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Predictors of Condom Use among Men Enrolled in Drug Treatment Programs

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Abstract

This study identified predictors of condom use and developed a model of condom use in a sample of men ($n=324$) enrolled in drug treatment. Utilizing a series of logistic regression analyses reported condom use was predicted by possession of condoms, future intention to use condoms, future intention to increase condom use, having a high-risk partner, low Condom Barriers Scale scores, being unmarried and ethnic minority status. A probit path analysis revealed the following model of condom use among men in drug treatment: Taking condoms from clinic stocks was the best predictor of condom possession, which in turn was the best predictor of condom use. These study findings identify condom availability in treatment programs as an important risk reduction intervention. Treatment programs can apply these predictors of condom use to better identify individuals at risk for HIV and sexually transmitted infections to better target prevention interventions.

Keywords

HIV prevention; drug treatment; condom use; men

INTRODUCTION

Research has demonstrated that drug-using populations exhibit high levels of sexual risk behaviors that can increase the risk of contracting and/or transmitting the Human Immunodeficiency Virus (HIV) and other sexually transmitted infections (STIs). This has been shown among heavy drinkers (Shillington, Cottler, Compton & Spitznagel, 1995), cocaine users (Ross, Kohler, Grimley & Bellis, 2003), methamphetamine abusers (Halkitis, Shrem & Martin, 2005), MDMA users (McElrath, 2005), and injection drug users (Chitwood, Comerford & Sanchez, 2003). Enrollment in drug treatment has been shown to

reduce HIV risk behaviors related to drug use, such as risky injection practices (Sorensen & Copeland, 2000). However, studies indicate that many drug users enrolled in treatment continue to engage in high-risk sexual behaviors (Avins et al., 1997; Farrell et al., 2005; Longshore & Hsieh, 1998). Therefore, people in drug treatment may benefit from targeted HIV reduction interventions aimed at sexual risk behaviors. A meta-analysis of HIV risk-reduction interventions delivered within drug treatment programs demonstrated that such interventions have a clinically relevant impact on reducing sexual HIV risk behaviors beyond the effects of enrollment in drug treatment alone (Prendergast, Urada & Podus, 2001). Interventions often stress the use of condoms to lower one's risk of contracting and/or transmitting HIV or a STI.

Research has elucidated some factors associated with the use of condoms among drug users. Rosengard, Anderson, and Stein (2006) found that drug users were more likely to use condoms when they had more positive attitudes toward the effects of condoms on sexual pleasure and perceived themselves to be at a greater risk for HIV/STIs. Additionally, van Empelen and colleagues (2001) found greater self-efficacy and positive feelings toward condoms by one's sexual partner as significant predictors of condom use among drug users. Although some studies have associated lower rates of condom use with being under the influence of alcohol or drugs, event analysis studies have only supported this link with amphetamine-type drugs (Leigh, Ames & Stacy, 2008; Colfax et al., 2004).

Recent studies have explored condom use behaviors from the following behavior change models: the Theory of Reasoned Action -TRA (Ajzen & Fishbein, 1980), the Theory of Planned Behavior - TPB (Ajzen, 1985), and the Information-Motivation-Behavior Skills model – IMB (Fisher & Fisher, 1992). They are effective at predicting condom use behaviors (i.e., condom use, condom purchasing, and communication with partners about use) in diverse situations (Albarracin, Johnson, Fishbein & Mullerleile, 2001; Fisher, Fisher & Rye, 1995). They reflect the basic premise that intention to perform these behaviors can predict future changes (Nutbeam & Harris, 2004). However, intention is often not sufficient to effect changes in the sexual decision-making process (Fisher & Fisher, 2000). Even well intentioned and motivated individuals often end up not using condoms, particularly when they lack basic condom use skills (Fisher & Fisher, 1992). Current research best supports the Information Motivation Behavioral Skills (IMB) model's premise that individuals who are well informed, motivated, and possess appropriate skills are likely to engage in, or maintain, intended future behaviors (Fisher & Fisher, 2000). This has been demonstrated with diverse populations, including college students (Fisher, Fisher, Misovich, Kimble & Malloy, 1996), inner city youth (Fisher, Fisher, Bryan & Misovich, 2002), and mentally ill drug users (Kalichman, Malow, Devieux, Stein & Peidman, 2005).

While some studies have shed light on condom use among drug users, little attention has focused on condom use behaviors among men enrolled in drug treatment. Furthermore, no study to date has focused on predictors of condom use among a large sample of men enrolled in drug treatment. This paper will present an exploratory path analytic model aimed to identify predictors of condom use among men in drug treatment enrolled in a multi-site randomized clinical trial testing the effectiveness of a gender-specific group HIV/STI reduction intervention.

