1996

Longitudinal Prediction of Women in the Stages of Change for Condom Use: A Comparison of Methods

Kerry E. Evers
University of Rhode Island

Follow this and additional works at: <https://digitalcommons.uri.edu/theses>

Recommended Citation

Evers, Kerry E., "Longitudinal Prediction of Women in the Stages of Change for Condom Use: A Comparison of Methods" (1996). *Open Access Master's Theses*. Paper 1658.
<https://digitalcommons.uri.edu/theses/1658>

This Thesis is brought to you for free and open access by DigitalCommons@URI. It has been accepted for inclusion in Open Access Master's Theses by an authorized administrator of DigitalCommons@URI. For more information, please contact digitalcommons-group@uri.edu.

BF 637
B4
E 8-16
1996

LONGITUDINAL PREDICTION OF WOMEN IN THE STAGES OF CHANGE FOR

CONDOM USE:

A COMPARISON OF METHODS

BY

KERRY E. EVERS

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE

REQUIREMENTS FOR THE DEGREE OF

MASTER OF ARTS

IN

PSYCHOLOGY

UNIVERSITY OF RHODE ISLAND

1996

3 6007419

Abstract

This study attempts to identify how women naturally progress through the Transtheoretical Model Stages of Condom Use over a one year period, as well as identifies the psycho-social and behavioral predictors of these changes. Three separate types of analyses (Latent Transition Analysis, Discriminant Function Analysis, and Logistic Regression) were used in an effort to assess how they complement each other in longitudinal studies such as this. A total of 545 women participated in the one year study of HIV risk in women. Latent Transition Analysis identified the best fitting model of change of stage, which included both forward and backward movement. Precontemplation and Maintenance were found to be the most stable stages. Results from the MANOVA/DFA and Logistic Regression procedures showed that women with high Condom Pros at baseline were more likely to move either forward or backward at least one stage than they were to remain in the same Stage of Condom Use over one year. In addition, Positive Psychosexual Attitudes were negatively associated with forward stage movement. The Logistic Regression model for progression showed that those women who were non-white, had more than a high school education, or were single were more likely to progress than to remain stable. The model on backward movement identified age and race as important predictors. Strengths and limitations for all three types of analyses were apparent. Based on the results of this study, interventions can be developed focusing on these findings in an effort to increase condom use among women. In addition, these results suggest that a combination of methods be employed when analyzing longitudinal data such as in this study.

Acknowledgment

I would like to thank the following people for their assistance in this project:

Dr. Lisa Harlow, my major professor, for inspiring me to pursue this research area. Her enthusiasm, encouragement, and support has made this process an enjoyable learning experience. She has been a role model, and I only hope that I will one day be able to provide a student with the same amount of dedication and concern.

Dr. Colleen Redding, for the guidance and advice she has provided since beginning graduate school. She has taught me lessons that I will carry with me throughout my career.

Dr. Bob LaForge, for encouraging me to expand my methodological knowledge, as well as teaching a new perspective.

Dr. Janet Hirsh, for providing me with a new perspective on the implications of this research.

My friends, especially Sara Johnson, for allowing me to use them as a sounding board for ideas and problems, especially in times of crisis.

Finally, my family, for their love, guidance, support, and tolerance of my neuroticism. Their constant belief that I could accomplish anything has made finishing this work possible.

Table Of Contents

ABSTRACT	ii
ACKNOWLEDGMENT	iii
LIST OF TABLES.....	vi
LIST OF FIGURES.....	viii
LIST OF MEASURES	ix
STATEMENT OF THE PROBLEM	1
JUSTIFICATION OF THE STUDY.....	3
TRANSTHEORETICAL MODEL STAGES OF CHANGE.....	4
MULTIFACETED MODEL OF HIV RISK	7
PSYCHOSOCIAL PREDICTORS OF CONDOM USE	7
<i>Decisional balance.....</i>	<i>8</i>
<i>Self-Efficacy</i>	<i>11</i>
<i>Substance use.....</i>	<i>11</i>
<i>Sexual assertiveness.....</i>	<i>13</i>
<i>Psychosexual attitudes</i>	<i>13</i>
RESEARCH HYPOTHESES	14
METHOD.....	16
PARTICIPANTS	16
MEASURES	17
PROCEDURE	19
ANALYSES.....	21

RESULTS.....	25
PRELIMINARY ANALYSIS.....	25
LATENT TRANSITION ANALYSIS.....	25
<i>Delta Parameters</i>	26
<i>Tau Parameters</i>	26
DFA/MANOVA	27
<i>Stage at Time 2</i>	28
<i>Progression versus Stability</i>	29
<i>Regression versus Stability</i>	30
LOGISTIC REGRESSION ANALYSIS	31
<i>Direct Logistic Regression</i>	31
Progression versus Stability	32
Regression versus Stability	33
<i>Model Building</i>	33
Progression versus Stability	33
Regression versus Stability	35
DISCUSSION.....	37
STAGE TRANSITIONS	37
LONGITUDINAL PREDICTORS OF STAGE OF CONDOM USE.....	38
METHODS OF ANALYSIS.....	42
STUDY LIMITATIONS	45
IMPLICATIONS	46
FIGURES	68
APPENDIX A.....	73
BIBLIOGRAPHY.....	84

List of Tables

TABLE 1. CORRELATION TABLE FOR ALL VARIABLES	48
TABLE 2. SAMPLE DEMOGRAPHICS AT BASELINE	49
TABLE 3. DESCRIPTIVE STATISTICS FOR PREDICTORS VARIABLES AT BASELINE	50
TABLE 4. OVERALL FIT FOR ALL 6 LATENT TRANSITION MODELS TESTED	51
TABLE 5. DELTA PARAMETER ESTIMATES (PROBABILITY OF LATENT STATUS MEMBERSHIP) FOR MODEL 6	52
TABLE 6. TAU PARAMETER ESTIMATES (TRANSITION PROBABILITIES) FOR MODEL 6	53
TABLE 7. ANOVA RESULTS FOR 12 PSYCHO-ATTITUDINAL VARIABLES AT BASELINE WITH STAGES OF CONDOM USE 1 YEAR LATER (5 LEVELS) AS THE INDEPENDENT VARIABLE	54
TABLE 8. STANDARDIZED CANONICAL COEFFICIENTS FOR 12 PREDICTORS OF STAGE OF CONDOM USE 1 YEAR LATER (N=522)	55
TABLE 9. ANOVA RESULTS FOR 12 VARIABLES WITH STAGE MOVEMENT (2 LEVELS; PROGRESSION VS. STABILITY) AS THE INDEPENDENT VARIABLE (N=405)	56
TABLE 10. STANDARDIZED CANONICAL COEFFICIENTS FOR 12 PREDICTORS OF POSITIVE STAGE MOVEMENT (PROGRESSION VERSUS STABILITY) (N=405)	57
TABLE 11. ANOVA RESULTS FOR 12 VARIABLES WITH STAGE MOVEMENT (2 LEVELS; REGRESSION VS. STABILITY) AS THE INDEPENDENT VARIABLE (N=393)	58
TABLE 12. STANDARDIZED CANONICAL COEFFICIENTS FOR 12 PREDICTORS OF NEGATIVE STAGE MOVEMENT (REGRESSION VERSUS STABILITY) (N=393)	59
TABLE 13. DIRECT LOGISTIC REGRESSION ANALYSIS ON PROGRESSION VERSUS STABILITY WITH 12 PSYCHO-ATTITUDINAL AND BEHAVIORAL PREDICTORS (N=405)	60
TABLE 14. DIRECT LOGISTIC REGRESSION ANALYSIS ON REGRESSION VERSUS STABILITY WITH 12 PSYCHO-ATTITUDINAL AND BEHAVIORAL PREDICTORS (N=393)	61

TABLE 15. WALD STATISTIC AND ESTIMATED COEFFICIENT RESULTS FROM THE UNIVARIATE LOGISTIC REGRESSION ANALYSES ON PROGRESSION VS. STABILITY (N=405)	62
TABLE 16. WALD STATISTIC AND ESTIMATED COEFFICIENT RESULTS FROM THE MODEL CONTAINING VARIABLES IDENTIFIED IN THE UNIVARIATE ANALYSIS ON PROGRESSION VS. STABILITY (N=405)	63
TABLE 17. FINAL LOGISTIC REGRESSION MODEL FOR PROGRESSION VS. STABILITY (N=405)	64
TABLE 18. WALD STATISTIC AND ESTIMATED COEFFICIENT RESULTS FROM THE UNIVARIATE LOGISTIC REGRESSION ANALYSES ON REGRESSION VS. STABILITY (N=393)	65
TABLE 19. WALD STATISTIC AND ESTIMATED COEFFICIENT RESULTS FROM THE MODEL CONTAINING VARIABLES IDENTIFIED IN THE UNIVARIATE ANALYSIS ON REGRESSION VS. STABILITY (N=393)	66
TABLE 20. FINAL LOGISTIC REGRESSION MODEL FOR REGRESSION VS. STABILITY (N=393)	67

List of Figures

<u>FIGURE 1.</u> LATENT TRANSITION MODELS OF STAGES OF CONDOM USE	68
<u>FIGURE 2.</u> DISCRIMINANT FUNCTION ANALYSIS ON STAGE OF CONDOM USE	69
<u>FIGURE 3.</u> DISCRIMINANT FUNCTION ANALYSIS AND LOGISTIC REGRESSION ANALYSIS ON STAGE PROGRESSION	70
<u>FIGURE 4.</u> DISCRIMINANT FUNCTION ANALYSIS AND LOGISTIC REGRESSION ANALYSIS ON STAGE REGRESSION	71
<u>FIGURE 5.</u> TAU PARAMETERS (TRANSITION PROBABILITIES) FOR MODEL 6	72

List of Measures

MEASURES 1 STAGING FOR CONDOM USE	73
MEASURES 2 CONDOM PROS	74
MEASURES 3 CONDOM CONS	75
MEASURES 4 CONDOM USE EFFICACY	76
MEASURES 5 ALCOHOL USE	77
MEASURES 6 DRUG USE	78
MEASURES 7 INITIATION SEXUAL ASSERTIVENESS	79
MEASURES 8 REFUSAL SEXUAL ASSERTIVENESS	80
MEASURES 9 BIRTH CONTROL SEXUAL ASSERTIVENESS	81
MEASURES 10 INFORMATION COMMUNICATION SEXUAL ASSERTIVENESS	82
MEASURES 11 PSYCHOSEXUAL ATTITUDES ¹	83

Statement of the Problem

In the era of Human Immunodeficiency Virus (HIV) and Acquired Immune Deficiency Syndrome (AIDS) and the increasing rates of Sexually Transmitted Diseases (STDs), condoms have become a main means of defense against infection for women who are sexually active. A secondary analysis of HIV risk in women (Harlow, Morokoff, & Quina, 1991) is undertaken to investigate the Stages of Change for condom use over a one year period. By increasing condom use among women who are at risk for HIV and STDs, their risk level may be lowered. The Transtheoretical Model of behavior change (e.g., Prochaska, Norcross, & DiClemente, 1994) provided the major conceptual framework as it is a systematic approach to studying stages of change, particularly for health related behaviors. In addition, other theories of HIV risk reduction were incorporated, such as the Health Belief Model (Rosenstock, Strecher, & Becker, 1994), the AIDS Risk Reduction Model (Catania, Kegeles, & Coates, 1990), and the Multifaceted Model (Harlow, Quina, Morokoff, Rose, & Grimley, 1993). By using these models to identify both how women naturally progress through these stages of change and what the predictors of change are, interventions can be developed focusing on these findings in an effort to increase condom use among women.

The overriding goal of this study is to understand more about the nature of condom use in women. Within this, there are three sub goals. The first of these is to assess how women naturally progress through the stages of change for condom use over a one year time period. Secondly, longitudinal predictors of any changes in stage are to be evaluated. A third sub-goal, which focuses on methods of analyses, is to assess how Latent Transition Analysis, Discriminant Function Analysis, and Logistic

Regression complement each other in this study and potentially others.

Justification of the Study

In 1994, the World Health Organization estimated that at least 15 million people have been infected by the Human Immunodeficiency Virus. A significant advance since the discovery of AIDS is the identification of the modes of transmission for the virus and the risk behaviors associated with them. This has led to the conclusion that the most promising method of decreasing the transmission of HIV is to change these high risk behaviors. In addition to the risk of becoming infected with HIV, women who are sexually active are also faced with a growing incidence of other sexually transmitted diseases. Condom use during intercourse has been identified as an important protective behavior against the transmission of STDs and HIV. Both social and public health scientists have been given the significant challenge of developing prevention programs aimed at increasing the use of condoms (Kelly, Murphy, Sikkema, & Kalichman, 1993).

A number of different models of health behavior have been applied to the problem of increasing condom use in women. These include the Health Belief Model (e.g., Brown, DiClemente, & Reynolds, 1991; Petosa, & Jackson, 1991; Petosa, & Wessinger, 1990; Rosenstock, Strecher, & Becker, 1994; Rosenthal, Hall, & Moore, 1992), Social Learning Theory (e.g., Bandura, 1982; Bandura, 1986; Bandura, 1994), the AIDS Risk Reduction Model (e.g., Catania, Kegeles, & Coates, 1990; Kline & VanLandingham, 1994), the Multifaceted Model of HIV Risk (Harlow, Quina, Morokoff, Rose, & Grimley; 1993) and the Transtheoretical Model (e.g., Grimley,

Riley, Bellis, & Prochaska, 1993; Grimley, Prochaska, Velicer, & Riley, in press; Harlow, Prochaska, et al., in press; Prochaska, Redding, Harlow, Rossi, & Velicer, 1994; Prochaska, Norcross et al., 1994; Redding, Rossi, Velicer, & Prochaska, 1989; Riley et al., 1993). The Transtheoretical Model appears to be the most comprehensive of these, encompassing many of the best features of the other major health models. Based on fifteen years of research, the Transtheoretical Model postulates that people move through a series of stages on their way to the adoption of a healthy behavior. It has been successfully applied to several areas of health behavior, such as smoking cessation, weight control, quitting cocaine, high-fat diets, exercise acquisition, mammography screening, sunscreen use and condom use (e.g., Prochaska, Velicer et al., 1994). Research on these different problem behaviors has shown that there are certain predictors of progression through these stages (e.g., Prochaska, & DiClemente, 1983; Prochaska, Norcross, et al., 1994). Predictors that have already been examined include: decisional balance between the pros and cons of behavior change (e.g., Velicer, DiClemente, Prochaska, & Brandenburg, 1985) and self efficacy (e.g., DiClemente, Prochaska, & Gibertini, 1985). By identifying these predictors, interventions can be designed to focus on them in an effort to move women along through the stages of change for condom use.

