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Alcohol and Sexuality Research in the AIDS Era: Trends in Publication Activity, Target Populations and Research Design

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Abstract

Research addressing relationships between alcohol and human sexuality has proliferated, due in part to efforts to characterize alcohol's role in HIV risk behavior. This study provides a descriptive review of the alcohol–sexuality literature, using abstracts from 264 identified studies to estimate changes in publication activity, target populations, and the prevalence of HIV-related studies over time. We also examine methodological trends by estimating the prevalence of experimental vs. non-experimental studies. Findings show considerable increases in research activity and diversity of populations studied since the mid-1980's and highlight the emergence of HIV-related studies as a focal point of alcohol–sexuality research efforts. Results also demonstrate a substantial decline in the proportion of studies utilizing experimental methods, in part because of frequent use of non-experimental approaches in studies of alcohol and HIV risk behavior. We discuss implications and review the role of experiments in evaluating causal relationships between alcohol and sexual risk behavior.

Keywords

Alcohol; Sexuality; HIV; AIDS; Experimental design

Introduction

Studies addressing relationships between alcohol and human sexuality have been accumulating for several decades. During this time period the activity level, topical emphases and scientific methods characterizing this research have changed considerably. As alcohol consumption has been more frequently implicated in problematic behavioral outcomes (e.g., sexual assault, HIV-related sexual risk behavior), efforts to understand relationships between alcohol and sexuality have increased in societal importance. In accordance with these developments the body of empirical work in this area has also expanded. Notably, the AIDS crisis has had a marked impact on the theoretical objectives, methodological strategies and target populations typifying this research. This paper aims to provide a broad review of alcohol and sexuality research, placing the evolution of this literature in context with the emergence of the AIDS epidemic.

Despite longstanding anecdotal associations between alcohol and sexuality (Crowe & George, 1989; Lang, 1985), scientific attention to this relationship is relatively recent (Wilson, 1977). However, perusal of this literature suggests that thematic and methodological emphases have changed over time. Some of the earliest published studies were informed by psychodynamic

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theories of alcoholism (e.g., Bergler, 1942, 1944); descriptive studies examining alcohol–sexuality relationships in college samples emerged shortly thereafter (Straus & Bacon, 1953; Westling, 1954). In the 1970's, considerable attention focused on the effects of acute intoxication and expected intoxication on physiological sexual arousal (Briddell & Wilson, 1976; Farkas & Rosen, 1976; Wilson & Lawson, 1976, 1978), and research on alcohol-related sexual assault also gained momentum (e.g., Johnson, Gibson, & Linden, 1978; Rada, 1975). Beginning in the 1980's researchers made headway in developing laboratory analogues of sexual behavior (George & Marlatt, 1986; Lang, Searles, Lauerman, & Adesso, 1980), which made alcohol–sexuality relationships more amenable to experimental study. Overall, alcohol and sexuality research through the early 1980's was characterized methodologically by studies relying on samples of convenience (i.e., college students) and frequently using experimental methods.

The existing body of alcohol–sexuality research underwent a marked topographical shift beginning in the mid-1980's. In the wake of the AIDS epidemic, rapid allocation of federal funding fueled an urgent, cross-disciplinary effort to advance scientific understanding of HIV/AIDS epidemiology and pathogenesis (Fauci, 2003). In appreciation of psychosocial factors critical to HIV/AIDS epidemiology (Coates, Temoshok, & Mandel, 1984; Coates et al., 1987), research increasingly focused on identification of intrapersonal, social or environmental variables that increase risk for HIV transmission. Research by Stall, McKusick, Wiley, Coates, and Ostrow (1986) established alcohol as a potentially critical cofactor in HIV-related sexual risk behavior; this finding provided empirical justification for a growing consensus that alcohol variables be studied in relation to HIV/AIDS (Coates et al., 1987; Molgaard, Nakamura, Hovell, & Elder, 1988; Siegel, 1986). HIV/AIDS-related alcohol research received an increase in federal support in 1987 when the National Institute on Alcohol Abuse and Alcoholism (NIAAA) established its AIDS research program (Auerbach, Wypijewska, Brodie, & Hammond, 1994). In the ensuing years, studies examining alcohol in relation to HIV-related sexual risk behavior came to represent an increasing proportion of alcohol–sexuality research. The diversity of populations under examination also increased, in part due to efforts to identify and include demographic groups at elevated risk for HIV infection.