METHODS

Participants

Participants were enrolled in a National Institute on Drug Abuse Clinical Trials Network protocol ("Safer Sex Skills for Men in Methadone Maintenance and Psychosocial Outpatient Drug Abuse Treatment Programs"- CTN-0018) which compared a 5-session group

intervention developed for men, “Real Men Are Safe” (REMAS), to a standard single session HIV/AIDS (HIV-Ed) education group intervention (Calsyn et al., in press). Inclusion criteria were: (a) males over the age of 18, (b) enrolled in one of 14 methadone maintenance (MMT) or outpatient non-medication assisted psychosocial drug treatment programs, (c) reported unprotected vaginal or anal intercourse during the prior 6 months, (d) a willingness to be randomly assigned to one of two interventions, (e) a willingness to complete baseline and follow-up assessments, and (f) the ability to speak and understand English. Participants with gross mental status impairment as measured by the Mini Mental Status Exam (Folstein et al., 1975) were excluded. For analyses reported here, participation was limited to (a) men who reported engaging in vaginal or anal intercourse in the past 90 days who (b) were not missing values in the outcome variables of interest. Of the 590 original study participants, 520 participants had data available on the predictor variables of interest in the study and 469 reported sexual activity in the previous 3 months. In addition, 145 participants were from sites that did not have condoms available. They were thus eliminated from the logistic and path regression model analyses since individuals from clinics where condoms were not available could not possibly take them from the clinic stocks. Therefore, data from 324 participants were included in the analyses presented here. Sample demographics are as follows. The mean age and education were 39.71 ($sd=9.97$, $median=40$) and 12.16 ($sd=1.91$, $median=12$) years. The vast majority were non-Hispanic Caucasian ($n=220$, 61.73%), African American ($n=86$, 26.54%) or Hispanic ($n=30$, 9.6%). Only 72 (22.22%) were married; 140 (34.57%) had never been married; and 112 were divorced, separated or widowed. These demographics are similar to the demographics for the 590 men eligible for randomization in the parent protocol, which is described in further detail elsewhere (Calsyn et al., in press).

Assessment Measures

The Sexual Behavior Interview (SBI) was administered during the baseline assessment as part of a larger battery. The SBI items were selected or adapted from the SADAR (Sex and Drug Abuse Relationship Interview; Calsyn et al., 2000) and the SERBAS (Sexual Risk Behavior Assessment Schedule; Meyer-Bahlburg et al., 1991; Sohler et al., 2000). Behaviors assessed included, but were not limited to the following: 1) frequency of vaginal, anal, oral sex by partner type (main versus casual); 2) reported frequency of male or female condom use for each vaginal, anal, and oral sex act by partner type; 3) number, gender, and perceived HIV serostatus of partners; 4) the perceived likelihood to use condoms in the future; 5) current possession of condoms and whether condoms were taken from treatment clinic stocks; and 6) communication about condom use with partners. To lessen the impact of social desirability distortions in self reports of sexual risk behaviors, SBI items were administered using the audio computer-assisted self-interviewing (ACASI) method. ACASI methodology has been shown to improve disclosure of high risk behaviors compared to in-person, face-to-face interviews (Gross et al., 2000; Metzger et al., 2000).

The Condom Barriers Scale (CBS; St. Lawrence et al., 1999) is a self-report instrument consisting of 29 items worded as short statements and rated on a 5-point Likert scale. Items are summed to yield a total Condom Barriers Scale score, as well as scores on four factor analytically supported conceptual domains: Partner Barriers (8 items), Effects on Sexual Experience (7 items), Access/Availability (8 items) and Motivational Barriers (6 items). Since the CBS was originally developed for use with heterosexual women, the wording of relevant items was slightly modified to make items gender or sexual orientation neutral. The reliability and validity of this modification has been established for men (Doyle, Calsyn & Ball, 2009).

The male condom use skills measure (MCUS) was comprised of 14 items. The items for each scale correspond to the steps for correct condom use being taught in the parent study

interventions. The MCUS included all seven items of the Condom Skill Scale (Farris, Fenaughty & Lindemann, 2003), previously shown to be a valid measure of condom use skills. Participants are asked to choose a condom and lubricant that would provide protection from HIV and apply and remove the condom from the model, verbalizing what they are doing as they do it. Participants receive a point for each activity they demonstrate correctly. The female condom use skills measure (FCUS) included 11 items. For the FCUS a female condom and a pelvic model are placed on the table and the application/removal instructions are repeated with similar scoring as the MCUS.

The Addiction Severity Index-Lite (ASI-L; McLellan et al., 1992) is a standardized, multidimensional, semi-structured, comprehensive clinical interview that provides clinical information important for formulating treatment plans as well as problem severity profiles in six domains of functioning. The domains covered are chemical abuse (alcohol and drug), medical, psychiatric, legal, family/social and employment/support. Composite Scores for each problem domain are derived.

Urine specimens collected at the time of the baseline assessment were tested onsite for 10 illicit substances.

Statistical Analyses

The purpose of the analysis was to derive a model of reported condom use considering possession of condoms and taking condoms from clinic stocks as intervening endogenous variables. Health risk factors, demographic information and condom use skills were considered as potential predictors of these three variables.

Initial analyses focused on the prediction of the primary outcome variable of reported condom use in the previous 3 months (i.e., any condom use in the past 3 months), and the two secondary outcome variables, current possession of condoms and taking condoms from clinic stocks. Secondary outcomes were also included as potential predictors of reported condom use. The prediction of current possession of condoms excluded the primary outcome, as did the prediction of taking condoms from clinic stocks, which also eliminated current possession of condoms as a potential predictor variable. The predictions of the primary and secondary outcomes were each first assessed with separate univariate and multivariate logistic regression analyses. All outcome variables were dichotomous.

