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Predicting Sexual Risk Behaviors among Adolescent and Young Women Using a Prospective Diary Method

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Abstract

We describe the sexual risk behaviors, psychological distress, and substance use of 102 late adolescent girls and identify predictors of protected and unprotected vaginal sex. Participants completed questionnaires assessing hypothesized predictors and then daily behavioral diaries for 12 weeks. Protected intercourse was predicted by baseline sexual behavior, greater knowledge, positive condom attitudes, lower perceived condom-use difficulty, greater condom-use intentions, more drinking days, less binge drinking, less Ecstasy use, and lower psychological distress. Unprotected intercourse was predicted by baseline sexual behavior, binge drinking, Ecstasy and opiate use, fewer drinking days, and fewer daily drinks. These findings suggest that psychological distress, substance use, and sexual risk behavior are interconnected and should be considered collectively in interventions for adolescent females.

Keywords

sexual behavior; HIV; adolescent girls; substance use; depression; diary

Decreasing adolescent girls' vulnerability to sexually transmitted infections (STIs), including the human immunodeficiency virus (HIV), is an important national health priority. Thus, an important goal in the *Healthy People 2010* initiative is to reduce sexual risk taking behaviors in adolescent and young women (U.S. Department of Health and Human Services, 2001). Almost one-half of sexually active persons will acquire a STI by age 25, and late adolescent girls, in particular, face pronounced risks for chlamydia and gonorrhea infections (Centers for Disease Control and Prevention [CDC], 2005). In 2003, females accounted for 50% of new HIV cases in persons ages 13–19 and 37% of cases in persons ages 20–24. When considering the HIV/AIDS rates in young adults, and assuming a time from HIV infection to diagnosis with AIDS averaging 5–10 years, many of these persons were infected

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as adolescents. Recent data support this interpretation, with three-quarters of adolescent HIV transmissions having occurred through heterosexual contact, and 89% of these transmissions diagnosed in girls (CDCP, 2004a). Yet, despite the extensive evidence indicating the effectiveness of condoms in preventing HIV transmission, a subset of adolescent girls continue to have unprotected sex, often in serially monogamous relationships (Morrison-Beedy, Carey, & Aronowitz, 2003).

Adolescence is a time of exploration, and often involves experimentation with sex and substance use, uncertainty, and emotional turmoil. More than 25% of respondents in the Youth Risk Behavior Survey (CDCP, 2004b) reported feeling so sad or hopeless on a daily basis that they stopped their usual activities. An adolescent girl's risk for HIV increases if she is psychologically distressed or depressed (DiClemente et al., 2001; Lehrer, Shrier, Gortmaker, & Buka, 2006), and if she cannot negotiate safer sex practices with her partner, particularly if she is under the influence of alcohol or other drugs (Morrison et al., 2003). Substance use often reflects an attempt to cope with mental health concerns including depression (Novotna et al., 1999), which may increase sexual risk taking.

Many of the risk behaviors initiated in adolescence covary (Lindberg, Boggess, & Williams, 2000; Shrier, Emans, Woods, & DuRant, 1997), including substance use, risky sexual behaviors, and depressive symptoms. Using the National Longitudinal Study of Adolescent Health (Add Health) data set, Waller et al. (2006) examined the relationship between patterns of risk behaviors (i.e., smoking, sex, drug, and alcohol use) and depressive symptoms. Overall, girls experienced more depressive symptoms than boys, and every risk behavior was related to increased depressive symptoms. Although their study was limited by its cross-sectional design, it provides evidence of the prominent nature of depressive symptoms in a nationally representative sample of adolescent girls.

The clustering of sexual and substance use behaviors was also observed in a recent study of clients attending an STD clinic (50% female); in this sample of patients with documented sexual risk behaviors, one-third of the females were also classified as having a substance use disorder (Cook et al., 2006). Other investigators have reported a significant association between substance use and risky sex in teens as young as 12–15 years (Bachanas et al., 2002). The co-occurrence of substance use and risky sex has not been found universally, however; for example, drinking before sex was not related to unprotected sex in girls attending an STD clinic (Fortenberry, Orr, Katz, Brizendine, & Blythe, 1997) nor in college students (deVisser & Smith, 2001).