Initial findings linking alcohol to HIV risk behavior introduced a significant focal point for behavioral research on HIV/AIDS epidemiology. Nevertheless, these findings were qualified by important methodological limitations. In particular, because this work was based on cross-sectional and retrospective data it was not possible to effectively evaluate causal relationships between alcohol and sexual risk-taking (Stall et al., 1986). This limitation in evaluating causality would be emphasized often in response to the increasing frequency of survey-based and cross-sectional research on alcohol and sexual risk behavior in subsequent years (Cooper, 1992; Dingle & Oei, 1997; Donovan & McEwan, 1995; Leigh & Stall, 1993; Morris & Albery, 2001). Questions about causality have therefore historically been recognized as critical to interpreting findings linking alcohol to HIV risk behavior. In particular, researchers have noted that paradigms well-suited to evaluating causal relationships have been relatively slow to emerge (George & Stoner, 2000), and that targeting alcohol use in HIV prevention may represent a premature effort in the absence of causal evidence (e.g., Dingle & Oei, 1997; Halpern-Felsher, Millstein, & Ellen, 1996; Weinhardt & Carey, 2000). Evaluating the causal nature of alcohol-HIV risk associations is therefore of clear importance to future research and prevention initiatives.

The notion of establishing causation has been a focus of longstanding scientific and philosophic discussion (Hume, 1739; Mill, 1874; Popper, 1959). While suggested considerations for evaluating causation have been put forward (e.g., Hill, 1965), these may vary across scientific disciplines and no infallible criteria currently exist. We therefore concur that causation, as a theoretical and relative concept, can never be definitively proven (Blalock, 1961; Cook &

Campbell, 1979; Rothman, 1986). However, we also agree that inferring causation can be simplified considerably by use of experimental approaches (Aronson, Wilson, & Brewer, 1998; Blalock, 1961; Cook & Campbell, 1979; Shadish, Cook, & Campbell, 2002). The hallmark characteristics of experiments, manipulation of putative causes and random assignment to treatment conditions to rule out alternative causes (Cook & Campbell, 1979), enable causal inference with fewer simplifying assumptions than are required with use of non-experimental approaches (Blalock, 1961). Therefore, although causation may never be directly demonstrated, experiments greatly improve the ability to evaluate causal hypotheses (Aronson et al., 1998; Cook & Campbell, 1979; Shadish et al., 2002).

This study offers a broad review of the alcohol and sexuality research literature in accordance with three aims. First, given an apparent proliferation of this research in recent years we seek to provide an account of changes in publication activity and populations studied over time. Second, we aim to document the rising prevalence of HIV-related studies within the alcohol–sexuality literature. Third, because questions about causality represent a recurrent theme in this research area (e.g., Cooper, 1992; George & Stoner, 2000; Leigh & Stall, 1993), we review trends in the utilization of experimental vs. non-experimental methods.

In providing a descriptive summary of a representative body of studies this review is not presented as exhaustive (unpublished studies were not identified) nor does it aim to summarize or synthesize research findings. Readers are referred elsewhere for substantive empirical reviews of research on alcohol in relation to sexuality (Crowe & George, 1989; George & Stoner, 2000; Lang, 1985) and HIV risk behavior (Cooper, 1992, 2002; Donovan & MacEwan, 1995; Halpern-Felsher et al., 1996; Leigh & Stall, 1993; Weinhardt & Carey, 2000).

This review concentrates on studies published within the past three decades (1976–2005) for two reasons. First, a steady stream of empirical publications on alcohol and sexuality was absent until the mid-1970's. Second, this time span covers periods before and after the emergence of empirical reports linking alcohol to HIV risk behavior (Stall et al., 1986). Including the years prior to this point establishes the context for examining the impact of HIV/AIDS-related studies on the broader alcohol and sexuality research agenda.

Method

Literature Review Objectives and Procedures

Our aim was to obtain a sizable and representative sample of studies examining alcohol–sexuality relationships. Two search strategies were employed: first, we searched online literature databases (PsycINFO and Medline), crossing alcohol- and sex-related search terms. Alcohol-related search terms were *alcohol*, *drinking*, *intoxication* and *alcohol expectancies*. Sex-related search terms consisted of pairing the stem *sexual* with the words *arousal*, *response*, *aggression*, *coercion*, *risk behavior*, *intentions*, *attitudes*, and *functioning*. We also included *HIV risk behavior*, *risky sex*, *unsafe sex* and *rape* as sex-related terms. We implemented a second search stage by examining reference sections of relevant review papers on alcohol and sexuality. Studies potentially eligible for inclusion were identified by study title, and abstracts were obtained from online databases. We limited our search to studies that were published in English journals between 1976 and 2005 and for which abstracts were available online as of January 2006. Based on these criteria our initial searches yielded over 1800 candidate studies. Given the large number of studies identified and our intent to provide a descriptive and broad review of this literature, we relied on information provided in study abstracts in classifying studies (i.e., we did not obtain all candidate articles). In cases where information provided in the abstract was insufficient to determine whether the study warranted inclusion, we retrieved the original article whenever possible. If retrieving the original article was not possible, the study was omitted.

