-Mendell-Rubin adjusted likelihood ratio test (LMR-LRT) (Lo, Mendell, & Rubin, 2001) to test the fit of the n -class model to the $n-1$ -class model. A better fitting model was defined as one with a lower AIC and SABIC, a higher entropy (range 0–1, where 1=perfect classification), and a significant LMR-LRT ($p<0.05$).

Because the literature suggests that relationship status and HIV status influence pre-sexual agreements (Davidovich et al., 2004; Kippax et al., 1997; Neilands et al., 2010; Prestage et al., 2008; Prestage et al., 2006), we wanted to examine differences in agreement patterns across these characteristics to see if the patterns formed differently. We tested for measurement equivalence across both characteristics (Geiser, Lehmann, & Eid, 2006). We identified a classification that was similar across relationship status but not HIV status. Thus, subsequent analyses examined data in two ways: first by treating all participants as one group based on the relationship status agreement pattern and second by treating participants as two groups by stratifying on HIV status.

Post hoc regression models were conducted in *STATA-IC, version 11* (StataCorp LP, 2009). Our analyses of sexual behavior outcomes focused on UAIMP, URAS, and UIAS. Given the high prevalence of these outcomes, we used a modified Poisson regression that employed sandwich estimation of the error term (Zou, 2004) to estimate the prevalence ratio of engaging in each behavior as a function of agreement and substance use classifications. (UAIMP=29.04%, URAS=17.00%, and UIAS=17.51%).

Results

Characteristics for this sample are summarized in Table 1. More participants were from pro-MSAs ($n=730$) than anti-MSAs ($n=458$). Participants from the pro-MSAs were older ($p=0.018$), identified more as gay/homosexual ($p=0.006$), were more open about their same-sex attractions ($p=0.001$), and had a greater prevalence of HIV ($p=0.009$). Across MSAs,

participants' engagement in unprotected anal sex was similar. Thus, for the remainder of our analysis, we considered participants from all MSAs as one group.

A qualitative comparison of our three-class solution suggested a possible difference in endorsement patterns based on relationship status and HIV status. To account for possible pattern variation, we conducted multigroup latent class analyses of the agreement variable across both statuses. Constraining the model to estimate the same pattern parameters for both relationship groups did not worsen fit, suggesting comparable pattern structures. Similarly, forcing an equivalent distribution of participants across the identified classes did not worsen model fit. We concluded that the pattern formation and participants' distribution were equivalent between single individuals and those in a relationship, e.g., fully constrained. However, agreement patterns appeared to differ across HIV status, e.g., unconstrained (Geiser, Lehmann, & Eid, 2006; Table 2).

Endorsement patterns for the three agreement classifications are summarized in Table 3. The labels for the final classifications were determined by identifying the more highly endorsed items (0.70) within each cluster. The three groupings for the overall participant pattern were anal sex with condoms (n=581), anal sex without specifying condom use (n=369), and no anal sex (n=238). It should be noted that 60% of participants included in the anal sex without specifying condoms classification agreed to have anal sex without condoms (bareback). When stratified by HIV status, participants seeking anal sex without condoms shift into their own group. Among HIV positive participants, the three groupings were anal sex with condoms (n=45), anal sex without condoms (n=106), and no anal sex (n=30). Among HIV-negative participants, the three groupings were the same as the overall pattern: anal sex without specifying condoms (n=268), anal sex with condoms (n=470), and no anal sex (n=264).

A comparison of demographic characteristics of each agreement classification identified key differences between groups (Table 4). Overall, participants agreeing to anal sex without specifying condom use were driving the proportional difference in age ($\bar{X}=36.4(10.2)$), outness, and HIV-status of the participant (70.7% HIV-positive) and last non-primary sex partner (17.7% HIV-positive). Among HIV-positive participants, proportional differences were driven by participants agreeing to anal sex without condoms. Compared to HIV-positive participants agreeing to use condoms or not have anal sex, fewer HIV-positive participants agreeing to anal without condoms were in a relationship (21.7%) or had sex with an HIV-negative non-primary sex partner (13.2%). Among HIV-negative participants, the only proportional difference between groupings was age. HIV-negative participants agreeing to anal sex without specifying condom use were slightly older ($\bar{X}=35.0(10.5)$).

