

Impact of Marriage on HIV/AIDS Risk Behaviors Among Impoverished, At-Risk Couples: A Multilevel Latent Variable Approach

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Studies among normative samples generally demonstrate a positive impact of marriage on health behaviors and other related attitudes. In this study, we examine the impact of marriage on HIV/AIDS risk behaviors and attitudes among impoverished, highly stressed, homeless couples, many with severe substance abuse problems. A multilevel analysis of 368 high-risk sexually intimate married and unmarried heterosexual couples assessed individual and couple-level effects on social support, substance use problems, HIV/AIDS knowledge, perceived HIV/AIDS risk, needle-sharing, condom use, multiple sex partners, and HIV/AIDS testing. More variance was explained in the protective and risk variables by couple-level latent variable predictors than by individual latent variable predictors, although some gender effects were found (e.g., more alcohol problems among men). The couple-level variable of marriage predicted lower perceived risk, less deviant social support, and fewer sex partners but predicted more needle-sharing.

KEY WORDS: HIV/AIDS risk behaviors; latent variable models; marriage; multilevel models; needle-sharing.

INTRODUCTION

The correlates and predictors of HIV/AIDS risk and protective behaviors have been studied primarily at the level of the individual. However, many HIV risk-related behaviors occur within couples and not enough attention has been paid to this social level (O'Leary *et al.*, 2003). Risky sexual behavior may be due to mutual influences within a couple (Sherman and Latkin, 2001), individual attributes (Trobst *et al.*, 2002), or perhaps both. Individual anal-

yses do not separate the two levels of effects. Moreover, they cannot discern their relative importance or differential influences at each level (Wendorf, 2002).

Although prior research has found value in intervening at the couple level, this technique has been employed very infrequently in HIV/AIDS prevention intervention trials (Kelly and Kalichman, 2002). Padian and colleagues reported that counseling at the couple level as well as at the individual level has been effective in increasing condom use and reducing anal intercourse (Padian *et al.*, 1993, 1994). In support of this viewpoint, Wermuth (1996) stressed that HIV prevention programs need to reach sexual partners of substance abusers in addition to the abusers themselves. Salt *et al.* (1990) found that the interaction between couples and contextual factors need to be considered when studying determinants of health promoting behaviors such as condom use.

The importance of developing effective theoretical HIV/AIDS risk-reduction programs coupled with analytic problems posed by data from couples

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provides the basis for the two major goals of this paper. The primary goal is substantive and the secondary goal is methodological. Our primary interest is examining the role of marital status in the prediction of high-risk behaviors in a sample of impoverished, homeless sexually intimate couples. We include theoretical psychological and behavioral constructs (types of social support, substance use problems, AIDS knowledge, and perceived risk of HIV/AIDS), and variables directly related to HIV/AIDS risk and protection: Multiple sex partners, needle-sharing, condom use, and HIV/AIDS testing. The demographic variable of gender, an individual characteristic, is included as well.

The analytic problem when data are analyzed from nested groups, in this case, individuals within couples, is the second focus of this paper. When data from couples are analyzed in a single-level model, observations are not independent and standard statistical methods are inappropriate (Kenny *et al.*, 2002). Dyadic data are non-independent due to their composition (non-random assortment into a group) and through mutual influence (Kenny, 1996). Non-independent observations lead to standard errors that are too small thereby increasing type-I error (Bryk and Raudenbush, 1992; Heck and Thomas, 1999).

The Comprehensive Health Seeking and Coping Paradigm (CHSCP; Nyamathi, 1989) is the theoretical framework that underlies this study. The CHSCP was adopted from the Lazarus and Folkman (1984) Stress and Coping Paradigm and the Schlotfeldt (1981) Health Seeking Paradigm. This framework has guided our research program investigating HIV/AIDS risk behaviors among homeless men and women, many of whom are immersed in the drug culture (e.g., Nyamathi *et al.*, 1995, 2000a,b, 2003).

In the multilevel model tested in this study, four components of the CHSCP that have been demonstrated to be relevant to AIDS risk behavioral outcomes in prior research are used as correlates and/or predictors of HIV/AIDS risk and protective behaviors among high-risk couples. These components include: Psychosocial factors (social support from drug users, deviant social support, and from non-drug users, non-deviant social support, e.g., Nyamathi *et al.*, 2000a,b); cognitive factors (AIDS knowledge and perceived risk of HIV/AIDS); substance abuse-related variables (drug problems and alcohol problems), and sociodemographic variables (gender and marital status).