Inclusion Criteria and Definition of Terms

We sought only studies in which a stated primary aim was to examine the influence of an alcohol-related independent variable on a sexuality-related dependent variable. Abstracts were first screened to determine whether this criterion was met. For the purposes of this study we defined an *alcohol-related variable* as one that serves to index at least one of the following: (a) alcohol use behavior (e.g., self-reported alcohol use; drinking consequences; alcohol treatment history), (b) alcohol-related attitudes, beliefs or cognitions (e.g., alcohol expectancies; drinking motives), (c) state intoxication (e.g., experimentally administered alcohol dose; blood alcohol level; subjective intoxication), or (d) other variables manipulated experimentally with the intention of observing alcohol-related effects on some dependent measure (e.g., alcohol expectancy set; manipulated drinking status of an actual or imagined other). We omitted studies with a focus on non-individual alcohol variables (e.g., per capita consumption rates, state drinking age, liquor sales tax).

We defined a *sexuality-related variable* as one serving to index at minimum one of the following: (a) self-reported sexual behavior (e.g., sexual activity; sexual aggression; STD status); (b) sex-related attitudes, beliefs or intentions (e.g., self-reported sexual desire or interest; sexual inferences made about others; estimated likelihood of engaging in sexual behavior), (c) sexual functioning, (d) sexual arousal (e.g., self-reported or measured genital arousal), or (e) other forms of experimenter-measured sexual behavior or interest (e.g., erotica viewing). Our definition precluded studies examining exclusively biological sex-related variables (e.g., sex-related hormones). Finally, while we included those studies that examined the influence of an alcohol variable on a sexuality variable, studies examining the influence of a sexuality variable on an alcohol variable (e.g., examining sexual orientation or sexual abuse history as a predictor of drinking outcomes) were omitted.

Studies meeting these initial inclusion criteria were retained only if they met each of the following additional criteria. 1) The paper reported results of an original empirical study published in a scientific journal (i.e., the publication was not a literature review, book chapter, meta-analysis, etc.). 2) It was evident from the abstract that alcohol was a primary independent variable included in the study. Studies that did not either a) include an alcohol-related word in the title or b) mention in the study description the intent to evaluate an alcohol-related variable were considered to have not met this criterion, and studies that evaluated use of multiple substances in relation to sexual behavior were omitted unless it was apparent that alcohol was the primary variable of interest. 3) It could be surmised from the abstract that the authors provided an independent statistical evaluation of the alcohol–sexuality relationship (i.e., results were not exclusively qualitative or descriptive, and alcohol was not aggregated with other drugs or subsumed under the category of substance use). Both authors independently screened all qualifying studies to confirm eligibility. When ambiguous studies were encountered, the reviewers conferred and arrived at agreement through discussion. A conservative approach was employed whereby studies remaining ambiguous after discussion were omitted. In all, these procedures yielded 264 qualifying studies. (An Appendix listing these studies is provided at Electronic Supplementary Material.)

Classification of Experimental and Non-experimental Studies

An experiment can be defined as a study in which an intervention or treatment is deliberately introduced in order to observe its effects, and in which participants are randomly assigned to experimental conditions (Shadish et al., 2002). For the purposes of this review we chose to classify as experimental only those studies that deliberately manipulated an alcohol-related variable. This category primarily comprised laboratory studies in which alcohol administration procedures and random assignment to experimental conditions were employed prior to assessing sexuality-related variables. Also included were studies that manipulated alcohol-

related variables without administering alcohol (e.g., manipulating alcohol expectancy set or the drinking status of a hypothetical partner in a vignette paradigm). Field experiments that met the above criteria were included. Studies that did not include an experimenter-manipulated alcohol variable, thus precluding random assignment (including quasi-experimental studies), were classified as non-experimental. Studies implementing a treatment intervention to reduce alcohol and assessing sexual behavior at a later point were classified as non-experimental, since such studies do not provide direct control over alcohol-related variables and relative control of confounding variables. In the event that a publication comprised both experimental and non-experimental studies that met our inclusion criteria, the study was counted toward each category.