We were interested in the effect of substance use during sex on agreement patterns. We first regressed UAIMP, URAS, and UIAS on the overall agreement pattern after adjusting for substance use during last sex and other covariates (Table 5). For all outcomes, agreeing to anal sex without specifying condoms was a significant predictor of unprotected anal sex ($PR_{UAIMP\ Adj.}=6.89 [5.30, 8.95]$; $PR_{URAS\ Adj.}=5.64 [3.94, 8.08]$; $PR_{UIAS\ Adj.}=8.78 [5.96, 12.93]$). We tested for an interaction between agreements and substance use during sex when UAIMP was the outcome; the interaction was not statistically significant. Nevertheless, because previous literature suggests an association between substance use and condom use, we chose to regress the measures of unprotected anal sex on the agreement patterns after stratifying on substance use during the last sex act and adjusting for covariates. When compared to participants agreeing to use condoms during anal sex, the prevalence ratios of participants agreeing to anal sex without specifying condom use decreased if one or both participants were using substances during sex. Due to the small number of persons living with HIV, we were not able to replicate this analysis by stratifying on HIV-status.

Discussion

When classifying GBM by agreement pattern, our data suggests that HIV-prevention educators should view HIV-positive and -negative men as two distinct groups. Without stratification, our overall pattern was driven by the HIV-negative participants, whose numbers were greater than the HIV-positive participants. With stratification, the largest group of HIV-negative participants agreed to anal sex with condoms, the middle group agreed to not have anal sex without specifying condom use, and the smallest group agreed to not have anal sex. The largest group of HIV-positive participants agreed to anal sex without condoms, the middle group agreed to anal sex with condoms, and the smallest group agreed to no anal sex.

A proportional comparison of participant characteristics by class membership suggests that regardless of HIV-status, participants agreeing to anal sex with condoms and no anal sex are similar. However, their motivations for agreeing to use condoms or to not have anal sex might be unique. We did not assess motivation for engaging in a particular behavior.

Among HIV-negative participants, persons who agreed to anal sex without specifying condoms were slightly older than participants in the other two categories. Compared to younger HIV-negative GBM, it might be that older participants perceive the risk or consequences of infection as lower or are experiencing condom fatigue at a greater rate (Adams et al., 2005). It might also be a data anomaly, in which case, participants' motivations for engaging in a behavior rather than their characteristics would need to be considered significant explanatory variables.

The majority (59.0%) of HIV-positive participants agreed to anal sex without condoms. A greater proportion was single and had a seroconcordant sex partner compared to HIV-positive participants agreeing to use condoms or not have anal sex. The single HIV-positive participants in our sample appear to be serosorting. Because our study was cross-sectional, the temporal relationship between serosorting and the making of the pre-sexual agreement is unclear.

Substance use during sex appears to result in increased unprotected anal sex even when the participant and his non-primary sex partner had a pre-sexual agreement to use condoms. The low prevalence of substance use in our sample could explain the lack of statistically significant interaction between it and pre-sexual agreements. In general, the literature suggests that substance use is associated with riskier sexual behavior and that engaging in substance use could be inversely associated with agreements to use condoms for anal sex (Bimbi et al., 2006; Celentano et al., 2006; Koblin et al., 2007; Mimiaga et al., 2010; Mor et al., 2008; Parsons et al., 2005; Schönnesson et al., 2008; Shoptaw et al., 2009; Wilson et al., 2008).

Classifying GBM according to their pre-sexual agreement pattern has important implications for health educators interested in applying a harm reduction framework when developing individual-, group-, and community-level interventions that target GBM. During an individual counseling session, educators who first ask about previous pre-sexual agreements can use the information to inform the development of a tailored risk-reduction plan. Similarly, when facilitating a risk-reduction discussion with a group of GBM, an educator who is aware of his/her groups' previous pre-sexual agreement patterns can adjust prevention messages to increase group members' acceptance of the messages. When developing a community-level intervention, such as a social marketing campaign, educators can target specific prevention messages to groups of men based on the agreements they are willing to make. The result should increase the likelihood that members of the priority

population will be receptive to one or more messages (Carballo-Diequez, 2001; Herbst et al., 2005; Kippax & Kinder, 2002; Kippax & Race, 2003).

Regardless of HIV-status, the prevention messages for GBM agreeing to not have anal sex and GBM agreeing to anal sex with a condom can be similar. Participants in these groups adhered to HIV-prevention messaging, lowering the risk of transmission. Men in this category would likely benefit from prevention message that reinforces their current behavior, hopefully motivating them to continue to use condoms or to abstain from anal sex with non-primary sex partners and strengthening their existing skills to negotiate low-risk pre-sexual agreements (Crawford, Rodden, Kippax, & Van de Ven, 2001; Kippax et al., 1997). Since men who make a pre-sexual agreement to not have anal sex or to use condoms appear to use condoms less when under the influence of substances, prevention messages should focus on either discouraging the men to have sex when under the influence, as well as teach them how to negotiate and to ensure easy access to condoms when intoxicated.

