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Does Alcohol Lead to Sexual Risk Behavior? Findings from Event-Level Research

Lance S. Weinhardt and
Medical College of Wisconsin

Michael P. Carey
Syracuse University

Abstract

The belief that alcohol use leads to sexual risk behavior is nearly ubiquitous. To determine if this belief is warranted, we identify theory and research regarding the alcohol, risky-sex link. We focus our review on studies that use the event-level methodology because this approach provides a particularly sensitive but stringent test of the alcohol, risky-sex connection. Overall, the data from available event-level studies indicate that people who use condoms when they are sober also tend to use them when drinking; people who fail to use condoms when drinking probably also fail to use them when sober. We recognize several empirical exceptions to this rule and provide suggestions for future research.

Once HIV had been identified as the cause of AIDS and sexual behavior determined to be a prime transmission route for HIV infection, researchers began to identify the determinants of sexual risk behavior. Alcohol use was soon hypothesized as a cause of risky sex, and prevention and intervention campaigns were developed to warn against combining alcohol with sex. The CDC even advised that raising taxes on alcohol would help to reduce the incidence of sexually transmitted diseases (CDC, 2000). But is the belief that alcohol use leads to risky sex supported by the available evidence? Even though a great deal of research has been conducted in the past decade, it turns out the answer to this question is not simple. Therefore, in this review, we examined the evidence for the purported association between alcohol use and risky sexual behavior.

Alcohol and Risky Sex: Preliminary Evidence From Multiple Methods

Several research strategies have been employed in the effort to understand the alcohol-risky sex relationship. One of the most basic methods used to study the purported link between alcohol and risk behavior is exemplified by *global association studies*. In a typical global association study, participants provide information about the quantity and frequency of their recent alcohol use, as well as information about the number of times they engaged in specific sexual HIV-risk behaviors during the same reporting period. These two sources of information are then correlated to test for their association. Although there is some variation in results, in most global association studies researchers have found that participants who use alcohol, and those who use alcohol more heavily, are more likely to engage in sexual HIV-risk behavior. For example, using data obtained from the general population, Shillington, Cottler, Compton, & Spitznagel (1995) found that participants classified as “heavy drinkers” were more likely to report engaging in sexual acts outside of marriage, multiple sex partners in a year, and sex trading (i.e., exchanging sex for money, drugs, or lodging) when they were compared to “nonheavy

drinkers.” Other investigators have examined “at risk” groups (i.e., those populations who are disproportionately impacted by AIDS). For example, Weinhardt et al. (in press) found that adults with severe mental illness who engaged in high-risk sexual behavior in the past 3 months were more likely to have a current alcohol use disorder than were participants who did not engage in such risk behavior.

In other global association studies, it has also been confirmed that a history of problem drinking has been associated with treatment for sexually transmitted diseases (Ericksen & Trocki, 1994) and that alcoholics in treatment are more likely to engage in risky sexual behaviors than the general population (Scheidt & Windle, 1995). Overall, in several detailed reviews of global assessment studies (Bolton, Vincke, Mak, & Dennehy, 1992; Halpern-Felsher, Millstein, & Ellen, 1996; Leigh & Stall, 1993), it has been confirmed that alcohol and risky sex appear to be linked.

This link is plausible, leading researchers to offer a variety of explanations for global associations between alcohol use and sexual risk behavior. Most explanations focus on the nearly ubiquitous belief that engaging in sexual acts while intoxicated increases the likelihood of the activity being unsafe (Crichtlow, 1986). Public education campaigns have been based on this message (e.g., “Get high, get stupid, get AIDS”; National Institute on Drug Abuse, 1994), and in many HIV-risk-reduction programs, substance use prior to sexual behavior is discussed as a risk behavior and is assessed as an outcome (e.g., Carey et al. 1997; Fullilove, Fullilove, Bowser, & Gross, 1990). Theory and experimental research provide support for this association.

The *alcohol myopia model* (Steele & Josephs, 1990) has been proposed to explain the effects of alcohol on social behavior. According to this model, alcohol reduces cognitive capacity and causes people to focus on the cues that are most salient in the environment. Less salient cues require additional cognitive resources to process and are, therefore, less likely to be acted upon by an intoxicated person. Furthermore, the effect of alcohol on cognition is proposed to be linear; the more intoxicated a person is, the more pronounced the myopia becomes (Steele & Josephs). In sexual encounters, the most salient cues are usually those that involve intimacy and the immediate pleasure of the sexual contact. More abstract or distal cues, such as suspicion that the sexual partner could be HIV infected, or a public service announcement seen on television, are less salient and require additional cognitive resources to process. Thus, when intoxicated, the ability to consider these distal, inhibitory cues decreases and protective behavior is less likely to be enacted.

The results of recent laboratory-based experiments also provide support for a causal effect of alcohol on sexual risk behavior in that alcohol consumption leads to decrements in the hypothesized theoretical determinants of condom use. MacDonald, Zanna, and Fong (1996) found decreased intentions to use condoms as a result of alcohol consumption. Fromme, D’Amico, and Katz (1999), in two alcohol administration studies, found that alcohol led to decreases in perceptions of the negative consequences of risk behavior with no impact on recall of positive consequences. They also found that participants who held stronger beliefs that alcohol would disinhibit their sexual behavior reported greater perceived benefits of, and greater likelihood of engaging in, unsafe sexual behaviors. Gordon, Carey, and Carey (1997) used a placebo design in an alcohol-administration study and found that alcohol and sex-related alcohol expectancies had a negative impact on motivation for condom use and performance of condom negotiation skills.

Despite the advantages of these experiments over cross-sectional global association studies, out of necessity laboratory studies have been focused on theoretical determinants of risky sexual behavior instead of actual risk behavior. Although the results support the idea that

alcohol influences sexual risk behavior, data linking patterns of results from experiments to naturalistic sexual behavior would add compelling evidence of a causal relationship between alcohol and sexual risk behavior. The most compelling evidence for such a relationship would come from studies showing that people's sexual risk behavior is related to their sexual behavior when intoxicated.

To extend upon global association studies and laboratory experiments, some investigators have conducted situational association studies to study the link between sexual risk behavior and intoxication during sexual behavior in natural settings. Situational association studies move beyond global association studies in that whether participants engaged in sexual acts while intoxicated is assessed and related to an index of sexual risk behavior. For example, Valdiserri et al. (1988) surveyed gay and bisexual men and found that participants who were "high" (i.e., used alcohol or drugs) during sexual acts with more than half of their partners were less likely to have used condoms overall. Kelly, St. Lawrence, and Brasfield (1991), in a longitudinal study of risk-behavior relapse among gay men following a risk-reduction intervention, found that men who reported being intoxicated prior to engaging sexual acts at least once in the previous 4 months were more likely to begin engaging in high-risk sexual behavior (i.e., relapse) than other participants. Findings of many situational association studies indicate that persons who used substances prior to sexual activity also engaged in more sexual risk behavior overall. In this way, the results are more specific than the global association studies described earlier. However, these results do not indicate whether the sexual risk behavior occurred on the same occasions as alcohol use and, therefore, whether or not people are less likely to practice safer sexual acts after drinking cannot be evaluated from situational association studies. Specific sexual events are not examined in sufficient detail to make this inference. Dissatisfaction with the global association, experimental, and situational association methods have led researchers to employ a fourth method to investigate the alcohol, risky-sex link.