In summary, psychological distress and depressive symptoms, substance use, and sexual health are often intertwined in girls from early to late adolescence and their interconnectedness needs to be clarified. To reduce the incidence of HIV in adolescent girls, health educators and other interventionists must develop effective, theoretically-driven gender-tailored interventions that target the determinants of sexual risk behavior (Fishbein, 2000).

One theoretical framework that has proven helpful in this context is the Information-Motivation-Behavioral Skills (IMB) model (J. D. Fisher & Fisher, 2000). The IMB model posits three constructs affecting sexual risk behavior: information, motivation, and behavioral skills. Individuals are predicted to engage in risk reduction to the extent that they are informed about HIV transmission and prevention, motivated to reduce their risk, and skilled with regard to performing HIV preventive behaviors. Evidence supporting the IMB model comes from several diverse groups, including samples of high school and college students (e.g., J. D. Fisher, Fisher, Bryan, & Misovich, 2002; J. D. Fisher, Fisher, Misovich, Kimble, & Malloy, 1996; W. A. Fisher, Williams, Fisher, & Malloy, 1999).

An important limitation of prior research has been the reliance upon retrospective recall of sexual risk behaviors. Such measures are limited by cognitive (e.g., memory) biases (Schroder, Carey, & Vanable., 2003). To minimize these biases, some authors have used a diary method (Durant & Carey, 2000; Graham, Catania, Brand, & Canchola, 2003; Jaccard, McDonald, Wan, Dittus, & Quinlan, 2002). This method reduces the burden of recalling long periods of sexual behavior, improving data quality. A second limitation evident in the literature is that few researchers have examined person factors with adolescent samples. As a heuristic framework, the IMB model allows for inclusion of person factors that might moderate the effects of information, motivation, and behavioral skills on sexual risk behavior. Researchers have investigated person factors in adults; for example, Carey, Carey, Weinhardt and Gordon (1997) extended the IMB to include mental health factors in adults with a mental illness, but little empirical work has addressed such person factors with adolescents.

To address these two limitations, we examined the potential influence of psychological well-being on sexual risk behavior in a prospective study, using daily diaries to measure sexual behavioral outcomes. The purposes of this study were to: (a) describe sexual risk behavior correlates in a sample of late-adolescent girls and (b) identify predictors of sexual risk behaviors. We predicted that the IMB constructs of information (increased knowledge about HIV), motivation (i.e., perceived social norms, behavioral intentions, condom attitudes), and behavioral skills (i.e., greater confidence in condom use, less perceived difficulty of performing AIDS preventive behaviors) would predict greater condom use and less risk behavior. We also predicted that fewer symptoms of psychological distress and less substance use would also be associated with more protected (and less unprotected) sexual behavior.

Methods

Participants

Following approval by the institutional review boards of the University of Rochester and Syracuse University, a sample of sexually-active, late-adolescent girls between the ages of 18–21 within an urban Northeast city was recruited. We approached clients in waiting areas at several clinical agencies providing family planning services to adolescents (56% of sample), and recruited through word-of-mouth and posted flyers (44% of sample). Eligibility criteria included that the girls were unmarried, sexually active with a male partner in the past 3 months, not pregnant, and able to converse in English. The girls in this prospective study ranged in age from 18 to 21 years ($M = 19.5$, $SD = 1.1$ years), with 66% describing themselves as White, 25% African-American, 7% Asian, and 2% American Indian and Pacific Islander; all were non-Hispanic. The majority lived alone (37%), with friends (33%), or with either a parent(s) or family member (29%). Of the 159 girls who completed the baseline survey, 102 continued participation in the remainder of the 3-month long study. The girls who completed the study ($n=102$) differed in only two ways from those who did not complete the study ($n= 57$); those who continued were slightly younger ($M = 19.1$ years) and had been tested for HIV fewer times ($M = .44$) compared to those who left the study ($M_s = 19.5$ years and .67, respectively).

Data Collection Procedures

We used a prospective, longitudinal survey design to examine predictors of sexual risk behavior; predictor variables were collected at baseline using self-administered questionnaires (SAQs). Criterion variables were collected throughout the 3-month follow-up interval (on a weekly basis) with daily diaries.

Participants were screened for eligibility by trained research recruiters. Interested girls who met the inclusion criteria completed the consent process in a private room. After informed written consent was obtained, participants completed a 30-minute baseline survey in a private area of the recruitment sites. Participants were then provided with instructions on how to complete the 3" × 5" stamped, return-addressed diary cards documenting daily behaviors using discrete abbreviations for each behavior (e.g., "v with c #" meaning number of episodes of vaginal sex with a condom). These cards have been used successfully with adolescent females in prior research. Girls were instructed to complete the diary card daily and return one card each week for 12 weeks. They were paid \$10 for completing the baseline survey, and \$5 for each week of daily cards returned on time.