Predictor Variables—Predictor variables included self risk factors (having multiple partners, injection drug use, drug related HIV risk, recent stimulant use, perceived HIV risk of partner); demographic variables (marital status, employment, minority status [non-Hispanic white/minority], education, age, income); partner risk factors (partner was thought to be HIV positive, partner traded sex for money, drugs or other goods, partner drug use, cohabitation with partner); drug treatment factors (prior drug treatment, treatment modality [methadone maintenance vs. outpatient psychosocial treatment], availability of free condoms from the clinic facility, taking condoms from the clinic); likelihood of using condoms (the likelihood of using a male condom, the likelihood of increasing the number of times a male condom is used), current possession of condoms, male and female Condom Use Skills (MCUS/FCUS), and scores on the Condoms Barriers Scales (CBS): Access Availability, Partner Barriers, Effect on Sexual Experience and Motivational Barriers). A sexual partner was defined as a high risk partner (either male or female) if they were a new lover (less than 6 months), someone they exchanged sex with drugs or money, a friend they had sex with occasionally, or someone they had sex with only once. Age, education, and the MCUS/FCUS and CBS continuous variables deviated little from normality and were dichotomized at the median for ease of interpretation. The likelihood of using or increasing the use of male condoms was measured on a Likert scale (0 = very unlikely, 1 = unlikely, 2 = neither likely

nor unlikely, 3 = likely, 4 = very likely) and both variables were dichotomized as 1 for likely or very likely and 0 otherwise.

Univariate Logistic Regression—The criteria for inclusion into the multivariate logistic regression model first involved the selection of potential predictor variables with a univariate analysis.¹ All variables of interest were not included in the model since considerable confounding (Miettinen, 1976) and suppressor effects (Tzelgov & Henik, 1991) may be present in the data, and this approach may lead to model overfitting and numerically unstable estimates (Hosmer & Lemeshow, 2000). Any variable with an associated univariate p -value < 0.20 was considered as a candidate for the multivariate logistic regression model. Use of the 0.20 level of significance as a screening criterion is based on the work by Mickey and Greenland (1989) who demonstrated that a more conventional level, such as 0.05, often fails to identify important variables and a higher level minimizes type II error selection.

Multivariate Logistic Regression—Variables selected for consideration with the univariate logistic regression were included in a stepwise method of selection for the multivariate logistic model. The 0.15 alpha level for inclusion into the final prediction model was based on the work by Bendel and Afifi (1977) and Costanza and Afifi (1979), whose research showed that the choice of the conventional 0.05 level is too stringent for stepwise regression, and a range of 0.15 to 0.20 is more highly recommended. All three models were assessed with the Hosmer and Lemeshow goodness-of-fit test (Hosmer & Lemeshow, 1980; Lemeshow & Hosmer, 1982).

Probit Path Analysis—Based on the results of the three separate multivariate logistic regression analyses, a probit path analysis model was fitted using the robust weighted least squares estimation procedure (WLSMV) with the Mplus program (version 5.0, Muthén & Muthén, 1998–2007). This type of structural equation modeling is based on the work by Xie (1989) and Muthén (1979) for dealing with situations involving multivariate dichotomous responses. The adequacy of the model was assessed by four indices of model fit: the comparative fit index (CFI; Bentler, 1990), the Tucker-Lewis incremental fit index (TLI; Tucker & Lewis, 1973), root mean square error of approximation (RMSEA; Steiger & Lind, 1980) and the weighted root mean square residual (WRMR; Yu and Muthén, 2002). The magnitude of the fit indices was evaluated on recommendations given by Hu and Bentler (1999) and Yu and Muthén (2002): > .95 for the CFI and TLI, < .06 for the RMSEA and < 1 for the WRMR.

The probit regression coefficient and standard error of the indirect effect of taking condoms from clinic stocks on condom use was estimated by the method provided by Sobel (1982). For ease of interpretation, probit coefficients were transformed to logit coefficients and exponentiated to produce approximated odds ratios (*AOR*). Following Maddala (1983), who cites Amemiya (1981), probit estimates were transformed into approximations of logistic estimates (β_L) by multiplying the probit coefficient (β_P) by a factor 1.6.²

¹Although the final path model is based on probit analysis, initial analyses were conducted with logistic regression for ease of interpretation of coefficients and odds ratio, and substantive decisions on the selection of potential predictor variables. This is not considered to be problematic, since in practice, standard probit and logistic models tend to yield essentially the same conclusions for the same data the majority of the time.

²Probit and logit regression models tend to produce highly similar results, with differences generally being in the way the coefficients are scaled. The transformation function for the probit model is the cumulative standard normal distribution function with unit variance; whereas, the cumulative distribution function for the logit model is $\pi^{1/3}$. Therefore, the logit estimates tend to be larger than probit estimates by a factor of approximately $\pi/\sqrt{3} @ 1.81$ (Maddala, 1983). However, Amemiya (1981) suggests that 1.6 provides a better estimate of the factor by which logit estimates tend to exceed probit estimates. A further justification for this 1.6 estimate is presented in Greene (2003, p. 676) concerning the marginal effects at the center of the distributions.