Transtheoretical Model Stages of Change

The Transtheoretical Model is a model of behavior change that describes the acquisition of a healthy behavior or the cessation of an unhealthy behavior as a continuous, gradual process through a series of five stages. This model theorizes that

individuals cycle through the stages of change in a spiral pattern, which means that people may recycle back through earlier stages as they work through the change process (e.g., Prochaska, DiClemente, & Norcross, 1992). Before progressing to another stage, a person must be in the previous stage for a certain interval of time and meet the behavioral criteria for that stage (e.g., Grimley, et al., in press; Prochaska, & DiClemente, 1983; Prochaska, Norcross, et al. 1994; Prochaska, Redding et al., 1994; Prochaska, Velicer et al., 1994).

The first of the five stages is Precontemplation. People in this stage are not seriously considering changing their behavior within the next six months. They have no intentions of changing their behavior in the future. These people may be defensive and resistant to pressures to force them to change. In terms of AIDS risk, this stage may include people who do not intend to change their behavior, as well as people who do not know they are at risk or minimize that risk (Prochaska, Redding, et al., 1994).

The second stage of change is Contemplation, in which a person may be aware of a problem, but is not yet ready to make a commitment to change. They are considering a change within the next 6 months. People in this stage may know about risky behavior, such as unprotected sex with casual partners. However, even though they are thinking about changing their behavior, they do not plan to do so in the near future. They also tend to be more open to information concerning a behavior change, such as condom use, than people in the Precontemplation stage.

The third stage of change is called Preparation. During this stage people have taken some action to change their behavior, and plan to take more very soon, but have

not yet committed to change. They plan to change in the next 30 days and have met some behavioral criteria. In terms of AIDS risk reduction, this could involve a person who occasionally uses condoms but has not fully decided to be consistent with their use.

The Action stage requires the person to reach a behavioral criterion for up to six months. When looking at the research that has been done specific to AIDS risk sexual behavior, no clear criterion has yet been established (Prochaska, Redding et al., 1994). In most instances, consistent condom use during intercourse has been used as the criterion. However, the criterion often depends upon which population is being examined, as well as the specific risk behavior that is being assessed. If a woman is having sex in a long term completely monogamous relationship, for example, consistent condom use is not as important.

Maintenance is the final stage. It is during this time that a person continues to maintain successful behavior change for a period of six months or more. A woman in the Maintenance stage for condom use will have been using them consistently for more than six months.

When discussing how people move through the stages of change, smoking cessation has been the behavior most often studied. Studies of smokers have shown that both backward and forward movement along the stages of change are important to include in models of behavior change (Martin, Velicer, & Fava, 1996). Self-changers tend to cycle through a series of progressions and regressions while moving toward maintaining their behavior change (Prochaska, DiClemente, & Norcross, 1992). In

addition, it has been found that smokers are more likely to transition to the nearest stage, with movement of two stages being much less likely (Martin, Velicer, & Fava, 1996).

Multifaceted Model of HIV Risk

The Multifaceted Model is a predictive model of HIV risk in women developed by Harlow, Quina, Morokoff, Rose, and Grimley (1993). This model uses three multifaceted sets of variables to predict risk for HIV due to sexual behavior. These three sets of variables were able to predict 41% to 70% of the variance in HIV risk in women. Behavioral risk, the first set of variables, included substance use and sexual experience variables. Higher level of substance use, as well as greater sexual experience were significant predictors to HIV risk. The second set of variables was labeled interpersonal. This included variables such as victimization, sexual assertiveness, and anticipated partner reaction. Low levels of sexual assertiveness were found to be associated with a high level of risk for HIV. The last set of variables included in this model was psychoattitudinal risk. The variables involved in this portion of the model were psychosexual attitudes, psychosocial functioning, and self-efficacy. Low levels of psychosexual attitudes and self-efficacy, as well as high psychosocial functioning were included as strong predictors of HIV risk in women. All three factors appeared necessary to explain a majority of the unique variance within the model. However, the behavioral and interpersonal factors were found to be the most central. Results from their study, suggesting several significant predictors of HIV risk in women, are drawn from behavioral, interpersonal, and psychoattitudinal variables.

Psychosocial Predictors of Condom Use

Several variables have been found to be central mediating constructs for HIV risk reduction through condom use. Decisional balance and self efficacy have both been successfully applied to the stages of change for condom use. In addition to these variables, a number of other predictors of AIDS risk behavior have been studied. These include substance use (e.g., Harlow, Quina, Morokoff, Rose, & Grimley, 1993; Hingson, Strunin, Berlin, & Heeren, 1990), psychosexual attitudes (e.g., Harlow et al., 1993), and sexual assertiveness (e.g., Harlow, Rose, Morokoff, Quina, & Mitchell, 1996; Harlow et al., 1993; Morokoff, Quina, Harlow, Johnsen, Gibson, Grimley, & Burkholder, 1996; Yesmont, 1992). Although all of these constructs have not yet been studied together in terms of their predictive value for Stage of Condom Use, they have been identified as significant predictors of protected or unprotected sex and deserve further study.

Decisional Balance One variable that has been found to be related to a person's decision to use a condom is weighing the Pros and Cons of making that decision (e.g., Prochaska et al., 1994). The Health Belief Model (e.g., Janz & Becker, 1984) incorporates similar dimensions of perceived benefits and perceived barriers. Perceived benefits refer to a person's beliefs regarding the effectiveness of the available actions in reducing the disease threat. In other words, what are the benefits of taking the health action. In order to take the desired action, a person must view the action as effective. This dimension defines the course of action that a person is likely to take. Perceived barriers are the potential negative aspects of a particular health change. These negative aspects may act as obstacles to attempts to start an action (Brown et al., 1991; Janz & Becker, 1984; Rosenstock, 1974; Rosenstock et al., 1994). Rosenstock

states that “the perception of benefits (less barriers) provided a preferred path of action” (Rosenstock, 1974).

The AIDS Risk Reduction Model (ARRM) also uses variables similar to decisional balance. The second stage of the ARRM is titled Commitment to change (Bertrand, Brown, Kinzonzi, Mansilu, & Djunghu, 1992; Catania et al., 1990; Kline & VanLandingham, 1994). It is during this stage that a person must come to a decision and make a commitment to make a change. One factor that affects this decision is costs and benefits (Catania et al., 1990; Kline & VanLandingham, 1994). This includes two factors: response efficacy and enjoyment. Response efficacy refers to a person's feelings that the action they plan to take is going to be effective. Enjoyment, the second portion of cost and benefits, may seem like an insignificant factor. However, in the context of sexual behaviors, enjoyment is a crucial factor to consider (Catania et al., 1990). Many of the changes that a person must consider making in order to decrease their risk of contracting HIV may be perceived as being less enjoyable than the high risk behaviors in which they are currently engaging. Kline and VanLandingham (1994) found that women who believe that condoms decrease their sexual pleasure do not use them as consistently as women who have more positive attitudes about their use. In addition, Malow, Corrigan, Cunningham, West, and Pena, (1993) found that condom users felt that condoms decreased pleasure less than non-users. This is an important consideration for a person to make when he/she is weighing the costs and benefits of a behavior.

Within the Transtheoretical Model, transitions among the 5 stages of change are partially mediated by the decisional balance an individual engages in when considering a behavior change. Decisional Balance refers to the weighing of the advantages (Pros) of changing a behavior, as well as the disadvantages (Cons) of changing a behavior (e.g., Grimley et al., 1993; Grimley et al., in press; Prochaska, Redding et al., 1994; Prochaska, Velicer et al., 1994; Redding et al., 1989; Velicer et al., 1985). This construct was originally postulated by Janis and Mann's decision making model (1977) to include eight different categories. However, the Transtheoretical Model only uses two of these constructs, based upon the results of a principal components analysis done on 960 smokers (Velicer et al., 1985). These two constructs are relatively independent of one another and show a distinctive pattern across the stages of change over a variety of behaviors. Research on a variety of problem behaviors has shown that the Pros increase across the stages. In addition, the Cons have been shown to decrease across the stages. This pattern has been deemed the cross-over pattern of decisional balance (Prochaska & Goldstein, 1991; Prochaska, Velicer, et al., 1994).

In specific studies of the Transtheoretical model as it applies to contraceptive behaviors, AIDS risk reduction and condom use, the Pros accounted for more variance in the movement and the Cons remained stable (Grimley et al., 1993; Grimley et al., in press; Prochaska, Redding et al., 1994; Prochaska, Velicer et al., 1994). Therefore, the Cons outweighed the Pros in the Precontemplation stage and the Pros outweighed the Cons for those in the maintenance stage. Grimley et al. (1993) also showed that in a

sample of college freshman, movement through the stages was predicted by an increased perception of the Pros of condom use.

Self-Efficacy Another variable that is linked with protected and unprotected sex is self-efficacy (e.g., Bandura, 1986; 1994; Goldman and Harlow, 1993; Harlow et al., 1993). Self efficacy refers to a person's perceptions of their ability to perform a particular activity (e.g., Bandura, 1982; Bandura, 1986; Bandura, 1994; Catania et al., 1990; Kline & VanLandingham, 1994). People must believe that they are capable of reducing high risk behaviors and increase their low risk behaviors if they are going to make that change. Kline and VanLandingham (1994) found that feelings of self-efficacy in terms of influencing partners sexual behavior is the most significant correlate of condom use among HIV positive women. Other researchers (e.g., Malow et al. 1993) found that condom users had more feelings of self-efficacy than non users.

Within the Transtheoretical Model, self-efficacy has been shown to mediate movement through the stages of change (e.g., DiClemente, et al. 1985; Grimley et al., in press; Prochaska, Redding et al., 1994; Riley et al., 1993; Velicer, DiClemente, Rossi, & Prochaska, 1990). This concept has been assessed as situational confidence in terms of changing a problem behavior and the temptations to engage in the problem behavior (Prochaska, Redding et al., 1994). These two constructs are inversely related and highly correlated. In addition, they have been shown to vary depending on the current stage of change. Perceived self-efficacy has been shown to increase across the stages until the Maintenance stage, where it plateaus (e.g., Riley et al., 1993).

Substance Use Substance use has often been linked to HIV-risky sexual behavior. Both injection drug use, and alcohol and other drug use have been shown in

many studies to be associated with greater HIV-risk among women (e.g., Harlow, et al., 1993). The connection between injection drug use and HIV risk is due to the exposure to body fluids. However, the reason that alcohol and other drug use contribute to risk is not always clear. It is possible that this form of substance use reduces the probability that a person will protect themselves during sexual activity by using a condom (Harlow, et al., 1993). Studies of condom use have found strong relationships between increased sexual risk behavior and increased drinking and substance use behaviors (Hingson, et al., 1990). It has also been noted that alcohol use may alter the persons' perception of the risk of having unprotected sex (McEwan, McCallum, Bhopal, & Madhok, 1992). Kline and VanLandingham (1994) found that women who had used alcohol or drugs in the previous four weeks used condoms less consistently. Harlow et al. (1996) found that women whose sexual behavior placed them in a relatively low-risk cluster showed significantly less alcohol and drug use than women whose sexual behavior put them at extremely high risk. Thus, women who engaged in little or no sexually risky behavior were less apt to engage in substance use; whereas women with a large number of sexual partners, and who engage in a high frequency of unprotected sex were more involved with substance use. Substance use may also decrease condom use self-efficacy and/or increase temptation to have sex without condoms. College aged subjects rated their situational self-efficacy for safer sex lowest after using alcohol or drugs, when compared to other situations (Redding & Rossi, in press). Although a number of studies have found a link between substance use and sexual behavior in adolescents and young adults, (see: Ensminger, 1987 for a

comprehensive review), more research is needed to address this risky sexual behavior in adult women.

Sexual Assertiveness Due to the nature of condom use, sexual assertiveness is an important variable for women who need to negotiate condom use with their partner (e.g., Harlow et al., 1993). Researchers have found that assertiveness significantly discriminates between adolescents who use condoms consistently and those who do not use them (Yesmont, 1992). This association between assertiveness and protective sexual practices has also been demonstrated in other populations, including heterosexual women (Catania et al., 1989). In a study of HIV-risk taking women, researchers found that women in lower sexual risk clusters were found to be more sexually assertive (Harlow, et al., 1996). Research has suggested that assertiveness be assessed using 4 separate factors: initiation, refusal, information communication, and pregnancy/STD prevention (i.e., condom use) assertiveness (Deiter, 1994; Morokoff et al., 1996). In a study using this scale, it was found that college women were more likely to engage in HIV-risky sexual behavior when they were less assertive about using birth control. In addition, women who were more assertive about initiating unprotected sex were more likely to be at high risk (Harlow, et al., 1993).