Event-Level Research Strategies

The event-level method refers to an in-depth examination of the characteristics of a specific behavior occurring on a particular occasion. The advantage of the event-level method over the global and situational association approaches described earlier is that more detailed information is gathered regarding specific sexual events during which alcohol was consumed (e.g., whether a condom was used, the type of relationship between the participant and the partner, and the amount of alcohol consumed prior to engaging in sexual behavior can be assessed for each sexual encounter reported). This information allows a more detailed examination of the hypothesis that intoxication during sexual activity is associated with increased risk behavior/decreased condom use. More specifically, these data can be used to determine if people behave differently as a function of intoxication. The two subtypes of event-level investigations of alcohol and sexual behavior that have been conducted are (a) critical-incident and (b) multiple-event.

Critical-Incident Studies

In critical-incident studies, the details of one to three specific sexual events are assessed. When a single event from each participant is assessed, the relationship between alcohol use and condom use can be tested by cross-classifying participants according to whether they used alcohol during the sexual event and whether they used a condom. The relationship can be evaluated using a chi-square test, odds ratio, or log-linear analysis, whereby the likelihood of condom-protected events after alcohol use is compared to the likelihood of condom protected events in which participants did not use alcohol. Only between-subject analyses can be conducted because each participant contributes a single observation. In other critical-incident studies, researchers have assessed two or three sexual events per participant (e.g., the most recent sexual event and the most recent sexual event that occurred when intoxicated). In these

studies, participants' sexual behavior under the influence in one event can be compared to their behavior in another event if appropriate within-subject analyses are conducted.

Evidence for an association between alcohol use and sexual behavior has been found in several critical-incident studies. For example, Gold, Karmiloff-Smith, Skinner, and Morton (1992) asked college students in London about one event during which they had unprotected intercourse and one event during which they resisted a strong urge to have unprotected intercourse. They found that level of perceived intoxication was greater in the unsafe encounter among participants with a casual partner. In contrast, Temple and colleagues (Temple & Leigh, 1992; Temple, Leigh, & Schafer, 1993) failed to find an association between alcohol and condom use during participants' most recent intercourse or during their most recent intercourse with a new partner. Overall, the findings of critical-incident studies have been inconsistent (see Table 1 for details): In approximately one half of these studies, condom use was not related to alcohol use.

There are important methodological differences among these studies that may help to explain some of the variability in results. In different studies, participants were from different socioeconomic backgrounds, and their ages ranged from adolescents to adults. The studies were conducted in different regions of the United States and the United Kingdom. Perhaps more importantly, in most studies participants were asked to report on their most recent intercourse, whereas in four they were asked about first intercourse (Dermen, Cooper, & Agocha, 1998; Flanagan & Hitch, 1986; Kraft, Rise, & Traeen, 1990; Robertson & Plant, 1988), and in three they were asked about most recent intercourse with a new partner (Dermen, Cooper, & Agocha, 1998; Friemuth, Hammond, Edgar, McDonald, & Fink, 1992; Graves & Hines, 1997). When only a few encounters are the focus of the analyses, the specific event(s) assessed may bear directly on the results.

In contrast to the critical-incident studies described previously, in which either one event was assessed, or two or three events were treated as independent, the data from two critical-incident studies were analyzed by appropriate within-subjects tests to focusing specifically on whether participants' condom use changed as a function of substance use. Testa and Collins (1997) and Trocki and Leigh (1991) examined the characteristics of two sexual events from each of their participants: one that included alcohol and one that did not. Trocki and Leigh studied men and women by administering a postal survey in San Francisco. Heterosexual women and homosexual men used condoms less frequently when "feeling strong effects" of alcohol, compared to when they did not. Testa and Collins, using a sample of female adolescents, included only those participants who reported one event of each type and found no difference between events in the proportion of participants who used condoms. However, participants' sexual partners were more likely to have been new acquaintances in the alcohol event compared to the no-alcohol event. Although neither study's results supported the association between alcohol and sexual risk behavior, the focus on two specific events may have produced data that were not representative of the participants' sexual behavior. In both studies, participants were free to recall any events that fit these criteria, and they may have chosen events that were highly salient. Assessing a more comprehensive sample of sexual events for each participant may reveal more natural patterns of behavior.

Multiple-Event Studies

To obtain a more representative sample of sexual behavior, some researchers have asked participants about the details of all of their recent sexual encounters. Like two and three-event critical-incident studies, multiple-event assessment allows within-subjects comparisons of sexual events involving alcohol use to sexual events without alcohol use, but bases the conclusions on a larger sample of behavior. Six groups of researchers have employed a

multiple-event assessment strategy. Details of all published multiple-event studies are displayed in Table 2.

Harvey and Beckman (1986) asked 69 college-aged women to complete daily logs of alcohol consumption, sexual activity, and coitus-dependent contraceptive use (i.e., diaphragm, cervical cap, and condoms) for “two or three menstrual cycles.” The authors categorized the days into those on which no alcohol, a moderate amount, or a heavy amount (i.e., more than three drinks) of alcohol was consumed. A one-way ANOVA revealed no differences between alcohol-use categories in the proportion of intercourse events during which contraceptives were used. Although Harvey and Beckman collected the appropriate type of multiple-event level data to test for a within-subject effect of alcohol on contraceptive use, they did not report the results of this analysis. In addition, because several types of contraceptives, some of which do not prevent HIV infection, were aggregated in the assessment and analyses, the results may not be applicable to condom use specifically.

Leigh (1993) had 99 male and female participants complete separate daily diaries of their sexual behavior and alcohol use over a 10-week period. Leigh used a within-subject analytic strategy in an effort to predict the proportion of sexual incidents with new or occasional sexual partners in which a condom was used, using participant gender as a between-subjects factor and alcohol consumption (coded as present or absent) as a repeated measure factor. Only the 29 participants who reported sexual activity both with and without alcohol were included in this analysis. ANOVA did not reveal a significant effect for gender or alcohol consumption before sex.

Fortenberry, Orr, Katz, Brizendine, and Blythe (1997) administered a diary measure to a sample of 82 adolescent females (*M* age = 17 years). Logistic regression was used to predict condom use at each event based on three variables: (a) each participant’s “usual” condom use (i.e., proportion of intercourse that was condom-protected when not drinking); (b) whether the current partner was a different one from the preceding event (i.e., partner change); and (c) whether alcohol and/or drugs were used prior to intercourse. Fortenberry et al. found that event-specific condom use was associated with participants’ usual pattern of condom use, but they did not find a main effect for substance use during the event on condom use. In other words, the likelihood of condom use when sober was the best predictor of condom use when drinking. The interaction between substance use and partner change (i.e., whether the event occurred with a different partner than the previous event) was significant. However, because of the lack of a main effect of substance use on condom use, and because the significant interaction was not robust to variation in definition of “partner change,” the authors concluded that their results did not support the hypothesis that substance use and condom use are related at the event level. These authors did not examine alcohol use separately from other substances. The analytic strategy used by Fortenberry et al. may have been problematic because there were different numbers of sexual events across participants, and, therefore, the number of outcome observations varied widely across participants. Thus, these data are not amenable to traditional regression analyses to evaluate the significance of a within-subject effect. Multilevel regression models (i.e., statistical procedures for study designs involving two or more levels of sampling for unbalanced data) similar to those used to analyze ecological momentary data (see Schwartz & Stone, 1998) would be necessary to most appropriately conduct regression analyses with these data.

