

# Retrospective Assessment of the Association Between Drinking and Condom Use\*

BARBARA C. LEIGH, PH.D., M.P.H.,<sup>†</sup> DIANE M. MORRISON, PH.D.,<sup>†</sup> MARILYN J. HOPPE, PH.D.,<sup>†</sup>  
BLAIR BEADNELL, PH.D.,<sup>†</sup> AND MARY ROGERS GILLMORE, PH.D.<sup>†</sup>

*Alcohol and Drug Abuse Institute, University of Washington, 1107 N.E. 45th Street, Suite 120, Seattle, Washington 98105*

**ABSTRACT. Objective:** Retrospective reports of the association between drinking and high-risk sexual behavior can be biased by implicit theories of the effects of drinking or may represent post hoc justifications instead of accurate reports of behavior. Using data from a daily diary study, we compared daily reports of condom use when drinking and not drinking with the same participants' reports of these behaviors from a retrospective questionnaire administered after diary collection was complete. **Method:** Participants included adolescents ( $n = 145$ ), adult sexually transmitted disease clinic clients ( $n = 167$ ), college students ( $n = 145$ ), and men who have sex with men ( $n = 147$ ). All participants reported their alcohol consumption and sexual activity daily for 8 weeks and then completed a retrospective questionnaire about their behavior over the diary period. **Results:** Participants' retrospective judgments

about whether they used condoms more or less when drinking were not significantly related to their behavior as reported in the diary. Fewer than two thirds of the participants were accurate in their recollection of the association of condom use and drinking. Teenagers and men who have sex with men were more likely to retrospectively overestimate the negative effect of alcohol on condom use. **Conclusions:** Retrospective questions about the association between drinking and condom use were consistent with actual behavior only among people who consistently either never or always used condoms. These individuals correctly reported that drinking had no effect on their condom use. For people whose condom use varies, questions about associations between drinking and sex may be difficult to answer, owing to their conditional nature, and may lead to error. (*J. Stud. Alcohol Drugs* 69: 773-776, 2008)

**R**ESearch on factors associated with high-risk sexual behavior for disease transmission has suggested that drinking alcohol at the time of sexual activity is related to the occurrence of unprotected sex. Investigating links between drinking and high-risk sexual activities requires accurate measures not only of alcohol use and of sexual behavior but also of the co-occurrence of the two. In the absence of noninvasive and ecologically valid biological or observational techniques, measurement of both alcohol use and sexual behavior must rely on self-reports, which generally are retrospective.

Retrospective reports of associations between drinking and other behaviors can be biased by implicit theories about covariation of drinking, its precursors, and its consequences. For example, several surveys of adolescent and college student drinking use retrospective questions such as "Do you use condoms more or less when drinking?" or "Have you had unprotected sex because you were drinking?" as

indicators that drinking increases the likelihood of unprotected sex (Hingson et al., 2003; Kaiser Family Foundation et al., 2003; Strunin and Hingson, 1992). Such retrospective reports, however, may represent an "effort after meaning," or the tendency to reconstruct events in a manner consistent with current attitudes and knowledge (Bartlett, 1932; Ross, 1989). Given the strong cultural beliefs about the effects of drinking on sexual activity (Leigh 1993b; Reinerman and Leigh, 1987), such retrospective reports might represent after-the-fact justifications rather than accurate reflections of behavior.

To examine recollections about drinking and condom use with sex, we used data from a study in which participants completed daily diaries about their alcohol use and sexual behavior. A major advantage of diary studies is that they can be used to examine the co-occurrence of drinking and other behaviors, including sexual activity and condom use (Gillmore et al., 2002; Leigh, 1993a; Morrison et al., 2003). Collecting reports of behavior on the day that it occurred can reduce memory biases of retrospective interviews and may provide a less biased measure that can be used to assess the validity of retrospective reports.

In this study, we compared reported condom use when drinking and not drinking, collected over 8 weeks in daily diaries, with the same participants' reports of these behaviors reported in a retrospective questionnaire administered after diary collection was complete.