In this study, we examine whether the influence of types of social support differs at the individual or couple level. We include deviant and non-deviant sources of support in our model. We have found previously that social support may be a “mixed blessing” if the reference group for support resides in a deviant subculture that promotes drug use and unsafe behaviors associated with AIDS risk. Nyamathi *et al.* (2000b) reported more emotional distress predicted by deviant social support and less distress predicted by positive sources of social support among homeless women. Additionally, non-deviant social support as opposed to deviant support has been associated with more active coping, lower levels of anxiety and depression, and less likelihood of drug and alcohol use (Nyamathi *et al.*, 2000a). Whether this finding extrapolates to couples is unclear. The type and quality of the support network of the couple may be more central to their risk-related outcomes than support at the level of the individual. We expect that those that are married to each other will report higher levels of non-deviant social support.

Research using the CHSCP has found cognitive factors to be predictors of HIV-related behaviors (Nyamathi *et al.*, 1995). For instance, Nyamathi *et al.* (2000c) found an association between greater perceived risk for AIDS and more HIV testing. Other studies report a positive association between perceived susceptibility to contracting AIDS and risky behaviors (e.g., Ratliff-Crain *et al.*, 1999) although others have not found such a relationship (Robertson and Levin, 1999; Sarkar, 2001).

The cognitive factor of AIDS knowledge is also included in the model. Studies assessing the impact of knowledge have had mixed results. Some studies have found associations between greater knowledge and fewer risk behaviors (e.g., Avants *et al.*, 2001; Bazargan *et al.*, 2000; Stein and Nyamathi, 2000) and others have not (e.g., Lanier *et al.*, 1999; Ratliff-Crain *et al.*, 1999; Robertson and Levin, 1999; Sarkar, 2001). In a multilevel study by Morisky *et al.* (2002), AIDS knowledge emerged as important at the individual level rather than at the group level in predicting condom use. However, this finding among commercial sex workers nested within establishments may not extrapolate to the relationship within an intimate couple with its higher degree of mutual influence, and when looking at other AIDS-related outcomes in addition to condom use such as number of partners and HIV/AIDS testing.

Problems with drugs and alcohol are pervasive in homeless populations. This study provides an

opportunity to assess the impact of drug and alcohol problems on risk-related variables and also to ascertain if the model for married versus unmarried couples explains more variance and more associations with the outcomes when their dyadic status is included.

Not all of the intimate couples in this study are married to each other. This situation provides a sociodemographic difference at the couple level that can be used to assess whether there is a protective influence of the formal commitment of marriage in this high-risk group. Prior studies among normative samples have generally demonstrated a positive impact of marriage on health (Waldron *et al.*, 1996). It has been suggested that marriage regulates conduct and encourages healthy behaviors (Anson, 1989; Umberson, 1987, 1992). Whether the positive effect of marriage extrapolates to impoverished, highly stressed married couples, many with severe substance abuse problems, needs exploration.

We expect that married couples will report fewer behaviors positively associated with HIV/AIDS risk such as multiple sex partners. However, it is possible that marriage will not be protective in this sample. Marital status may, for instance, be relatively unrelated to the number of recent sex partners they report, or marriage may reduce condom use when such use would be warranted due to prior or current infidelity (Hirsch *et al.*, 2002), intravenous drug use (Seidlin *et al.*, 1993), unreported homosexual activities (Earl, 1990), or needle-sharing by one of the partners (Wells *et al.*, 1994). The greater trust and intimacy of marriage may increase some HIV/AIDS risk behavior such as more needle-sharing with the spouse. There is a belief or hope in the safety of monogamy even though one or both of the partners may not be “safe” due to prior or current risky practices (Hirsch *et al.*, 2002).

We also include gender effects on HIV/AIDS risk behaviors and subsequent intervention strategies (e.g., Mize *et al.*, 2002). Gender is an individual “within-subjects” variable in our sample of heterosexual couples. In research among at-risk men and women, Stein and Nyamathi (1999, 2000) found significant gender differences in behaviors and attitudes associated with AIDS risk. For example, Stein and Nyamathi (1999) found no relationship between stress and sexual risk behaviors for the men, whereas the relationship was powerful for the women. Stein and Nyamathi (2000) reported that men evaluated their risk of AIDS significantly lower than the women although they reported more sexual

risk behaviors and equally risky injection drug use behaviors. The men also reported less HIV testing.

The current sample was designed deliberately to include a subset of heterosexual couples that are clearly described as intimate sexual partners. This subgroup of intimate partners, both married and unmarried, requires a multilevel framework because of the dependence that exists due to the nesting of the individuals within couples (Kenny *et al.*, 2002; Raudenbush *et al.*, 1995). In this paper, we estimate a two-level multilevel model (individuals and couples).

Multilevel models are recognized as excellent analytic methods for dyadic data with a nested structure (Bryk and Raudenbush, 1992; Duncan *et al.*, 1996; Goldstein, 1995; Heck and Thomas, 1999; Wendorf, 2002). These are regression models in which the sample covariance matrix is partitioned in two parts (the variance due to different couples and the variance due to individuals differing within couples). The percent of variance in the dependent variable that is accounted for by the grouping variable is called the intraclass correlation coefficient (ICC). The extent that the ICC is greater than zero indicates the need for a multilevel approach. After partitioning, the contribution of within- and between-level variables operating at more than one level (in our analysis, the level of the individual and the level of the couple) can be estimated.