Measures

We assessed these constructs at baseline: psychological distress, substance use, HIV-related information, motivation to reduce risk, behavioral skills, and sexual risk history (e.g., number of sexual partners in past year, history of STI). The contemporaneous diary cards assessed sexual risk (protected and unprotected vaginal and anal intercourse) on a daily basis for three months.

Demographics—Individual items assessed included age, marital status, living situation, and race/ethnicity.

Psychological distress—Respondents indicated how often in the past week they experienced feeling sad, hopeless, lonely, or similar symptoms of emotional distress, using the 20-item Center for Epidemiological Studies-Depression (CES-D) scale (Radloff, 1977). Scores on 20 individual items were summed with higher totals (range 0 to 60) indicating greater psychological distress. Total scores of 23 or greater indicate psychological distress in adolescents but may not be specifically indicative of depression (Furukawa, Hirai, Kitamura, Takahashi, 1997; Roberts, Andrews, Lewinsohn & Hops, 1990). Evidence for the validity and reliability of the measure has been assembled (Radloff). Cronbach's alpha in our sample was .91.

Substance use—Lifetime and recent (last month) use of 13 different street drugs (e.g., marijuana, cocaine) was assessed using items with a *yes/no* response option. Higher scores indicate more types of drug use. This measure, a component of the widely used psychometrically validated Addiction Severity Index (ASI), has been used for over a decade to assess intake of various substances (McCellan et al., 1992). Alcohol use in the past month was assessed using three questions about (a) the frequency (number of days in the past week) and (b) typical quantity of alcohol used, as well as (c) binge drinking (4 or more drinks in past month). Variations of these items used to assess alcohol use in adolescents are found in Wechsler's College Alcohol Surveys with evidence of validity and reliability of these measures (e.g., Wechsler et al., 2003).

Information—The brief HIV Knowledge Questionnaire (HIVKQ) was used to assess knowledge regarding transmission and prevention of HIV (Carey, Morrison-Beedy, & Johnson, 1997). Participants responded to 19 items using *true/false* and *I don't know* options; responses were scored as correct or incorrect, with higher scores indicating greater HIV-related knowledge (0–100% correct). Factor analyses with diverse samples indicate the measure contains a single factor; ample evidence for the validity of the measure has been compiled (Carey, Morrison-Beedy; Carey & Schroder, 2002; Volpe, Nelson, Kraus, & Morrison-Beedy, in press). For our sample, the KR-20 was .79.

Motivation—The motivation construct was assessed with three variables.

First, to assess *social norms*, we modified a measure of peer attitudes (DiIorio et al., 2001) to assess perception of boyfriend and parental attitudes towards sexual intercourse and condom use. Higher total scores correspond to more favorable attitudes toward adolescents having sex. Sample items include: “Your boyfriend thinks having sex is a normal part of growing up for teenagers,” and “Your parent(s) think it is OK for teenagers to have sex if they protect themselves by using condoms.” Cronbach’s alpha for the original scale with adolescents was .80 and construct validity has been established (DiIorio et al.). In our sample, Cronbach’s alpha was .60 for the boyfriend subscale and .82 for the parental subscale.

Second, we assessed *behavioral intentions* regarding risk-reduction, using one 8-item scale. Participants read details of a high-risk situation and then indicated how likely they would use several risk-reduction strategies (e.g., use a condom, avoid drugs or alcohol before sex). The Likert-type responses ranged from 1 = *definitely will not do* to 5 = *definitely will do*, with higher mean scores (range 8–40) indicating increased intentions to reduce risk. An example of these items is: “I will wait to see what my partner says we should do about condoms.” Versions of this scale have been used in previous studies (Carey et al., 2000; Carey, Maisto et al., 1997; Kalichman, Somlai, & Adair, 1996). Cronbach’s alpha in our sample was .81.

Third, a modified version of the Adolescent version of the Condom Attitude Scale (CAS-A) was used to measure *attitudes towards condoms* (St. Lawrence et al., 1994). Response options ranged from 0 = *strongly disagree* to 4 = *strongly agree*, with higher scores (range 0 to 64) indicating more positive attitudes towards condoms. Evidence for the validity and reliability of the CAS-A has been assembled (St. Lawrence et al.), and Cronbach’s alpha for our sample was .70.