Classification of Study Topic and Population

Studies were also classified by topic, as inferred by the title/abstract of the study and/or the primary dependent variable(s) studied. Because a primary goal was to estimate the prevalence of HIV-related studies in the alcohol–sexuality literature, studies were classified as HIV-related or non-HIV-related. A study was categorized as HIV-related if the primary dependent variable (s) represented: (a) sexual behavior conferring risk for HIV infection (e.g., unprotected intercourse; condom use; multiple sex partners), or (b) HIV risk-relevant intentions, cognitions or attitudes (e.g., unsafe sex intentions; appraisal of another's HIV risk status). Studies examining a dependent variable that did not meet one of these criteria were assigned to the non-HIV category.

Finally, we categorized studies based on population studied. Based on initial examination of qualifying studies we arrived at eight possible categories comprising both specific populations (adolescent, gay/bisexual, sex workers, sexual assault victims, substance abusers) and broader categories (community/population, undergraduate, other/unspecified). When possible, studies were assigned to one of the first five categories. Studies that reported between-sample comparisons of more than one of these populations were classified according to the group representing the majority of the sample. If a study sample comprised multiple groups, (e.g., substance-abusing adolescents), the study was assigned to the first appropriate category based on the order listed above. Studies not assigned to one of the first five categories were assigned to one of the latter three as appropriate.

Results

Research Activity and Populations Studied

With regard to publication frequency, this sample indicates a proliferation of alcohol–sexuality studies over the past three decades. This trend was especially noteworthy in the two most recent decades (from 1986 to 2005); during this period the number of published studies increased by more than 1000 percent (Table 1). The per-year rate of alcohol–sexuality publications in this sample of studies was 2.2 for the years 1976–1985, and 12.1 for the years 1986–2005. We also observed a notable increase in diversity of populations studied. From 1976 to 1985, the majority (68%) of studies relied on college samples. From 1986 to 2005, the overall proportion of studies utilizing college samples was considerably less (26%). Studies including adolescent or gay/bisexual samples were absent in the first 10-year-period we examined, but these studies were frequent in the subsequent two decades. Also, the proportion of studies utilizing community/population samples increased considerably over time (Table 2).

Methodological Trends and the Prevalence of HIV-related Research

In the present sample, studies employing experimental methods comprised 91% of publications between 1976 and 1985 (20 of 22 studies). Conversely, experimental studies represented only 24% of publications from 1986 to 2005 (57 of 242 studies). Although it appears that the

incidence of experimental studies is not decreasing (as suggested by estimated per-year publication rates of 2.0 from 1976 to 1985 and 2.85 from 1986 to 2005), these studies constitute a diminishing proportion of alcohol–sexuality studies over the past 30 years. It seems evident that this reversal in methodological emphasis was attributable in part to a considerable rise in non-experimental publications beginning in the early 1990's (Fig. 1). The per-year rate of non-experimental publications in our sample increased from 0.2 from 1976–1985 to 9.25 from 1986–2005. Non-experimental studies represented 71% (187 of 264 studies) of our sample overall.

We next examined the prevalence of alcohol–sexuality studies classified as HIV-related. Predictably, the first 10-year-period examined did not include HIV-related publications. The first identified study relating alcohol to HIV risk behavior was published in 1986 (Stall et al., 1986). Since then, HIV-related studies have grown to comprise a considerable proportion of alcohol–sexuality research and represented 47% of our sample overall (126 of 264 studies). Our data suggest that since emerging in 1986, HIV-related studies have comprised over half (52%) of alcohol–sexuality publications (126 of 242 studies from 1986 to 2005).

Finally, we examined methodological characteristics as a function of study topic. Of HIV-related studies, 90% (114 of 126 studies) were classified as non-experimental, while 47% of non-HIV studies (65 of 138 studies) were classified as such. This discrepancy can be in part attributed to the fact that experimental HIV-related publications emerged in 1996, 10 years after the emergence of non-experimental HIV-related studies. However, experimental studies have also been slower to accumulate. These studies appeared in our sample with a per-year frequency of 1.2 since emerging in 1996. In contrast, non-experimental HIV-related studies appeared at a rate of 5.7 studies per year since emerging in 1986.

Notably, a trend for increased use of non-experimental methods was also found among studies unrelated to HIV. Among non-HIV studies published from 1976 to 1985, 9% (2 of 22) were classified as non-experimental; this proportion increased to 61% (71 of 116 studies) between 1986 and 2005. In sum, these data indicate a considerable increase in the proportion of non-experimental alcohol–sexuality studies overall. This increase can partially be explained by the fact that an estimated 90% of HIV-related studies have utilized non-experimental approaches, and that HIV-related studies represent the majority of alcohol–sexuality publications published in the past two decades.