HIV-positive men agreeing to anal sex without specifying condoms would likely be unreceptive to messages encouraging them to always use condoms for anal sex and would benefit instead from a harm reduction approach to prevention messaging. During an individual motivational interviewing session, educators might focus on reducing the number of casual sex partners, reducing substance use during sex, strategic positioning, and serosorting (Kippax & Race, 2003; Parsons, 2005). Group and community-level interventions can reinforce this message by acknowledging that condoms are the best way to avoid infection when engaging in anal sex but that there are other strategies that can reduce risk of infection (Hart & Elford, 2010; Jin et al., 2009).

HIV-negative men agreeing to anal sex without specifying condoms would likely benefit from a combination of the skill building and harm reduction approaches. Like the groups of men who use condoms and abstain from anal sex, these men might benefit from increasing motivation and skills to explicitly negotiate condom use prior to a sexual encounter (Crawford et al., 2001; Kippax et al., 1997). In addition, educators can use motivational interviewing during an individual session to identify strategies to increase condom use, to decrease number of sexual partners and the number of sexual encounters in which substances are consumed, and to use strategic positioning and serosorting when anal sex without condoms appears imminent. Group- and community-level interventions might encourage participants to negotiate the use of condoms but supplement the message with alternatives participants can use when in a situation in which condom use no longer seems a feasible option.

There are four notable limitations to this study. First, since this analysis used cross-sectional data, we were limited in our ability make temporal inferences. While the last sexual act provides an indication of participants' sexual behavior, it might not represent their typical behavior. Second, this study relied on self-reported data and we did not assess for social desirability, requiring us to assume participants reported their sexual encounters accurately. Limiting this analysis to participants who met someone online or in a bar for sex in the last 90-days minimized recall error, increasing the accuracy of the self-reported data. Third, since data were collected from gay- or bisexual-identified men frequenting two gay websites in the US and since our sample was mostly white, results should not be generalized to all MSM. Fourth, we did not ask participants' their motivation for making a pre-sexual agreement.

The individual-, group-, and community-level implications for HIV-prevention should be viewed as suggestions. It is likely that educators already consider prior negotiation patterns during an individual-level session. However, having a quick classification schema can

provide another means by which educators can organize their thoughts when tailoring a prevention message. Future research is needed to compare the attitudes, norms, self-efficacy, and intentions to enact harm reduction strategies of men in each classification. Research is also needed to develop and test targeted group- and community-level messages. If implemented properly, there is potential to further the field's ability to move HIV-prevention messages from a position that focuses only on condom use to a position that encourages condoms while recognizing the benefit of other harm reduction strategies when in a situation in which anal sex without the use of a condom is the desired outcome.

Conclusion

Classifying GBM based on their pre-sexual agreement classifications might be useful when tailoring a prevention message in an individual counseling session or when targeting a prevention message in a group- or community-level intervention. The majority of GBM will likely benefit from a prevention message that increases their motivation and skills to negotiate the use of condoms if intending to have anal sex. However, there are groups of GBM for whom the dominant prevention message appears inappropriate. HIV-positive GBM who insist on anal sex without condoms will likely benefit from messages that focus on harm reduction, and HIV-negative GBM who engage in anal sex without specifying condom use will likely benefit from messages that combine motivation and skills building and harm reduction.

Acknowledgments

This study was funded by the National Institute on Alcohol Abuse and Alcoholism, funding number R01AA016270-01A1.