Although none of these multiple event studies supported the alcohol, risky-sex association by finding an event-level association, they shared one methodological element that may have hampered finding this association. A potential limitation of all three multiple-event studies described to this point is that participants were asked to self-monitor their behavior by completing diaries. Requiring participants to keep records may sensitize them to the potential hazards of combining substance use with sexual behavior or may lead them to infer the

hypotheses of the study. This heightened sensitization could lead to changes in participants' behavior during the course of the study (Nelson & Hayes, 1981) and may not have revealed natural patterns of behavior. Assessment instruments that yield multiple-event data without the potential for influencing, at least during the course of the study, the behaviors being researched have been used to examine the relationship between alcohol use and sexual behavior in three studies.

Weatherburn et al. (1993) used a 1-week retrospective interview to assess daily sexual behavior data in 461 gay and bisexual men. These authors categorized occasions of anal sex across all participants by whether condoms were used and whether the event occurred under the influence of alcohol. Categorizations were made separately for insertive and receptive sex, and for sex acts with a regular or casual partner. Using between-subject analyses, odds ratios did not reveal alcohol-related differences in condom-protected insertive or receptive anal sex, or in condom-protected sexual activity with regular or casual contacts. The average amount of alcohol consumed, based on all drinking days, differed as a function of whether sexual activity occurred (i.e., men who drank and had engaged in sexual acts consumed an average of 1.5 standard drinks more than those who drank and did not have sex) and as a function of partner type (i.e., men who had engaged in sexual acts with casual partners consumed 2 standard drinks more than men who had engaged in sexual acts with regular partners). Amount consumed did not differ, however, based on whether anal intercourse occurred or whether condoms were used for anal intercourse. Like Harvey and Beckman (1986), these investigators collected the type of multiple-event data necessary to test for a within-subject effect of substance use on condom use but did not report the results of these analyses.

Crosby, Stall, Paul, Barrett, and Midanik (1996) used a modification of the Timeline Followback interview (TLFB; Sobell & Sobell, 1996), a calendar-based, semi-structured interview originally developed to assess alcohol use. Crosby et al. assessed the co-occurrence of unprotected anal intercourse with substance use over a 1-month reporting period in 133 gay and bisexual men engaged in substance abuse treatment. The authors did not attempt to assess whether substance use during sexual activity was related to condom use. Instead, they divided participants into two groups based on their condom use during anal sex while under the influence of alcohol or other drugs: Those who reported that they used condoms during every sexual event ($n = 43$) and those who never used condoms ($n = 88$). They then conducted exploratory logistic regression analyses to identify predictors of consistent condom use under the influence. Ethnicity, attitudes toward casual sex, and perceived community norms regarding safer sex were significant predictors of consistent condom use under the influence of alcohol or drugs. Crosby et al. did not report results of a within-subject analysis of the relationship of alcohol or substance use to condom use.

Most recently, Weinhardt et al. (in press) examined alcohol use and sexual risk behavior in adults with severe and persistent mental illness also using a modified version of the TLFB interview. Consistent with prior research, global association analyses revealed that participants who had engaged in high risk sexual behavior (defined as unprotected vaginal or anal intercourse with a partner known or suspected to have at least one risk factor for HIV infection) had more heavy drinking days, scored more highly on the Alcohol Use Disorders Identification Test and were more likely to have had an alcohol dependence disorder than did other participants. However, when more sensitive within-subject analyses were used, the hypothesized event-level association between alcohol consumption and condom use did not emerge. An exploratory analysis, used to explore possible gender differences, did reveal that female participants were more likely to have had intercourse with a new or casual partner when drinking. This is consistent with the findings of Testa and Collins (1997), who used a sample of female college students.

Integration of Findings and Critique of Literature

Event-level research is a promising technique for testing the hypothesis that alcohol use increases the probability of risk sex. Studies employing the critical-incident event-level method provide inconsistent support for this hypothesized association. In light of the inconsistency in results, what can we learn from the event-level research conducted to date?

The inconsistency in results of critical-incident studies highlights the importance of factors that differed between the studies that may moderate the relationship between alcohol use during sexual activity and condom use. For example, some studies focused exclusively on one gender, whereas others used mixed-gender samples. Gender may be an important moderator of the event-level relationship between alcohol use during sexual activity and condom use because women and men often have different levels of control in sexual relationships (e.g., Amaro, 1995), and condom use requires different behaviors for males and females. Men have more direct control over condom application, whereas women must convince their male partner to use a condom. Because men have more direct control over condom use, psychological factors theoretically related to condom use should emerge more consistently and strongly among men than among women. Findings of critical incident studies, however, are generally inconsistent with respect to gender. In five of the 12 studies in which data for men were analyzed separately, condom use was less likely when sexual activity occurred with substance use (Kraft, Rise, & Traeen, 1990; Lindan et al., 1990; Robertson & Plant, 1988; Trocki & Leigh, 1991; Weinstock, Lindan, Bolan, Kegeles, & Hearst, 1993). Of the 11 studies in which the data from women were analyzed separately, in four (Flanagan & Hitch, 1986; Graves & Hines, 1997; Robertson & Plant, 1988; Trocki & Leigh, 1991) condom use was found to be less likely when participants had used substances. Both men and women were included in several studies, but the results were not reported by gender. Among the studies in which male and female participants were compared, differences indicating a stronger association among men were found (Graves & Hines, 1997; Lindan et al., 1990; MacDonald, Zanna, & Fong, 1996; Weinstock et al., 1993), whereas others found no differences (Kraft & Rise, 1991; Kraft et al., 1990; Robertson & Plant, 1988; Temple & Leigh, 1992; Temple et al., 1993; Traeen & Kvalem, 1996).

One of the few consistent findings emerging from the critical-incident literature is related to the type of event assessed. In the five studies in which participants' first sexual intercourse was assessed (Cooper, Pierce, & Huselid, 1994; Dermen et al. 1998; Flanagan & Hitch, 1986; Kraft et al., 1990; Robertson & Plant, 1988) individuals who used drugs or alcohol during their first sexual encounter were also less likely to use a condom. Assessment of other sexual events (e.g., most recent encounter, most recent sexual intercourse with a new partner, an event in which the participant resisted a strong urge to have unprotected sex) yielded inconsistent findings across studies. These findings suggest that the specific events assessed in critical-incident studies may be important for revealing an association between alcohol and condom use. They also suggest that the type of partner may moderate the event-level association between alcohol use during sexual activity and condom use. Whether the partner is a new acquaintance, an occasional partner, or a regular and committed partner likely influences the perceived need for condom use. An association between alcohol use during sexual activity and condom use may be attenuated with steady partners.

Three limitations of critical-incident research literature warrant mention. First, single-event studies do not allow examination of whether individuals' condom use changes as a function of substance use; instead, analyses are necessarily between-subject. Second, although some critical-incident designs allow within-subject comparisons and can, therefore, control for dispositional variables, few authors conducted the necessary within-subject analyses, instead analyzing the events as if they were independent. Those who did conduct within-subject analysis found inconsistent support for an association between alcohol and condom use. Third,

despite the advantages of critical-incident studies, reliance on one, two, or even three sexual events for each participant is problematic because the events assessed may not be representative of the participant's sexual behavior under the influence of alcohol. For example a participant's first sexual intercourse is not likely to be representative of subsequent sexual behavior and is likely to be different in many ways, other than whether alcohol was used, from the participant's first intercourse with their most recent partner. Nevertheless, in some studies condom use in these two events was compared to assess the association between substance use and condom use.