Psychosexual Attitudes Psychosexual attitudes refer to a person's comfort with their own sexual behavior as well as attitudes about their sexuality (Harlow et al., 1993). In studies of this construct it was found that substance use and sexual behavior were significantly associated with negative Psychosexual attitudes. This suggests that women who feel good about their sexuality and who feel they have control over their sex lives may be less likely to engage in diverse and potentially riskier forms of sexual

behavior (Harlow, Stein & Rose, 1996). In addition, Harlow et al. (1993) found that college women who had negative beliefs and attitudes about their sexuality were more likely to engage in HIV-risky sexual behavior. Thus, women who express poor Psychosexual attitudes are expected to exhibit more sexual risk behavior than those women with better Psychosexual functioning (Harlow, et al., 1996).

Research Hypotheses

Several hypotheses were investigated in this research.

1. Movement of at least one Stage of Condom Use will occur for approximately 20% of the women over one year.
2. More movement will occur to adjacent stages than to non-adjacent stages.
3. The second most frequent pattern will be a movement of two stages.
4. Movement will be both forward and backward through the stages.
5. Greater Condom Pros at baseline will be associated with being in a later stage of change for condom use one year later.
6. Greater Condom Cons at baseline will be associated being in an earlier stage of change for condom use one year later.
7. Greater Condom Use Efficacy at baseline will be associated with being further along in the stages of change for condom use one year later.
8. More substance use at baseline will be associated with being in an earlier stage of change for condom use one year later.
9. More positive Psychosexual attitudes at baseline will be associated with being further along in the stages of change for condom use one year later.

10. Greater sexual assertiveness at baseline will be associated with being in a later stage of change for condom use one year later.

Method

Participants

In 1993-1994, almost 800 women were recruited from local media ads and various agencies in the community as part of a longitudinal study of HIV risk in women (Harlow, Morokoff, & Quina, 1991). Eligibility requirements included engaging in one of the following HIV risk behaviors in the previous five years: having two or more sexual partners, having a sexual partner who has used intravenous drugs, or having a sexual partner who has had other sexual partners. Women who were under 18 years of age or trying to get pregnant were not eligible to be included in the study.

Recruitment of participants was conducted in a New England community through a number of different methods. These methods included distributing fliers at community centers and women's health centers, printing ads and articles in seven different newspapers, conducting radio and television interviews, a bulk mailing to every woman enrolled in an adult college of continuing education, and collaboration with a continuing study of the heterosexual transmission of HIV. Interested women were instructed to call, after which they were mailed consent forms and exclusion criteria for participation. Once the participant returned the signed consent form, she was sent a survey and asked to complete and return it in the provided stamped addressed envelope.

Completed surveys were received from 793 women during the baseline data collection. For the purposes of this study however, only the 545 women who completed two assessments over a one year time span have been included. The ethnic

distribution of this sample included: 84% Caucasian, 9% African-American, 1% Native-American, 1% Asian-American, 2% Hispanic-American, and 3% other. The mean age of the sample was 31.47, and 88% had some college education. The marital status of the participants was 58% single and never married, 27% separated or divorced, 12% married, and 3% widowed.

Measures

The survey included a large set of measures. Discussed below is the subset that pertains to this study. In addition, the items are provided in Appendix A.

Stages of Condom Use Two items (adapted from Prochaska et al., 1990), were used to assess subjects' Stage of Condom Use at two time periods, one year apart. These two questions were used to develop a staging algorithm that placed subjects in one of five stages of change for condom use; Precontemplation, Contemplation, Preparation, Action, or Maintenance. The first of these questions referred to the subject's frequency of condom use. The second question established a time frame for their condom use behavior. Higher scores indicated further progression along the stages of change. The coefficient α was .90.

Condom Pros An 8-item subscale (adapted from Prochaska et al., 1990; Prochaska, Velicer, et al., 1994) was used to assess the Pros of condom use (coefficient α = .81). Items such as "Sex would feel safer" were assessed using a five-point response scale. Higher scores on these items indicated that greater importance was placed on this statement when thinking about using a condom.

Condom Cons The measure used to assess the perceived Cons of Condom Use was an 8-item scale with a coefficient α of .83 (adapted from Prochaska et al., 1990; Prochaska, Velicer, et al., 1994). This scale used a five-point response and included items such as "Sex is less exciting", with higher scores reflecting greater importance when considering condom use.

Condom Use Efficacy Self-efficacy for condom use was assessed using six items, adapted from Prochaska et al. (1990). A five-point response scale asked how sure the respondent was that they would use a condom in certain situations, such as when: they were really turned on, depressed, drinking or doing drugs, or angry. Higher scores indicated higher efficacy and the coefficient alpha was .89.

Substance Use Substance use was evaluated in terms of alcohol use and drug use. Alcohol Use Frequency was determined by calculating the average number of drinks per day that the women reported having. The one year test-retest reliability was .87. The frequency of binge drinking of 3 or more drinks was also measured. Drug use was assessed in terms of the frequency of marijuana, cocaine, heroin, and other hard drug use; one-year test-retest reliability was .78. Higher scores indicated greater use. The internal consistency for this factor was .65.

Sexual Assertiveness Sexual assertiveness was assessed using 4 six-item scales pertaining to Initiation, Refusal, Birth Control, and Information Communication adapted from the Sexual Assertiveness Scale (Deiter, 1994; Quina, Harlow, Gibson, & Morokoff, 1990). The coefficient alphas were .80, .79, .82, and .93 respectively. Higher scores on these scales reflected greater sexual assertiveness.

Psychosexual Attitudes Two three-item scales assessed a woman's positive and negative attitudes towards their sexuality (adapted from Harlow, et al., 1993). These items used a 5 point Likert response scale, with higher scores reflecting positive Psychosexual attitudes. The coefficient alpha was .85. The positive scale included items such as "Sex is a positive part of my life" and the negative scale included "I do not like some parts of my sex life".

Procedure

This study represents a secondary analysis of data collected through the Women's Health Project at the University of Rhode Island (Harlow, Morokoff, & Quina, 1991). Recruitment of participants was conducted in a New England community in three separate sections. First, a letter of invitation for participation in the study, pending satisfaction of the eligibility requirements, was sent to women attending a New England university adult college of continuing education campus. The second form of recruitment took place through various types of media advertisements. An effort was made in the third form to recruit women of color by using voter registration lists. These lists were from areas of high concentrations of minorities. All recruitment procedures asked women to call a toll-free number if they were interested in participating. Callers were sent packets that included consent forms and a list of the eligibility requirements. Those women who met the criteria, gave informed consent and were interested in the study were then sent surveys. Baseline surveys were completed by 88% of the women who returned consent forms. In order to ensure participant confidentiality, a four-digit code number was matched on a list to each

participants' name and address. This list was kept in a locked cabinet and only used for tracking the responses across the three different time points. Participants were paid \$5.00 and were given the chance to win a \$250 cash bonus at time one. One year later, women were paid \$15.00 and a chance to win a \$750 cash prize after the last survey. In addition, they were provided with a card of referrals and phone numbers for local women's centers. They were also given a toll free number that they could use to reach a counselor if they became distressed by completing the survey.

Analysis

Five different sets of secondary analyses were conducted on the longitudinal data. First, preliminary analyses included descriptive statistics for the sample, and the calculation of reliability coefficients for all of the variables.

Second, Latent Transition Analysis (LTA) was applied to Stages of Condom Use in an effort to evaluate the distribution of women at each occasion by latent status (Stage of Condom Use). This analysis was conducted using a FORTRAN program developed by Collins, Wugalter, and Rousculp (1991). This analysis provides four different parameters: Gamma parameters, or estimates of the proportion of the sample in each defined latent class or group; Delta parameters, or estimates of the proportion of the sample in each latent status or stage at time t ; Tau parameters, or the conditional probabilities of membership in stage B at time 2 conditional on membership in Stage A time one; and Rho parameters, or the probability of response i at time t conditional on stage membership (Graham, Collins, Wugalter, Chung, & Hansen, 1991). When looking at this sample, Gamma parameters were not used due to the single latent class in the sample. In addition, because Stage of Condom Use was indicated using a single variable at each time point, Rho parameters were also not examined. Six different models were tested, and based on the goodness of fit statistic (G^2 : approximately distributed as a χ^2) the best fitting model was to be retained (see Figure 1). The Delta parameters provided the proportion of women in each stage at each timepoint. Tau parameters estimated the probability of a woman being in stage B at time 2, conditional upon their membership in a stage A at time 1. These also

provide the probability of a person remaining in a particular stage of change over the one year time period (stable).

The third set of analyses included Discriminant Function Analysis (DFA) and Multivariate Analysis of Variance (MANOVA). The first of this set of analyses used the continuous variables Condom Pros, Condom Cons, Condom Use Efficacy, substance use (i.e., Alcohol, binge drinking and drug use), positive and negative Psychosexual attitudes, and four aspects of sexual assertiveness at time one to predict the categorical variable Stage of Condom Use one year later (see Figure 2). Overall Wilks' Lambda and the results from follow-up ANOVAs and Tukey Tests are reported. Also, the percentage of correct classification of Stage of Condom Use controlling for prior probabilities, based on these six major areas, is evaluated. In addition, the most valuable predictors are discussed, based on a Standardized Canonical Coefficient of absolute value greater than .30 (Tabachnick, & Fidell, 1989).

Two additional DFA/MANOVAs were conducted to allow a direct comparison between these results and those of the Logistic Regression Analyses, described next. These analyses compare those women who progress through the Stages of Condom Use to those who remained stable over one year (See Figure 3), as well as look at those who regressed compared to those who remained stable (see Figure 4). As with the previous DFA/MANOVA, overall Wilks' Lambda, significant follow-up ANOVAs and Tukey Tests, correct classification of stage movement controlling for prior probabilities, significant Standardized Canonical Coefficients were discussed.

Fourth, a set of Logistic Regression Analysis (LRA) was conducted (e.g., Hosmer, & Lemeshow, 1989) on sets of predictors with dichotomous dependent variables. Two different forms of LRA were used in this study. The first LRA to be conducted in this set of analyses were two direct LRA which examined progression (moving forward at least one stage) versus stability, and regression (moving backward at least one stage) versus stability using the same set of time one continuous predictors from the DFAs discussed earlier: Condom Pros, Condom Cons, Condom Use Efficacy, substance use, Psychosexual attitudes, and sexual assertiveness variables (See Figure 3 and 4). This allowed for the comparison of results between the LRA and DFA/MANOVAs discussed earlier. The goodness of fit index used for these analyses was the Hosmer-Lemeshow Goodness of Fit Test. This test is approximated by the chi-square distribution (Hosmer, & Lemeshow, 1989), where a good model produces a nonsignificant chi-square (Tabachnick & Fidell, 1996). In addition, the Wald statistic and odds ratio for each individual variable were examined.

The second form of Logistic Regression Analysis included the building of two Logistic Regression Models in an effort to provide the best fitting model to describe the relationship between a dichotomous variable (progression/ regression vs. no change in stage). The first step in this model building process included the univariate analysis of each variable selected for possible inclusion in the model. Those variables with a *p*-value less than .20 were considered for inclusion in the multivariate model (Hosmer, & Lemeshow, 1989). Evaluation of the fit of the multivariate model included the examination of the Hosmer-Lemeshow Goodness of Fit Test, as well as the

examination of the individual Wald statistics and the estimated coefficients. Variables that did not contribute to the model ($p > .05$) were then eliminated, and the fit of the new model was evaluated (Hosmer, & Lemeshow, 1989). The new model was then compared to the old model using a likelihood ratio test. Once a model was established that contained all variables that were found to be statistically significant, they were examined for confounding using procedures suggested by Hosmer and Lemeshow (1989). In this procedure, an Index of Confounding is calculated using the B for the full model, and a model with a single variable deleted. Confounding is suggested if the Index of Confounding is greater than 15 percent.

Finally, a qualitative assessment of the findings from the three methodologies (i.e., LTA, DFA, and LRA) was conducted. This provided information on the strengths and weaknesses of each of these methods in analyzing longitudinal data such as these.

Results

Preliminary Analysis

Of the 545 women who complete both surveys, 522 were eligible to be included in the analyses. The remaining 23 women were omitted because they were not able to be classified into a Stage of Change due to conflicting answers on staging questions. However, for some of the procedures, it was necessary to look at sub-samples of the entire group of 522 women. The stage distribution at baseline included 57% in Precontemplation, 14% in Contemplation, 11% in Preparation, 3% in Action, and 15% in Maintenance. In addition, preliminary analyses showed that 62.5% of the sample remained in the same stage of change over one year, 17.5% regressed at least one stage, and 20% progressed at least one stage. Descriptive statistics for each of the predictor variables at baseline are given in Table 1. The women in this sample had very low frequencies of Drug and Alcohol Use, and Binge Drinking. Additional analyses showed that the length of the women's most current relationship showed no significant relationship with Stage of Condom Use.

Latent Transition Analysis

The overall model fit of the 6 models depicted in Figure 1 was assessed using a comparison of the G^2 values, which are shown in Table 2. All models were nested, (Model 1 may be seen as a special case of Model 2 with certain parameters fixed to zero) and could therefore be compared using a G^2 difference test. The G^2 difference between Model 5 and Model 6 was $G^2(1) = 899.94$, indicating that the addition of

backward movement from Maintenance to Precontemplation was a necessary aspect of the model. Model 6 provides a significantly better fit than do the other models.

Delta Parameters/ Probability of Latent status membership

Delta parameters represent the probability of membership in each latent status at each timepoint, unconditional upon any previous status. Table 3 represents the proportion of subjects in each stage at both times 1 and 2. The proportion of subjects in the Precontemplation stage remains high across both timepoints, while the proportion in the Action stage is relatively low. In general, the proportion in each stage did not show any dramatic change over the one year time period.