Received: May 11, 2007. Revision: April 2, 2008.

\*This research was supported by National Institute on Alcohol Abuse and Alcoholism grants AA013688, AA000183, and K05AA015050.

<sup>†</sup>Correspondence may be sent to Barbara C. Leigh at the above address or via email at: leigh@u.washington.edu. Diane M. Morrison, Marilyn J. Hoppe, and Blair Beadnell are with the School of Social Work, University of Washington, Seattle, WA. Mary Rogers Gillmore is now with the School of Social Work, Arizona State University, Phoenix, AZ.

## Method

The data come from a larger study of substance use and unprotected sex that included adolescents ( $n = 145$ ), adults visiting a sexually transmitted disease (STD) clinic ( $n = 167$ ), college students ( $n = 145$ ), and men who have sex with men ( $n = 147$ ) (see Gillmore et al., 2002; Leigh et al., 2008; Morrison et al., 2003). Eligible participants were unmarried, had sex at least four times in the prior 2 months, were not in a current monogamous relationship of more than 6 months' duration, had used condoms at least once in the last year, and had drunk alcohol at least four times in the last 2 months (the last two conditions were required for sufficient variation in key variables).

### Procedure

The study was described as a "health habits" study examining daily patterns of various health-related behaviors. Participants were mailed a baseline questionnaire and were randomly assigned to fill out written daily diaries and to return them by mail or to participate in daily telephone interviews. Daily data collection began when the entry questionnaire was returned. Participants in the self-administered written diary condition were sent weekly packets containing instructions; seven daily diary forms; and seven self-addressed, stamped envelopes in which to mail back each day's diary. Participants in the telephone condition responded to a daily telephone interview, at the conclusion of which an appointment was made for the next day's interview. The diary (identical in the telephone and written conditions) included a checklist of questions about smoking, diet, dental care, exercise, seat belt use, sleeping patterns, drug and alcohol use, and sexual behaviors. Pretests of the questionnaire demonstrated that, with the inclusion of items assessing other "health habits," participants did not discern that the study was intended to examine the relationship between intoxication and condom use.

On the first day of daily data collection, participants reported on their activities in the past 24 hours. Each day thereafter, participants were asked, "Since you filled out this form [talked with us] yesterday, did you ...?" Comparisons of the telephone and written conditions revealed no differences in reports, and data from the two conditions were collapsed for this analysis.

Following the 8 weeks of daily data collection, participants were mailed a questionnaire that asked about their behavior over the diary period. They were randomly assigned to recall their behavior over the past week, past month, or past 2 months.

### Measures

Up to three sexual encounters and three occasions of drinking could be recorded each day. For each sexual en-

counter, participants were asked when the encounter began; whether intercourse was vaginal, anal, or oral; and whether a condom was used for each type of sexual behavior. Questions about drinking occasions included the number of drinks consumed and the time that drinking began and ended.

In the retrospective questionnaire, participants were asked how often they used condoms during sex when they were drinking and how often they used condoms with sex when they were not drinking (response alternatives, coded 1-7, were "never," "rarely," "less than half the time," "about half the time," "more than half the time," "almost always," and "every time").

### Construction of variables

Using the daily reports, drinking episodes were matched with sexual encounters if drinking occurred within 4 hours before sexual activity started (Harvey and Beckman, 1986; Leigh, 1993a). We calculated for each participant the proportion of condom use in sexual encounters with and without drinking (using only reports of vaginal or anal sex) for the time period specified in the assigned recall condition. Then we subtracted the without-drinking proportion from the with-drinking proportion to generate a measure of the association between drinking and condom use (values from -1 to 1).

Using the retrospective questions about condom use, we subtracted the frequency of condom use without drinking from the frequency of condom use with drinking, yielding an ordinal measure (values from -6 to +6) that represents the increase or decrease in condom use while drinking compared with not drinking.