References

- Adams BD, Husbands W, Murray J, Maxwell J. AIDS optimism, condom fatigue, or self-esteem? Explaining unsafe sex among gay and bisexual men. *The Journal of Sex Research*. 2005; 42(3):238–248.
- Akaike H. Factor analysis and AIC. *Psychometrika*. 1987; 52(3):317–332.
- Bimbi DS, Nanin JE, Parsons JT, Vicioso KJ, Missildine W, Frost DM. Assessing gay and bisexual men's outcome expectancies for sexual risk under the influence of alcohol and drugs. *Substance Use & Misuse*. 2006; 41(5):643–652. [PubMed: 16603452]
- Carballo-Diequez A. HIV, barebacking, and gay men's sexuality, circa 2001. *Journal of Sex Education & Therapy*. 2001; 26(3):225–233.
- Celentano DD, Valleroy LA, Sifakis F, Mackellar DA, Hylton J, Thiede H, et al. Associations between substance use and sexual risk among very young men who have sex with men. *Sexually Transmitted Diseases*. 2006; 33(4):265–271. [PubMed: 16434886]
- Centers for Disease Control and Prevention. HIV/AIDS surveillance report: Cases of HIV infection and AIDS in the United States and Dependent Areas, 2007. Atlanta, GA: Department of Health and Human Services; 2009a.
- Centers for Disease Control and Prevention. Sexually transmitted disease surveillance, 2008. Atlanta, GA: U.S. Department of Health and Human Services; 2009b.
- Crawford JM, Rodden P, Kippax S, Van de Ven P. Negotiated safety and other agreements between men in relationships: Risk practice redefined. *International Journal of STD and AIDS*. 2001; 12(3): 164–170. [PubMed: 11231869]
- Davidovich U, de Wit JBF, Stroebe W. Behavioral and cognitive barriers to safer sex between men in steady relationships: Implications for prevention strategies. *AIDS Education & Prevention*. 2004; 16(4):304–314. [PubMed: 15342333]

- Gaies LA, Sacco WP, Becker JA. Cognitions of gay and bisexual men in sexual situations: Development of the Sex and AIDS Thought Scale (SATS). *AIDS Education and Prevention*. 1995; 7(6):513–522. [PubMed: 8924348]
- Geiser C, Lehmann W, Eid M. Separating "rotators" from "nonrotators" in the mental rotations test: A multigroup latent class analysis. *Multivariate Behavioral Research*. 2006; 41(3):261–293.
- Goodroad BK, Kirksey KM, Butensky E. Bareback sex and gay men: An HIV prevention failure. *Journal of the Association of Nurses in AIDS care*. 2000; 11(6):29–36. [PubMed: 11082800]
- Gorbach PM, Galea JT, Amani B, Shin A, Celum C, Kerndt P, et al. Don't ask, don't tell: Patterns of HIV disclosure among HIV positive men who have sex with men with recent STI practising high risk behaviour in Los Angeles and Seattle. *Sexually Transmitted Infections*. 2004; 80(6):512–517. [PubMed: 15572626]
- Harawa NT, Williams JK, Ramamurthi HC, Bingham TA. Perceptions towards condom use, sexual activity, and HIV disclosure among HIV-positive African American men who have sex with men: Implications for heterosexual transmission. *Journal of Urban Health*. 2006; 83(4):682–694. [PubMed: 16736115]
- Hart GJ, Elford J. Sexual risk behaviour of men who have sex with men: Emerging patterns and new challenges. *Current Opinion in Infectious Diseases*. 2010; 23(1):39–44. [PubMed: 19949328]
- Herbst JH, Sherba RT, Crepaz N, Deluca JB, Zohrabyan L, Stall RD, et al. A meta-analytic review of HIV behavioral interventions for reducing sexual risk behavior of men who have sex with men. *Journal of Acquired Immune Deficiency Syndromes*. 2005; 39(2):228–241. [PubMed: 15905741]
- Horvath KJ, Oakes JM, Rosser BR. Sexual negotiation and HIV serodisclosure among men who have sex with men with their online and offline partners. *Journal of Urban Health*. 2008; 85(5):744–758. [PubMed: 18649141]
- Jin F, Crawford J, Prestage GP, Zablotska I, Imrie J, Kippax SC, et al. Unprotected anal intercourse, risk reduction behaviours, and subsequent HIV infection in a cohort of homosexual men. *AIDS*. 2009; 23(2):243–252. [PubMed: 19098494]
- Kippax S, Kinder P. Reflexive practice: The relationship between social research and health promotion in HIV prevention. *Sex Education*. 2002; 2(2):91–104.
- Kippax S, Noble J, Prestage G, Crawford JM, Campbell D, Baxter D, et al. Sexual negotiation in the AIDS era: Negotiated safety revisited. *AIDS*. 1997; 11(2):191–197. [PubMed: 9030366]
- Kippax S, Race K. Sustaining safe practice: Twenty years on. *Social Science & Medicine*. 2003; 57(1):1–12. [PubMed: 12753812]
- Koblin BA, Murrill C, Camacho M, Guozhen X, Kai-lih L, Raj-Singh S, et al. Amphetamine use and sexual risk among men who have sex with men: Results from the National HIV Behavioral Surveillance Study - New York City. *Substance Use & Misuse*. 2007; 42(10):1613–1628. [PubMed: 17918031]
- Lo Y, Mendell N, Rubin DB. Testing the number of components in a normal mixture. *Biometrika*. 2001; 88:767–778.
- Mimiaga MJ, Reisner SL, Fontaine YM, Bland SE, Driscoll MA, Isenberg D, et al. Walking the line: Stimulant use during sex and HIV risk behavior among Black urban MSM. *Drug and Alcohol Dependence*. 2010; 110:30–37. [PubMed: 20334986]
- Mor Z, Davidovich U, McFarlane M, Feldshtein G. Gay men who engage in substance use and sexual risk behaviour: A dual-risk group with unique characteristics. *International Journal of STD & AIDS*. 2008; 19(10):698–703. [PubMed: 18824624]
- Muthén, B.; Muthén, LK. *Mplus* (Version 5.21). Los Angeles: Muthén & Muthén; 1998–2009.
- Neilands TB, Chakravarty D, Darbes LA, Beougher SC, Hoff CC. Development and validation of the sexual agreement investment scale. *Journal of Sex Research*. 2010; 47(1):24–37. [PubMed: 19396645]
- Parsons, JT. Motivating the unmotivated: A treatment model for barebackers. In: Halkitis, PN.; Wilton, L.; Drescher, J., editors. *Barebacking: Psychosocial and public health approaches*. Binghamton, NY: The Hawthorn Medical Press; 2005. p. 129–148.
- Parsons JT, Schrimshaw EW, Bimbi DS, Wolitski RJ, Gomez CA, Halkitis PN. Consistent, inconsistent, and non-disclosure to casual sexual partners among HIV-seropositive gay and bisexual men. *AIDS*. 2005; 19(Suppl 1):S87–S97. [PubMed: 15838198]