Tau Parameters/ Transition probabilities

The estimated probabilities of transition for model 6 are provided in Table 4 and Figure 5. The values within each circle in Figure 5 and along the diagonal in Table 4 represent the percent of women who remained in the same stage of change at both timepoints. Forward movement is represented by the paths above the stage circles in Figure 5, and by the probabilities to the right of the diagonal in the matrix in Table 4. It was hypothesized that movement of at least one stage would occur for approximately 20% of the women. Based on the Tau parameters, this is true, however not consistently across the stages at baseline. For women in the Contemplation, Preparation, and Action stages at time 1, forward or backward movement of at least one stage occurred for more than 70% of these women. For women in Maintenance at baseline, 54% remained in Maintenance at time 2. Precontemplation was shown to be the most stable stage, with 79.6% of the women initially in Precontemplation

remaining in that stage over the one year time period. Action was the least stable stage, with only 17.5% remaining in the stage for 1 year. It was also hypothesized that movement through the stages would be both forward and backward. This was also shown to be true for all five possible initial stages, however backward movement was more likely.

A third hypothesis was that more movement would occur to adjacent than non adjacent stages and that the second most frequent path would be a movement of 2 stages. This was true only for those women in Precontemplation at baseline. For women who transitioned out of this stage, the highest percentage moved to Contemplation. The most frequent path for women in Contemplation at time 1 was to an adjacent stage (backward movement to Precontemplation), however the second most frequent path was that of 3 stages (Contemplation to Maintenance). Of the women who were in Preparation at baseline, a higher percentage of women moved two stages than to adjacent stages. For this group of women, the highest transition probability was the two stage backward path to Precontemplation, with the second highest being backward one stage to Contemplation. Women in the Action stage at time 1 were more likely to move either forward or backward to an adjacent stage rather than move more than one stage. However, the highest transition probability was the regression path to Precontemplation. The most frequent path of movement for women in Maintenance at baseline was a backward change of four stages (Maintenance to Precontemplation) with backward 3 stage movement being the second most likely path (Maintenance to Contemplation).

MANOVA/ DFA Results

Stage one year later

A direct discriminant function analysis was used to assess the prediction of Stage of Condom Use at time 2 from 12 variables (Condom Pros and Cons, Condom Use Efficacy, Frequency of Alcohol Use, Binge Drinking and Drug Use, 4 Sexual Assertiveness Scales, and Positive and Negative Psychosexual Attitudes) at baseline for 522 women. MANOVA results showed a significant Wilks' Lambda of .68, $F(48, 1951) = 4.35$, $p < .0001$, $\eta^2 = .32$. Six of the 12 follow-up ANOVAs were found to be significant (Table 5). Condom Pros showed a univariate $F(4,521) = 7.40$, $p < .001$, $\eta^2 = .05$, with Maintainers having significantly higher Pros than Precontemplators; while Condom Cons had a univariate $F(4,521) = 7.15$, $p < .001$, $\eta^2 = .05$, with those in Maintenance having significant less Cons than those in Precontemplation, Contemplation and Preparation stages. Women in Maintenance at time two had significantly more Condom Use Efficacy at baseline than those women in Precontemplation, Contemplation, and Preparation ($F(4,521) = 19.40$, $p < .001$, $\eta^2 = .13$). Birth Control Sexual Assertiveness showed univariate $F(4,521) = 28.36$, $p < .001$, $\eta^2 = .18$. Those women in the Maintenance stage had significantly higher scores on the Birth Control Sexual Assertiveness scale at baseline than did those in Precontemplation, Contemplation, and Preparation. Positive Psychosexual Attitudes showed a univariate $F(4,521) = 9.03$, $p < .001$, $\eta^2 = .07$. Women in the Precontemplation stage at time two had significantly more positive feelings about their sexuality than those women in the Contemplation, Preparation and Maintenance stages at time two. Regarding Negative Psychosexual Attitudes (univariate $F(4,521) = 4.42$,

$p < .01$, $\eta^2 = .03$), Precontemplators had significantly less Negative Psychosexual Attitudes than those in Contemplation and Preparation.

DFA results correctly classified 55% of the Precontemplators, 24% of the Contemplators, 32% of those in Preparation, 13% of those in Action, and 71% of the Maintainers. Overall, the 12 variables at time 1 correctly classified 50% of the women in the Stage of Change for Condom Use one year later versus 20% by chance alone. The standardized canonical coefficients are shown in Table 6, showing absolute values above .3 for Condom Use Efficacy, Birth Control Sexual Assertiveness, and Positive Psychosexual Attitudes. The percent of variance accounted for by the first function (the only significant one) was 27%.

Women who Progressed versus those who remained Stable

A MANOVA was conducted on 405 women who either moved forward at least one stage (progressed) or did not change Stage of Condom Use over one year (stable) using the Condom Pros and Cons, Condom Use Efficacy, Frequency of Alcohol Use, Binge Drinking, and Drug Use, 4 Sexual Assertiveness scales, and Positive and Negative Psychosexual Attitudes. Results showed an overall Wilks' Lambda = .92, $F(12,392) = 2.83$, $p < .001$, $\eta^2 = .08$, with 3 of the 12 follow-up ANOVAs being significant (Table 7). Condom Pros had a univariate $F(1, 404) = 6.72$, $p < .01$, $\eta^2 = .02$. Those women who progressed through the Stages of Condom Use had higher Condom Pros at baseline than those women who remained stable. Women who remained stable also had significantly more Positive Psychosexual Attitudes than those who made progress (univariate $F(1, 404) = 17.79$, $p < .001$, $\eta^2 = .04$). Whereas

those who progressed had more Negative Psychosexual Attitudes at baseline than those who remained stable (univariate $F(1,404) = 8.56, p < .01, \eta^2 = .02$).

The DFA correctly classified 65% of the stage movement of the women. This is 16% improvement over chance alone. Of those who remained stable, 66% were correctly classified, and 61% of those who progressed were correctly classified. The first function accounted for 8% of the variance. Standardized Discriminant coefficients are given in Table 8. Condom Pros, Frequency of Binge Drinking, Birth Control Sexual Assertiveness, and Positive Psychosexual Attitudes all had coefficients above an absolute value of .30, with Birth Control Sexual Assertiveness and Positive Psychosexual Attitudes showing an inverse relationship to progression

Women who Regressed versus those who remained Stable

A MANOVA looking at those women who remained in the same Stage of Condom Use over one year (stable) versus those who moved backward through the Stages of Condom Use (regressed) resulted in an overall Wilks' Lambda = .9106, exact $F(12,380) = 3.11, p < .001, \eta^2 = .09$ ($N=393$). Six of the 12 follow-up ANOVAs were found to be significant (Table 9). Condom Cons, Frequency of Alcohol Use, Binge Drinking, and Drug Use, as well as Refusal and Birth Control Sexual Assertiveness did not show any significant results. A significant result was found for Condom Pros ($F(1,391) = 10.82, p < .001, \eta^2 = .03$) and Condom Use Efficacy ($F(1,391) = 5.16, p < .05, \eta^2 = .01$). Those women who showed backward movement through the stages had higher scores on these two scales at baseline when compared to those who showed no movement over 1 year. Two sexual assertiveness

subscales resulted in significant follow-up ANOVAs: Initiation Sexual Assertiveness ($F(1,391) = 5.62, p < .05, \eta^2 = .01$) and Information Sexual Assertiveness ($F(1,391) = 8.22, p < .01, \eta^2 = .02$). On both of these scales, those who remained in the same stage of change over one year had significantly higher scores than those who regressed through the stages of change. Follow-up ANOVAs on both Positive Psychosexual Attitudes ($F(1,391) = 10.96, p < .001, \eta^2 = .03$), and Negative Psychosexual Attitudes ($F(1,391) = 12.24, p < .001, \eta^2 = .03$) revealed significant results. Those women who remained stable over the one year time period had significantly higher Positive Psychosexual Attitudes, and significantly lower Negative Psychosexual Attitudes at baseline when compared to those women who regressed in the stages of change.

DFA results correctly classified 65% of those women who remained stable, and 64% of those who regressed. The overall correct classification for this analysis was 65%, a 15% improvement over chance alone. The amount of variance accounted for by the first function was 8%. Three variables; Condom Pros, Condom Use Efficacy, and Information Sexual Assertiveness, had standardized discriminant coefficients over an absolute value of .30 (Table 10).

Logistic Regression Analyses

Direct Logistic Regression

Two direct logistic regression analyses were performed on stage movement as the outcome and 12 psycho-attitudinal and behavioral predictors: Condom Pros and Cons, Condom Use Efficacy, Frequency of Alcohol Use, Binge Drinking, and Drug

Use, 4 subscales of Sexual Assertiveness, and Positive and Negative Psychosexual Attitudes.

Women who progressed versus those who remained stable.

The first of the two logistic regression analyses classified stage movement as either at least one stage movement forward (progression) or no stage movement (stable) over one year. Due to the deletion of subjects who had regressed in Stage of Condom Use over the one year, the sample size for this analysis was 405 women.

The Hosmer-Lemeshow Goodness of Fit Test for the full model resulted in $\chi^2(8) = 8.864$, $p = .35$, indicating that the fit of the model was adequate. In addition, a test of the full model against the constant-only model was statistically reliable, $\chi^2(10) = 46.773$, $p < .001$. The model successfully predicted 96% of the women who remained stable, and 9% of those who progressed, with an overall prediction rate of 75%. Table 11 shows the regression coefficients, Wald statistics, and odds ratios for each of the 12 predictors. Condom Pros ($z = 6.59$, $p < .01$) and Positive Psychosexual Attitudes ($z = 9.24$, $p < .01$) were reliable predictors of forward movement in Stage of Condom Use. A model that omitted Condom Pros and Positive Psychosexual Attitudes was not significantly different from the constant only model. However, when tested against the full model it was significantly different ($\chi^2(1) = 8.56$, $p < .01$). These results confirm that Condom Pros and Positive Psychosexual Attitudes are reliable predictors of positive stage movement. Specifically, the lower the Positive Psychosexual Attitudes (odds ratio = 0.57) and the higher the pros of condom use (odds ratio = 1.46), the more likely the women were to

move forward throughout the Stages of Condom Use over the one year assessment period.

Women who regressed versus those who remained stable.

The second logistic regression on stage movement classified women as either remaining stable over the one year period, or moving backward at least one Stage of Condom Use (regression). Due to the omission of women who progressed, this analysis was run on 393 women. The fit of the full model was found to be statistically reliable based on both the Hosmer-Lemeshow goodness of fit statistic ($\chi^2(8) = 6.38$, $p = .604$) and testing the full model against the constant only model ($\chi^2(12) = 36.48$, $p < .001$). The model successfully classified 77.6% of the women overall, with 97.4% of the stable women, and 7% of the women who regressed correctly classified. The results of this analysis are in Table 12. Based on the Wald statistic, only the Pros of condom use ($z = 7.10$, $p < .01$) was a significant predictor of backward movement. Those women who had higher Condom Pros at baseline were more likely to display backward movement through the Stages of Condom Use.

Model Building

Two separate logistic regression models were built to identify predictors of positive and negative change. Potential predictors included demographics (age, race, education, marital status), alcohol use (Alcohol Use and Binge Drinking Frequency), Sexual Assertiveness (Initiation, Refusal, Birth Control, and Information Communication Sexual Assertiveness) and psychoattitudinal variables (Condom Pros and Cons, Condom Use Efficacy, Positive and Negative Psychosexual Attitudes).

Progression versus stability.

The first model looked at women who moved forward at least one Stage of Condom Use (progressed) over the one year assessment period versus those women who remained in the same stage (stable). The results of the univariate logistic regression models are given in Table 13. Education, race, marital status, Condom Pros, Initiation Sexual Assertiveness, and Positive and Negative Psychosexual Attitudes were selected for inclusion in the full model based on their Wald statistics. The output based on this full model are given in Table 14. Based on this model, all of the variables except Condom Pros, Initiation Sexual Assertiveness, and Negative Psychosexual Attitudes have a significant Wald statistic ($p < .05$), and therefore show importance in the multivariate model. A new model that did not include these three non-significant variables was then compared to the full model. The likelihood ratio test for the difference between the two models ($\chi^2(3) = 3.82, p > .05$) showed that the three variables did not add any significance to the model. Based on this, the variables Condom Pros, Initiation Sexual Assertiveness, and Negative Psychosexual Attitudes were removed from the full model. No effects of confounding were found with the four variables in the full logistic regression model (Education, Race, Marital Status, and Positive Psychosexual Attitudes), based on the procedure outlined by Hosmer and Lemeshow (1989).

The results based on this final model are shown in Table 15. The overall fit of the model was shown to be significant when tested against the constant only model ($\chi^2(6) = 54.373, p < .001$). In addition, the Hosmer-Lemeshow goodness of fit test demonstrated that the model had a very good fit ($\chi^2(8) = 2.43, p = .97$). The model

correctly predicted 95% of the women who remained stable, 17% of the women who progressed, and an overall correct prediction of 77%. Women of color were 2.8 times more likely to progress, while those with more than a high school education were 1.4 times more likely to progress. Low Psychosexual attitudes were more likely to predict that the women remain stable over one year. In addition, those women who were married, separated or divorced were more likely to remain stable when compared to single women.

Regression versus stability.

A second model was established that looked at women who move backward at least one stage versus those who remained stable over the one year period. A univariate logistic regression was conducted on each of 15 variables, and the results are given in Table 16. Nine variables were shown to have a Wald statistic with $p < .2$ (Age, education, race, Condom Pros, Condom Use Efficacy, Initiation and Information Sexual Assertiveness, and Positive and Negative Psychosexual Attitudes) and were therefore chosen for inclusion in the main effects model. The results of the full multivariate model are shown in Table 17. The only variables in this model that have a Wald statistic with $p < .1$ were age, race, Condom Pros, and Information Sexual Assertiveness. A new model which included only these variables was then compared to the full model using a likelihood ratio test which showed that the omitted variables did not add any significance to the model ($\chi^2(6) = 11.9, p > .05$). However, the reduced model was still significantly different than the constant only model ($\chi^2(4) = 34.87, p < .001$). Based on this, the only variables included in the final model were age, race,

Condom Pros, and Information Sexual Assertiveness. Tests for confounding did not find any significant results.