We constructed a three-category measure of "recall accuracy"—that is, the agreement of the drinking–no drinking differences in condom use in the diary compared with those in the retrospective questionnaire. Participants were coded as having accurate recall ( $n = 117$ ) if the standardized diary-based and retrospection-based difference scores were in the same direction and within 10% of each other. They were coded as *overestimating* the negative association of drinking and condom use if they (1) reported at least 10% more condom use on the diary when drinking than when not drinking but recalled that their condom use was the same or lower when drinking ( $n = 28$ ) or (2) used condoms at the same rate when drinking and not drinking as reported in the diary but later recalled using condoms less when drinking ( $n = 12$ ). Finally, participants were coded as *underestimating* the negative association of drinking and condom use if the opposite was true ( $n = 28$ ). Of these respondents, 19 had lower rates of condom use in the diary when drinking than when not drinking but recollected equal use in both conditions, and 9 had equal rates of condom use when drinking and not drinking but recollected using condoms more often when drinking. Ten percent was a natural cut point for categorization: Most cases were either within 10% or much larger.

## Results

Two hundred seventy-seven participants retrospectively reported having sex while drinking during the diary period and answered the retrospective questions indicating how often they used condoms when they were drinking and when they were not drinking. Of these, 185 had diary reports of sexual encounters both with and without drinking, and their data were used in this analysis (38 men who have sex with men, 71 STD clinic patients, 29 adolescents, and 47 college students). This group was largely white (72%) and included 98 men and 87 women with a mean age of 24 (range: 14-35).

The proportion of condom use while drinking and not drinking were highly correlated in the diary ( $r = .82$ ) and on the retrospective questionnaire ( $\rho = .88$ ). Data from the diaries indicated no association between drinking and condom use: Participants used condoms on 44% of sex occasions in both drinking and sober events (paired  $t$  tests). In the retrospective reports, the majority of participants ( $n = 134$ ; 72%) reported using condoms at the same rate when drinking as when not drinking. Thirty one (17%) reported using condoms more often when not drinking, and 20 (11%) reported using condoms more when drinking.

The drinking–no drinking discrepancy in condom use from the diary and the retrospective measures was virtually uncorrelated ( $r = .19$ ). (This correlation was heavily influenced by two outliers; with one outlier removed,  $r = .09$  or  $.12$ ; with both removed,  $r = .004$ .) That is, participants' retrospective judgments about whether they used condoms more or less when drinking were not significantly related to their behavior as reported in the diary.

Of the 117 people coded as “accurate” on the three-category accuracy measure, 46 never used condoms and 38 always used condoms during the time period studied. Therefore, most (72%) participants who correctly estimated their behavior while drinking and sober had consistent condom-use habits. Of the 68 who were not accurate, only 9 (13%) used condoms always or never: 6 (15%) of the 40 who overestimated negative effects of alcohol and 3 (11%) of the 28 who overestimated positive effects. Neither the condom consistency nor accuracy category was significantly related to gender, diary condition, the number of sexual encounters during the diary period, the number of encounters that included drinking, condom self-efficacy, or alcohol expectancy (all  $p$ 's  $> .20$ ).

We explored predictors of accuracy separately in two groups: those with consistent condom habits (they used condoms always or never during the diary period;  $n = 93$ ) and those who sometimes used condoms ( $n = 92$ ). Among the inconsistent users, logistic regression analyses showed that accuracy (accurate/inaccurate) was unrelated to age, gender, or the number of drinking occasions during the diary period but that accuracy was greater among those with more sexual

encounters during the specified time period (odds ratio [OR] = 1.04, 95% confidence interval [CI]: .1.0-1.07). Among consistent users/nonusers, accuracy was greater among women (OR = 5.9, CI: 1.06-32.37) and tended to be greater among older participants (OR = 1.19, CI: 0.97-1.46) and those who drank more often (OR = 1.08, CI: 0.99-1.17). The results for these subgroups, however, should be interpreted with caution, given that only nine participants in this group were inaccurate.