Discussion

The present findings illustrate considerable growth in the volume of alcohol–sexuality research over the three-decade period examined. This growth is especially apparent over the past two decades, with our results indicating that this literature expanded by more than 1000 percent between 1986 and 2005. The past two decades are also characterized by diversification in populations studied: most notable were increases in the frequency of studies characterized by adolescent, community/population and gay/bisexual samples. Studies of college samples, while increasing in absolute number, represent a decreasing proportion of this literature over time. Our findings further highlight the contribution of HIV/AIDS-related research to the alcohol–sexuality literature. HIV-related studies accounted for slightly under half of the alcohol–sexuality publications we identified overall, and for more than half of those published after 1985. Given the relatively recent debut of HIV-related work, the impact of this topic on the alcohol–sexuality literature is striking.

A key finding from this review was that a distinct shift in methodological emphasis has occurred in the alcohol–sexuality literature over time. Experimental studies comprised 91% of publications from 1976 to 1985, but 24% of studies from 1986 to 2005. The recent

predominance of non-experimental methods was especially pronounced among studies classified as HIV-related, of which 90% were classified as non-experimental.

Multiple factors may account for this finding. First, the urgency provoked by the AIDS epidemic may have fueled an early demand for surveillance reports and epidemiological data and necessitated establishment of a broad characterization of psychosocial factors related to HIV transmission. This urgency may have paved the way for early funding opportunities that emphasized expedient and/or exploratory modes of investigation, perhaps forestalling efforts to develop laboratory analogues of HIV risk behavior. A second explanation is that experimental studies are generally theory-testing endeavors that emerge after basic associations have been identified (Aronson et al., 1998). Consistent with these notions, initial experimental research (Gordon & Carey, 1996) appeared a decade after the first non-experimental publication (Stall et al., 1986). A third explanation is that experimental research has undeniably been slowed by the practical and ethical constraints inherent to measuring sexual behavior under laboratory conditions. Such constraints necessitate development of laboratory analogues of sexual risk behavior. Fourth, whereas non-experimental studies may target clinical or otherwise at-risk samples (e.g., substance abusing individuals, adolescents, sex workers), recruiting such populations for laboratory and/or alcohol administration studies introduces ethical and pragmatic hurdles, thus curtailing the range of populations available for study. It is also possible that the diminishing proportion of experimental studies in the alcohol–sexuality literature is simply consistent with a more general trend observed within other areas of psychological research (Aronson et al., 1998). Although each of these (and other) explanations can be considered plausible, the degree to which they individually or collectively account for this shift in method emphasis is unknown.

The accelerated growth and diversification of work witnessed in the last 20 years has contributed toward enriching alcohol–sexuality research in at least four ways. First, the sheer increase in research volume suggests that more descriptive relationships among alcohol and sexuality variables are being identified, replicated, and extended; thereby subjecting these relationships to progressive waves of investigation and verification. Second, because research rigor and sophistication generally tend to improve across time, expanded publication volume can be viewed as a rough barometer of improved methodological quality of alcohol–sexuality research. Third, the external validity of alcohol–sexuality relationships has improved because of the inclusion of diverse samples in the existing body of non-experimental studies. Finally, the modest but demonstrable increase in published experimental studies over the past decade contributes toward parsing and evaluating causal linkages between alcohol variables and sexual risk-related outcomes.

To further illustrate the latter point we briefly review the role of experiments in evaluating causal relationships between alcohol and HIV risk behavior. It should first be underscored, however, that non-experimental studies are critical for evaluating reliability and generalizability of observed relationships, and that such studies have been vital to developing a broad characterization of alcohol-HIV risk associations. These contributions include identification of key dispositional variables and contextual factors that may qualify alcohol-HIV risk relationships as well as observations of these associations across diverse settings and populations. Also, although some non-experimental approaches offer little ability to address causality directly (e.g., global association studies), use of sophisticated measurement and statistical approaches can enhance the ability to draw causal inferences in non-experimental contexts. For example, event-level studies (reviewed in Leigh, 2002; Weinhardt & Carey, 2000) can offer nuanced assessments of covariation between drinking and risk behavior across discrete sexual events. The use of prospective designs and advanced statistical modeling approaches (e.g., Bryan, Rocheleau, Robbins, & Hutchison, 2005) can further enhance the ability to infer causal associations.