Multilevel models can employ latent variables operating at several levels (Duncan *et al.*, 1998). Latent variable modeling allows correlations or simultaneous equations relations among unobserved but hypothesized unmeasured variables, with indicators of these latent variables serving as a factor analysis type of measurement model (Li *et al.*, 1998). In this paper, we analyze HIV/AIDS risk behaviors in individuals and couples using latent variables with a maximum likelihood (ML) approach in a two-level model (Bentler and Liang, 2002).

The interactions within couples may be equal to or more important than their individual actions (Hayden *et al.*, 1998). It would be useful to know which psychosocial and AIDS risk-related variables are more important on a couple level as well as the specific contribution of marital status to risk and protection. This analysis may therefore provide information on whether it is reasonable and cost-effective for intervention programs designed to reduce HIV/AIDS risk to concentrate on individuals and disregard their relationship status, or whether such programs would be more constructive and effective if the couple were the target of intervention.

Predictive variables employed in both the individual and couples models include the theoretical variables (types of social support, AIDS knowledge, drug problems, and alcohol problems). Perceived Risk for HIV/AIDS is used as an intermediate predictor. The outcome variables include four indicators of risk and protection: Needle-sharing, condom use frequency, the number of sex partners, and whether they have gone for HIV/AIDS testing.

Multiple sexual partners and needle-sharing are high-risk behaviors. Condom use is promoted in most interventions, and HIV/AIDS testing is encouraged for high-risk individuals as well (Kelly and Kalichman, 2002; Stein and Nyamathi, 2000). Voluntary testing allows access to treatment and may motivate behavior change and greater awareness of AIDS risk. It would be most effective if both members of a high-risk couple were to have been tested.

Specific to the between-couples level we include a variable, "married to each other." Based on prior research, we expect marriage to be protective on drug and alcohol problems, perceived risk for HIV/AIDS, sources of social support, and number of sexual partners. However, we hypothesize that marriage will also predict more needle-sharing and less condom use. At the individual level, we expect that the males will report more drug and alcohol problems (e.g., Halford and Osgarby, 1993), lower perceived risk for HIV/AIDS, less HIV testing, and that they will report more sexual partners (e.g., Stein and Nyamathi, 1999, 2000).

METHOD

Participants and Procedure

Assessments were conducted among 1061 homeless and/or impoverished men and women participating in a health promotion study conducted in homeless shelters and sober living recovery programs in Los Angeles. Within this sample of 1061 people, 736 were in intimate heterosexual relationships (368 couples, 24% married to each other). These 368 couples are included in the current study. The individuals are primarily of minority ethnicity (over 80% African-American and Hispanic) and many are drug-addicted or recovering from drug addiction. Participants range in age from 16 to 65 years (mean age = 36 years). All individuals used in the current study were HIV-negative as indicated by testing performed after their participation in the baseline survey.

After obtaining voluntary informed consent, baseline data were collected with face-to-face questionnaires administered in English and Spanish by trained research nurses and outreach workers. All participants were interviewed separately and modestly compensated. Participants were eligible for the intervention study if they met the following criteria: 15–65 years of age; homeless; and had an intimate partner who was willing to participate in the study. For the larger study, the partner did not need to be of the opposite sex but only heterosexual couples are included in this current analysis. Scales were pilot tested using focus groups to determine their clarity and sensitivity to the culture and living conditions of the participants (Nyamathi and Lewis, 1991). Content validity of the scales and measures was established through review and consensus of a 12-member expert panel experienced in the areas of medical research, ethnic/racial diversity, psychosocial constructs, and measurement.

Measures

Deviant social support: This construct consists of five indicators that are responses to five questions concerning various forms of support from drug-using friends or family. These items were on a 1–5 scale ranging from *none of the time* to *all of the time*. The items assessed the amount of time he/she had family or friends available to: Have a good time, provide food or a place to stay, listen to them talk about themselves or their problems, accompany them to an appointment to provide moral support, and show that they love or care for them.

Non-deviant social support: This construct was identical to deviant social support but was concerned with various forms of support from non-drug-using friends or family.

Drug problems: Drug problems were assessed with seven items scaled 0 (*never*) to 4 (*almost always*) that asked how their use of drugs affected their physical health, relationships, general attitude, attention and concentration, their work, their finances, and arguments and fights.

Alcohol problems: Alcohol problems were assessed similarly to the drug problem construct with the same seven items assessing how alcohol had affected various areas of their lives.