Due to these limitations of critical-incident studies, we propose that multiple-event studies are an improvement and allow the most direct test of whether alcohol and sexual risk behavior are associated at the event-level. However, in *none* of the multiple-event studies conducted to date has compelling evidence for an association between alcohol and sexual risk behavior been found, indicating that there is either a very weak or no event-level association between alcohol and risky sexual behavior. This conclusion must be tempered by the fact that only six studies of this type have been conducted, and all have limitations that prohibit broad generalization of their results. Most multiple-event studies have been limited by the use of reactive assessment techniques (i.e., self-monitoring) and analytic strategies that have not taken full advantage of the data. In addition, to conduct within-subject analyses correctly, the sample must be further limited to participants who report sexual activity both when sober and when intoxicated. In the studies conducted to date, this requirement has dramatically reduced the final sample size.

Despite these limitations, given the current state of event-level research, the following conclusions are supported:

1. There is currently little evidence that being intoxicated during sexual activity affects the likelihood that condoms will be used. In other words, people who tend to use condoms with a new or casual partner when they are sober also use them when drinking.
2. The lack of compelling event-level findings, in conjunction with relatively consistent results from global association studies suggests that intensified intervention efforts should target heavy drinkers. These individuals are more likely to be engaging in high-risk sexual behaviors.
3. Adolescents' whose first experiences with sexual intercourse occurs under the influence of alcohol are less likely to have planned for sexual activity and contraception and/or HIV-risk-reduction strategies are less likely to be used.
4. Women may be more likely to engage in sexual acts with a less well-known partner when they have been drinking than when sober. This association has not been found among men in within-subject analysis. This finding may be related to effects of alcohol on sexual decision making; however, it may be related to the venues in which the female participants met their sexual partners.

Laboratory studies also provide important data that, in contrast to event-level research, appear to indicate that there is a causal relationship between alcohol and the theoretical determinants of sexual risk behavior. There are, however, two important caveats to conclusions regarding the experimental literature. First, some, but not all, theoretical determinants of sexual risk behavior were affected as hypothesized. Second, in studies in which a placebo design was used, it has been shown that the amount of "effect" of alcohol on these theoretical determinants is predicted by pre-existing sex-related alcohol expectancies (e.g., Gordon et al., 1997); that is, it is likely that the associations found in some laboratory studies are mediated by alcohol-related expectancies. People who have strong expectancies that they will behave in a certain way when drinking are the ones that do so. Thus, although they are a valuable supplement to the survey

research reviewed in this paper, laboratory studies do not provide clear-cut support for a causal effect of alcohol on risky sexual behavior.

Implications and Future Directions

Event-level research does not support the hypothesis that there is a direct influence of alcohol on sexual risk behavior. Other than methodological limitations and differences between studies, what could explain the consistent lack of event-level findings? In this section we briefly review alternative explanations to the view that alcohol leads to sexual risk behavior.

Some authors (e.g., McKirnan, Ostrow, & Hope, 1996) have argued that rational decision-making models of sexual risk behavior do not adequately account for variability in behavior and have posited that people may drink to escape from anxiety associated with pleasurable activities that are contrary to strong social norms. According to this model, alcohol and risky sex may be associated at the global level because when people plan to engage in risk behavior they may drink or use drugs to decrease cognitive dissonance about their behavior. However, given this explanation, we would also expect to see an event-level association.

A more likely explanation is that dispositional or personality traits, or attitudes and beliefs, may function as “third variables” to influence both behaviors. People likely to use alcohol more heavily may also be more likely to engage in more sexual risk behavior because of a specific personality trait, or a constellation of attitudes and beliefs, rather than because of a unique relationship between alcohol use and sexual risk behavior. Several researchers have examined the relationship of personality factors to both sexual behavior and substance use. Jessor and Jessor (1977), in a classic longitudinal study of the development of problem behaviors in adolescents, concluded that problem behaviors, including alcohol use and early initiation of sexual behavior, tend to cluster in the same individuals. They found that a set of beliefs and attitudes such as concern for personal autonomy, a relative lack of interest in the goals of conventional institutions (e.g., school and church), a cynical view of the larger society, and a more tolerant attitude about transgression were predictive of problem behavior. In two more recent investigations, Kalichman, Heckman, and Kelly (1996) found that sensation-seeking is related to sexual HIV-risk behavior and substance use whereas Caspi, Begg, Dickson, and Langley (1995) found that impulsivity predicted several health-risk behaviors, including sexual risk behavior and alcohol and drug dependence, in adolescents. Research that examines relevant personality factors as mediators of the global associations between alcohol consumption and sexual risk behavior, and that also tests for an event-level relationship between alcohol and condom use, would help to provide a better understanding of the nature of this relationship.

Alcohol expectancy theory (Goldman, Del Boca, & Darkes, 1999) provides another potential explanation. For example, Leigh (1990) found that participants who held stronger beliefs that alcohol would cause them to become less nervous, caused them to become sexually disinhibited, or enhance their sexual experiences were more likely to have recently initiated sexual behavior, to have consumed alcohol during sexual encounters, and to have drunk more heavily during sexual encounters. Condom use was not assessed in this study, but it is possible that some participants with strong expectancies drank in anticipation of engaging in risky behavior to minimize negative affect related to risky behavior. In event level studies, it is possible that a subgroup of participants with strong sex-related alcohol expectancies may increase their sexual risk behavior when they are drinking. Although supported by laboratory data (Gordon, Carey, & Carey, 1997), this hypothesis has been examined in only two critical incident (Dermen, Cooper, & Agocha, 1998; Koch, Palmer, Vicary, & Wood, 1999) and no multiple event, event-level studies. For example, Dermen et al., using between-subjects analysis, found that on two of three sexual events assessed (first intercourse and most recent

intercourse) alcohol use was related to sexual risk taking primarily among participants who held stronger expectancies that alcohol use would lead to increased sexual risk behavior. Researchers using within-subject analysis should, in the future, examine the relationship of SRAE to individual differences in the event-level association between alcohol and sexual risk behavior.

Based on a critical review of this literature, we conclude that it is imprecise (and even misleading) to disseminate the message that alcohol leads to sexual risk behavior. Other authors (Bolton et al., 1992) have noted that if there is no association at the event-level (and therefore no causal association) then disseminating this message may have the effect of giving people an excuse to engage in risk behavior when drinking. This idea is plausible, especially when expectancy theory is taken into account. Because alcohol expectancies can be acquired from a variety of sources other than personal experience (Goldman et al. 1999), delivering a message that alcohol use proximal to sexual activity causes riskier sexual behavior may have the effect of “teaching” sex-related alcohol expectancies to intervention participants who may not have previously held them, and may reinforce expectancies in other participants. This could have the effect of giving some people an excuse for engaging in unsafe behavior when drinking (Bolton, Vincke, Mak, & Dennehy, 1992); they may attribute their risk behavior to being intoxicated instead of exercising responsibility for their behavior. Conversely, based on the findings from laboratory and survey data, it is also inaccurate to tell participants that there is no association. Perhaps the most accurate representation is to present the current inconsistency to intervention participants (a) to illustrate that not everyone becomes more risky when drinking, and (b) to encourage them to consider whether drinking may be a *trigger* for high-risk behavior for them so that they can develop strategies to avoid drinking in situations where sexual activity is likely. For adolescents, however, the message can be delivered more strongly. Because many adolescents experience their sexual debut under the influence of alcohol, and these experiences occur with less planning, and with less likelihood of contraception or HIV prophylaxis, prevention programs should be designed that focus on this critical event. School-based sexuality programs have made great strides toward encouraging and normalizing safer sex behavior without increasing sexual behavior overall (Kirby & DiClemente, 1994).