Among heterosexual participants, there was a trend for younger participants to report that drinking hindered condom use more than it did: 38% of teens overestimated the negative effect of drinking, and only 7% underestimated it. These proportions were 21% and 15%, respectively, in college students, and 13% and 17%, respectively, in STD clinic clients ( $\chi^2 = 8.68$ , 4 df,  $p = .07$ ). Among men who have sex with men, 26% overestimated the negative effect of drinking, and 18.4% underestimated it.

## Discussion

We undertook these analyses to examine the accuracy of retrospections about the relationship between drinking and condom use. Many studies have reported that drinking reduces condom use, based on self-reports, and the idea that “high = high risk” is embedded in many HIV- and STD-prevention messages. Given the potential role of alcohol as an excuse for bad behavior (Leigh and Stall, 1993; Weinhardt and Carey, 2000), however, there is reason to suspect that individuals may poorly estimate the role that drinking plays in sexual risk taking.

When we compared retrospective reports with behavior reported in a daily diary (which is assumed to be more accurate), we found that fewer than two thirds of participants were accurate in their recollection of the association between condom use and drinking, and, of these, 72% were using condoms either never or always. In contrast, many fewer (13%) of those who were inaccurate were “never” or “always” users. This result implies that there may be personal rules about using condoms that simplify decision making in sexual situations. Such rules are likely to be absolute, based on personal preferences or concerns for safety, and to stipulate using condoms either always or never—there is little reason to establish a personal rule to “use condoms half the time.” When asked to report on recent condom use, people may be reporting their rules rather than actually recalling and counting their behaviors. These rules, even when broken, may aid recall. For example, a person who has a rule to always use condoms may particularly recall an occasion of not using one because it is a notable exception, leading to an accurate report of “almost always.”

About one third of study participants poorly recalled the difference in rates of condom use when they were drinking versus when they were not drinking. Somewhat surprisingly,

the differences were not overwhelmingly in the direction of “blaming the booze”—22% of participants thought that the association of condom use with alcohol use was more detrimental than what was found based on diary reports, and a similar proportion (15%) underestimated the negative association with condom use. We were not able to predict these differences with cognitions such as alcohol expectancies or condom self-efficacy.

Teens and men who have sex with men were more likely to overestimate the negative effects of alcohol. These groups are often targeted for HIV interventions, and greater exposure to messages that blame intoxication for failure to use condoms may account for this bias. Teens also were somewhat less likely to report that they use condoms always or never, which, as discussed above, is related to lower accuracy. Because of their relative lack of sexual experience, teens may be less likely to have well-established habits of condom use or to have formulated rules for their use. As a result, they may be more likely to base their self-reports on counting, computing, and comparing proportions, and therefore they may be more prone to making errors. They also may be more susceptible to the effects of bias based on cultural beliefs of alcohol–sex stereotypes.

Our findings suggest that these types of retrospective questions about rates of condom use when drinking and not drinking are consistent with actual behavior only among people who demonstrate a consistent habit of either never or always using condoms. For these people, answering retrospective questions requires little actual retrospection; instead, their responses are simple descriptions of what they “always” or “never” do. For people whose condom use varies, questions about associations between drinking and sex may be difficult to answer owing to their conditional nature.

The same types of errors may be found in other retrospective estimates of associations. Indeed, several studies have revealed inconsistencies between retrospective and same-day accounts of the relationship between drinking and smoking (Shiffman et al., 1994), mood and smoking relapses (Shiffman et al., 1997), and daily events and mood changes (Wilson et al., 1982).

We used only one of the many possible measures that may be used to capture retrospective self-reports about drinking and condom use. Answering questions about conditional probabilities (i.e., the likelihood of using condoms while drinking) is a complex process and involves recalling two sets of events, computing proportions or probabilities for each, and comparing them. It is likely that people use sub-

stitute strategies such as personal rules and truisms to answer these questions, and these strategies may result in misleading research findings.