The results of the final model are given in Table 18. The Hosmer-Lemeshow goodness of fit test showed that the overall fit of the model was good ($\chi^2(8) = 10.49$, $p = .232$). In addition, the model was significantly different from the constant only model ($\chi^2(4) = 34.87$, $p < .001$). This model correctly predicted 98.4% of the women who remained stable, 11.6% of those who regressed, and had a total correct prediction of 79.4%. Non-white women were 1.8 times more likely to regress than to remain stable. In addition, women with higher Condom Pros at baseline were more likely to regress.

Discussion

Stage Transitions

One of the major goals of this study was to assess how women naturally progress through the stages of change for condom use over a one year time period. Preliminary analyses using frequencies found that over half of the women remained in the same stage, with the remaining 40% split almost equally between forward and backward movement. Latent Transition Analysis was then used to provide a more in-depth look at the nature of these changes. An appropriate model of movement among the Stages of Condom Use in a naturalistic sample over one year was identified. The best fitting model found was a general model that included both forward and backward movement. Due to the long period of time between assessments, it was difficult to make theoretical restrictions upon stage movements when testing the models. Analysis of a shorter assessment period, such as 6 months, would demand that certain movement paths be restricted due to the 6 month time criterion involved with most of the stages. It will be important in the future to assess appropriate models for shorter periods of time in which certain paths would be restricted.

This study was ideal for establishing the stability of the Stages of Condom Use in a naturalistic sample. Based on previous research in other behaviors, the Precontemplation and Maintenance stages should be the most stable, with Preparation and Action showing the least stability (Velicer, Martin, & Collins, 1996). This study has shown that this is also true for the Stages of Condom Use, illustrated by the high proportion of women who remained in the Precontemplation and Maintenance stages,

and the low proportion who remained in the Preparation and Action stages over the one year assessment period. The LTA also established the probabilities of transitions from one stage to another. For those in preparation and action, backward movement was more likely to occur than either forward movement or stability. The only stage in which forward movement was more likely was for those in Contemplation.

Longitudinal Predictors of Stage of Condom Use

A second goal of this study was to evaluate the longitudinal predictors of changes in Stage of Condom Use. The results from the DFA/MANOVA looking at predictors of stage membership one year later showed that 3 of the traditional Transtheoretical Model variables (i.e. Pros, Cons, and Self-efficacy) were significant predictors. The finding that Condom Pros are higher for later stages individuals, whereas Condom Cons are lower for those in maintenance, is consistent with research on 12 stages of change behaviors (Prochaska, Velicer, et al., 1994). Also consistent with other research, self-efficacy was found to be positively related to being in the maintenance stage of condom use. Previous studies have linked self-efficacy with less HIV risk behavior (e.g. Bandura, 1994; Catania et al., 1990; Goldman, & Harlow, 1993; Harlow, et al., 1993) particularly within the Transtheoretical Model (e.g. DiClemente, et al., 1985; Velicer, DiClemente, Rossi, & Prochaska, 1990). Current findings extend earlier research by demonstrating a consistent pattern of findings on these decisional balance and self-efficacy variables with a longitudinal population of women. No previous research has examined one year predication of the Stages of Condom Use in women using Transtheoretical or other theory-based predictors.

In addition to Transtheoretical predictors, Birth Control Sexual Assertiveness and both Positive and Negative Psychosexual Attitudes were shown to be important predictors of stage. These results are consistent with results from the Multifaceted Model of HIV Risk, which examined HIV risk due to unprotected vaginal intercourse instead of Stage of Condom Use (Harlow et al., 1993). Across earlier and current research, it appears that high levels of sexual assertiveness is significantly linked with lower risk of HIV infection. Although current longitudinal prediction of Stage of Condom Use using MANOVA/DFA provides some insight into the long term prediction of Stage of Condom Use, future research is needed to further explore patterns of movement of women through the stages of change.

Different analyses looking at women who progress as compared to those who remained stable showed a few similarities. In both the DFA and the Logistic Regression, Condom Pros and Positive Psychosexual attitudes were shown to be important variables to consider as predictors of change. Predictions of group membership in both of these analyses were better than chance, with logistic regression predicting a higher percentage of the women correctly. Those women with higher Condom Pros were more likely to move forward at least one Stage of Condom Use. This confirms findings of cross-sectional samples that found a positive relationship between the Pros of Condom Use and Stage of Change (Grimley et al., 1993). In both analyses, Positive Psychosexual Attitudes were negatively associated with progression. In other words, those women who remained stable had higher positive Psychosexual attitudes at baseline than did those who progressed. This finding is contradictory to

those results found in the Multifaceted Model of HIV risk where negative attitudes and beliefs about sexuality were related to increases in the risk of HIV (Harlow et al., 1993). A possible explanation may be that those women who have positive feelings about their sexual life are in a long term relationship in which they do not use condoms as a form of protection from sexual diseases. This possibility should be investigated more thoroughly in the future by asking more about the length and nature of women's relationships, in addition to their HIV protective and risky behavior.

When building the Logistic Regression Model for Progression, categorical demographic variables were tested that were not included in any of the other analyses, since DFA requires continuous predictors. Those demographic variables (education, race, and marital status) proved to be very important when predicting the forward movement of women. The only psychoattitudinal variable that was found to be important for progression was Positive Psychosexual Attitudes. This finding has important implications for the application of the Transtheoretical Model to condom use in women. Although in other analyses more Transtheoretical variables were found to be important to consider, current findings imply that the importance of demographics and psychosexual attitudes also need to be recognized for condom adoption. Thus, other models that examine sociological factors, as well as multifaceted predictors for women, offer additional avenues to explore to reduce HIV risk in women.

The only common significant result between the two analyses on the regression of women was the Pros of condom use. In both the Logistic Regression and the DFA, women with higher pros of condom use at baseline were shown to be more likely to

regress. This is contrary to the predictors based on the Transtheoretical Model (Prochaska, Velicer, et al., 1994). A possible explanation of this finding is that women with high Pros of Condom use at baseline move too quickly into a later stage. Behaviorally, they may not be ready to use condoms consistently, and therefore regress to earlier stages. The DFA resulted in many other significant variables in this analysis than did the Logistic Regression. Psychosexual attitudes were supported in the direction hypothesized, with high negative and low positive attitudes predicting regression. Low levels of Information and Initiation sexual assertiveness were also found to be related to backward movement. As with the Pros of condom use, Condom Use Efficacy was also found to have an inverse relationship with regression, those with high levels at baseline were more likely to regress. This is not in the direction that was hypothesized based on previous cross-sectional studies done on Stage of Condom Use (Grimley et al., in press; Prochaska, Redding et al., 1994; Riley et al., 1993) This may be for the reasons similar to those described above for Condom Pros.

When building the Logistic Regression model for regression, it became apparent that two demographic variables (age and race) were important components of the model. These variables were not included in the DFA/ MANOVA analysis due to their categorical nature. Women who were older were more likely to remain stable rather than regression, while non-white women were much more likely to regress. There are several implications for these findings. Neither of these variables are under the direct control of the participant. Therefore, there is no intervention that could be designed to impact upon them. However, it is important to take the relationship of these variables

into consideration when working with diverse populations. For instance, when working with an older population of women, long term regression may not be as important to take into consideration, especially if the women are in long-term monogamous relationships. Whereas with a younger population who may have less relationship stability, this would be a concern that should be addressed in the intervention.

Methods of Analysis

The third goal of this study focused on the methods of analyses. An assessment of how Latent Transition Analysis, Discriminant Function Analysis, and Logistic Regression complement each other in longitudinal studies such as this was looked at. The first method, LTA, provides a unique way of looking at the data. It allows the researcher to test detailed stage-sequential models. One unique assumption that this method makes is that the manifest variables are indicators of a single dynamic latent variable (Graham, Collins, Wugalter, Chung, Hansen 1991). This is a very flexible method to employ for longitudinal studies because it allows the researcher to look at individual movement paths rather than just classifications such as forward, backward, or stable movement. In this way, smaller and different types of movements are able to be detected. Current findings extend previous research on stages of change for smokers (Martin, Velicer, & Fava, 1996) to the long-term study of condom use in women.

One of the strengths of LTA, the use of Rho parameters, was not discussed in this study. The Rho parameters look at the response to different variables, conditional

on latent status membership at each timepoint. Due to the use of a single manifest variable in this study, Rho parameters were not used. However, in future research they could provide additional information on the response patterns of women based on latent class and status.

One drawback to using LTA is the need for a large sample size. This is to ensure that the distribution of subjects among the possible response patterns is not sparse. If a small sample size is used, and some of the response patterns have empty cells, the use of G^2 as distributed at a chi-square test would be limited (Velicer, Martin, & Collins, 1996; Graham, Collins, Wugalter, Chung, Hansen, 1991). The sample size in this study was large enough so that this was not a problem. However, the low number of women in the action stage at baseline is something that should be taken into consideration when looking at the results. Future research should examine the patterns of change in women who are more ready for action, perhaps in partners of HIV positive men.

The method of using DFA is very appropriate for certain types of data. It easily allows for more than two levels of the categorical variable, which make it ideal for the analysis of stage of change. One of its weaknesses is that it is most often used for continuous predictor variables. Although it is possible to use a categorical predictor variable with DFA, it is not a technique that is often employed.

One difference between the results of the Logistic Regression and DFA was that the DFA/ MANOVA procedure produced significant results for variables not found significant in the Logistic Regression. One explanation for this is that in a direct

Logistic Regression, all other variables are controlled for when calculating the individual Wald statistics. When looking at the follow-up ANOVAs conducted in the DFA/MANOVA technique, controlling for other factors is not conducted. Therefore, analyses may result in significant findings that would not be found in the other analysis. A demonstration of this can be seen when comparing the results of the DFA/MANOVA and the univariate Logistic Regression analyses on regression. Both of these analyses resulted in the same individual variables being significant predictors. In the univariate Logistic Regression, there is no control for other factors, because the individual variable is the only one included in the analysis. This is also the case with the ANOVAs done as follow-ups for the DFA. However, when a direct Logistic Regression is conducted, the individual results for a variable control for the other factors.

One strength of Logistic Regression Analysis is that it is more flexible in terms of the kinds of variables (categorical, continuous) that can be used as predictors. It is also more robust in dealing with violations of the assumptions of predictor variables than DFA (Hosmer & Lemeshow, 1989). In addition, as discussed before, in a direct Logistic Regression Analysis, control for other predictor variables is built in. Logistic Regression also has the ability to use interaction terms as predictors. By allowing the assessment of interactions between two predictor variables, a better understanding of the data may be possible. In this study, however, the use of interaction terms was not considered to allow a more equitable comparison of the different methods. However, it is a strength of the analysis, and one that should be kept in mind when looking at

certain types of data. In addition, the model building approach to Logistic Regression is one of its strengths. However, in this study, the full process was not conducted. In future studies, researchers could examine Logistic Regression more thoroughly with respect to model building.

One weakness of Logistic Regression is that the outcome variable is more easily analyzed if it is dichotomous. In the case of this study, this limitation was addressed by conducting more than one analysis, separating the stage movement categories into dichotomous outcomes. This concern has begun to be addressed with the development of Polytomous Logistic Regression, a technique that allows for more than two levels of the outcome variable. However, this newer method is not yet readily available.

Study Limitations

There are some limitations to this study that must be kept in mind when discussing the results. The first of these is the reliability of self-report data. This is a consideration that all researchers in the area of sexual behavior must deal with. However, since there was no way in which to validate the information that the participants provided, self-report data was used. Still, psychometric analysis of these data lend some confidence to self-report data (Rose, et al., 1996). Test-re-test analyses were conducted on the data as part of a different study (Rose, et al., 1996), and the resulting reliabilities were found to be adequate.

Another consideration that must be made is the length of time between the assessment periods. Because this study was looking at women over a one year time period, only long term changes were discussed. It will be important in the future to

have similar studies look at shorter periods of time and to evaluate the short term process of changing condom use behavior.

As mentioned earlier, the small number of women in the Action stage at baseline may be seen as a limitation of this study. It is hard to generalize the results of the analyses that looked at this stage with such a low number of people to base it on. However, as confirmed by the LTA results of this study, Action is a very unstable stage. Current findings and the dynamic nature of the stage suggest that the numbers of women reporting being in this stage at a certain time will always be lower than that of the other stages.

Implications

The overriding goal of this study was to understand more about the nature of condom use in women. This is the first study to look at the natural process that women go through in their adoption and retention of condom use over one year. By understanding the way in which women change their condom use behavior on their own, interventions can be designed to help other women consistently use condoms. The long term changes that women make in their condom use behavior show us that certain considerations need to be made in interventions. For example, the proportion of relapse in this sample is higher than in studies looking at other health behaviors, specifically smoking (Martin, Velicer, & Fava; 1996) This suggests that relapse is a problem that should be addressed in condom use interventions. The predictors of stage membership, as well as the predictors of stage movement provide researchers with an understanding of variables that need to be addressed in interventions designed to help

women progress through the Stages of Condom Use. Several variables showed significant relationships to Stage of Condom Use and could be potentially intervened upon. These include: Condom Pros, Condom Use Efficacy, Sexual Assertiveness, and Psychosexual Attitudes. For other predictors, specifically race, age and marital status, analyses provided insight into how certain subgroups of the population may differ in the process of adapting condom use. It may be beneficial to tailor interventions to these different demographic groups in order to more effectively intervene to increase condom use. Future research may also look at shorter periods of time to assess how short term change is related to longer term adoption. Finally, the expansion of this study to include other populations such as men, homosexuals and adolescents, would provide much more insight into this dynamic behavior.

Longitudinal data such as in this study can often be difficult to obtain as well as analyze. A variety of methods were used in this study in an effort to provide some insight as to the strengths and limitations of these methods for studying condom use adoption. These results have shown that often the method of analysis chosen can shape the results of the study. For this reason, it maybe important to include a variety of methods when looking at longitudinal data. This study offers a possible framework for future studies in an attempt to employ a cross-methodological approach to longitudinal data analysis.