Acknowledging the necessity of non-experimental methods, we also observe that certain limitations to these approaches seem insurmountable in the quest to establish reliable causal interpretations (Aronson et al., 1998; Blalock, 1961, Cook & Campbell, 1979). The most obvious consideration is that evaluating causality is difficult, if not impossible, in the absence of random assignment to treatment conditions. In experiments, alcohol-related variables are systematically manipulated prior to the assessment of sexual risk-related behavior. Therefore, experimental approaches reduce measurement error that is inherent to assessing alcohol and sexual behavior variables retrospectively, and also reduce the threat of confounding variables. In addition to permitting random assignment, experimental approaches can maximize the ability for precise measurement and specification of alcohol-related variables. While non-experimental approaches often rely on global self-reports of drinking that may be subject to response errors and/or biases, experimental manipulations can be used to control and/or assess specific intoxication parameters (e.g., blood alcohol content, ascending vs. descending blood alcohol limb, actual vs. perceived intoxication), allowing for a more precise account of alcohol's effects on sexual risk-related behavior.

A third advantage of experiments concerns the increasingly apparent need to attend to contextual factors that have potential to moderate the relationship between intoxication and risky sex. Two observations that can be drawn from existing event-level studies are that (a) the relation of alcohol to sexual risk behavior is inconsistent across studies (Weinhardt & Carey, 2000), and (b) contextual factors (for instance, partner characteristics and amount of alcohol consumed; Venable et al., 2004) often moderate this relationship. While contextual factors can be retrospectively measured using survey methods, experimental approaches can be used to directly manipulate and/or control for these potential influences, thus serving as a valuable complement to event-level studies. A fourth issue concerns the relative infrequency of theory-based research on the mechanisms underlying alcohol-HIV risk relationships (George & Stoner, 2000; Maisto et al., 2004b; Morris & Albery, 2001). Explication of causal mechanisms represents an important future direction, as failure to pursue and develop theory-driven conceptualizations of alcohol–sexual risk relationships could compromise the effectiveness of intervention programs. Experimental approaches are generally well suited to parsing and evaluating theoretical mechanisms (Aronson et al., 1998; Cook & Campbell, 1979).

A final consideration concerns the types of questions under investigation. While non-experimental studies often seek to address whether a phenomenon *does* appear to occur in naturalistic settings, the goal of experiments is often to ask simply whether a phenomenon *can* occur under specified conditions (Mook, 1983). As such, an explicit goal of many experiments is not to establish generalizability of a phenomenon, but rather to test a theory about how or why the phenomenon operates (Aronson et al., 1998; Mook, 1983). That the vast majority of the alcohol-HIV risk literature is comprised of non-experimental studies suggests that “does” questions have been addressed frequently, perhaps at the expense of examining equally important “can” questions (e.g., is acute intoxication capable of exerting causal influences on sexual risk-related processes and outcomes, and if so, can this influence be explained by available theories?). If these capability questions are not answered affirmatively, then “does” questions may be either premature or in need of qualification. A distinct advantage to addressing both types of questions is that divergent findings would indicate new research directions. For instance, if alcohol appears capable of influencing risky sex-related behavior under controlled conditions but not otherwise, questions arise as to which circumstantial factors serve to nullify or qualify alcohol's capacity to cause these outcomes.

It should be emphasized that experimental studies possess key limitations and obstacles as well. The most obvious of these limitations is the fact that ethical and pragmatic restrictions render experimental research reliant on analogue procedures (e.g., vignette paradigms) and assessments of theoretical antecedents of sexual behavior (e.g., sexual risk intentions). The

extent to which these situations can approximate real-life sexual context and behavior is questionable, thus limiting generalizability of experimental findings to other settings. As noted earlier, experimental studies also must contend with a restricted range of populations available for participation. For instance, studying adolescents, homeless individuals, substance abusers, and other high-risk populations may introduce insurmountable logistical difficulties, and alcohol administration may be ill advised. Moreover, individuals who do volunteer for such studies could differ in important ways from the population at large, thus introducing volunteer bias concerns. These considerations carry important implications regarding the external validity of experimental studies. As we have noted above, however, non-experimental approaches are useful in addressing questions of generalizability, thus compensating for lower external validity in experimental studies. It should therefore be clear that non-experimental and experimental approaches are ultimately both essential to forming a coherent characterization of the link between alcohol and risky sexual behavior. While each method offers unique strengths, their complementary application carries promise for advancing a fuller understanding of relationships between alcohol-related and sexual risk-related variables.