## References

- BARTLETT, F.C. *Remembering: A Study in Experimental and Social Psychology*, New York: Cambridge Univ. Press, 1932.
- GILLMORE, M.R., MORRISON, D.M., LEIGH, B.C., HOPPE, M.J., GAYLORD, J., AND RAINEY, D.T. Does “high=high risk”? An event-based analysis of the relationship between substance use and unprotected anal sex among gay and bisexual men. *AIDS Behav.* **6**: 361-370, 2002.
- HARVEY, S.M. AND BECKMAN, L.J. Alcohol consumption, female sexual behavior and contraceptive use. *J. Stud. Alcohol* **47**: 327-332, 1986.
- HINGSON, R., HEEREN, T., WINTER, M.R., AND WECHSLER, H. Early age of first drunkenness as a factor in college students’ unplanned and unprotected sex attributable to drinking. *Pediatrics* **111**: 34-41, 2003.
- KAISER FAMILY FOUNDATION, HOFF, T., GREEN, L., AND DAVIS, J. *National Survey of Adolescents and Young Adults: Sexual Health Knowledge, Attitudes and Experiences*, Menlo Park, CA: Henry J. Kaiser Family Foundation, 2003.
- LEIGH, B.C. Alcohol consumption and sexual activity as reported with a diary technique. *J. Abnorm. Psychol.* **102**: 490-493, 1993a.
- LEIGH, B.C. Alcohol use and unsafe sex: An overview of research and theory. Paper presented at the University of California Extension conference on “HIV and Alcohol Impairment: Reducing Risks,” San Diego, California, 1993b.
- LEIGH, B.C. AND STALL, R. Substance use and risky sexual behavior for exposure to HIV: Issues in methodology, interpretation, and prevention. *Amer. Psychol.* **48**: 1035-1045, 1993.
- LEIGH, B.C., VANSLYKE, J.G., HOPPE, M.J., RAINEY, D.T., MORRISON, D.M., AND GILLMORE, M.R. Drinking and condom use: Results from an event-based daily diary. *AIDS Behav.* **12**: 104-112, 2008.
- MORRISON, D.M., GILLMORE, M.R., HOPPE, M.J., GAYLORD, J., LEIGH, B.C., AND RAINEY, D. Adolescent drinking and sex: Findings from a daily diary study. *Perspect. Sex. Reprod. Hlth* **35**: 162-168, 2003.
- REINARMAN, C. AND LEIGH, B.C. Culture, cognition, and disinhibition: Notes on sexuality and alcohol in the age of AIDS. *Contemp. Drug Probl.* **14**: 435-460, 1987.
- ROSS, M. Relation of implicit theories to the construction of personal histories. *Psychol. Rev.* **96**: 341-357, 1989.
- SHIFFMAN, S., FISCHER, L.A., PATY, J.A., GNYS, M., HICKCOX, M., AND PERZ, W. Drinking and smoking: A field study of their association. *Ann. Behav. Med.* **16**: 203-209, 1994.
- SHIFFMAN, S., HUFFORD, M., HICKCOX, M., PATY, J.A., GNYS, M., AND KASSEL, J.D. Remember that? A comparison of real-time versus retrospective recall of smoking lapses. *J. Cons. Clin. Psychol.* **65**: 292-300, 1997.
- STRUNIN, L. AND HINGSON, R. Alcohol, drugs, and adolescent sexual behavior. *Int. J. Addict.* **27**: 129-146, 1992.
- WEINHARDT, L.S. AND CAREY, M.P. Does alcohol lead to sexual risk behavior? Findings from event-level research. *Annual Rev. Sex Res.* **11**: 125-157, 2000.
- WILSON, T.D., LASER, P.S., AND STONE, J.I. Judging the predictors of one’s own mood: Accuracy and the use of shared theories. *J. Exp. Social Psychol.* **18**: 537-556, 1982.