Four avenues for future research appear warranted. First, large-scale survey studies using multiple-event assessment will be necessary to determine whether there is an association between alcohol use before/during sexual activity and sexual-risk behavior. To improve upon the current literature, future research would benefit from the addition of measures of relevant psychological constructs (e.g., AIDS-related information, motivation, and behavioral skills, measures of sex-related alcohol expectancies, and relevant personality traits that may underlie both alcohol use and HIV-risk behavior). Given that multiple-event assessment and within-subject analysis have been used in only three studies designed to examine the alcohol, risky-sex hypothesis, it is feasible that larger and more detailed studies could produce evidence for such an association. Such studies would also benefit from assessing the *level* of intoxication during each sexual event. This could be accomplished by assessing at the beginning of the assessment process how much alcohol, in standard drink units, each participant requires in order to feel varying degrees of intoxication. Then, using this individually tailored cutoff, sexual events could be divided into those during which the individual participant was or was not likely to have felt intoxicated. Alternatively, blood alcohol content could be calculated by assessing the amount consumed, the time it took to consume that amount, and the participant’s body weight.

Second, a number of social factors may also be important when studying the relation between alcohol use and sexual risk behavior in disadvantaged populations. Particular attention should be paid to the social context of participants’ sexual behavior. For example, participants who are sexually coerced have less control over condom use during these encounters. Given that

men have more direct control over condom use, it may also be important to assess whether male sexual partners of the participants were drinking prior to sex. Any systematic relationship between alcohol and HIV-risk behavior will be better understood by taking into account the social context of the sexual activity.

Third, laboratory-based research that examines the effects of alcohol on theoretical determinants of condom use and risk behavior may benefit from using vignettes designed to invoke different risk levels of hypothetical partners and a wider range of outcomes. Results may indicate that alcohol influences the likelihood of sexual activity with riskier partners, but not the likelihood of condom use.

Finally, studies should be undertaken, or variables added to existing and planned studies, to determine if successfully treating or preventing alcohol and substance dependence also leads to decreased sexual risk behavior. Given the current understanding of the alcohol, risky-sex relationship, this approach to reducing the potential impact of alcohol on sexual risk is warranted and would have few drawbacks. Alternatively, the effectiveness of adding effective sexual HIV-risk-reduction interventions to drug and alcohol treatment programs should be evaluated to determine if they help to reduce risky behavior.

The association between alcohol and sexual risk behavior is complex. Personality and other person variables are related to both alcohol use and sexual behavior. People may drink in anticipation of potential sexual situations due to social or sexual anxiety, and their expectancies about how they will behave when intoxicated may predict that behavior. Alcohol use may lead to increased likelihood of sexual activity, although it does not appear that, in general, being intoxicated at the time of sexual behavior leads to decreased HIV-prevention measures. Although event-level studies are able to examine the latter possibility with a high degree of rigor, the research on which our conclusions are based has several limitations. To better understand the highly consistent global association findings and to allow a more thorough understanding of this phenomenon to guide prevention messages, there is a need for (a) additional multiple-event investigations in which the magnitude of the event-level relationship between substance use and condom use are evaluated (b) using nonreactive assessment instruments and (c) appropriate data-analytic methods.

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Table 1
Studies in Which Critical-Incident Assessment Was Used to Examine the Relationship Between Alcohol Use and Condom Use

Study	Participants	Type of Event(s) Assessed/ Type of Substance(s) Assessed	Analysis	Results and (Comments)
Studies In Which One Event Per Participant Was Assessed				
Boldero, Moore, & Rosenthal (1992)	<i>N</i> = 144 <i>Age</i> : <i>M</i> = 18.7 years <i>Gender</i> : 66% female <i>Ethnicity</i> : NR <i>Orientation</i> : NR <i>Source</i> : College students responding to campus advertisements	<i>Event</i> : Most recent intercourse <i>Substance(s)</i> : Alcohol	"Effects of alcohol" (i.e., level of intoxication) was entered into regression model predicting condom use during event.	<ul style="list-style-type: none"> No association between alcohol and condom use. "Effects of alcohol" operationalized as response on 3-point scale for self and 4-point scale for partner assessing the extent to which they were affected by alcohol during the sexual encounter.
Flanagan & Hitch (1986)	<i>N</i> = 125 <i>Age</i> : median = 20 <i>Gender</i> 100% female <i>Ethnicity</i> : 96% Caucasian <i>Orientation</i> : NR <i>Source</i> : Family planning clinic in small midwestern city.	<i>Event</i> : First intercourse ever <i>Substance(s)</i> : Alcohol	Cross-tabulated by alcohol and condom use.	<ul style="list-style-type: none"> First intercourse more likely to be unplanned if drinking. Birth control less likely if first intercourse was unplanned. Birth control slightly less likely if drinking ($p = .06$). Confound between planned sex and alcohol use limits interpretation of findings regarding association between drinking and use of birth control.
Friemuth et al. (1992)	<i>N</i> = 204 <i>Age</i> : 90% between 18 and 22 years <i>Gender</i> : 63% female <i>Ethnicity</i> : NR <i>Orientation</i> : NR <i>Source</i> : Voluntary college course participation, snowball sampling technique	<i>Event</i> : Most recent intercourse with a new sexual partner <i>Substance(s)</i> : Drugs (not defined) and alcohol	Performed discriminant analysis to identify factors related to the desire to use condoms, initiation of discussion of condom use, and actual condom use during the sexual event assessed.	<ul style="list-style-type: none"> Alcohol/drug use during encounter not related to condom use or desire to use condoms, but was negatively associated with initiation of discussion of condom use
Graves & Hines (1997)	<i>N</i> = 916 <i>Age</i> : NR <i>Gender</i> : 50% male <i>Ethnicity</i> : 34% Caucasian, 34% African American, 30% Hispanic <i>Orientation</i> : NR <i>Source</i> : Multistage area probability sample from 48 contiguous United States	<i>Event</i> : Most recent intercourse with a new sexual partner <i>Substance(s)</i> : Alcohol	Cross-tabulated events by alcohol and condom, separately by gender and ethnicity. Stepwise forward logistic regression analyses on condom use, on casual partner, and on condom use with casual partner.	<ul style="list-style-type: none"> Hispanic men and women <i>more</i> likely to use condoms after drinking than when not drinking. Black women <i>less</i> likely to use condoms in events involving alcohol. White, Black, and Hispanic men more likely to have sex with a casual partner when drinking. White and Hispanic women more likely to have sex with casual partner when drinking. Logistic regression did not find alcohol or drug use predictive of condom use, except for significant interaction indicating that Hispanics who drank more were <i>more</i> likely to have used a condom.