RESULTS

Availability and possession of condoms

The total analysis sample consisted of 324 participants with the treatment modalities represented by $n = 126$ for outpatient psychosocial (OPS) and $n = 198$ for methadone maintenance treatment (MMT). Of these participants, 172 were from treatment sites where condoms were readily available and 152 from sites where condoms were available but the participants had to request them. There was no statistically significant difference in the percents of men possessing condoms between OPS and MMT when condoms were readily available ($\chi^2_1 = 0.3022$, $p = .5825$). However, if condoms were available but the participant had to request them, the odds were greater (odds ratio (*OR*) = 2.98, 95% *CI* = 1.533, 5.789, $p = .0013$) that men in MMT versus OPS would possess condoms.

Predictors of condom use

Logistic regression analyses indicated that the best predictors of reported condom use were possession of condoms, the high likelihood of using condoms in the future, the high likelihood of increasing the use of condoms in the future, being unmarried, having a high risk partner, reporting low CBS partner barriers to condom use, being a minority and obtaining a high score on the male condom use skill. In turn, possession of condoms was predicted by taking condoms from clinic stocks, reporting the likelihood of increasing condom use in the future, being less than 40 years of age, and CBS subscales indicating low Motivation Barriers, low Partner Barriers and low Access Barriers to condom use. Taking condoms from clinic stocks was predicted by being in MMT versus OPS, not living with their sexual partner, reporting the likelihood of increasing condom use in the future, low CBS Motivation Barriers to condom use and being a minority. It should be noted that recent stimulant use or injection drug use were not significant correlates of any of the outcome variables. The Hosmer-Lemeshow goodness-of-fit test indicated a good fit for each stepwise multivariate logistic model: $\chi^2_8 = 10.65$ ($p = .2223$), $\chi^2_8 = 10.97$ ($p = .2032$) and $\chi^2_8 = 4.47$ ($p = .8123$) for condom use, possession of condoms and taking condoms from clinic stocks, respectively.

The proportion of respondents by outcome and predictor variable and their associated univariate odd ratios are presented in Table 1. For example, 77.98% of the 109 participants who reported using condoms also indicated possession of condoms; whereas, only 39.53% of the 215 participants not using condoms also possessed them. That is, participants who possessed condoms have 5 times greater odds ($OR = 5.42$) of using condoms, than those who didn't possess them. In a similar manner, the odds of possessing condoms were nine times greater ($OR = 9.26$) for men who reported taking condoms from clinic stocks than those that did not.

Probit path model of condom use

These predictors, along with the two endogenous or secondary outcome variables, possession of condoms and taking condoms from clinic stocks, and the primary outcome variable of condom use were then used in the probit path analysis model presented in Table 2. Indices of model fit indicated a very good fit of the data to the model: CFI = 0.980, TLI = 0.968, RMSEA = 0.025 and WRMR = 0.720. Taking condoms from clinic stocks was the best predictor of the possession of condoms ($\beta_P = 1.434$, $\beta_L = 2.294$, $AOR = 9.92$), which in turn was the best predictor of condom use ($\beta_P = 0.814$, $\beta_L = 1.302$, $AOR = 3.68$). Taking condoms from clinic stocks did not have a direct effect on condom use, but did have an indirect effect as mediated by condom possession ($\beta_P = 1.167$, $\beta_L = 1.867$, $AOR = 6.47$).

Based on the probit path regression model, sample-based probabilities of condom use, possession of condoms and taking condoms from clinic stocks were calculated. The maximum probabilities are associated with participant responses that support each outcome variable. For example, if the participant reports possessing condoms, a high likelihood of both using and increasing the use of condoms, being unmarried, having a high risk partner, reporting low CBS partner barriers to condom use, being a minority and revealing a high score on the skill of using male condoms, the estimated probability is 97.10% that this man will also report the use of condoms. The lowest probabilities (e.g., 0.50% for condom use) are associated with men who report the opposite on each predictor variable. Intermediate probability values are associated with indicators of some but not all of the predictor variables associated with the outcome. In summary, Figure 1 provides a diagram of the probit path analytic model, with path coefficients presented as approximated odds ratios.

DISCUSSION

This study found that behavioral intentions to use condoms, possession of condoms and having sexual partners at high risk for HIV were the best predictors of condom use among men enrolled in drug treatment programs. Contrary to expectations, condom use was not associated with drug use in this study, as our analyses did not find significant associations between these two variables. In turn, condom possession was best predicted by condom acquisition from free condoms available from the drug treatment program, one's perceived likelihood to increase condom use and low condom use barriers. This study found some differences in condom taking behaviors as a function of the type of drug treatment program. Patients enrolled in methadone maintenance (MMT) treatment programs were more likely to take condoms from clinic stocks than those enrolled in outpatient psychosocial (OPS) programs. Several factors may contribute to this difference. Since the HIV epidemic had a significant impact on injection drug using populations, MMT programs have longer histories of providing HIV risk reduction education and prevention interventions to their patients, including free condom distribution. Another factor may relate to dosage of drug treatment. Methadone maintenance treatment typically lasts longer than outpatient drug free treatment programs. Therefore, patients enrolled in MMT may have had greater treatment exposure, including HIV prevention education, than those in outpatient psychosocial programs.