- Prestage G, Jin F, Zablotska I, Grulich A, Imrie J, Kaldor J, et al. Trends in agreements between regular partners among gay men in Sydney, Melbourne and Brisbane, Australia. *AIDS and Behavior*. 2008; 12(3):513–520. [PubMed: 18188690]
- Prestage G, Mao L, McGuigan D, Crawford J, Kippax S, Kaldor J, et al. HIV risk and communication between regular partners in a cohort of HIV-negative gay men. *AIDS Care*. 2006; 18(2):166–172. [PubMed: 16338775]
- Rissanen J. Modeling by shortest data description. *Automatica*. 1978; 14:465–471.
- Rutledge SE. Formation of personal HIV disclosure policies among HIV-positive men who have sex with men. *AIDS Patient Care and STDS*. 2009; 23(7):531–543. [PubMed: 19621994]
- Schönnesson LN, Atkinson J, Williams ML, Bowen A, Ross MW, Timpson SC. A cluster analysis of drug use and sexual HIV risks and their correlates in a sample of African-American crack cocaine smokers with HIV infection. *Drug & Alcohol Dependence*. 2008; 97(1/2):44–53. [PubMed: 18495380]
- Schroder KE, Carey MP, Venable PA. Methodological challenges in research on sexual risk behavior: II. Accuracy of self-reports. *Annals of Behavioral Medicine*. 2003; 26(2):104–123. [PubMed: 14534028]
- Serovich JM, Oliver DG, Smith SA, Mason TL. Methods of HIV disclosure by men who have sex with men to casual sexual partners. *AIDS Patient Care and STDS*. 2005; 19(12):823–832. [PubMed: 16375614]
- Sheon N, Crosby MG. Ambivalent tales of HIV disclosure in San Francisco. *Social Science and Medicine*. 2004; 58(11):2105–2118. [PubMed: 15047070]
- Shoptaw S, Weiss R, Munjas B, Hucks-Ortiz C, Young S, Larkins S, et al. Homonegativity, substance use, sexual risk behaviors, and HIV status in poor and ethnic men who have sex with men in Los Angeles. *Journal of Urban Health*. 2009; 86:77–92. [PubMed: 19526346]
- StataCorp, LP. STATA-IC (Version 11). College Station, TX: StataCorp LP; 2009.
- Vermunt, JK.; Magidson, J. Latent class cluster analysis. In: Hagenaars, JA.; McCutcheon, AL., editors. *Applied latent class analysis*. New York: Cambridge University Press; 2002.
- Wilson PA, Cook S, McGaskey J, Rowe M, Dennis N. Situational predictors of sexual risk episodes among men with HIV who have sex with men. *Sexually Transmitted Infections*. 2008; 84(6):506–508. [PubMed: 19028956]
- Zou G. A modified poisson regression approach to prospective studies with binary data. *American Journal of Epidemiology*. 2004; 159(7):702–706. [PubMed: 15033648]

Table 1

Sample characteristics (N=1188)