Study	Participants	Type of Event(s) Assessed/ Type of Substance(s) Assessed	Analysis	Results and (Comments)
Koch, Palmer, Vicary, & Wood (1999)	<i>N</i> = 320 <i>Age</i> = NR <i>Gender</i> : 57% female <i>Ethnicity</i> : 91% Caucasian <i>Orientation</i> : Heterosexual <i>Source</i> : Undergraduate college sample	<i>Event</i> : Last sexual encounter <i>Substance(s)</i> : Alcohol	Logistic regression predicting condom use Separate analysis by gender	<ul style="list-style-type: none"> No direct association was found between amount of alcohol consumed by the respondent or his or her partner and whether a condom was used Participants who discussed contraception, emotional involvement, or HIV/AIDS with the partner were more likely to have used condom When male participants or their partners drank prior to sex, they were less likely to have discussed the above topics during the event Sex-related alcohol expectancies, drinking attitudes, and social norms for drinking predicted alcohol use prior to the event
Kraft, Rise, & Traeen (1990)	<i>N</i> = 1172 <i>Age</i> = 17 -19 years <i>Gender</i> : 55% female <i>Ethnicity</i> : NR <i>Orientation</i> : NR <i>Source</i> : Norwegian population-based survey	<i>Event</i> : First intercourse <i>Substance(s)</i> : Alcohol	Chi-square tests and logistic regression. Separate analyses by gender.	<ul style="list-style-type: none"> Alcohol use was negatively associated with condom use in univariate and multivariate analyses. Relationship was consistent for boys and girls.
Lindan et al. (1990)	<i>N</i> = 341 <i>Gender</i> = 52% female <i>Age</i> : <i>M</i> women = 27; <i>M</i> men = 29 <i>Ethnicity</i> : 40% Af. Am., 38% Caucasian. <i>Orientation</i> : NR (all reported engaging in sexual behavior with member of opposite sex at least once in past year) <i>Source</i> : Sexually transmitted disease clinic in San Francisco	<i>Event</i> : Most recent intercourse <i>Substance(s)</i> : Drugs (not defined) and alcohol	Computed odds-ratio with dichotomous condom use and drug/alcohol use classification.	<ul style="list-style-type: none"> Men were less likely to use condoms if alcohol or other drugs were used, and were less likely to use condoms if partner did not support condom use. Among women there was no relationship between substance use and condom use. Women were less likely to use condoms if partner did not endorse condom use, they believed that condoms decrease sexual pleasure, were black, or had sex with a steady partner.
MacDonald, Zanna, & Fong (1996)	<i>N</i> = 1069 <i>Age</i> : NR <i>Gender</i> : 56% male <i>Ethnicity</i> : NR <i>Orientation</i> : NR <i>Source</i> : College students in Canada	<i>Event</i> : Most recent intercourse <i>Substance(s)</i> : Alcohol	Chi-square tests, by level of intoxication.	<ul style="list-style-type: none"> Men who were moderately to extremely intoxicated were less likely to have used a condom than men who were less intoxicated or who had not consumed alcohol. No association among women. Sample limited to those who used condoms at least sometimes.
Robertson & Plant (1988)	<i>N</i> = 335 (230 married) <i>Gender</i> = 50% female <i>Age</i> : 16 - 20 <i>Ethnicity</i> : NR <i>Orientation</i> : NR	<i>Event</i> : First intercourse <i>Substance(s)</i> : Alcohol	Chi-square analysis by gender.	<ul style="list-style-type: none"> Less likely to use contraception if drinking 13% of men who had drunk during event reported using contraception. 57% of

Study	Participants	Type of Event(s) Assessed/ Type of Substance(s) Assessed	Analysis	Results and (Comments)
	<i>Source:</i> Survey in Edinburgh Scotland			<ul style="list-style-type: none"> men who had not drunk reported using contraception. 24% of women who had drunk used contraception, whereas 68% who had not drunk used contraception. Contraception included methods other than condoms.
Scheidt & Windle, (1996)	<i>N</i> = 802 <i>Age</i> = 34.4 <i>Gender:</i> 60% male <i>Ethnicity:</i> 52% African American, 23% Hispanic <i>Orientation:</i> NR <i>Source:</i> Inpatients at alcohol treatment centers	<i>Event:</i> Most recent intercourse before entering alcohol treatment (also assessed rate [on a 5-pt scale] of condom use and alcohol/drug use during sex for primary and nonprimary partners for the six months prior to entering alcohol treatment) <i>Substance(s):</i> Alcohol or drugs	Logistic regression analysis including blocks of person, sexual history, and event variables.	<ul style="list-style-type: none"> Alcohol use during the event was associated with sex with a nonprimary partner for both men and women, but was not associated with condom use during the event for either gender. Sex with a nonprimary partner was positively associated with condom use among men, but not women. Within-subject analyses on 6-month summary data indicated that both alcohol use and condom use were more likely in situations involving nonprimary partners.
Senf & Price (1994) Includes data from 3 samples	<i>Ns</i> = 452, 111, 79 <i>Age</i> = 16 - 30 <i>Gender:</i> 57% male, NR, NR <i>Ethnicity:</i> 81% Caucasian, NR, NR <i>Orientation:</i> 100% heterosexual <i>Source:</i> University subject pool, technical and community colleges, community social event	<i>Event:</i> Most recent intercourse <i>Substance(s):</i> Alcohol	Chi-square analysis.	<ul style="list-style-type: none"> No difference in condom use by alcohol in any sample.
Traeen & Kvalem (1996)	<i>N</i> = 920 <i>Gender:</i> 50% female <i>Age:</i> 16 - 20 <i>Ethnicity:</i> NR <i>Orientation:</i> NR <i>Source:</i> Stratified sample of Norwegian adolescents	<i>Event:</i> Most recent intercourse <i>Substance(s):</i> Alcohol and drugs	Chi-square analysis by gender. Multivariate regression predicting failure to use contraception.	<ul style="list-style-type: none"> Contraceptive use was less likely if alcohol/drugs were used; true for both genders. Intercourse occurring outside of the participant's and partner's home was the strongest predictor of whether alcohol/drugs were used prior to sex.
Weinstock et al. (1993) (also see Lindan et al., 1990)	<i>N</i> = 200 <i>Age:</i> <i>M</i> men = 29; <i>M</i> women = 27 <i>Gender</i> = 55% female <i>Ethnicity:</i> 44% Af. Am., 37% Caucasian, 10% Hispanic <i>Orientation:</i> NR (all reported engaging in sexual behavior at least once in past year with member of opposite sex)	<i>Event:</i> Most recent intercourse <i>Substance(s):</i> Drugs (not defined) and alcohol	Univariate and multivariate logistic regression, stratified by gender. Predicted failure to use a condom during most recent intercourse.	<ul style="list-style-type: none"> Condom use less likely if drinking among men. No difference in condom use among women.