This study's probit path model supports existing HIV risk reduction behavior theoretical models. The three major theoretical frameworks (i.e., TRA, TPB and IMB) are based on the assumption that intent to perform a behavior predicts future behavior. Along with intention, a strong self-efficacy component, integral in both TPB and IMB, is another important factor in predicting HIV risk reduction behaviors. However, having both intention and self-efficacy is not always sufficient to effect changes in condom use among men in drug treatment. This study supports the IMB model, where intention, self-efficacy as well as possession of appropriate skills are all necessary to perform and maintain new condom use behaviors. Applied to our study, a high score on the condom use skill test was predictive of both condom use and taking condoms from clinic stocks. All these results are consistent with the theoretical underpinnings of existing behavior change models for condom use behaviors.

It is crucial to understand other factors influencing condom use behaviors so that more work can be done to prevent the transmission of HIV/STDs among this population at high risk of contracting and/or transmitting HIV and STIs. As this study explored predictors of condom use and condom possession behaviors among men enrolled in drug treatment, future studies should explore predictors of condom use for women. What are the differential predictors of condom use among women in drug treatment? This understanding can better inform the treatment and prevention community in providing relevant gender specific HIV prevention interventions to persons receiving drug treatment. In addition, future studies could further

explore the different HIV prevention needs for persons in different types of drug treatment. Our study found that MMT patients were more likely to have taken condoms from clinic stocks than those enrolled in OPS. There may be other factors contributing to this difference, such as length of treatment, greater exposure to HIV prevention education in one type of program, greater knowledge and skill among treatment staff on HIV prevention, etc. Most studies exploring HIV risk behaviors among persons in drug treatment have mainly focused on MMT programs, thus, less is known about OPS programs, particularly whether OPS programs are similar or differ from MMT programs in HIV risk reduction education and prevention.

These study findings should be interpreted with caution due to several factors. Although this study had a relatively ethnically diverse large sample drawn from multiple drug treatment programs across the U.S., all enrolled study participants also consented to participating in a clinical trial testing two HIV risk reduction counseling interventions. Those who consented to enroll in this study may represent a sub-sample of individuals in drug treatment differentially malleable to HIV prevention interventions limiting generalizability. For example, this study may have attracted persons who possess greater insight and concern about HIV risk behaviors. Therefore, these study findings cannot be generalized to all men enrolled in drug treatment. It is also important to note that alternative models of condom use may also account for the condom use behaviors described in this study. Finally, the model of condom use presented in this study was developed using cross-sectional data to derive a path model to predict condom use behaviors; therefore, it is important to note that causality cannot be inferred from this study.

One of the most compelling clinical implications of this study is the benefit of having condoms readily available in treatment programs. In order to use them, patients in drug treatment must first possess them. Having condoms readily available in the treatment programs predicted possession, which in turn predicted actual condom use. Since reported condom use was largely determined by condom possession, these results suggest that one of the simplest and most cost effective HIV and STI reduction interventions drug treatment programs can employ is having condoms readily available to clients in their programs (Calsyn, Meinecke, Saxon, and Stanton, 1992). In addition to increased condom availability, drug treatment programs may improve condom use outcomes among their patients by motivational enhancement interventions to increase motivation or behavioral intentions to increase condom use. As drug treatment programs are increasingly adopting more evidence-based treatment modalities in their treatment repertoire, drug treatment program staff can employ motivational enhancement (e.g., Miller & Rollnick, 2002) strategies to improve behavioral intentions to use condoms as a way of improving HIV risk reduction outcomes. Finally, as drug treatment programs are continuously enhancing their provision of targeted treatments for different types of patients, this study suggests that there are particular predictors of reported condom use among men enrolled in drug treatment. Knowing these predictors can better equip drug treatment staff in producing superior HIV sexual risk reduction outcomes.