An emerging body of research supports the utility of experimental approaches in addressing alcohol-HIV risk relationships. Because reviews of studies published between 1996 and 2000 are provided elsewhere (George & Stoner, 2000; Maisto, Carey, M. P., Carey, K. B., & Gordon, 2002) we limit our discussion to studies published since the year 2000. Maisto and colleagues (2002, 2004a, b) have examined alcohol's effects on theoretical determinants of sexual risk behavior in a research program theoretically informed by the Information–Motivation–Behavioral Skills model (Fisher & Fisher, 1992). In two recent studies focusing on heterosexual females (Maisto et al., 2002, 2004a), women receiving alcohol (as compared to sober or placebo controls) reported increased intentions to engage in unsafe sex in response to a hypothetical sexual scenario. In addition, greater perceived intoxication (but not beverage condition) predicted decreased behavioral skills relevant to safe sex decision-making (i.e., condom negotiation), and participants' a priori alcohol expectancies also predicted safe-sex antecedents. Notably, these studies also found diminished sexual risk perception to occur at moderate, but not low doses of alcohol (Maisto et al., 2004a).

In a similar study involving heterosexual men (Maisto et al., 2004b), participants receiving alcohol reported greater intentions for unsafe sex and evidenced diminished behavioral skills relevant to safe sex decision-making. Although no direct or interactive effects of a priori alcohol expectancies were found in this study, other individual difference variables (lower perceived pleasure from condom use and higher levels of sexual sensation seeking; Kalichman et al., 1994) predicted greater sexual risk intentions and reduced behavioral skills. Overall, these studies build upon previous findings from the same research group (Gordon & Carey, 1996; Gordon, Carey, M. P., & Carey, K. B., 1997) indicating that alcohol indeed can exert a causal impact on sexual risk-related constructs. They further offer evidence that (a) acute intoxication exerts detrimental effects on safe-sex antecedents among both women and men, (b) perceived intoxication may be a more important predictor of safe sex antecedents in women as compared to men, (c) alcohol's effects on some safe-sex antecedents may be dose-dependent, and (d) individual difference factors (alcohol expectancies, condom use attitudes, sensation seeking) can be incorporated in experimental studies to enhance the explanatory capability of conceptual models of risk behavior.

In evaluating a comprehensive conceptual model of risky sex decision-making, Abbey, Saenz, and Buck (2005) administered background questionnaires to 180 men and women prior to assigning participants to alcohol, placebo and control beverage conditions. A hypothetical sexual risk scenario was created using a vignette paradigm and participants provided sexual risk intentions as well as cognitive–affective responses to the sexual risk scenario. Intoxicated participants reported significantly greater intentions to engage in unsafe sex than those in the

sober or placebo groups. In addition, individual background factors (e.g., alcohol expectancies and sexual history variables), as well as participants' subjective responses to the vignette (e.g., self-reported sexual arousal and perceived negative consequences of unprotected sex) significantly predicted sexual risk intentions in a multivariate model. This study supports the utility of experimental methods in examining acute intoxication in conjunction with stable (i.e., dispositional) and state (cognitive–affective) person-level variables, thus offering a more nuanced account of the factors influencing decision-making in a discrete sexual event.

In another recently published study (Kruse & Fromme, 2005), researchers randomly assigned men to alcohol or placebo conditions and provided participants with photographs of potential female sexual targets. Participants estimated targets' attractiveness and risk characteristics and provided information on sexual intentions. Although this study found no direct effect of intoxication on sexual intentions, it offered an important theoretical advance; the researchers assessed participants on either the ascending limb of the blood alcohol curve (as blood alcohol level rises) or the descending limb (as blood alcohol level declines). Partner risk estimations influenced behavioral intentions differentially as a function of limb, suggesting that biphasic alcohol effects could moderate aspects of intoxicated sexual decision-making.

In sum, recent experimental studies generally support the existence of causal relationships between alcohol variables and theoretical antecedents of sexual risk behavior. These studies also demonstrate the importance of concurrently assessing relevant dispositional and event-level factors. Precise measurement and/or manipulation of intoxication parameters (e.g., alcohol dose, subjective vs. actual intoxication, alcohol limb) have further yielded findings potentially critical to characterizing and understanding alcohol-risky sex relationships.

Findings from the present study were qualified by its limitations, which pertained largely to the scope and aims of our review. This sampling of studies was not proposed as exhaustive and our inclusion criteria were intended to be conservative, so as to minimize chances of including studies not germane to our research aims. We limited our search to studies clearly emphasizing evaluation of an alcohol–sexuality relationship as a primary aim. This choice resulted in exclusion of studies that examined alcohol as one of multiple demographic or substance use variables in relation to sexual risk behavior. We also omitted descriptive and/or qualitative studies. Because these choices primarily resulted in omission of non-experimental studies, we believe that we have provided a conservative estimate of the prevalence of non-experimental methods in the alcohol-HIV risk literature. Another possible limitation was our exclusion of studies that could not convincingly meet our criteria based on information provided in study abstracts. While we likely underestimated the overall number of studies examining alcohol–sexuality relationships as a result, we believe this sample to be highly representative of alcohol–sexuality research as a whole.