Behavioral skills—Behavioral skills were assessed with two measures. First, we used the *Condom Use Confidence (self-efficacy)* questionnaire Galavotti et al. (1995) developed to assess how confident participants would be using condoms every time they had sex. Participants used a 5-point scale (1 = *not at all confident* to 5 = *extremely confident*) with higher total scores indicating greater self-efficacy to use condoms. Adequate reliability has been documented ($\alpha = .87-.88$) and construct validity has been established for this measure (Galavotti et al.). Cronbach’s alpha for our sample was .83.

Second, adolescent’s *perceived difficulty* performing several AIDS preventive behaviors was assessed with seven items (W. A. Fisher et al., 1999). Items assessed perceived difficulty in “purchasing condoms” or “talking about condoms.” Higher total scores indicated less difficulty in performing safer sexual behavior. Evidence for the reliability and validity of this measure has been demonstrated (Williams et al., 1998). Cronbach’s alpha in our sample was .67.

Sexual risk behavior—Using the daily diary, participants documented on a daily basis for three months the number of episodes of both vaginal and anal sex with and without condoms. We focused on these two types of intercourse and did not include non-coital acts of oral sex as the risk of contracting HIV is minimal for oral sex, and the use of condoms with noncoital acts of oral sex has been documented to be very low (Campo et al., 2006; Morrison-Beedy, Carey & Tu, 2006).

Data Analysis

Due to low frequencies of protected and unprotected anal sex, these variables were not used in the analyses; low frequencies of such behaviors are not uncommon (Graham et al., 2003). Protected and unprotected vaginal sex are count data whose analysis is complex.

Examination of the data distributions for these variables revealed that there was an excessive number of zeros in the distribution of each of these variables. For example, the distribution of condom-protected vaginal sex was 26% with zero episodes, 6% with 1 episode, 7% with 2 episodes, 4% with 3 episodes, and so forth, indicating a preponderance of zeros. Thus, the observed frequency of zeros far exceeded the expected frequency as modeled by the Poisson distribution, a phenomenon known as over-dispersion (Cheung, 2002; McCullagh & Nelder, 1989). Because forcing a Poisson model to fit such data would bias the expected number of counts, we employed an alternative approach to account for this over-dispersion in the analysis of our data.

An appropriate model for such over-dispersed count responses is the zero-inflated Poisson (ZIP) regression (Cheung, 2002; Lambert, 1992). A ZIP model has two components; one component fits the regular Poisson regression; the other component models the occurrence of the extra zeros using logistic regression. Thus, under the ZIP model, two sets of estimates are provided for assessing the contribution of a predictor; estimates under the Poisson model assess its role in predicting the mean frequency of the response and those from the logistic regression evaluate the effect of the predictor on predicting the occurrence of zero frequency. For example, in ZIP modeling, if the relationship between a predictor and unprotected vaginal sex shows the predictor is significant in the logistic model and non-significant in the Poisson regression, this variable only predicts the likelihood of unprotected vaginal sex. Likewise, if a predictor is significant only in the Poisson model, it only predicts the mean frequency of the count response.

For the regression analysis of predictors of sexual risk behaviors, we fitted a ZIP to each of the two primary outcomes: one for the unprotected and the other for the protected vaginal sex. To protect the overall statistical significance for the two regression analyses, we conservatively set the level of statistical significance for each analysis at $\alpha = 0.01$, using two-tailed p values, given the number of predictors entertained. All analyses were conducted using SAS version 9.1, except for the ZIP regression analysis. For the ZIP regression analyses, we used STATA (Statistical software release 9.0. College station, TX, STATA Corporation, 2005) to model both unprotected and protected vaginal sex.

Results

Baseline Data

Baseline data for the participants are presented in Table 1. As shown there, scores on the CES-D for psychological distress were relatively high for this age group. Underage drinking was common. Binge drinking (i.e., 4 or more drinks in close proximity on one occasion) was reported by 70% of the drinkers in the sample. Three drugs were identified as the most commonly used (lifetime): marijuana, opiates, and Ecstasy. Recent use (past month) was reported by 31% of the sample for marijuana and 12% for opiates.