Perceived risk for HIV/AIDS: Five risk-perception items from the Copasa Health Protection Questionnaire (Erickson *et al.*, 1989) were included in this construct. Four items were assessed on 1–5

rating scales ranging from *disagree strongly* to *agree strongly* and reverse-scored where applicable. (1) I've already done plenty that could have exposed me to AIDS, (2) I've never done anything that could give me AIDS, (3) My chances of getting AIDS are great, (4) I don't think I'm at risk for AIDS. The fifth item was a rating of their chances of getting AIDS ranging from 1: *no chance* to 4: *high chance*.

Needle-sharing: Needle-sharing was indicated by two items. The first item was the number of people with whom they had shared needles in the past 6 months; the second was how often they used "works" (drug paraphernalia) that were dirty ranging from 1: *never* to 5: *all of the time*.

Single-Variable Items

AIDS knowledge: The participants were administered a 21-item test of knowledge about AIDS. This is a one-item variable that consists of the participant's score on the test (i.e., the number of items answered correctly).

Number of sexual partners in the past 6 months was a single-item indicator that was log-transformed to avoid extreme skewness and kurtosis. Only eight participants reported more than 10 sexual partners in the past 6 months and 550 participants reported one sexual partner.

Condom use frequency assessed how often they used a condom in the last 6 months when they had sex, ranging from 1: *never* to 8: *everyday*.

HIV/AIDS test: Whether they were tested in the last 6 months (1: *no*; 2: *yes*).

Demographics: Gender (1: *female*; 2: *male*); married to each other (0: *no*; 1: *yes*). Twenty-four percent of the couples reported being married to each other.

Data Analyses

We used the EQS structural equations program that includes a special maximum likelihood estimation procedure available for multilevel models (Bentler, 2004; Bentler and Liang, 2002). There were two phases to the analysis. The first phase involved evaluating an aggregated model of the entire data set with a confirmatory factor analysis (CFA) while ignoring its multilevel structure; the second phase tested the disaggregated multilevel structure. In the aggregated analysis, the maximum-likelihood χ^2 statistic was corrected with the Satorra-Bentler robust χ^2 statistic to account for non-normality (Bentler, 2004). Mardia's normalized multivariate

kurtosis estimate was very high (z -statistic = 226.39). Fit was assessed with the comparative fit index (CFI), the robust comparative fit index (RCFI) (Bentler, 2004), and the root mean square error of approximation (RMSEA, Browne and Cudeck, 1993). The CFI and RCFI range between 0 and 1 and compare the relative fit of the hypothesized model to a baseline model of independence among the measured variables. Values greater than 0.95 are desirable, indicating that the hypothesized model reproduces 95% or more of the covariation in the data. The RMSEA indicates fit per degrees of freedom, controlling for sample size; values less than 0.06 indicate a relatively good fit between the hypothesized model and the observed data (Bentler, 2004).

The second phase of analysis fit a two-level model that accounted for the variability of individuals within couples and for the variability between couples (Bentler and Liang, 2002). We initially calculated the ICC to assess the amount of variance in the variables accounted for by the grouping variable (Heck and Thomas, 1999). If the ICC is very low, there is very little variance accounted for by grouping the individuals, and a multilevel model is unnecessary. A large ICC implies that persons within a couple are more alike each other than people in other couples, and that a multilevel approach is necessary. The sample covariance matrix was then partitioned into the variance due to couples differing and the variance due to individuals differing within couples. In addition to the partitioned variables we also included variables that were meaningful only at the individual level (gender) and only at the couple level (marital status).

RESULTS

Aggregated Analysis

The initial CFA of the aggregated measurement model on the total sample of 736 subjects had an excellent fit: ML χ^2 (634) = 1394.43, CFI = 0.97, RMSEA = 0.04, $p < 0.001$; Robust χ^2 (634) = 1001.10, RCFI = 0.98, RMSEA = 0.028, $p < 0.001$. This model had no supplementary parameters added to improve the fit except for a priori correlated error residuals of similar measured items from the drugs and alcohol latent variables (e.g., problems with health due to drugs, problems with health due to alcohol). The factor loadings of the measured variables in the aggregated model are reported in Table I, column 3. All loadings were statistically significant.