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References

- Albarracin D, Johnson B, Fisbein M, Mullerleile P. Theories of reasoned action and planned behavior as models of condom use: A meta-analysis. *Psychological Bulletin*. 2001; 127:142–161. [PubMed: 11271752]
- Ajzen, I.; Fishbein, M. Understanding attitudes and predicting social behavior. Englewood Cliffs, NJ: Prentice Hall; 1980.
- Ajzen, I. From intentions to actions: A theory of planned behavior. In: Kuhl, J.; Beckman, J., editors. Action-control: From cognition to behavior. Heidelberg: Springer; 1985. p. 11-39.
- Amemiya T. Qualitative response models: A survey. *Journal of Economic Literature*. 1981; 19:1483–1536.
- Avins AL, Lindan CP, Woods WJ, Hudes ES, Boscarino JA, Clark W, et al. Changes in HIV-related behaviors among heterosexual alcoholics following addiction treatment. *Drug and Alcohol Dependence*. 1997; 44:47–55. [PubMed: 9031820]
- Bendel RB, Afifi AA. Comparison of stopping rules in forward regression. *Journal of the American Statistical Association*. 1977; 72:46–53.
- Bentler PM. Comparative fit indices in structural models. *Psychological Bulletin*. 1990; 107:238–246. [PubMed: 2320703]
- Calsyn DA, Hatch-Maillette M, Tross T, Doyle SR, Crits-Christoph P, Song YS, Harrer JM, Lalos G, Berns SB. Motivational and skills training HIV/STI sexual risk reduction groups for men. *Journal of Substance Abuse Treatment*. in press.
- Calsyn DA, Meinecke C, Saxon AJ, Stanton V. Risk reduction in sexual behavior: A condom giveaway program in a drug abuse treatment clinic. *American Journal of Public Health*. 1992; 82:1536–1538. [PubMed: 1332520]
- Calsyn, DA.; Wells, EA.; Saxon, AJ.; Jackson, R.; Heiman, JR., et al. Sexual activity under the influence of drugs is common among methadone clients p. 315. In: Harris, L., editor. Problems of Drug Dependence. Rockville, MD: National Institute on Drug Abuse; 2000. p. 1999
- Chitwood DD, Comerford M, Sanchez J. Prevalence and risk factors for HIV among sniffers, short-term injectors, and long-term injectors of heroin. *Journal of Psychoactive Drugs*. 2003; 35:445–453. [PubMed: 14986873]
- Colfax G, Vittinghoff E, Husnik MJ, McKirnan D, Buchbinder S, Kolbin B, et al. Substance use and sexual risk: A participant- and episode-level analysis among a cohort of men who have sex with men. *American Journal of Epidemiology*. 2004; 159:1002–1012. [PubMed: 15128613]
- Costanza MC, Afifi AA. Comparison of stopping rules in forward stepwise discriminant analysis. *Journal of the American Statistical Association*. 1979; 74:777–785.
- Doyle SR, Calsyn DA, Ball SA. Factor Structure of the Condoms Barriers Scale with a Sample of Men at High Risk for HIV. *Assessment*. 2009; 16:3–15. [PubMed: 18689777]
- Farrell M, Gowing L, Marsden J, Ling W, Ali R, et al. Effectiveness of drug dependence treatment in HIV prevention. *International Journal of Drug Policy*. 2005; 16S:S67–S75.
- Farris CA, Fenaughty AM, Lindemann DF. A condom scale: Assessing condom skills among female drug users. *Drug Education*. 2003; 33:217–231. [PubMed: 12929711]
- Fisher JD, Fisher WA. Changing AIDS Risk Behavior. *Psychological Bulletin*. 1992; 111:455–474. [PubMed: 1594721]
- Fisher JD, Fisher WA, Rye B. Understanding and promoting AIDS-prevention behavior: Insights from the theory of reasoned action. *Health Psychology*. 1995; 14:255–264. [PubMed: 7641667]
- Fisher JD, Fisher WA, Misovich S, Kimble D, Malloy T. Changing AIDS risk behavior: Effects of an intervention emphasizing AIDS risk reduction information, motivation, and behavioral skills in a college student population. *Health Psychology*. 1996; 15:114–123. [PubMed: 8681919]
- Fisher, JD.; Fisher, WA. Theoretical approaches to individual-level change. In: Peterson, J.; DiClemente, R., editors. HIV Prevention Handbook. New York: Kluwer Academic/Plenum Press; 2000. p. 3-55.
- Fisher JD, Fisher WA, Bryan A, Misovich S. Information-motivation-behavioral skills model-based HIV risk behavior change intervention for inner-city high school youth. *Health Psychology*. 2002; 21:177–186. [PubMed: 11950108]