Study	Participants	Type of Event(s) Assessed / Type of Substance(s) Assessed	Analysis	Results and (Comments)
	Source: STD clinic clients			
Studies In Which Two or Three Events Per Participant Were Assessed				
Cooper, Pierce, & Huselid (1994)	<i>N</i> =1,259 <i>Age: M</i> = 16.7 years <i>Gender</i> : 50% female <i>Ethnicity</i> : 48% Caucasian, 44% African American <i>Orientation</i> : NR <i>Source</i> : Random digit dial survey in Buffalo, NY	<i>Events</i> : 1 First intercourse 2 First intercourse with most recent partner <i>Substance(s)</i> : Alcohol and marijuana and other substances (combined for ANCOVA analysis)	Within-subject analysis: repeated measures ANCOVA. "Level of risk" for each event was operationalized as prior discussion of risk-related topics (yes or no), degree of partner intimacy, condom use (yes or no), and an index of overall risk based on these three factors.	<ul style="list-style-type: none"> • Within subjects: Participants who used substances on 1 of 2 occasions had higher risk index during the event when substances were used. However, the effect was not consistent for condom use specifically. Participants who used substances during their first intercourse were less likely to have used condoms during that event than during first intercourse with their most recent partner, whether alcohol was used or not. Participants who did not use substances during first intercourse had equivalent likelihood of condom use during first intercourse with most recent partner. • More consistent effect of substance use on condom use among White adolescents than among Black adolescents.
Dermen, Cooper, & Agocha (1998)	<i>N</i> = 907, 691, 656 (<i>N</i> for each event) <i>Age</i> = 13-19 years <i>Gender</i> : 52% male <i>Ethnicity</i> : 53% Caucasian, 40% African American <i>Orientation</i> : NR <i>Source</i> : Random digit dial sampling in Buffalo, NY	<i>Events</i> : First intercourse, first intercourse with most recent partner, and last intercourse <i>Substance(s)</i> : Alcohol Risk index variable computed for each event, consisting of condom use (yes/no), prior discussion of risk-related topics (yes/no), and level of partner intimacy (more / less)	Between-subjects analysis: Hierarchical multiple regression predicting risk index variable.	<ul style="list-style-type: none"> • Alcohol positively associated with risk taking for all three events. • Interaction with expectancies was significant for first intercourse and most recent intercourse, indicating a moderating role for sex-related alcohol expectancies. • Large sample size may have led to significant findings; effect sizes were small for all associations.
Gold & Skinner (1992)	<i>N</i> = 219 <i>Age: M</i> = 19 years <i>Gender</i> : 100% male <i>Ethnicity</i> : 81% Anglo-Celtic, 28% other. <i>Orientation</i> : 92% MSM <i>Source</i> : Gay bars, meetings, private parties	<i>Events</i> : During the previous six months 1 One event when they had unprotected intercourse and 2 One event when they resisted a strong temptation to engage in unprotected sexual acts <i>Substance(s)</i> : Drugs and alcohol. Asked participants how intoxicated and how stoned they were during each sexual encounter	Repeated measures ANOVA and <i>t</i> tests on 115 participants who reported both a safe and an unsafe encounter.	<ul style="list-style-type: none"> • Neither drug nor alcohol intoxication distinguished between the safe and unsafe events. • Participants free to recall any protected and unprotected event in past 6 months.
Gold, Karmiloff-Smith, Skinner, &	<i>N</i> = 284 <i>Age</i> : 79% between 18 and 21 years	<i>Events</i> : During the previous 6 months	Repeated measures ANOVA and <i>t</i> tests on 115 participants who reported both	<ul style="list-style-type: none"> • Intoxication was greater in the unsafe encounter among respondents with a casual partner.

Study	Participants	Type of Event(s) Assessed / Type of Substance(s) Assessed	Analysis	Results and (Comments)
Morton (1992)	<i>Gender:</i> 54% female <i>Ethnicity:</i> NR <i>Orientation:</i> 97% Heterosexual <i>Source:</i> University students in London	<ol style="list-style-type: none"> 1 One event when they had unprotected intercourse and 2 One event when they resisted a strong temptation to engage in unprotected sexual acts <p><i>Substance(s):</i> Drugs and alcohol. Asked participants how intoxicated and how stoned they were during each sexual encounter</p>	safe and unsafe encounter and who had the same type of partner at both encounters.	<ul style="list-style-type: none"> • Intoxication was greater in the unsafe encounter for all participants at the time of meeting the partner. • Participants free to recall any protected and unprotected event in past 6 months.
Gold, Skinner, Grant & Plummer (1991)	<i>N</i> = 219 <i>Age:</i> 87% between 20 and 39 years <i>Gender:</i> 100% male <i>Ethnicity:</i> NR <i>Orientation:</i> 100% MSM <i>Source:</i> Gay bars, "sex on premises venues," a medical practice, and support groups in Melbourne Australia	<p><i>Events:</i> During the previous year</p> <ol style="list-style-type: none"> 1 One event when they had unprotected intercourse and 2 One event when they resisted a strong temptation to engage in unprotected sexual acts <p><i>Substance(s):</i> Drugs and alcohol. Asked participants how intoxicated and how stoned they were during each sexual encounter</p>	Repeated measures ANOVA and <i>t</i> tests on 108 participants who reported both safe and unsafe encounters and who had the same type of partner at both encounters.	<ul style="list-style-type: none"> • Neither drug nor alcohol intoxication distinguished between the safe and unsafe events. • Participants free to recall any protected and unprotected event in past year.
Kraft & Rise (1991)	<i>N</i> = 1,827 <i>Age:</i> 17-19 years <i>Gender:</i> 53% female <i>Ethnicity:</i> NR <i>Orientation:</i> NR <i>Source:</i> Population Registry of Norway	<p><i>Events:</i></p> <ol style="list-style-type: none"> 1 Most recent intercourse 2 Most recent casual sex (defined as sexual intercourse with a partner met the same day) <p><i>Substance(s):</i> Alcohol</p>	Chi-square analysis by gender for both sexual events. Within-subject analysis not conducted.	<ul style="list-style-type: none"> • Proportion of participants (boys and girls) who used condoms if drinking during last intercourse was equivalent to the proportion who used condoms when not drinking both for the most recent intercourse and most recent casual sex events. • Girls: Less likely to be on the pill if drinking during last intercourse and during last casual sex; more likely to have used withdrawal if drinking during most recent casual sex. • Boys: Partner less likely to have been on the pill if drinking during last intercourse. • Casual sex more likely to have been while drinking alcohol compared to most recent intercourse. • Results indicate sex under the influence occurred with less planning and less wellknown partners.
Temple & Leigh (1992)	<i>N</i> = 774 <i>Age</i> = 18 or older	<i>Events:</i>	Chi-square analysis and logistic regression,	<ul style="list-style-type: none"> • Chi-square analysis revealed no differences in condom use during either

Study	Participants	Type of Event(s) Assessed / Type of Substance(s) Assessed	Analysis	Results and (Comments)
	<i>Gender:</i> 56% female <i>Ethnicity:</i> 77% Caucasian <i>Orientation:</i> 97% heterosexual <i>Source:</i> Area probability sample of one county in San Francisco Bay Area	<ol style="list-style-type: none"> 1 Most recent intercourse 2 Most recent intercourse with new partner <i>Substance(s):</i> Alcohol	including individual and situational (including number of drinks during event) factors, to predict unprotected sexual acts in event 2	<ul style="list-style-type: none"> • event for either gender based on alcohol consumption. • Logistic regression found that number of drinks consumed was not a significant predictor of condom use for men or for women. • For men's most recent intercourse, encounters with a newer sexual partner were more likely to have included alcohol than encounters with better-known partners.
Temple, Leigh, & Schafer (1993)	<i>N</i> = 2,058 <i>Age</i> = 18+ <i>Gender:</i> 52% female <i>Ethnicity:</i> 74% Caucasian, 13% African American, 1% Hispanic <i>Orientation:</i> 83% heterosexual, 15% unknown <i>Source:</i> Multi-stage area probability sample of the contiguous United States	<i>Events:</i> <ol style="list-style-type: none"> 1 Most recent intercourse 2 Most recent intercourse with new partner <i>Substance(s):</i> Alcohol	Chi-square analysis and logistic regression, including individual and situational (including number of drinks during event) factors, to predict unprotected sexual acts in event 2.	<ul style="list-style-type: none"> • No differences in condom use by alcohol consumption revealed with univariate or multivariate analysis for men or for women for either event. • Alcohol use was more likely in events involving new partners, casual partners, and events that were unexpected. • Among men, overall drinking patterns were related to use of condoms such that condom use was less prevalent among heavier drinkers.
Testa & Collins (1997)	<i>N</i> = 123 <i>Age:</i> <i>M</i> = 24 years <i>Gender:</i> 100% female <i>Ethnicity:</i> 78% Caucasian, 12% African American <i>Orientation:</i> NR (Sample limited to participants who reported vaginal intercourse) <i>Source:</i> City and campus newspaper ads and snowball sampling	<i>Events:</i> <ol style="list-style-type: none"> 1 Most recent intercourse with a new or occasional partner after alcohol was consumed 2 Most recent intercourse with new or occasional partner when no alcohol was consumed <i>Substance(s):</i> Alcohol	McNemar's tests examining whether condom use varied as a function of alcohol consumption.	<ul style="list-style-type: none"> • No differences in condom use or discussion of HIV or pregnancy for either event. • Participants more likely to engaging in sexual acts with a new partner if drinking than if not drinking.
Trocki & Leigh (1991)	<i>N</i> = 844 <i>Age</i> = 18 - 50 <i>Gender:</i> 52% male <i>Ethnicity:</i> NR <i>Orientation:</i> NR <i>Source:</i> San Francisco community via postal survey	<i>Events:</i> <ol style="list-style-type: none"> 1 Most recent intercourse with alcohol 2 Most recent intercourse without alcohol <i>Substance(s):</i> Alcohol	Characteristics of 2 events were combined across participants. Cross-tabulation analyses, and logistic regression analyses on unsafe sexual behavior in most recent sexual encounter with a new or occasional partner.	<ul style="list-style-type: none"> • Decreased likelihood of condom use for heterosexual women and homosexual men but not heterosexual men when feeling strong effects of alcohol. • Drug use (other than alcohol) was not a significant predictor of condom use. • No within-subject analyses presented.