Table I. Intraclass Correlations, Variable Means, and Factor Loadings Presented in Standardized Form in Aggregated and Multilevel Models

Constructs and measured variables	Mean	Intraclass correlation	Aggregated factor loadings	Within-factor loadings	Between-factor loadings
Deviant social support (1–5)					
Good time	1.8	0.24	0.73	0.67	0.89
Provide food/place to stay	1.7	0.16	0.84	0.81	0.93
Listen to	1.8	0.19	0.89	0.88	0.94
Accompany	1.6	0.15	0.86	0.86	0.88
Show love and care	1.8	0.20	0.88	0.87	0.91
Non-deviant social support (1–5)					
Good time	3.3	0.23	0.79	0.76	0.86
Provide food/place to stay	3.2	0.29	0.84	0.81	0.89
Listen to	3.4	0.19	0.89	0.88	0.93
Accompany	3.2	0.25	0.87	0.84	0.94
Show love and care	3.6	0.21	0.87	0.84	0.95
Drug problems (0–4)					
Health	1.2	0.35	0.84	0.78	0.93
Relations	1.6	0.39	0.94	0.91	0.99
Attitude	1.5	0.33	0.96	0.94	0.99
Attention	1.5	0.36	0.95	0.92	0.98
Work	1.5	0.42	0.90	0.85	0.97
Finances	1.7	0.43	0.93	0.88	0.98
Fights	1.5	0.36	0.92	0.89	0.98
Legal	1.1	0.34	0.79	0.72	0.91
Alcohol problems (0–4)					
Health	0.8	0.26	0.76	0.69	0.91
Relations	1.2	0.28	0.93	0.91	0.96
Attitude	1.2	0.22	0.95	0.94	0.98
Attention	1.2	0.22	0.94	0.93	0.97
Work	1.1	0.30	0.88	0.85	0.96
Finances	1.2	0.24	0.89	0.88	0.93
Fights	1.2	0.18	0.91	0.89	0.95
Legal	0.8	0.18	0.78	0.72	0.92
Perceived risk for AIDS					
Done plenty (1–5)	3.0	0.23	0.65	0.52	0.88
Never done anything (R) (1–5)	3.6	0.18	0.47	0.39	0.68
Chances are great (1–5)	2.4	0.18	0.54	0.51	0.66
Not at risk (R) (1–5)	2.9	0.10	0.43	0.39	0.63
Chances rating (1–4)	2.0	0.29	0.65	0.63	0.73
Needle-sharing					
Number of people (0–4)	0.1	0.45	0.81	0.64	0.93
How often dirty works (1–5)	1.1	0.57	0.82	0.57	0.99
AIDS knowledge (0–21)	15.9	0.37	1.00	1.00	1.00
Condom use frequency (1–8)	1.4	0.36	1.00	1.00	1.00
HIV/AIDS test (1–2)	1.4	0.35	1.00	1.00	1.00
Number of partners (1–200) ^a	2.1	0.23	1.00	1.00	1.00

Note. R: reverse-scored.

^aTransformed in analyses due to skewness and kurtosis.

Multilevel Analysis

Intraclass Correlations

As a preliminary step, the ICCs on the measured variables were calculated to determine the ex-

tent of relationship of the variables between couples. The ICCs are reported for all measured variables in Table I, column 2. The ICCs range from 0.10 to a high of 0.57. The strongest intraclass correlations were for the needle-sharing measured variables (0.45 and 0.57) and the drug problem variables (0.34–0.43).

Measurement Model

Standardized factor loadings of the measured variables on the latent variables are reported for the within-level and the between-level analyses in Table I, columns 4 and 5. As can be observed from the table, the factor loadings in the between-level analysis tended to be larger than those in the within-level analysis. The greatest differences between the within- and between-factor loadings occurred for drug problems and needle-sharing. These larger loadings indicate that the observed variables are more highly predicted by the between-couple factors than by the within-couple factors. This means that our theoretical model is stronger at the couple level than at the individual level.

As expected, the χ^2 was large, Bentler–Liang goodness-of-fit χ^2 (1252) = 1858.21, RMSEA = 0.026. The RMSEA fit index of 0.026 indicates a well-fitting model. Correlations among the latent variables and the individual within and between measured variables of gender and marital status are reported in Table II. Taking particular note of significant associations with marital status, marriage was associated with less deviant social support, fewer drug problems, lower perceived risk of HIV/AIDS, less condom use, and fewer sex partners. The final path model reported below also had excellent fit statistics: Bentler–Liang goodness-of-fit χ^2 (1324) = 1798.68, RMSEA = 0.022. The RMSEA fit index of 0.022 indicates a well-fitting model.

Within-Couples Predictive Analysis

The final within-couples multilevel model is depicted in Fig. 1, in the top portion. Only significant paths with their standardized coefficients are included in the diagram. There were a few significant gender differences. Women reported a higher Perceived Risk of HIV/AIDS; men reported more Alcohol Problems than women.

Drug Problems and Alcohol Problems predicted greater Perceived Risk for HIV/AIDS. Sixteen percent of the variance in Perceived Risk was explained by Drug and Alcohol Problems and Gender. Needle-sharing was predicted by greater Perceived Risk, Drug Problems, Deviant Social Support, and less Non-Deviant Social Support. Despite having several predictors, only 8% of the variance in needle-sharing was explained by these predictors. Condom use was predicted by more Perceived Risk for HIV/AIDS and more drug problems (5% variance explained). Perceived Risk for HIV/AIDS also predicted a greater number of sex partners (10% variance explained). HIV/AIDS testing was not predicted by any of the variables in the within levels model. AIDS knowledge was not associated with any of the outcome behaviors.