	Pro-MSA (n=730)	Anti-MSA (n=458)	
	n (%)	n (%)	p
Age [mean (sd)]	34.4 (10.8)	32.9 (10.2)	0.018
Education			0.079
High school or less	71 (9.7)	65 (14.2)	
Technical school or some college	261 (35.8)	161 (35.2)	
College graduate	265 (36.3)	145 (31.2)	
Graduate degree	133 (18.2)	87 (19.0)	
Race/Ethnicity			0.477
Latino	38 (5.2)	21 (4.6)	
Black	27 (3.7)	25 (5.5)	
White	620 (84.9)	380 (83.0)	
Other	45 (6.2)	32 (7.0)	
In a long-term relationship with a man (91+ days)			0.720
Yes	175 (24.0)	114 (24.1)	
No	555 (76.0)	344 (75.1)	
Sexual Orientation			0.006
Gay/Homosexual	656 (89.9)	387 (84.5)	
Bisexual	74 (10.1)	71 (15.5)	
Outness			0.001
Not at all out	22 (3.0)	25 (5.5)	
Out to a few people they know	61 (8.4)	65 (14.2)	
Out to about half the people they know	63 (8.6)	45 (9.8)	
Out to most people they know	179 (24.5)	107 (23.4)	
Out to all people they know	405 (55.5)	216 (47.2)	
Participant HIV Positive			0.009
Yes	127 (17.5)	54 (11.8)	
No	600 (82.5)	402 (88.2)	
Last casual partner HIV Positive			0.013
Yes	69 (9.5)	22 (4.8)	
No	500 (68.6)	327 (71.6)	
Unsure	160 (22.0)	108 (23.6)	
Engaged in UAIMP with a non-primary partner			0.066
Yes	226 (31.0)	119 (26.0)	
No	504 (69.0)	339 (74.0)	
Engaged in URAS with a non-primary partner			0.060
Yes	136 (18.6)	66 (14.4)	
No	594 (81.4)	392 (85.6)	
Engaged in UIAS with a non-primary partner			0.260

	Pro-MSA (n=730)	Anti-MSA (n=458)	
	n (%)	n (%)	p
Yes	135 (18.5)	73 (15.9)	
No	595 (81.5)	385 (84.1)	

Note: Difference in counts is the result of missing data. Bolding indicates statistical significance 0.05.

Table 2

Test of measurement invariance for the agreement variable: 3 class solution

Between participants who are single and participants who are in a LTR (N=1188)									
Model	Log Likelihood	Free Parameters	SCF	AIC	SABIC	Avg. SCF	LR X2	p	
Unconstrained	-3914.009	41	1.002	7910.171	7988.221	--	--	--	
Semiconstrained	-3921.703	23	1.035	7889.406	7933.190	0.960	16.033	0.590	
Fully Constrained	-3922.338	21	1.032	7886.676	7926.653	1.067	1.191	0.551	
Between participants who are HIV-negative and participants who are HIV-positive (N=1183)									
Unconstrained	-3687.048	41	1.128	7456.097	7533.974	--	--	--	
Semiconstrained	-3707.210	23	1.043	7460.419	7504.106	1.237	32.608	0.019	

Note: Bolding indicates results of fit statistics that informed subsequent analyses.

Table 3

Endorsements of pre-sexual agreements with last non-primary sex partner

Overall participant pattern (n=1188)			
	Anal sex with condoms	Anal sex without specifying condoms	No anal sex
	(n=581)	(n=369)	(n=238)
Agreed to have anal sex	0.62	0.87	0.00
Agreed to not have anal sex	0.03	0.01	1.00
Agreed to use a condom	0.83	0.03	0.04
Agreed to anal sex without condoms (bareback)	0.02	0.60	0.00
Agreed to drugs and sex	0.03	0.16	0.02
Agreed to have drug-free sex	0.47	0.16	0.27
Proportion single	0.48	0.31	0.21
Proportion in a LTR	0.50	0.32	0.18
HIV-positive participant pattern (n=181)			
	Anal sex with condoms	Anal sex without condoms	No anal sex
	(n=45)	(n=106)	(n=30)
Agreed to have anal sex	0.52	0.83	0.00
Agreed to not have anal sex	0.02	0.00	1.00
Agreed to use a condom	0.73	0.00	0.00
Agreed to anal sex without condoms (bareback)	0.09	0.79	0.00
Agreed to drugs and sex	0.03	0.22	0.03
Agreed to have drug-free sex	0.48	0.19	0.13
HIV-negative participant pattern (n=1002)			
	Anal sex with condoms	Anal sex without specifying condoms	No anal sex
	(n=470)	(n=268)	(n=264)
Agreed to have anal sex	0.66	0.91	0.00
Agreed to not have anal sex	0.02	0.02	0.82
Agreed to use a condom	1.00	0.06	0.06
Agreed to anal sex without condoms (bareback)	0.02	0.44	0.00
Agreed to drugs and sex	0.02	0.12	0.02
Agreed to have drug-free sex	0.45	0.14	0.42

Note: Bold indicated 0.70 endorsement.