Baseline recall of sexual behaviors over the past three months indicated that average number of episodes of unprotected ($M = 9.7$, $SD = 15.79$) and protected ($M = 9.0$, $SD = 12.84$) vaginal sex were equivalent. On average, girls reported one sexual partner in the past three months, and two partners in the past year. Thirty percent of the girls reported a history of STIs.

In response to the 19 questions assessing general knowledge of HIV prevention and transmission, participants averaged 14 correct (75%). We assessed motivational factors related to HIV risk reduction as well, with social norms supporting sexual activity in teens reported to be higher among boyfriends ($M = 9.5$) than parents ($M = 5.7$). Intentions to practice safer behaviors were positive, with most girls responding that they were "very likely to do" each safer behavior. Total scores on attitudes towards condoms averaged 35.5

out of a possible 64. Yet, measures of behavioral skills indicated that girls did not feel confident that they could use condoms every time they had sex when faced with situational challenges; total scores averaged 17.85 out of a possible 25. Girls also rated their ability to perform seven different HIV-preventive behaviors very highly with mean scores of 26 on the measure of perceived difficulty.

Next, we examined correlations among the predictor variables and the two criterion variables (see Table 2). Several of the motivational and behavioral skills variables (i.e., condom attitudes, confidence in condom use, behavioral intentions) correlated significantly with both protected and unprotected vaginal sex; perceived difficulty using condoms also correlated significantly with unprotected vaginal sex. Several of the theoretically-related constructs were associated with substance use measures, namely behavioral intentions with Ecstasy and alcohol use, and confidence with alcohol use. Several of the drug and alcohol measures also were intercorrelated. Psychological distress was not significantly correlated with any other variable or outcome. There was no statistically significant relationship between episodes of protected and unprotected vaginal sex.

Follow-up (Contemporaneous Self-Monitoring) Data

Most girls (81%) returned 12 completed cards, 10% returned 11 cards, and only one girl completed fewer than 8 cards. Because preliminary analyses revealed that the responses of two girls were extremely atypical (i.e., outliers, ≥ 3 standard deviations from all others), these data were not included in subsequent analyses. Nearly all of the girls (98%) reported some type of sexual behavior during the self-monitoring phase (data not tabled). During the recall period of 3 months, participants reported a mean of 12.87 ($SD = 15.37$) acts of unprotected vaginal sex and a mean of 12.13 acts of protected vaginal sex ($SD = 14.61$). Vaginal sex (protected and unprotected) was more frequent during this prospective period than during the baseline retrospective recall timeframe ($Ms = 9.0$, and 9.7 , respectively).

The results of the analyses for *protected* vaginal intercourse are shown in Table 3. The logistic part of the model indicates that more frequent protected sex at baseline predicted the *likelihood* of protected vaginal sex during the self-monitoring phase. The Poisson part of the model indicates that the *frequency* of condom-protected vaginal sex was predicted by information (better HIV knowledge), motivation (stronger intentions to practice safer sex, more positive attitudes towards condoms), skills (lower perceived difficulty for condom use and for negotiation with a partner), mental health (lower psychological distress) as well as alcohol (no binge drinking, more drinking days) and other drug use (non-use of Ecstasy). Predictors not included in Table 3 were not associated with predicting either the likelihood or the frequency of having protected vaginal sex.

The results of the analyses for *unprotected* vaginal intercourse are displayed in Table 4. Contrary to prediction, the logistic part of the model indicates that condom use confidence at baseline was associated with a greater *likelihood* of having unprotected vaginal sex during the self-monitoring phase. The Poisson part of the model indicates that the *frequency* of unprotected vaginal sex was predicted by alcohol (fewer drinking days, fewer average number of drinks per drinking day, more binge drinking) and other drug use (opiate and Ecstasy use), and frequency of protected vaginal sex at baseline. Predictors not included in Table 4 were not associated with predicting either the likelihood or the frequency of having unprotected vaginal sex.

Discussion

Sexual risk behavior, substance use, and psychological distress were prevalent in our sample of late adolescent and emerging adult females; in addition, baseline data indicated that many

of these girls were at increased risk for sexual morbidities and had reported a history of STIs, multiple sex partners, or having sex for money or drugs. Reports of substance use (especially marijuana) and alcohol were high, despite the fact that most were under the legal age to consume alcohol; reports of binge drinking and average number of drinking days in the past month suggest that the majority of times a girl drank, she did so in a hazardous way. This study confirms findings from other investigators indicating that risk behaviors are prevalent in urban adolescents (CDCP, 2004b; Waller et al., 2006).