Between-Couples Predictive Analysis

The final model is presented at the bottom of Fig. 1. More variance was accounted for in the dependent risk and sexual behavior constructs in the couple-level model than in the individual-level

Table II. Correlations Among Between-Level and Within-Level Constructs*

	1	2	3	4	5	6	7	8	9	10	11	12
1. Deviant social support	—	0.12	0.31 ^b	0.32 ^b	-0.12	0.31 ^b	0.10	0.02	0.05	0.34 ^b	—	-0.18 ^a
2. Non-deviant social support	0.10 ^a	—	-0.13	-0.15	0.06	-0.22	-0.06	-0.17	0.07	-0.20	—	-0.03
3. Drug problem	0.02	-0.02	—	0.83 ^c	0.08	0.66 ^c	0.19 ^a	0.05	0.33 ^c	0.36 ^c	—	-0.15 ^a
4. Alcohol problem	0.06	-0.05	0.59 ^c	—	-0.04	0.50 ^c	-0.06	0.05	0.24 ^a	0.40 ^c	—	-0.10
5. AIDS knowledge	-0.08 ^a	0.05	0.04	0.08 ^a	—	0.30 ^b	0.10	0.19	0.43 ^c	-0.15	—	-0.11
6. Perceived risk for AIDS	0.03	-0.05	0.38 ^c	0.32 ^c	-0.01	—	0.26 ^b	0.30 ^b	0.46 ^c	0.28 ^a	—	-0.31 ^c
7. Needle-sharing	0.09	-0.12 ^a	0.21 ^c	0.23 ^c	-0.06	0.22 ^c	—	0.12	0.10	0.05	—	0.05
8. Condom use frequency	0.04	0.01	0.22 ^c	0.03	-0.02	0.19 ^c	-0.02	—	0.20	0.24 ^a	—	-0.20 ^b
9. HIV/AIDS test	-0.03	-0.01	0.02	0.01	0.07	0.04	0.07	-0.01	—	0.14	—	-0.12
10. Number of sex partners	0.01	0.02	0.16 ^c	-0.04	-0.03	0.32 ^c	-0.03	0.29 ^c	0.01	—	—	-0.30 ^c
11. Male gender**	-0.02	-0.03	-0.03	0.11 ^c	0.03	-0.07	0.03	-0.04	-0.05	-0.07 ^a	—	—
12. Married to each other**	—	—	—	—	—	—	—	—	—	—	—	—

*Between-level correlations above the diagonal. Within-level correlations below the diagonal.

**Gender is not a between-couples variable. Married to each other is not a within-subjects variable.

^a $p \leq 0.05$. ^b $p \leq 0.01$. ^c $p \leq 0.001$.