Table 4

Characteristics by class membership (N=1188)

	Overall			
	Anal sex with condoms (n=581)	Anal sex without specifying condoms (n=369)	No anal sex (n=238)	<i>p</i>
	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	
Age [mean (sd)]	32.3 (10.5)	36.4 (10.2)	33.7 (11.0)	0.000
Education				0.739
High school or less	71 (12.2)	42 (11.4)	23 (9.7)	
Technical school or some college	205 (35.3)	139 (37.7)	78 (32.8)	
College graduate	198 (34.1)	125 (33.9)	87 (36.6)	
Graduate degree	107 (18.4)	63 (17.1)	50 (21.0)	
Race/Ethnicity				0.959
Latino	28 (4.8)	21 (5.7)	10 (4.2)	
Black	28 (4.8)	15 (4.1)	9 (3.8)	
White	486 (83.7)	311 (84.3)	203 (85.3)	
Other	39 (6.7)	22 (6.0)	16 (6.7)	
In a long-term relationship with a man (91+ days)				0.609
Yes	145 (25.0)	92 (24.9)	52 (21.9)	
No	436 (75.0)	277 (75.1)	186 (78.2)	
Sexual Orientation				0.390
Gay/Homosexual	504 (86.8)	331 (89.7)	208 (87.4)	
Bisexual	77 (13.3)	38 (10.3)	30 (12.6)	
Outness				0.017
Not at all out	29 (5.0)	8 (2.2)	10 (4.2)	
Out to a few people they know	73 (12.6)	27 (7.3)	26 (10.9)	
Out to about half the people they know	57 (9.8)	32 (8.7)	19 (8.0)	
Out to most people they know	148 (25.5)	83 (22.5)	55 (23.1)	
Out to all people they know	274 (47.2)	219 (59.4)	128 (53.8)	
Participant HIV Positive				0.000
Yes	537 (92.4)	258 (70.7)	207 (87.3)	
No	44 (7.6)	107 (29.3)	30 (12.7)	
Last casual partner HIV Positive				0.000
Yes	15 (2.6)	65 (17.7)	11 (4.6)	
No	472 (81.2)	185 (50.4)	170 (71.4)	
Unsure	94 (16.2)	117 (31.9)	57 (24.0)	
City grouping				0.013
Pro-city	334 (57.5)	247 (66.9)	149 (62.6)	
Anti-city	247 (42.5)	122 (33.1)	89 (37.4)	

	Overall			
	Anal sex with condoms (n=581)	Anal sex without specifying condoms (n=369)	No anal sex (n=238)	
	n (%)	n (%)	n (%)	p
HIV-positive (N=181)				
	Anal sex with condoms (n=45)	Anal sex without condoms (n=106)	No anal sex (n=30)	
	n (%)	n (%)	n (%)	p
Age [mean (sd)]	38.9 (10.4)	39.0 (9.1)	39.8 (10.6)	0.912
Education				0.663
High school or less	11 (24.4)	17 (16.0)	3 (10.0)	
Technical school or some college	16 (35.6)	40 (37.7)	12 (40.0)	
College graduate	12 (26.7)	38 (35.9)	10 (33.3)	
Graduate degree	6 (13.3)	11 (10.4)	5 (16.7)	
Race/Ethnicity				0.833
Latino	2 (4.4)	5 (4.7)	1 (3.3)	
Black	4 (8.9)	6 (5.7)	1 (3.3)	
White	39 (86.7)	91 (85.9)	27 (90.0)	
Other	---	4 (3.8)	1 (3.3)	
In a long-term relationship with a man (91+ days)				0.018
Yes	20 (44.4)	23 (21.7)	9 (30.0)	
No	25 (55.6)	83 (78.3)	21 (70.0)	
Sexual Orientation				0.241
Gay/Homosexual	43 (95.6)	103 (97.2)	27 (90.0)	
Bisexual	2 (4.4)	3 (2.8)	3 (4.4)	
Outness				
Not at all out	1 (2.2)	1 (0.94)	---	0.973
Out to a few people they know	3 (6.7)	5 (4.7)	2 (6.7)	
Out to about half the people they know	2 (4.4)	5 (4.7)	1 (3.3)	
Out to most people they know	10 (22.2)	23 (21.7)	9 (30.0)	
Out to all people they know	29 (64.4)	72 (67.9)	18 (60.0)	
Last casual partner HIV Discordant				0.000
Yes	23 (51.1)	14 (13.2)	12 (40.0)	
No	22 (48.9)	92 (86.8)	18 (60.0)	
City grouping				0.252
Pro-city	28 (62.2)	75 (70.8)	24 (80.0)	
Anti-city	17 (37.8)	31 (29.3)	6 (20.0)	
HIV-negative (N=1002)				