Guided by the IMB model (J. D. Fisher & Fisher, 2000), we hypothesized that information, motivation, and behavioral skills would predict safer and risky sex behaviors. Our findings provide mixed evidence for the influence of these constructs on sexual risk behavior in adolescent girls. Several of the IMB constructs (information, condom attitudes and behavioral intentions, and skills) did predict HIV protective behavior (i.e., protected vaginal sex). These findings are consistent with earlier research with solely cross-sectional measures (J. D. Fisher et al., 2002; Morrison et al., 2003; Morrison-Beedy, Carey, Lewis, & Aronowitz, 2001), and emphasize the importance of focusing on these constructs within interventions. Providers and scientists can confidently strive to develop interventions that help adolescent girls to realize “where there’s a will there’s a way” and provide them “the way” through psychoeducational and experiential activities that allow them to practice the behavioral skills they need to reduce their risk for HIV and other negative sexually-related outcomes.

In contrast, the only IMB construct to be associated with unprotected sex was condom use confidence, and this association was contrary to prediction. Although the construct of self-efficacy is frequently assessed in the HIV and sexual risk reduction literature, it has not predicted behavior consistently in adolescents (e.g., Crosby, et al., 2003; Heeren, Jemmott, Mandeya & Tyler, 2007). One possibility involves the difficulties inherent in measuring condom use self-efficacy, a subject that we have discussed elsewhere (Forsyth & Carey, 1998). Although the self-efficacy measure we used was carefully selected, further attention is warranted to gauge this measure’s ability to target attitudes, behaviors, and situations representing levels of behavioral challenge (Forsyth & Carey). The five items in this self-efficacy measure specifically address confidence under the following circumstances: alcohol or drug use, high sexual arousal, partner anger, already using another method of contraception, and wanting to express relationship commitment. This association may be spurious, or the IMB variables may influence only the adoption of condom use or condom use under different behavioral challenges not identified in this measure; these explanations should be investigated further.

Our prospective design allowed us to investigate the influence of alcohol and other drug use on sexual behavior. Similar to others (Cook et al., 2001; Ford & Norris, 1994), we found that urban adolescent girls reported frequent use of alcohol and other drugs; in addition, we observed that alcohol use (binge drinking) and other drug use (Ecstasy) predicted sexual risk behavior. Although evidence for the relationship between alcohol use and sexual risk behavior has been mixed (Leigh & Stall, 1993; Weinhardt & Carey, 2000), stronger evidence exists for the relationship between recreational drug use and risky sex (Kalichman, Heckman, & Kelly, 1996). Yet, most of this research has been with adult populations, often men who have sex with men (e.g., Ostrow et al., 1990). Thus, the current study adds to the literature by demonstrating the covariation among substance use and risky sex in adolescent females. Our findings also intimate that substance use may enable unsafe sex, and demonstrate the need to address drug and alcohol use within HIV-prevention interventions for adolescent girls. \

Several of the alcohol—sexual behavior associations are counterintuitive. For example, the average number of drinks on each drinking occasion predicted protected vaginal sex, that is, as a girl drank more on average on each occasion, she was more likely to use a condom. This inconsistency might be explained by considering the results of a recent meta-analysis. In this meta-analysis of adolescent problem behaviors across 43 studies, Guilamo-Ramos, Litardo, and Jaccard (2005) identified a lower correlation between risk behaviors in older adolescents versus younger adolescents. They divided samples into three age groups (early adolescence, 12 to 14 years; middle adolescence, 15 to 17; and late adolescence, 18 to 25) and found that covariation among risk behaviors were $r_s = .37, .41, \text{ and } .16$, respectively. In addition, looking across age groups, they concluded that there is more variation across adolescent risk behaviors than previously thought. They hypothesized that older adolescents may be leaving the more rebellious periods of early and middle adolescence and, as they move closer to adulthood, the clustering (covariation) of risk behaviors weakens. Thus, one explanation for our findings with older adolescent girls is Guilamo-Ramos et al.'s "developmental transition" hypothesis. This is an interesting hypothesis, but we encourage replication of such results and further testing of this (and other) hypotheses. Additional work is needed to examine the complex interconnections between alcohol, recreational drugs, and sexual risk behaviors.