Research examining alcohol–sexuality relationships has proliferated, especially since the advent of the AIDS era. However, a coherent explanatory account of alcohol-risky sex associations remains somewhat elusive through two decades of research in this area. Though the reasons for this are complex, one possible explanation is that research on the constituent mechanisms underlying these relationships is still in its early stages. Clarification of the conditions, mechanisms and qualifications of alcohol-risky sex relationships—a goal that ultimately requires complementary use of experimental and non-experimental approaches—will aid in maximizing the effectiveness of prevention/intervention programs targeting alcohol use as a cofactor in HIV transmission. In light of these considerations and the present findings, we propose that continued experimentation in this area is both necessary and well-justified. Greater balance in method choices holds considerable promise for enriching the science on alcohol and sexuality and for enhancing understanding of alcohol's role in HIV risk behavior.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

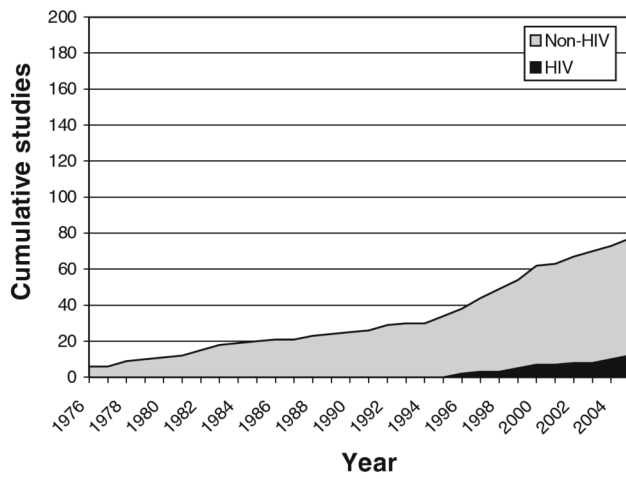
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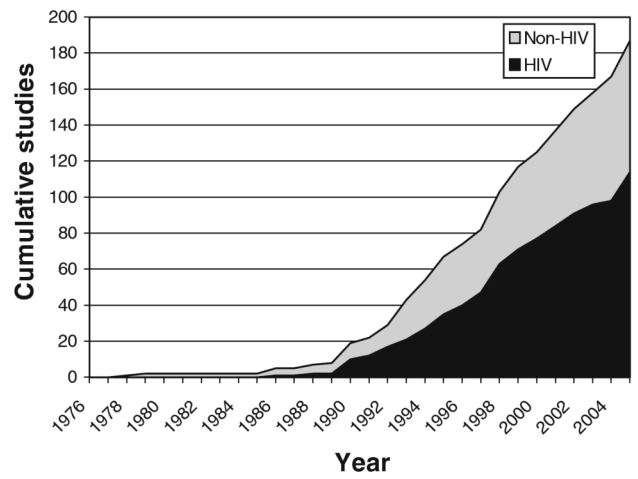
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Experimental studies



Non-experimental studies

Fig. 1. Estimated prevalence of alcohol–sexuality publications by methodology and topic

Table 1

Alcohol–sexuality publications by methodology and topic

Study type	5-year-period							Total
	76–80	81–85	86–90	91–95	96–00	01–05		
Experimental	11	9	5	10	28	14	77	
HIV-related	0	0	0	0	7	5	12	
Other	11	9	5	10	21	9	65	
Non-experimental	2	0	17	48	58	62	187	
HIV-related	0	0	10	25	42	37	114	
Other	2	0	7	23	16	25	73	
Total	13	9	22	58	86	76	264	

Table 2

Populations studied: 1976–1985 vs. 1986–2005

Study population	1976–1985		1986–2005		Total	
	Studies	%	Studies	%	Studies	%
Adolescent	0	0	34	14	34	13
Community/population	1	5	34	14	35	13
Gay/bisexual	0	0	15	6	15	5
Sex workers	0	0	4	2	4	2
Sexual assault victims	0	0	7	3	7	3
Substance abusing	2	9	16	7	18	7
Undergraduate	15	68	64	26	79	30
Other/unspecified	4	18	68	28	72	27