Table 1. Correlation Table for All Variables

	Stage	Age	Mar	Ed.	Race	Pros	Cons	Eff	Alc	Binge	Init	Info	Ref.	BCSA	+PSA
Stage	1.0														
Age	-.127	1.0													
Mar	-.126	.580	1.0												
Ed.	-.027	-.068	.076	1.0											
Race	.128	-.066	-.049	.147	1.0										
Pros	.252	-.169	-.113	-.022	.055	1.0									
Cons	-.216	.089	.071	.131	.020	-.036	1.0								
Eff.	.402	-.169	-.155	-.133	.089	.341	-.375	1.0							
Alc	-.040	.009	-.006	.063	-.028	-.022	.061	-.101	1.0						
Binge	-.004	-.078	-.029	.008	-.010	.015	.012	-.075	.832	1.0					
Init	-.029	-.008	-.035	-.135	.011	.016	-.170	-.095	-.062	-.042	1.0				
Info	-.011	-.073	-.026	-.110	-.006	.090	-.224	.176	-.051	-.074	.262	1.0			
Ref.	.052	-.123	-.046	-.147	.012	.144	-.242	.293	.000	-.003	.271	.328	1.0		
BCSA	.480	-.114	-.051	-.209	.060	.310	-.440	.639	-.060	-.039	.165	.231	.372	1.0	
+PSA	-.126	-.082	-.065	-.112	-.009	-.016	-.150	.075	-.009	.003	.272	.284	.216	.065	1.0
-PSA	.083	.023	-.013	.123	.125	.005	.250	-.097	.036	.025	-.268	-.334	-.285	-.126	-.678

Note¹:

Mar = Marital Status, Ed = Education, Eff = Condom Efficacy, Alc = Alcohol Frequency

Binge = Binge Drinking Frequency, Init = Initiation Sexual Assertiveness, Info = Information Sexual Assertiveness

Ref. = Refusal Sexual Assertiveness, -PSA = Negative Psychosexual Attitudes, BCSA = Birth Control Sexual Assertiveness

+ PSA = Positive Psychosexual Attitudes

Table 2. Sample Demographics at Baseline

Education

13 %	High School Graduate or Less
50 %	Some College
37 %	College Graduate or More

Race

84 %	White
9 %	African-American
1 %	Native American
1 %	Asian-American
2 %	Hispanic-American
3 %	Other

Marital Status

58 %	Single, never married
12 %	Married
27 %	Separated or divorced
3 %	Widowed

Stage of Condom Use

57 %	Precontemplation
14 %	Contemplation
11 %	Preparation
3 %	Action
15 %	Maintenance

Age: $M=31.4$ ($sd = 10.31$)

range: 18 to 77

Table 3. Descriptive Statistics for Predictors Variables at Baseline

Variable	Mean	Std Deviation	Range	α
Condom Pros	3.8	0.94	1 - 5	.81
Condom Cons	2.1	0.80	1 - 5	.83
Condom Use Efficacy	3.3	1.33	0 - 5	.89
Alcohol Use Frequency	0.57	1.04	0 - 11	.87
Binge Drinking Frequency	2.4	4.55	0 - 28	
Drug Use Frequency	0.34	0.94	0 - 28	.65
Initiation Sexual Assertiveness	3.3	0.86	1 - 5	.80
Refusal Sexual Assertiveness	3.9	0.82	1 - 5	.79
Birth Control Sexual Assertiveness	3.4	1.07	1 - 5	.82
Information Communication Sexual Assertiveness	4.4	0.90	1 - 5	.93
Positive Psychosexual Attitudes	3.9	0.88	1 - 5	.75
Negative Psychosexual Attitudes	1.9	0.78	1 - 5	.71

N=522

Table 4. Overall Fit for all 6 Latent Transition Models Tested

MODEL #	
1	$G^2(16) = 8266.571$
2	$G^2(13) = 7061.990$
3	$G^2(12) = 5838.848$
4	$G^2(6) = 3156.913$
5	$G^2(2) = 1225.143$
6	$G^2(1) = 325.203$

Note: G^2 can be interpreted like a χ^2 value, with smaller values relative to the degrees of freedom preferred.

Table 5. Delta Parameter Estimates (Probability of latent status membership) For Model 6

Stage	Occasion	
	1	3
Precontemplation	.489	.512
Contemplation	.151	.155
Preparation	.131	.108
Action	.065	.066
Maintenance	.164	.159

Table 6. Tau Parameter Estimates (Transition probabilities) for Model 6

Stage at Time 1	Stage at Time 3				
	PC	C	D	A	M
Precontemplation	.796	.119	.051	.034	
Contemplation	.261	.261	.207	.065	.207
Preparation	.288	.225	.175	.125	.188
Action	.250	.150	.225	.150	.225
Maintenance	.180	.110	.090	.080	.540

Table 7. ANOVA Results for 12 Psycho-attitudinal Variables at Baseline with Stages of Condom Use 1 year later (5 levels) as the Independent Variable

Variable	F(4,521)	p-value	Tukey Tests ^{a,b}	η^2
Condom Pros	7.40	***	5 > 1	.05
Condom Cons	7.15	***	1,3,2 > 5	.05
Condom Use Efficacy	19.40	***	5 > 1,2,3	.13
Alcohol Use Frequency	1.10			
Binge Drinking Frequency	1.09			
Drug Use Frequency	1.04			
Initiation Sexual Assertiveness	0.77			
Refusal Sexual Assertiveness	0.60			
Birth Control Sexual Assertiveness	28.36	***	5 > 1,3,2	.18
Information Communication Sexual Assertiveness	1.36			
Positive Psychosexual Attitudes	9.03	***	1 > 3,5,2	.07
Negative Psychosexual Attitudes	4.42	**	3,2 > 1	.03

Note. ^aCategorical variable = Stage of condom use (with 5 levels): Stage scores: 1 = Precontemplation; 2 = Contemplation; 3 = Preparation; 4 = Action; 5 = Maintenance.

^bTukey tests indicate which stage levels are significantly different. For example, for Condom Pros, women in stage 5 had significantly higher scores than women in stage 1.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 8. Standardized Canonical Coefficients for 12 Predictors of Stage of Condom Use 1 Year Later (N=522)

Variable	Standardized Canonical Coefficients ¹
Condom Pros	0.1774
Condom Cons	-0.2209
Condom Use Efficacy	0.3383 (+)
Alcohol Use Frequency	0.1267
Binge Drinking Frequency	-0.0312
Drug Use Frequency	-0.0609
Initiation Sexual Assertiveness	-0.0884
Refusal Sexual Assertiveness	-0.1413
Birth Control Sexual Assertiveness	0.6719 (+)
Information Communication Sexual Assertiveness	-0.0477
Positive Psychosexual Attitudes	-0.5463 (-)
Negative Psychosexual Attitudes	-0.0092

¹Note: The 2 positive values greater than .30 (+) and the negative value less than -.30 (-) are interpreted as meaningful

Table 9. ANOVA Results for 12 Variables with stage movement (2 levels; Progression vs. Stability) as the Independent Variable (N=405)

Variable	E(1,404)	p-value	Tukey Tests	η^2
Condom Pros	6.72	**	1 > 0	.02
Condom Cons	0.37			
Condom Use Efficacy	0.01			
Alcohol Use Frequency	0.70			
Binge Drinking Frequency	1.32			
Drug Use Frequency	1.28			
Initiation Sexual Assertiveness	3.30			
Refusal Sexual Assertiveness	0.02			
Birth Control Sexual Assertiveness	0.73			
Information Communication Sexual Assertiveness	0.02			
Positive Psychosexual Attitudes	17.79	***	0 > 1	.04
Negative Psychosexual Attitudes	8.56	**	1 > 0	.02

Note. ^aCategorical variable = Stage movement (with 2 levels): Movement scores: 0 = Stable over 1 year, 1 = Forward movement through the stages; ^bTukey tests indicate which movement category is significantly higher. For example, for Condom Pros, women who progressed had significantly higher scores than women who remained stable.

* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 10. Standardized Canonical Coefficients for 12 Predictors of Positive Stage Movement
(Progression versus Stability) (N=405)

Variable	Standardized Canonical Coefficients ¹
Condom Pros	0.5028 (+)
Condom Cons	-0.0741
Condom Use Efficacy	0.0203
Alcohol Use Frequency	-0.1815
Binge Drinking Frequency	0.3357 (+)
Drug Use Frequency	0.2140
Initiation Sexual Assertiveness	-0.2280
Refusal Sexual Assertiveness	0.2661
Birth Control Sexual Assertiveness	-0.4082 (-)
Information Communication Sexual Assertiveness	0.2696
Positive Psychosexual Attitudes	-0.7625 (-)
Negative Psychosexual Attitudes	0.0642

¹Note: The 2 positive values greater than .30 (+) and the 2 negative values less than -.30 (-) are interpreted as meaningful.

Table 11. ANOVA Results for 12 Variables with stage movement (2 levels; Regression vs. Stability) as the Independent Variable (N=393)

Variable	F(1,391)	p-value	Tukey Tests ^{a,b}	η^2
Condom Pros	10.82	***	1 > 0	.03
Condom Cons	0.30			
Condom Use Efficacy	5.16	*	1 > 0	.01
Alcohol Use Frequency	0.23			
Binge Drinking Frequency	0.01			
Drug Use Frequency	1.64			
Initiation Sexual Assertiveness	5.62	*	0 > 1	.01
Refusal Sexual Assertiveness	2.43			
Birth Control Sexual Assertiveness	1.73			
Information Communication Sexual Assertiveness	8.22	**	0 > 1	.02
Positive Psychosexual Attitudes	10.96	***	0 > 1	.03
Negative Psychosexual Attitudes	12.24	***	1 > 0	.03

Note.^a Categorical variable = Stage movement (with 2 levels): Movement scores: 0 = Stable over 1 year, 1 = Backward movement through the stages;

^b Tukey tests indicate which movement category is significantly higher. For example, for Information Sexual Assertiveness, women who regressed had significantly lower scores than women who remained stable. * $p < .05$. ** $p < .01$. *** $p < .001$.

Table 12. Standardized Canonical Coefficients for 12 Predictors of Negative Stage Movement
(Regression versus Stability) (N=393)

Variable	Standardized Canonical Coefficients ¹
Condom Pros	0.5071 (+)
Condom Cons	-0.1563
Condom Use Efficacy	0.3027 (+)
Alcohol Use Frequency	-0.2552
Binge Drinking Frequency	0.2201
Drug Use Frequency	0.1874
Initiation Sexual Assertiveness	-0.2362
Refusal Sexual Assertiveness	-0.1595
Birth Control Sexual Assertiveness	0.0025
Information Communication Sexual Assertiveness	-0.3343 (-)
Positive Psychosexual Attitudes	-0.2228
Negative Psychosexual Attitudes	0.2652

¹Note: The 2 positive values greater than .30 (+) and the negative value less than -.30 (-) are interpreted as meaningful.

Table 13. Direct Logistic Regression Analysis on Progression versus Stability with 12 Psycho-attitudinal and Behavioral Predictors (N=405)

Variable	B	S.E.	Wald χ^2	Exp (B)
Condom Pros	0.3801	0.1481	6.5927 **	1.4625
Condom Cons	-0.0587	0.1760	0.1113	0.9430
Condom Use Efficacy	0.0083	0.1179	0.0050	1.0084
Alcohol Use Frequency	-0.1077	0.2026	0.2828	0.8979
Binge Drinking Frequency	0.0427	0.0441	0.9410	1.0437
Drug Use Frequency	0.1529	0.1208	1.6013	1.1652
Initiation Sexual Assertiveness	-0.1823	0.1478	1.5213	0.8334
Refusal Sexual Assertiveness	0.2391	0.1780	1.8048	1.270
Birth Control Sexual Assertiveness	-0.2470	0.1522	2.6350	0.7811
Information Communication Sexual Assertiveness	0.2028	0.1595	1.6157	1.2248
Positive Psychosexual Attitudes	-0.5583	0.1837	9.2406 **	0.5722
Negative Psychosexual Attitudes	0.0605	0.2112	0.0820	1.0623

* $p < .2$ ** $p < .05$ *** $p < .01$ **** $p < .001$

Table 14. Direct Logistic Regression Analysis on Regression versus Stability with 12 Psycho-attitudinal and Behavioral Predictors (N=393)

Variable	B	S.E.	Wald χ^2	Exp (B)
Condom Pros	0.4498	0.1688	7.0960 **	1.5679
Condom Cons	-0.1412	0.1952	0.5230	0.8684
Condom Use Efficacy	0.1767	0.1363	1.6799	1.1933
Alcohol Use Frequency	-0.1889	0.2652	0.5074	0.8279
Binge Drinking Frequency	0.0316	0.0590	0.2865	1.0321
Drug Use Frequency	0.1383	0.1305	1.1229	1.1484
Initiation Sexual Assertiveness	-0.2170	0.1673	1.6831	0.8049
Refusal Sexual Assertiveness	-0.1532	0.1754	0.7633	0.8579
Birth Control Sexual Assertiveness	-0.0097	0.1708	0.0033	0.9903
Information Communication Sexual Assertiveness	-0.2317	0.1471	2.4796	0.7932
Positive Psychosexual Attitudes	-0.1724	0.1993	0.7482	0.8416
Negative Psychosexual Attitudes	0.2476	0.2275	1.1844	1.2810

* $p < .2$ ** $p < .05$ *** $p < .01$ **** $p < .001$

Table 15. Wald Statistic and Estimated Coefficient Results from the Univariate Logistic Regression Analyses on Progression vs. Stability (N=405)