Finally, we found that many of the girls in our sample reported an alarming number of psychological complaints (e.g., hopelessness, loneliness), and that those with higher psychological distress were less likely to have protected sex. These findings corroborate earlier findings (e.g., Bachanas et al., 2002; Waller et al., 2006) and raise several questions: (a) Should adolescent girls be routinely screened for psychological distress or depressive symptoms? (b) Do depressed adolescents need interventions that also address their mental health care needs within a sexual risk reduction intervention or, instead, need adjunct treatment? (c) If multiple services are needed, how should they be sequenced to optimize overall health? If the efficacy of sexual risk reduction programs is moderated by psychological distress, will mental health undermine both the distressed individual's likelihood of positive outcome as well as the group dynamics of such interventions (indirectly comprising the intervention's value for other recipients); the "best fit" with either individual versus group interventions for distressed individuals needs further study.

Although emotional turmoil during adolescence is normative, the consequences of untreated depression in adolescents can be severe. Screening for psychological distress and substance use could serve clinicians well as a strategy for identifying girls who are more likely to engage in sexual risk behavior. Conversely, girls receiving care for sexual risk behaviors (e.g., unplanned pregnancy, STI treatment) would benefit from assessments of psychological wellbeing and substance use.

These findings should be interpreted mindful of study limitations and strengths. First, we sampled mostly White women aged 18–21 years from clinical settings. The level of risk observed in this sample is likely higher than would be expected in a community sample of similarly aged young women. Thus, the results may be representative of other females who are at risk, but may not be representative of the general population. Second, we observed a modest level of attrition; it is possible that the girls who left the study early may differ from those who continued. Yet, because many of these participants were at risk and difficult to reach, some attrition in a longitudinal study of this kind is not unexpected. Overall, replication of these findings with a more diverse sample is warranted.

A third limitation is that we did not analyze protected or unprotected anal sex data because of the low frequencies of these behaviors. Although not assessed in this study, gaining a clearer understanding of oral sex risks in adolescent girls and implications for inclusion in

intervention approaches is also warranted. Future work might explore these behaviors in more detail because they may be seen by some girls as ways in which to protect themselves against pregnancy or maintain virginity without realizing what role these behaviors may play in other sexual morbidities. We also acknowledge that two of the measures (i.e., boyfriend social norms, perceived difficulty) did not demonstrate strong psychometric properties, suggesting the need for continued refinement of measures and caution in interpretation of findings involving these measures. Lastly, in our study, we had to consider both practical issues (e.g., minimizing participant burden, sufficient power) as well as conceptual aspects, thus we did not include other demographic, biological and social predictors (e.g., timing of physical development, parental influence) that may influence these behavioral outcomes. Additional research should address other predictors and adolescent populations (e.g., homeless youth).

Several strengths are also noteworthy and include the prospective design with contemporaneous self-monitoring over 3 months. Thus, the study extends previous cross-sectional investigations by examining predictors of sexual risk behavior using daily diary reports. We also examined how psychological wellbeing, as well as the IMB theoretically-driven constructs, predicted protected and unprotected vaginal sex. We focused on predicting these two behaviors because (a) condom protected vaginal sex is the targeted strategy in risk reduction interventions and (b) unprotected vaginal sex is prevalent and places adolescent girls at risk for STIs and HIV. In conclusion, these findings reveal that psychological distress, substance use, and sexual risk behavior are inter-related in adolescent females, and suggest that interventions that target multiple risk behaviors may be needed for adolescent girls.

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Table 1

Baseline Data

	<i>n</i>	Observed Range	Mean/%	<i>SD</i>
<i>Information:</i>				
HIV knowledge	102	7.0–19.0	14.32	3.01
<i>Motivation:</i>				
Condom use attitude	102	28.0–64.0	35.51	5.26
Social norm of parent	102	0.0–12.0	5.74	3.44
Social norm of boyfriend	99	5.0–12.0	9.45	1.91
Behavioral intentions	102	14.0–40.0	31.81	5.74
<i>Behavioral Skills:</i>				
Confidence in Condom Use	102	5.0–25.0	17.85	4.88
Perceived difficulty	102	11.0–35.0	26.02	4.20
<i>Psychological Well-Being</i>				
Psychological Distress Symptoms	102	1.0–57.0	18.40	6.44
<i>Substance Use:</i>				
Marijuana use ever	102		72%	
Ecstasy use ever	102		13%	
Opiates use ever	102		28%	
Alcohol use in past month	102		77%	
Number of drinks, typical use day	79	0.0–35.0	3.94	2.24
Binge drinking times/month	79	0.0–31.0	4.18	5.96
Drinking days/month	79	0.0–31.0	6.35	6.48
<i>Behavior over past 3 months:</i>				
Had STD	102		19%	
Accepted money, drugs or a place to stay in exchange for sex	102		8%	
Tested for HIV	101		44%	
Number of sex partners for vaginal sex	102	0.0–5.0	1.32	0.71
Number of sex partners for vaginal sex over past 1 year	102	0.0–15.0	2.23	1.94