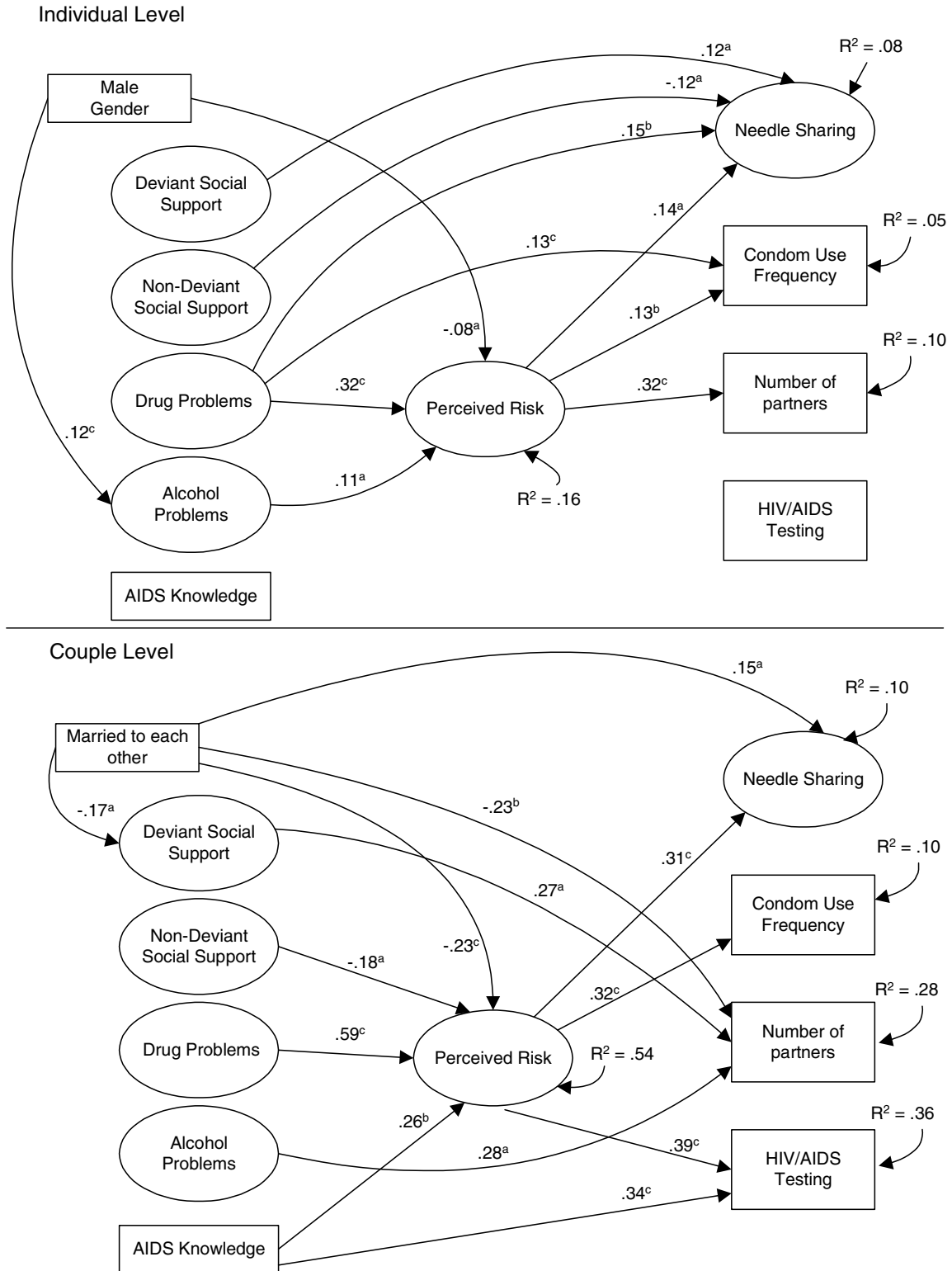


Fig. 1. Results of within-level and between-level analysis predicting AIDS risk and protective behaviors with standardized estimates of regression coefficients. *Large ovals* designate latent variables; *rectangles* represent single-indicator constructs; ^a*p* < 0.05; ^b*p* < 0.01; ^c*p* < 0.001

model. Married couples reported less Perceived Risk, fewer sex partners and less Deviant Social Support but also reported more Needle-Sharing. Perceived Risk was predicted by less Non-Deviant Social Support, more Drug Problems, and more AIDS Knowledge (54% variance explained). In addition to the marriage variable, Needle-Sharing was predicted by greater Perceived Risk (10% of variance explained). Condom Use Frequency was predicted by Perceived Risk (10% of variance). In addition to the marriage variable, number of partners was predicted by Deviant Social Support, and Alcohol Problems (27% of variance). Along with Perceived Risk, greater AIDS knowledge also predicted more HIV/AIDS testing among the couples (36% of variance).

DISCUSSION

The two goals of this paper were to assess the influence of marriage within impoverished at-risk couples on theoretical HIV/AIDS risk-related variables and AIDS-related behaviors; and to address analytic problems posed by data from couples. Our findings demonstrate that the mutual influences and behaviors operating within couples can heighten their risk, or, on the other hand, enhance their protective behaviors. Clearly, the multilevel analysis was an appropriate and informative method to use in investigating relationships among HIV/AIDS-related variables in a population of intimate couples. Our results support the contention that dyadic relationships among at-risk couples, whether they are married or not, must not be overlooked in HIV/AIDS risk-reduction programs.

We accounted for substantially more variance in our outcome variables in the couple model versus the individual-level model, and some key variables were particularly impacted at the couple level. These variables included the types of social support they experienced, drug problems, needle-sharing, AIDS knowledge, and condom use. Our results suggest that intervention at the couple level may prove to be more successful in effecting meaningful behavior change.

These findings also have particular relevance to treatment for drug abuse problems. It is likely that, if one partner has drug problems, the other partner has problems too. Treating only one member of a substance-abusing couple may be inadequate. We also found that males reported more alcohol problems. Thus, alcohol problems appear to be more individualized, more likely among males, and less de-

pendent on or influenced by behavior of the other member of a dyad. This finding suggests that alcohol treatment and outreach do not necessarily need to include the other member of a couple but rather can be approached on an individual level.