Variable	B	S.E.	Wald χ^2	Exp (B)
Age	-0.0132	.0016	1.3081	0.9868
Education (Reference Group: College Graduate)			6.4984 **	
Some College	0.3582	.2478	2.0905	1.4308
High School or less	-0.7339	.4752	2.3846	0.4801
Race (Reference Group: White)	0.8366	.2971	7.9282 ***	2.3085
Marital Status (Reference Group: Single)			13.9237 ****	
Separated or Widowed	-0.7193	.2747	6.8577 ***	0.4871
Married	-1.6156	.5407	8.9292 ***	0.1988
Condom Pros	0.3364	.1320	6.4943 ***	1.3998
Condom Cons	0.0877	.1441	0.3701	1.0916
Condom Use Efficacy	-0.0104	.0855	0.0147	0.9897
Alcohol Frequency (Reference Group: Nondrinkers)			4.3038	
Less than .2 drinks a day	-0.2348	.3550	0.4375	0.7907
Less than 1 drink a day	-0.0235	.3691	0.0041	0.9767
1 or more drink a day	0.4925	.4180	1.3879	1.6364
Binge Drinking Frequency	0.0251	.0220	1.3006	1.0254
Initiation Sexual Assertiveness	-0.2372	.1314	3.2612 *	0.7888
Refusal Sexual Assertiveness	0.0205	.1407	0.0212	1.0207
Birth Control Sexual Assertiveness	-0.0920	.1080	0.7261	0.9121
Information Communication Sexual Assertiveness	0.0177	.1329	0.0177	1.0178
Positive Psychosexual Attitudes	-0.5305	.1320	16.1482 ****	0.5883
Negative Psychosexual Attitudes	0.4135	.1449	8.1485 ***	1.5121

* p < .2 ** p < .05 *** p < .01 **** p < .001

Table 16. Wald Statistic and Estimated Coefficient Results from the Model Containing Variables Identified in the Univariate Analysis on Progression vs. Stability (N=405)

Variable	B	S.E.	Wald χ^2	Exp (B)
Education (Reference Group: College Graduate)			8.0334 **	
Some College	0.2546	.2712		
High School or less	-1.1691	.5262		
Race (Reference Group: White)	1.0577	.3375	9.8216 ***	2.8798
Marital Status (Reference Group: Single)			13.9445 ****	
Separated or Widowed	-0.6781	.2916	5.4087 **	0.5076
Married	-1.8590	.5785	10.3267 ***	0.1558
Condom Pros	0.2317	.1468	2.4906	1.2607
Initiation Sexual Assertiveness	-0.1732	.1450	1.4281	0.8409
Positive Psychosexual Attitudes	-0.5953	.1932	9.4902 ***	0.5514
Negative Psychosexual Attitudes	0.0098	.2159	0.0020	1.0098

* $p < .2$ ** $p < .05$ *** $p < .01$ **** $p < .001$

Table 17. Final Logistic Regression Model for Progression vs. Stability (N=405)

Variable	B	S.E.	Wald χ^2		Exp (B)
Education (Reference Group: College Graduate)			9.3512	***	
Some College	0.3124	.2674	1.3644		1.3667
High School or less	-1.1890	.5183	5.2618	**	0.3045
Race (Reference Group: White)	1.0505	.3326	9.9750	***	2.8592
Marital Status (Reference Group: Single)			15.0560	****	
Separated or Widowed	-0.7153	.2897	6.0986	**	0.4890
Married	-1.8837	.5678	11.0067	****	0.1520
Positive Psychosexual Attitudes	-0.6506	.1438	20.4805	****	0.5218

* $p < .2$ ** $p < .05$ *** $p < .01$ **** $p < .001$

Table 18. Wald Statistic and Estimated Coefficient Results from the Univariate Logistic Regression Analyses on Regression vs. Stability (N=393)

Variable	B	S.E.	Wald χ^2		Exp (B)
Age	-0.0517	.0148	12.2557	***	0.9496
Education (Reference Group: College Graduate)			3.9227		
Some College	0.5433	.2751	3.9011	*	1.7218
High School or less	0.2939	.3927	0.5602		1.3416
Race (Reference Group: White)	0.8246	.3108	7.0384	**	2.2811
Marital Status (Reference Group: Single)			2.7366		
Separated or Widowed	-0.2851	.2738	1.0841		0.7519
Married	-0.6157	.4150	2.2009		0.5402
Condom Pros	0.4766	.1489	10.1634	**	1.6074
Condom Cons	-0.0843	.1525	0.3054		0.9192
Condom Use Efficacy	0.2096	.0933	5.0454	*	1.2331
Alcohol Frequency (Reference Group: Nondrinkers)			2.1083		
Less than .2 drinks a day	0.2625	.3811	0.4743		1.3002
Less than 1 drink a day	-0.1011	.4212	0.0576		0.9038
1 or more drink a day	0.3971	.4762	0.6955		1.4876
Binge Drinking Frequency	0.0021	.0275	0.0057		1.0021
Initiation Sexual Assertiveness	-0.3367	.1438	5.4826	*	0.7141
Refusal Sexual Assertiveness	-0.2188	.1409	2.4117		0.8035
Birth Control Sexual Assertiveness	0.1500	.1144	1.7172		1.1618
Information Communication Sexual Assertiveness	-0.3381	.1213	7.7692	**	0.7131
Positive Psychosexual Attitudes	-0.4335	.1351	10.3028	**	0.6482
Negative Psychosexual Attitudes	0.5103	.1516	11.3334	***	1.6657

* $p < .2$ ** $p < .05$ *** $p < .01$ **** $p < .001$

Table 19. Wald Statistic and Estimated Coefficient Results from the Model Containing Variables Identified in the Univariate Analysis on Regression vs. Stability (N=393)

Variable	B	S.E.	Wald χ^2		Exp (B)
Age	-0.0431	.0159	7.3098	***	.0.9579
Education (Reference Group: College Graduate)			0.2149		
Some College	0.1324	.3007	0.1940		1.1416
High School or less	0.0318	.4434	0.0051		1.0323
Race (Reference Group: White)	0.5926	.3472	2.9132	*	1.8086
Condom Pros	0.3438	.1692	4.1289	**	1.4102
Condom Use Efficacy	0.1474	.1092	1.8214		1.1588
Initiation Sexual Assertiveness	-0.2220	.1650	1.8101		0.8009
Information Communication Sexual Assertiveness	-0.2518	.1452	3.0093	*	0.7774
Positive Psychosexual Attitudes	-0.3006	.1993	2.2736		0.7404
Negative Psychosexual Attitudes	0.1302	.2258	0.3326		1.1391

* $p < .2$ ** $p < .05$ *** $p < .01$ **** $p < .001$

Table 20. Final Logistic Regression Model for Regression vs. Stability (N=393)

Variable	B	S.E.	Wald χ^2		Exp (B)
Age	-.0442	.0153	8.2877	***	.9568
Race (Reference Group: White)	.5982	.3252	3.3840	*	1.8188
Condom Pros	.4106	.1566	6.8719	***	1.5077
Information Communication Sexual Assertiveness	-.3928	.1303	9.0866	***	.6752

* $p < .2$ ** $p < .05$ *** $p < .01$ **** $p < .001$

Figure 1. Latent Transition Models of Stages of Condom Use

Figure 2. Discriminant Function Analysis on Stage of Condom Use

Figure 3. Discriminant Function Analysis and Logistic Regression Analysis on Stage Progression

Figure 4. Discriminant Function Analysis and Logistic Regression Analysis on Stage Regression

Figure 5. Tau Parameters (Transition Probabilities) for Model 6

Appendix A

Measures

Measures 1 Staging for Condom Use

1. Do you use condoms (rubbers)?
 - never
 - sometimes, but not always
 - started always using 1 month ago
 - started always using 3-5 months ago
 - started always using 6 months ago or longer

2. Do you plan to start **always** using condoms when you have sex?
 - no
 - yes, within the next 6 months
 - yes, within the next 30 days
 - already always use condoms

Staging Algorithm

- If question #1 ≤ 2 AND question #2 = 1 THEN current stage is Precontemplation
- If question #1 ≤ 2 AND question #2 = 2 THEN current stage is Contemplation
- If question #1 ≤ 2 AND question #2 = 3 THEN current stage is Preparation
- If question #1 = 3 AND question #2 = 4 THEN current stage is Action
- If question #1 ≥ 5 AND question #2 = 4 THEN current stage is Maintenance

Measures 2 Condom Pros

If you were going to use a condom, how important would these things be?

1. It would build trust between partners.	Not at all important	A little important	Somewhat important	Fairly important	Very important
2. I would feel more responsible.	Not at all important	A little important	Somewhat important	Fairly important	Very important
3. Sex would feel safer.	Not at all important	A little important	Somewhat important	Fairly important	Very important
4. I would not worry as much about getting pregnant.	Not at all important	A little important	Somewhat important	Fairly important	Very important
5. I would not worry as much about getting AIDS.	Not at all important	A little important	Somewhat important	Fairly important	Very important
6. My partner would respect me more.	Not at all important	A little important	Somewhat important	Fairly important	Very important
7. It would protect my partner.	Not at all important	A little important	Somewhat important	Fairly important	Very important
8. Condoms are easy to get.	Not at all important	A little important	Somewhat important	Fairly important	Very important

Measures 3 Condom Cons

If you were going to use a condom, how important would these things be?

1. It is a lot of trouble.	Not at all important	A little important	Somewhat important	Fairly important	Very important
2. Sex has to be planned.	Not at all important	A little important	Somewhat important	Fairly important	Very important
3. My partner might get angry.	Not at all important	A little important	Somewhat important	Fairly important	Very important
4. Sex is less exciting.	Not at all important	A little important	Somewhat important	Fairly important	Very important
5. My partner might not want to have sex.	Not at all important	A little important	Somewhat important	Fairly important	Very important
6. My partner might not like it.	Not at all important	A little important	Somewhat important	Fairly important	Very important
7. My partner might make fun of me.	Not at all important	A little important	Somewhat important	Fairly important	Very important
8. My partner might think I play around.	Not at all important	A little important	Somewhat important	Fairly important	Very important

Measures 4 Condom Use Efficacy

How sure are you that a condom or latex barrier would be used for sex in these situations?

1. When I am really turned on.	Not at all sure	A little sure	Somewhat sure	Fairly sure	Very sure
2. When my partner gets mad about wearing a condom.	Not at all sure	A little sure	Somewhat sure	Fairly sure	Very sure
3. When I am depressed.	Not at all sure	A little sure	Somewhat sure	Fairly sure	Very sure
4. When I have been drinking or doing drugs.	Not at all sure	A little sure	Somewhat sure	Fairly sure	Very sure
5. When I'm angry.	Not at all sure	A little sure	Somewhat sure	Fairly sure	Very sure
6. When I'm afraid I might get AIDS.	Not at all sure	A little sure	Somewhat sure	Fairly sure	Very sure

Substance Use

In this section, we will ask you about your possible use of alcohol and other drugs. Please circle your best answer. Remember that no one will know that these answers came from you.

Measures 5 Alcohol Use

Frequency of Alcohol Use

1. In the past 6 months, how often have you had a drink of beer, wine, or liquor?

never
less than once a month
1-2 times a month
1-2 times a week
3-4 times a week
almost every day or every day

2. In the past 6 months, how many drinks did you normally have when you drank alcohol?

none - I don't drink
1-2 drinks
3-5 drinks
6-10 drinks
11 or more drinks

Frequency of Binge Drinking

3. In the past 6 months, how often did you have 3 or more drinks in one day?

never
less than once a month
1-2 times a month
1-2 times a week
3-4 times a week
almost every day or every day

Measures 6 Drug Use

In the past 6 months, how often have you used these drugs without a doctor's orders? Please circle your answer.

1. Marijuana or hashish (grass, pot, hash, hash oil)	Never	Once a month or less	About once a week	About twice a week	Almost every day or every day
2. Cocaine (coke, crack, rock)	Never	Once a month or less	About once a week	About twice a week	Almost every day or every day
3. LSD or psychedelics (PCP, mushrooms, mescaline, peyote, psilocybin)	Never	Once a month or less	About once a week	About twice a week	Almost every day or every day
4. Amphetamines (uppers, ups, speed, bennies, dexies, pep pills, prescription diet pills)	Never	Once a month or less	About once a week	About twice a week	Almost every day or every day
5. Quaaludes (quads, ludes, soapers, methaqualone)	Never	Once a month or less	About once a week	About twice a week	Almost every day or every day
6. Barbiturates (downs, downers, goofballs, yellows, reds, blues, rainbow)	Never	Once a month or less	About once a week	About twice a week	Almost every day or every day
7. Heroin or other narcotics (smack, horse, skag, methadone, opium, morphine, codeine, demerol, paregoric, talwin, laudanum)	Never	Once a month or less	About once a week	About twice a week	Almost every day or every day
8. Glue, poppers, or other gases or sprays to get high	Never	Once a month or less	About once a week	About twice a week	Almost every day or every day

Sexual Assertiveness

Think about what you *would* do even if you have not done some of these things. circle your best answer.