Note. ANOVA= Analysis of variance; STD = sexually transmitted disease; NR = not reported; MSM = men who have sex with men

Table 2

Studies In Which Multiple-Event Assessment Was Used to Examine the Relationship Between Alcohol Use and Condom Use

Study	Participants	Events Assessed, Assessment Methodology	Analysis	Results and Comments
Crosby, Stall, Paul, Barrett, & Midanik (1996)	<i>N</i> = 131 <i>Age</i> : 55% between 30 and 39 <i>Gender</i> : 100% male <i>Ethnicity</i> : 73% Caucasian <i>Orientation</i> : 100% MSM <i>Source</i> : Consecutive admissions to a substance abuse treatment center in San Francisco	<i>Events</i> : All occasions of anal sex for a 1-month period, using retrospective calendar-based assessment <i>Substance(s)</i> : Drugs (not specified) and alcohol	Compared psychosocial characteristics of men who used condoms during all anal sex involving substances and those who never used condoms for anal sex after using substances.	<ul style="list-style-type: none"> Alcohol use was not a significant predictor of condom use. Men who never used condoms were more likely to use nitrite inhalants and cocaine and had higher frequency of anal sex. Did not conduct within-subject analyses.
Fortenberry, Orr, Katz, Brizendine, & Blythe (1997)	<i>N</i> = 82 <i>Age</i> = 17.4 years <i>Gender</i> : 100% female <i>Ethnicity</i> : 76% African American <i>Orientation</i> : NR <i>Source</i> : STD and primary care clinics (all participants had gonorrhea, chlamydia, or trichomoniasis)	<i>Events</i> : All occasions of sexual behavior for an average of 9 weeks, assessed with diaries of every coital event <i>Substance(s)</i> : Drugs (not defined) and alcohol	Logistic regression was used to test whether condom use during each event was predicted by (a) proportion of nonsubstance events during which condoms were used, (b) whether the event was with a different partner than the previous event, and (c) whether alcohol or drugs were used during the event.	<ul style="list-style-type: none"> Logistic regression analysis indicated that substance use alone was not a predictor of condom use at the event level. However, the interaction between partner change and substance use was significant. Because this result was not robust to variation in the definition of <i>partner change</i>, the authors conclude, "These data do not support the hypothesis that substance use...increases risk of sexually transmitted disease."
Harvey & Beckman (1986)	<i>N</i> = 69 <i>Age</i> : <i>M</i> = 24 <i>Gender</i> : 100% female <i>Ethnicity</i> : 87% Caucasian <i>Orientation</i> : 100% heterosexual <i>Source</i> : University courses and campus newspaper advertisements	<i>Events</i> : All sexual behavior over the course of 2 to 3 menstrual cycles, assessed with separate daily logs for drinking and sexual events. Participants could report up to 4 drinking sessions and 3 occasions of sexual behavior on each day. <i>Substance(s)</i> : Alcohol	The percentage of intercourse sessions resulting in contraceptive nonuse was compared for events with no alcohol, moderate alcohol, and heavy alcohol. Also compared the mean number of female-initiated sexual activities per day across these categories of drinking.	<ul style="list-style-type: none"> No differences in condom use by alcohol use group. Many participants viewed alcohol as an aphrodisiac and reported (in a poststudy survey) increased sexual desire, arousal, and enjoyment when drinking. However, these reports were not consistent with the data collected at the event-level. Within-subject analysis not conducted.
Leigh (1993)	<i>N</i> = 99 <i>Age</i> : <i>M</i> = 23 <i>Gender</i> : 54% female <i>Ethnicity</i> : 85% Caucasian <i>Orientation</i> : 67% heterosexual <i>Source</i> : Responded to newspaper ads	<i>Events</i> : All sexual behavior for 10 weeks, assessed with daily diaries <i>Substance(s)</i> : Alcohol	For within-subject analysis, used participants who reported sexual acts both with and without alcohol. ANOVA on "proportion of sexual incidents with new or occasional partners in which a condom was used", respondent gender as a between subjects factor and alcohol use (yes or no) as a repeated measures factor.	<ul style="list-style-type: none"> No event-level association between alcohol on condom use for men or women.
Weatherburn et al. (1993)	<i>N</i> = 461 <i>Age</i> : NR <i>Gender</i> : 100% male <i>Ethnicity</i> : NR	<i>Events</i> : Weekly retrospective reports of all sexual occasions collected	Compared percentage of events involving condom use by whether the event involved alcohol.	<ul style="list-style-type: none"> No differences in condom use based on alcohol use, for receptive and insertive anal sex, or

Study	Participants	Events Assessed, Assessment Methodology	Analysis	Results and Comments
	<i>Orientation:</i> 100% MSM <i>Source:</i> gay press, pubs, clubs, and social and political organizations in London, UK	in face-to-face interviews <i>Substance(s):</i> Alcohol		<ul style="list-style-type: none"> for sex with regular or casual partners. Did not conduct within-subject analysis.
Weinhardt et al. (in press)	<i>N</i> = 159 <i>Age:</i> <i>M</i> = 37 years <i>Gender:</i> 52% male <i>Ethnicity:</i> 63% Caucasian, 30% African American <i>Orientation:</i> 79% Heterosexual <i>Source:</i> State outpatient psychiatric clinics	<i>Events:</i> All sexual behavior during 3-month reporting period, collected in face-to-face interview using retrospective calendar-based assessment <i>Substance(s):</i> Alcohol	Computed a log odds ratio (odds of condom use when drinking vs. odds when not drinking) for each participant who had engaged in sexual acts at least once when drinking and once without alcohol. Log odds ratio used as primary dependent variable.	<ul style="list-style-type: none"> Between subject analysis revealed global and situational associations between heavy drinking and sexual risk behavior. No event-level relationship found between alcohol use and condom use. Women more likely to engage in sexual behavior with a new or casual partner when drinking than when sober.

Note. ANOVA= Analysis of variance; STD = sexually transmitted disease; NR = not reported; MSM = men who have sex with men