- Folstein MF, Folstein SE, McHugh PR. "Mini-Mental Status": A practical method for grading cognitive state of patients for the clinician. *Journal of Psychiatric Research*. 1975; 12:196–198.
- Greene, WH. *Econometric Analysis*. 5th ed.. Prentice Hall: Upper Saddle River, NJ; 2003.
- Gross M, Holte SE, Marmor M, Mwatha A, Koblin BA, Mayer KH. Anal sex among HIV-seronegative women at high risk of HIV exposure: The HIVNET Vaccine Preparedness Study 2 Protocol Team. *Journal of Acquired Immune Deficiency Syndromes*. 2000; 24:393–398. [PubMed: 11015157]
- Halkitis PN, Shrem MT, Martin FW. Sexual behavior patterns of methamphetamine-using gay and bisexual men. *Substance Use & Misuse*. 2005; 40:703–719. [PubMed: 15887599]
- Hosmer DW, Lemeshow S. A goodness-of-fit test for the multiple logistic regression model. *Communications in Statistics*. 1980; A10:1043–1069.
- Hosmer, DW.; Lemeshow, S. *Applied logistic regression*. 2nd ed.. NY: John Wiley & Sons; 2000.
- Hu L, Bentler PM. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*. 1999; 6:1–55.
- Kalichman S, Malow R, Devieux J, Stein J, Peidman F. HIV risk reduction for substance using seriously mentally ill adults: Test of the information-motivation-behavior skills (IMB) model. *Community Mental Health Journal*. 2005; 41:277–290. [PubMed: 16131007]
- Leigh BC, Ames SL, Stacy AW. Alcohol, drugs, and condom use among drug offenders: An event-based analysis. *Drug and Alcohol Dependence*. 2008; 93:38–42. [PubMed: 17928167]
- Lemeshow S, Hosmer DW. The use of goodness-of-fit statistics in the development of logistic regression models. *American Journal of Epidemiology*. 1982; 115:92–106. [PubMed: 7055134]
- Longshore D, Hsieh S. Drug abuse treatment and risky sex: Evidence for a cumulative treatment effect? *American Journal of Drug and Alcohol Abuse*. 1998; 24:439–451. [PubMed: 9741945]
- Maddala, GS. *Limited-Dependent and Qualitative Variables in Econometrics*. Cambridge: Cambridge University Press; 1983.
- McElrath K. MDMA and sexual behavior: Ecstasy users' perceptions about sexuality and sexual risk. *Substance Use & Misuse*. 2005; 40:1461–1477. [PubMed: 16048828]
- McLellan A, Cacciola J, Kushner H, Peters F, Smilth L, Pettinati H. The fifth edition of the Addiction Severity Index. *Journal of Substance Abuse Treatment*. 1992; 9:199–213. [PubMed: 1334156]
- Metzger DS, Koblin B, Turner C, Navaline H, Holte S, Gross M, et al. Randomized controlled trial of audio computer-assisted self-interviewing: Utility and acceptability in longitudinal studies. *American Journal of Epidemiology*. 2000; 152:99–106. [PubMed: 10909945]
- Meyer-Bahlburg, H.; Ehrhardt, A.; Exner, TM., et al. *Sexual Risk Behavior Assessment Schedule-Adult-Armory Interview*. New York: Columbia University; 1991.
- Mickey J, Greenland S. A study of the impact of confounder-selection criteria on effect estimation. *American Journal of Epidemiology*. 1989; 129:125–137. [PubMed: 2910056]
- Miettinen OS. Stratification by multivariate confounder score. *American Journal of Epidemiology*. 1976; 104:609–620. [PubMed: 998608]
- Miller, WR.; Rollnick, S. *Motivational interviewing: Preparing people for change*. (2nd ed.). New York: Guilford Press; 2002.
- Muthén BO. A structural probit model with latent variables. *Journal of the American Statistical Association*. 1979; 74:807–811.
- Muthén, LK.; Muthén, BO. *Mplus user's guide*. Los Angeles, CA: Muthén & Muthén; 1998–2007.
- Nutbeam, D.; Harris, E. *Theory in a Nutshell*. 2nd. North Ryde, Australia: The McGraw-Hill Companies; 2004.
- Prendergast ML, Urada D, Podus D. Meta-analysis of HIV risk-reduction interventions within drug treatment programs. *Journal of Consulting and Clinical Psychology*. 2001; 69:389–405. [PubMed: 11495169]
- Rosengard C, Anderson BJ, Stein MD. Correlates of condom use and reasons for condom non-use among drug users. *American Journal of Drug and Alcohol Abuse*. 2006; 32:637–644. [PubMed: 17127552]

- Ross L, Kohler CL, Grimley DM, Bellis J. Intention to use condoms among three low-income urban African American subgroups: Cocaine users, noncocaine users, and non-drug users. *Journal of Urban Health*. 2003; 80:147–160. [PubMed: 12612104]
- Shillington AM, Cottler LB, Compton WM 3rd, Spitznagel EL. Is there a relationship between “heavy drinking” and HIV high risk sexual behaviors among general population subjects? *International Journal of Addiction*. 1995; 30:1453–1478.
- Sobel, ME. Asymptotic confidence intervals for indirect effects in structural equation models. In: Leinhardt, S., editor. *Sociological Methodology*. San Francisco, CA: Jossey-Bass; 1982. p. 290-312.
- Sohler N, Colson PW, Meyer-Bahlberg HFL, Susser E. Reliability of self reports about sexual risk behaviors for HIV among homeless men with severe mental illness. *Psychiatric Services*. 2000; 51:814–816. [PubMed: 10828118]
- Sorensen JL, Copeland AL. Drug abuse treatment as an HIV prevention strategy: A review. *Drug and Alcohol Dependence*. 2000; 59:17–31. [PubMed: 10706972]
- St. Lawrence JS, Chapdelaine AP, Devieux JG, O’Bannon RE, Brasfield TL, Eldridge GD. Measuring perceived barriers to condom use: Psychometric evaluation of the condom barriers scale. *Assessment*. 1999; 6:391–400. [PubMed: 10539985]
- Steiger, JH.; Lind, JM. Statistically based tests for the number of common factors. Iowa City, IA: Paper presented at the annual meeting of the Psychometric Society; 1980.
- Tucker LR, Lewis C. A reliability coefficient for maximum likelihood factor analysis. *Psychometrika*. 1973; 38:1–10.
- Tzelgov J, Henik A. Suppression situations in psychological research: Definitions, implications, and applications. *Psychological Bulletin*. 1991; 109:524–536.
- Van Empelen P, Schaalma HP, Kok G, Jansen MW. Predicting condom use with casual and steady sex partners among drug users. *Health Education Research*. 2001; 16:293–305. [PubMed: 11497113]
- Xie Y. Structural equation models for ordinal variables: An analysis of occupational destination. *Sociological Methods and Research*. 1989; 17:325–352.
- Yu, CY.; Muthén, BO. Evaluation of model fit indices for latent variable models with categorical and continuous outcomes. New Orleans, LA: Paper presented at the annual conference of the American Educational Research Association; 2002.