Our couple-level analysis allowed us to examine the impact of marriage on the variables included in this study. We found a generally positive and protective influence of marriage on many risky or risk-associated behaviors. Married couples reported fewer deviant, substance-abusing sources of social support and fewer sex partners than the unmarried intimate couples. However, due to the high-risk nature of the entire sample, the married couples may be experiencing a false or exaggerated sense of security because they also reported a lower perceived risk for AIDS. Although to some extent this could be an accurate assessment of their risk level, it may also signal a problem because marriage was associated with more needle-sharing. Those who share needles with their intimate partner often share needles with others as well (Wells *et al.*, 1994). Also, married individuals in this sample did report some extra-marital sexual activities. Although the unmarried intimate partners reported more sexual partners in the past 6 months ($M = 2.4$ partners) than the married partners, the married partners reported a mean of 1.2 sexual partners in the past 6 months, which indicates that not all marital partners were monogamous. Although marriage did not directly predict greater use of condoms in the predictive model, there was a significant correlation between less condom use and marriage in the confirmatory model. Also, there was a significant indirect effect of marriage on condom use mediated through their lower perceived risk of contracting HIV/AIDS.

Although we expected to observe gender differences similar to those that surfaced in other studies (e.g., Stein and Nyamathi, 1999, 2000), such differences did not emerge in this group of individuals nested within their influential intimate relationships. The influences within the couples overshadowed the effects of gender. In addition, this is a subsample of people who are in intimate relationships rather than all of the participants in the Stein and Nyamathi (2000) study. In the larger study (Stein and Nyamathi, 2000), women reported more HIV/AIDS testing than men. Single, uncommitted individuals are not included in the current study and that may explain the lack of association with female gender and HIV/AIDS testing in this study. As reported above, the males reported more

problems with alcohol. In addition, they reported less perceived risk of contracting HIV/AIDS.

Our results highlight the value of designing outreach efforts at the couple level. There was a greater amount of variance explained in the outcome variables and, generally, more substantial predictive paths between the theoretical constructs and the outcome behaviors in the couples model than in the individual model. For instance, perceived risk was an important intermediate variable in both the individual and couples models. However, it played a more powerful role in the couples model. It was predicted more strongly by couple-level drug problems, less non-deviant social support and AIDS knowledge, was lower among the married couples than at the individual level, and was a more powerful predictor of the outcomes.

Greater AIDS knowledge had significant effects at the couple level on both greater perceived risk and more HIV/AIDS testing, whereas it did not have any predictive effect in the individual-level model. Perhaps this finding is one explanation for the mixed and weak results that have been shown in various studies assessing the impact of knowledge on behaviors and on perception of risk. If both members of an intimate couple are not well-informed, the knowledge of one member may not be enough to impact behaviors normally performed mutually. The results imply that educational efforts at the couple level, in which the knowledge of both partners is increased, would help in AIDS prevention by enhancing risk perception and encouraging more AIDS testing. Given the important role HIV/AIDS testing can play in HIV/AIDS prevention, these findings clearly indicate that greater knowledge within couples can enhance efforts to have more at-risk individuals tested for HIV and AIDS.

The results also imply that some interventions should acknowledge the possibility of risky behaviors among at-risk married couples. For instance, those doing outreach among at-risk populations with substance abuse problems should be aware of the greater likelihood of needle-sharing among married couples that may be accompanied by a lower and perhaps misguided perception of risk. The current sample is cross-sectional and no intervention was delivered to this group. It would be useful in future research to compare intervention strategies in a longitudinal sample of intimate married and unmarried couples by intervening with individuals in one setting and with couples in another. That would be an excellent test of the various findings in this study.

A secondary goal of this study was to demonstrate the value and appropriateness of using a multi-level analysis when studying couples. The predictive paths among the theoretical constructs and the outcome variables in the couples model explained more variance. The couples are more "alike" which we knew from the preliminary analysis of the intraclass correlations, but the finding of greater explanatory power is an indication that using a data set with unanalyzed or unaccounted for dependencies may lead to distortion of associations in the data set on substantive theoretical issues. When the sources of variance were partitioned in the multilevel model, important relationships among the variables were established more clearly.

Morisky *et al.* (2002) used the method demonstrated here in a study among Filipino commercial sex workers who were nested within establishments. In that study, the clusters varied in size widely and individual effects on condom use were assessed in addition to between-establishment effects. AIDS knowledge was important at the individual level but not at the between-establishment level whereas in this current study, AIDS knowledge is more important at the couple level. Recognizing this distinction that has practical implications for outreach programs would not be possible without the fine-grained analysis offered by modern multilevel techniques. This is a case of advanced methodology working well with practical considerations.

Due to the fact that this sample is cross-sectional, influences and behaviors can be opposite from the direction in which we have placed them. The directionality of our path model, however, appears logical and defensible. Some reversed pathways would be highly unlikely. Reliability of the responses of the participants to the questionnaire is also an issue, especially among substance-abusing, impoverished individuals (Schroder *et al.*, 2003). However, every effort was made to establish rapport between the study participants and the interviewers. The generally positive effect of marriage may also reflect selection effects that have been observed for associations between marriage and physical health (Waldron *et al.*, 1996). It also would have been helpful to know with more specificity with whom the participants shared needles.

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