Correlation Matrix of Behavioral Antecedents and Outcome Behaviors

Table 2

	HIV Knowledge	Condom Attitudes	Behavioral Intentions	Condom Confidence	Perceived Difficulty	Psychological Distress	Lifetime Marijuana Use	Lifetime Ecstasy Use	Lifetime Opiate Use	Typical # of Drinks	Days Drank in Past Mo.	Binge Drinking	Vaginal Sex w/ Condom	Vaginal Sex w/o Condom
HIV Knowledge	--													
Condom Attitudes	-.13	--												
Behavioral Intentions	.03	.42**	--											
Condom Confidence	.05	.48**	.58**	--										
Perceived Difficulty	-.15	.53**	.28**	.36**	--									
Psychological Distress	-.05	.04	-.06	0	.05	--								
Lifetime Marijuana Use	-.01	-.15	-.12	-.04	.01	.15	--							
Lifetime Ecstasy Use	.05	-.10	-.24*	-.16	-.15	-.05	.19	--						
Lifetime Opiate Use	.10	-.01	.01	.02	-.07	0	.09	.22*	--					
Typical # of Drink	-.17	-.2	-.37**	-.29**	-.15	-.05	.05	.3**	-.16	--				
Days Drank in Past Month	-.17	-.12	-.28**	-.23*	-.16	.01	.33**	.18	-.01	.54**	--			
Binge Drinking	-.16	-.16	-.20	-.14	-.12	.09	.46**	.20	.02	.42**	.81**	--		
Vaginal Sex w/Condom	-.09	.25*	.28**	.31**	.19	-.05	.01	-.15	-.04	-.17	-.15	-.12	--	
Vaginal Sex w/o Condom	.20	-.49**	-.26*	-.28**	-.30**	0	.18	.19	.08	.08	.01	.07	-.06	--

* Note: $p < .05$;

** $p > .01$

Table 3

Predictors for Protected Vaginal Sex

Parameters	Coefficient	Standard Error	z Value	p Value
Logistic Regression				
Intercept	0.24	0.33	0.75	0.455
Protected Vaginal Sex 3 months prior to baseline	−0.39	0.12	−3.26	0.001
Poisson Regression Part				
HIV Knowledge	0.06	0.01	5.3	<.0001
Condom Attitudes	0.24	0.10	2.52	<.01
Perceived Difficulty	0.04	0.01	4.4	<.001
Behavioral Intentions	0.04	0.01	5.24	<.001
Number of Drinking Days	0.05	0.01	9.00	<.001
Binge Drinking	−0.03	0.01	−3.31	<.001
Ecstasy Use	−0.57	0.12	−4.65	<.001
Psychological Distress	−0.01	0.00	−2.73	<.01
Protected Vaginal Sex 3 months prior to baseline	0.01	0.00	4.58	<.001
Intercept	0.33	0.38	0.87	0.38

Table 4

Predictors for Unprotected Vaginal Sex

Parameter	Coefficient	Standard Error	z Value	p Value
<u>Logistic Regression</u>				
Intercept	-5.17	1.35	-3.84	<.001
Confidence	0.21	0.07	3.19	<.001
<u>Poisson Regression Part</u>				
Number of Drinking Days	-0.05	0.01	-4.56	<.001
Binge Drinking	0.04	0.01	3.12	<.001
Average # Drinks/Drinking Day	-0.06	0.01	-4.24	<.001
Ecstasy Use	0.55	0.07	7.60	<.001
Opiate Use	0.26	0.08	3.27	<.001
Protected Vaginal Sex 3 months prior to baseline	-0.01	0.00	-3.57	<.001
Intercept	3.09	0.06	55.83	<.001