Figure 1.

Predicting Condom Use: Path Values are Approximated Odds Ratios

Note: MMT = Methadone Maintenance Treatment; OPS = Outpatient Psychosocial; CUS = Condom Use Scale; CBS = Condom Behaviors Scale

Table 1

Baseline Predictors of Reported Condom Use, Possession of Condoms and Taking Condoms from Clinic Stocks

	Percent		OR
	Did Not Report Using Condoms n=215	Reported Using Condoms n=109	
Likely to use condoms in future	11.63	55.96	9.66
Likely to increase condom use	18.14	67.89	9.54
Possessed condoms	39.53	77.98	5.42
High risk partners	38.60	72.48	4.19
Not married	72.56	88.07	2.79
CBS partner barriers low	51.63	68.81	2.07
CUS male condom use skill high	46.05	62.39	1.94
Minority	35.35	44.04	1.44
	Did Not Possess Condoms n=154	Did Possess Condoms n=170	
Did take condoms from clinic stocks	26.62	77.06	9.26
CBS Motivation Barriers low	31.17	65.29	4.15
Likely to increase condom use	20.78	47.65	3.47
CBS Partner Barriers low	46.75	67.06	2.32
CBS Access Barriers low	39.61	53.53	1.76
Age (<40)	43.51	53.53	1.50
	Did Not Take Condoms from Clinic Stocks n=152	Did Take Condoms from Clinic Stocks n=172	
Treatment modality (MMT vs. OPS)	48.68	72.09	2.72
Condoms readily available	41.45	63.37	2.44
CBS Motivation Barriers low	38.16	58.72	2.31
Likely to increase condom use	26.32	42.44	2.06
Does not live with partner	50.00	65.12	1.87
Minority	34.87	41.28	1.31

Note¹: Odds ratios (OR) are univariate for selected predictor variables

Note²: For treatment modality, 1 = Methadone Maintenance, 0 = Outpatient Psychosocial

Table 2

Results of Multivariate Probit Path Analysis

	Estimate	Error	z - value	Pr > z	AOR
Condom Use					
Threshold	2.567	0.365	7.034	0.000	
Possessed condoms	0.814	0.209	3.891	0.000	3.68
Likely to use condoms in future	0.731	0.241	3.028	0.003	3.22
Likely to increase condom use	0.650	0.242	2.689	0.008	2.83
Not married	0.560	0.261	2.144	0.033	2.45
High risk partners	0.558	0.203	2.752	0.006	2.44
CBS Partner Barriers low	0.490	0.197	2.486	0.013	2.19
Minority	0.381	0.185	2.062	0.040	1.84
CUS male condom use skill high	0.278	0.188	1.477	0.141	1.56
<i>Indirect effects of taking condoms from clinic stocks on condom use</i>	1.167	0.334	3.493	0.000	6.47
Possession of Condoms					
Threshold	1.271	0.214	5.944	0.000	
Did take condoms from clinic stocks	1.434	0.176	8.140	0.000	9.91
Likely to increase condom use	0.621	0.191	3.245	0.001	2.70
CBS Motivation Barriers low	0.563	0.185	3.045	0.003	2.46
CBS Partner Barriers low	0.374	0.193	1.944	0.053	1.82
CBS Access Barriers low	0.302	0.192	1.570	0.117	1.62
Age (<40)	0.188	0.103	1.817	0.070	1.35
Take Condoms from Clinic Stocks					
Threshold	1.255	0.200	6.287	0.000	
Treatment modality (MMT vs. OPS)	0.697	0.164	4.240	0.000	3.05
Condoms readily available	0.568	0.158	3.593	0.000	2.48
Does not live with partner	0.473	0.163	2.908	0.004	2.13
Likely to increase condom use	0.417	0.173	2.417	0.016	1.95
CBS Motivation Barriers low	0.286	0.161	1.777	0.076	1.58
Minority	0.274	0.163	1.683	0.093	1.55
Quartile					
	Sample-based Probabilities				
	Condom Use	Possession of Condoms	Taking Condoms		

	Estimate	Error	z - value	Pr > z from Clinic Stocks	AOR
1	0.0051 - 0.0888		0.1019 - 0.3220	0.1047 - 0.3576	
2	0.1010 - 0.2729		0.3420 - 0.6565	0.3882 - 0.5773	
3	0.2816 - 0.6635		0.6790 - 0.8987	0.5797 - 0.7157	
4	0.6794 - 0.9710		0.9011 - 0.9865	0.7277 - 0.9279	
Mean	0.3812		0.6138		0.5484
Median	0.2773		0.6790		0.5797
Standard Deviation	0.3143		0.2017		0.2116

Note¹: Approximated odds ratios (AOR) are estimated from predictor variables with the probit path model

Note²: For treatment modality, 1 = Methadone Maintenance, 0 = Outpatient Psychosocial