	Overall			
	Anal sex with condoms (n=581)	Anal sex without specifying condoms (n=369)	No anal sex (n=238)	
	n (%)	n (%)	n (%)	p
Age [mean (sd)]	31.5 (10.0)	35.0 (10.5)	33.0 (11.0)	0.000
Education				0.380
High school or less	55 (11.7)	26 (9.7)	24 (9.1)	
Technical school or some college	168 (35.7)	104 (38.8)	81 (30.7)	
College graduate	157 (33.4)	88 (32.8)	104 (39.4)	
Graduate degree	90 (19.2)	50 (18.7)	55 (20.8)	
Race/Ethnicity				0.844
Latino	26 (5.5)	16 (6.0)	9 (3.4)	
Black	20 (4.3)	9 (3.4)	12 (4.6)	
White	390 (83.0)	225 (84.0)	224 (84.9)	
Other	34 (7.2)	18 (6.7)	19 (7.2)	
In a long-term relationship with a man (91+ days)				0.171
Yes	113 (24.0)	71 (26.5)	52 (19.7)	
No	357 (76.0)	197 (73.5)	212 (80.3)	
Sexual Orientation				0.508
Gay/Homosexual	400 (85.1)	234 (87.3)	232 (87.9)	
Bisexual	70 (14.9)	34 (12.7)	32 (12.1)	
Outness				0.258
Not at all out	26 (5.5)	7 (2.6)	12 (4.6)	
Out to a few people they know	60 (12.8)	23 (8.6)	33 (12.5)	
Out to about half the people they know	51 (10.9)	26 (9.7)	21 (8.0)	
Out to most people they know	111 (23.6)	64 (23.9)	68 (25.8)	
Out to all people they know	222 (47.2)	148 (55.2)	130 (49.2)	
Last casual partner HIV Discordant				0.264
Yes	9 (1.9)	7 (2.6)	2 (0.8)	
No	461 (98.1)	261 (97.4)	262 (99.2)	
City grouping				0.131
Pro-city	270 (57.5)	174 (64.9)	156 (59.1)	
Anti-city	200 (42.6)	94 (35.1)	108 (40.9)	

Note: Difference in counts is the result of missing data. Bolding indicates statistical significance 0.05.

Table 5

Adjusted prevalence ratio of engaging in sexual behavior by agreement and substance use classifications (N=1188)

Overall adjusting for substance use			
	UAIMP (n=345)	URAS (n=202)	UIAS (n=208)
Agree to anal sex with condoms	Ref.	Ref.	Ref.
Agree to anal sex without specifying condoms	6.89 [5.30, 8.95]	5.64 [3.94, 8.08]	8.78 [5.96, 12.93]
Agree to no anal sex	0.51 [0.27, 0.93]	0.46 [0.21, 1.04]	0.85 [0.42, 1.74]
Overall stratified by substance use			
	UAIMP (n=345)	URAS (n=202)	UIAS (n=208)
Both sober during sex (n=908)			
Agree to anal sex with condoms	Ref.	Ref.	Ref.
Agree to anal sex without specifying condoms	7.46 [5.46, 10.2]	6.11 [3.95, 9.44]	9.27 [5.86, 14.64]
Agree to no anal sex	0.53 [0.26, 1.08]	0.38 [0.13, 1.08]	0.95 [0.43, 2.14]
One or both using substance use during sex (n=280)			
Agree to anal sex with condoms	Ref.	Ref.	Ref.
Agree to anal sex without specifying condoms	5.58 [3.53, 8.81]	4.75 [2.54, 8.88]	7.16 [3.59, 14.28]
Agree to no anal sex	0.45 [0.14, 1.50]	0.69 [0.19, 2.51]	0.62 [0.13, 2.99]

Note: Adjusted for city assignment, relationship status, age, education, race/ethnicity, outness sexual orientation, and HIV-status of the participant and his last non-primary sex partner.