Measures 7 Initiation Sexual Assertiveness

1. I let my partner know if I want my partner to touch my genitals.	Never	Sometimes	About half of the time	Usually	Always
2. I begin sex with my partner if I want to.	Never	Sometimes	About half of the time	Usually	Always
3. I wait for my partner to touch my breasts instead of letting my partner know that's what I want.	Never	Sometimes	About half of the time	Usually	Always
4. I wait for my partner to touch my genitals instead of letting my partner know that's what I want.	Never	Sometimes	About half of the time	Usually	Always
5. Women should wait for men to start things like breast touching.	Never	Sometimes	About half of the time	Usually	Always
6. I let my partner know if I want to have my genitals kissed.	Never	Sometimes	About half of the time	Usually	Always

Measures 8 Refusal Sexual Assertiveness

7. I refuse to put my mouth on my partner's genitals if I don't want to, even if my partner insists.	Never	Sometimes	About half of the time	Usually	Always
8. I put my mouth on my partner's genitals if my partner wants me to, even if I don't want to.	Never	Sometimes	About half of the time	Usually	Always
9. I give in and kiss if my partner pressures me, even if I already said no.	Never	Sometimes	About half of the time	Usually	Always
10. I let my partner kiss my genitals if my partner wants to, even if I don't want to.	Never	Sometimes	About half of the time	Usually	Always
11. If I said no, I won't let my partner kiss my genitals even if my partner pressures me.	Never	Sometimes	About half of the time	Usually	Always
12. I refuse to let my partner touch my breasts if I don't want that, even if my partner insists.	Never	Sometimes	About half of the time	Usually	Always

Measures 9 Birth Control Sexual Assertiveness

13. I have sex without a condom or latex barrier if my partner doesn't like them, even if I want to use one.	Never	Sometimes	About half of the time	Usually	Always
14. I make sure my partner and I use a condom or latex barrier when we have sex.	Never	Sometimes	About half of the time	Usually	Always
15. I insist on using a condom or latex barrier if I want to, even if my partner doesn't like them.	Never	Sometimes	About half of the time	Usually	Always
16. I have sex without using a condom or latex barrier if my partner insists, even if I don't want to.	Never	Sometimes	About half of the time	Usually	Always
17. I have sex without using a condom or latex barrier if my partner wants.	Never	Sometimes	About half of the time	Usually	Always
18. I refuse to have sex if my partner refuses to use a condom or latex barrier.	Never	Sometimes	About half of the time	Usually	Always

Measures 10 Information Communication Sexual Assertiveness

19. I would ask if I want to know if my partner ever had an HIV test.	Never	Sometimes	About half of the time	Usually	Always
20. I would ask my partner about the AIDS risk of his or her past partners, if I want to know.	Never	Sometimes	About half of the time	Usually	Always
21. I would ask if I want to know if my partner ever had a sexually transmitted disease (STD).	Never	Sometimes	About half of the time	Usually	Always
22. If I want to know, I would ask my male partner if he ever had sex with a man.	Never	Sometimes	About half of the time	Usually	Always
23. I would ask if I want to know if my partner ever had sex with someone who shoots drugs with a needle.	Never	Sometimes	About half of the time	Usually	Always
24. I would ask if I want to know if my partner ever used needles to take drugs.	Never	Sometimes	About half of the time	Usually	Always

Measures 11 Psychosexual Attitudes¹

For the next questions, think about the past 6 months. How often have you felt this way?

1. Sex is a positive part of my life.	Never	Rarely	Sometimes	Most of the time	Always
2. I do not like some parts of my sex life.	Never	Rarely	Sometimes	Most of the time	Always
3. I have control of my sex life.	Never	Rarely	Sometimes	Most of the time	Always
4. I feel powerless in sex situations.	Never	Rarely	Sometimes	Most of the time	Always
5. I like the way my sex life is going.	Never	Rarely	Sometimes	Most of the time	Always
6. I have little or no say about my sex life.	Never	Rarely	Sometimes	Most of the time	Always

¹Note: Items 1,3,&5 were used to assess Positive Psychosexual Attitudes,

Whereas Items 2,4 &6 were used to assess Negative Psychosexual Attitudes

Bibliography

Bandura, A. (1982). Self-efficacy mechanism in human agency. American Psychologist, 37, 122-147.

Bandura, A. (1986). Social foundations of thought and action: A social cognitive theory. Prentice Hall, Inc.: New Jersey.

Bandura, A. (1994). Social cognitive theory and exercise of control over HIV infection. In R.J. DiClemente and J.L. Peterson (Eds.) Preventing AIDS: Theories and methods of behavioral interventions (pp. 25-59). New York: Plenum Press.

Bertrand, J.T., Brown, L.F., Kinzonzi, M., Mansilu, M. & Djunghu, B. (1992). AIDS knowledge in three sites in Bas-Zaïre. AIDS Education and Prevention, 4(3), 251-266.

Brown, L.K., DiClemente, R.J., & Reynolds, L. (1991). HIV prevention for adolescents: Utility of the Health Belief Model. AIDS Education and Prevention, 3(1), 50-59.

Catania, J.A., Dolcini, M.M., Coates, T.J., Kegeles, S.M., Greenblatt, R.M., Puckett, J.D., Corman, M., & Miller, J. (1989). Predictors of condom use and multiple partnered sex among sexually active adolescent women: Implications for AIDS-related health interventions. Journal of Sex Research, 26, 514-524.

Catania, J.A., Kegeles, S.M. & Coates, T.J. (1990). Towards and understanding of risk behavior: An AIDS Risk Reduction Model (ARRM). Health Education Quarterly, 17 (1), 53-72.

Deiter, P. (1994). Sexual assertiveness training for college women.

Unpublished doctoral dissertation, University of Rhode Island.

DiClemente, C.C., Prochaska, J.O., & Gibertini, M. (1985). Self-efficacy and the stages of self-change of smoking. Cognitive Therapy and Research, 9, 181-200.

Ensminger, M.E. (1987). Adolescent sexual behavior as it relates to other transition behaviors in youth. In S.L. Hofferth & C.O. Hayes (Eds.) Risking the future: Adolescent sexuality, pregnancy, and childbearing (Vol. 2, pp. 36-55).

Washington DC: National Academy Press.

Goldman, J.A., & Harlow, L.L. (1993). Self-perception variables mediating AIDS preventive behavior. Health Psychology, 12, 489-498.

Graham, J.W., Collins, L.M., Wugalter, S.E., Chung, N.K., & Hansen, W.B. (1991). Modeling transitions in latent stage-sequential processes: A substance use prevention example. Journal of Consulting and Clinical psychology, 59(1), 48-57.

Grimley, D.M., Riley, G.E., Bellis, J.M. & Prochaska, J.O. (1993). Assessing the stages of change and decision-making for contraceptive use for the prevention of pregnancy, sexually transmitted diseases, and Acquired Immunodeficiency Syndrome. Health Education Quarterly, 20, 455-470.

Grimley, D.M., Prochaska, J.O., Velicer, W.F. & Riley, G.E. (in press). Contraceptive and condom use adoption and maintenance: A stage paradigm approach. Health Education Quarterly.

Harlow, L.L., Morokoff, P.J., & Quina, K. (1991). Predicting HIV-risky heterosexual behavior in women. University of Rhode Island, NIMH Grant MH47233.

Harlow, L.L., Prochaska, J.O., Redding, D.A., Rossi, J.S., Velicer, W.F., Snow, M.G., Schnell, D., Galavotti, D., O'Reilly, K., & Rhodes, F. (In press). Stages of condom use in a high HIV-risk sample. Psychology & Health.

Harlow, L.L., Rose, J.S., Morokoff, P.J., Quina, K. & Mitchell, K. (1996). Women HIV-risk takers: Related behaviors, issues, and attitudes. Manuscript submitted for publication.

Harlow, L.L., Quina, K., Morokoff, P.J., Rose, J.S., & Grimley, D.M. (1993). HIV risk in women: A multifaceted model. Journal of Applied Biobehavioral Research, 1, 3-38.

Harlow, L.L., Stein, J.A., & Rose, J.S. (1996). Substance abuse and risky sexual behavior in women: A longitudinal quasi-simplex stage model. Manuscript submitted for publication.

Hingson, R.W., Strunin, L., Berlin, B.M., & Heeren, T. (1990). Beliefs about AIDS, use of alcohol and drugs, and unprotected sex among Massachusetts adolescents. American Journal of Public Health, 80, 295-299.

Hosmer, D.W., & Lemeshow, S. (1989). Applied logistic regression. New York: John Wiley & Sons.

Janis, I.L., & Mann, L. (1977). Decision making: A psychological analysis of conflict, choice and commitment. New York: The Free Press.

Janz, N.K. & Becker, M.H. (1984). The Health Belief Model: A decade later. Health Education Quarterly, 11 (1), 1-47.

Kelly, J.A., Murphy, D.A., Sikkema, K.J. & Kalichman, S.C. (1993).

Psychological interventions to prevent HIV infection are urgently needed. American Psychological, 48, (10), 1023-1034.

Kline, A. & VanLandingham, M. (1994). HIV-infected women and sexual risk reduction: The relevance of existing models of behavior change. AIDS Education and Prevention, 6 (5), 390-402.

Malow, R.M. Corrigan, S.A., Cunningham, S.C., West, J.A. & Pena, J.M. (1993). Psychosocial factors associated with condom use among African-American drug abusers in treatment. AIDS Education and Prevention, 5 (3), 244-253.

Martin, R.A., Velicer, W.F., & Fava, J.L. (1996). Latent transition analysis to the stages of change for smoking cessation. Addictive Behaviors, 21 (1), 67-80.

McEwan, R.T., McCallum, A., Bhopal, R.S., & Madhok, R. (1992). Sex and the risk of HIV infection: The role of alcohol. British Journal of Addiction, 87, 577-584.

Morokoff, P.J., Quina, K., Harlow, L.L., Johnsen, L.W., Grimley, D.M., Gibson, P.R., & Burkholder, G. (1996). The sexual assertiveness scale (SAS) for women: Development and validation. Manuscript submitted for publication.

Petosa, R. & Jackson, K. (1991). Using the health Belief Model to predict safe sex intentions among adolescents. Health Education Quarterly, 18 (4), 463-476.

Petosa, R., & Wessinger, J. (1990). Using the Health Belief Model to assess the HIV education needs of junior and senior high school students. International Quarterly of Community Health Education, 10, 135-143.

Prochaska, J.O., & DiClemente, C.C. (1983). Stages and processes of self-change in smoking: Towards an integrative model of change. Journal of Consulting and Clinical Psychology, 51, 390-395.

Prochaska, J.O., DiClemente, C.C., & Norcross, J.C. (1992). In search of how people change. American Psychologist, 47, 1102-1114.

Prochaska, J.O., & Goldstein, M.G. (1991). Process of smoking cessation: Implications for clinicians. Clinics in Chest Medicine, 12, 727-735.

Prochaska, J.O., Harlow, L.L., Redding, C.A., Snow, M.G., Rossi, J.S., & Velicer, W.F. (1990). Models of behavior change for condom use: Preliminary analyses in an AIDS-risking community sample (Contract #0-4115-002). Atlanta, GA: Centers for Disease Control and Prevention.

Prochaska, J.O., Norcross, J.C., & DiClemente, C.C. (1994). Changing For Good. New York: William Morrow and Company, Inc.

Prochaska, J.O., Redding, C.A., Harlow, L.L., Rossi, J.S. & Velicer, W.F. (1994). The Transtheoretical Model of change and HIV prevention: A review. Health Education Quarterly, 21 (4), 471-486.

Prochaska, J.O., Velicer, W.F., Rossi, J.S., Goldstein, M.G., Marcus, B.H., Rakowski, W., Fiore, C., Harlow, L.L., Redding, C.A., Rosenbloom, D. & Rossi, S.R. (1994). Stages of change and decisional balance for 12 problem behaviors. Health Psychology, 13 (1), 39-46.

Rose, J.S., Harlow, L.L., Morokoff, P.J., Quina, K., Lang, M., Johnsen, L.W., & Deiter, P. (1996). Using structural modeling to assess comparability across revised scales and diverse samples. Manuscript submitted for publication.

Quina, K., Harlow, L., Gibson, P., & Morokoff, P. (1990, August). Psychometric investigation of a sexual assertiveness scale. Paper presented at American Psychological Association annual meeting, Boston, MA.

Redding, C.A., & Rossi, J.S. (in press). Testing a model of situational self-efficacy for safer sex among college students: Stage and gender-based differences. Psychology & Health.

Redding, C.A., Rossi, J.S., Velicer, W.F. & Prochaska, J.O. (1989, August). The pros and cons of safer sex: A measurement model. Paper presented at the 97th annual convention of the American Psychological Association, New Orleans, LA.

Riley, G.E., Grimley, D.M., Prochaska, J.O., Redding, C.A., Ruggiero, L., Velicer, W.F., Rossi, J.S., Galavotti, C. & Cabral, R.J. (1993, August). Self-efficacy for contraceptive and condom use in women at risk for HIV infection or transmission. Presented at the 101st annual meeting of the American Psychological Association, Toronto, Canada.

Rosenstock, I.M. (1974). Historical origins of the Health Belief Model. Health Education Monographs, 2 (4), 328-335.

Rosenstock, I.M. (1974). The Health Belief Model and preventive health behavior. Health Education Monographs, 2 (4), 354-386.

Rosenstock, I.M., Strecher, V.J. & Becker, M.H. (1994). The Health Belief Model and HIV risk behavior change. In R. DiClemente, & J. Peterson (Eds.), Preventing AIDS: Theories and methods of behavioral interventions, (pp. 5-24). New York and London: Plenum Press.

Rosenthal, D.A., Hall C. & Moore, S.M. (1992). AIDS, adolescents and sexual risk taking: A test of the Health Belief Model. Australian Psychologist, 27, 166-171.

Tabachnick, B.G., & Fidell, L.S. (1989). Using multivariate statistics (2nd Edition). New York: HarperCollins Publisher, Inc.

Tabachnick, B.G., & Fidell, L.S. (1996). Using multivariate statistics (3rd Edition). New York: HarperCollins Publisher, Inc.

Velicer, W.F., DiClemente, C.C., Rossi, J.S., & Prochaska, J.O. (1990). Relapse situations and self-efficacy: An integrative model. Addictive Behaviors, 15, 271-283.

Velicer, W.F., DiClemente, C.C., Prochaska, J.O., & Brandenburg, N. (1985). A decisional balance measure for assessing and predicting smoking status. Journal of Personality and Social Psychology, 48, 1279-1289.

Yesmont, G.A. (1992). The relationship of assertiveness to college students' safer sex behaviors. Adolescence, 27 (106), 253-272.