JOURNAL OF ADOLESCENT HEALTH 1995;16:304–308

REVIEW ARTICLE

Adolescent Substance Use and Sexually Transmitted Diseases Risk: A Review

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The behavioral antecedents and correlates of sexually transmitted diseases (STD) among adolescents are issues of clear relevance to the prevention of STD (1). Substance use—particularly of alcohol and other mood-altering drugs—is often identified as an important causal link with risky sexual behavior (2). This assumption of causal relationships between abuse of substances and high-risk sexual behavior is derived from cultural lore (3), and patterns of increasing involvement in both types of behavior during adolescence (4,5). Heavy alcohol use is associated with increased STD rates for some adolescent groups (6,7), and "sex under the influence" as a risk for adolescent STD appears to be an assumption held by both researchers and policy makers (8). Many STD prevention programs now target substance use as a preventable antecedent of risky sexual behavior. Some studies, however, raise questions about a *causal* role for substance use in STD-risk, and point toward more complex relationships of these behaviors (9–12).

This review assesses evidence for association of substance use with adolescents' STD-risk behaviors and the nature of the relationship. Limitations of existing research are noted, and some directions for future research will be suggested. The framework is the examination of relationships of substance use to three key elements of STD epidemiology among adolescents: sexual intercourse; use of condoms; and, sex with multiple partners (13). For each of these broad categories, data assessing global relationships are reviewed, followed by a summary of data that attempts to link substance use and these STD-risk behaviors at an event level.

Substance Use and Adolescent Sexual Activity

Earlier age at first intercourse is a well-established STD risk factor among adolescents and probably marks both biological and behavioral issues (14). The covariation of substance use and earlier sexual activity among adolescents is documented with sufficient consistency to suggest that involvement with alcohol, cigarettes, other substances, and earlier sexual activity describes a common behavioral pattern among U.S. adolescents (5,15,16). From a theoretical perspective, these "problem behaviors" may serve as indicators of attempts to achieve adult status; their covariation is explained by teenagers' willingness to violate age-related social norms in order to achieve these markers of adult status (5).

Several aspects of the consistently observed behavioral covariation of substance use and sexual behavior are important. First, the magnitude of the relationship is more than trivial. Correlation coefficients between measures of alcohol use and sexual activity in the range of .40 to .50 are reported; a similar magnitude of relationship is observed between marijuana use and sexual activity (15). Relationships of this magnitude have been observed in a variety of adolescent populations (11).

Second, the majority of adolescents do not engage in behavior patterns characterized by frequent sexual intercourse and regular substance use: such a pattern is reported by fewer than 20% of adolescent males, and fewer than 10% of adolescent females

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Manuscript accepted June 2, 1994.

1054-139X/95/$9.50
SSDI 1054-139X(94)00062-J

Published by Elsevier Science Inc., 655 Avenue of the Americas, New York, NY 10010

(17). These data help to distinguish adolescents with sufficient behavior involvement to characterize a "lifestyle" from those for whom substance use and sexual behavior covary on the basis of lower levels of "experimental" behavior (4). Interpreting the substance use—sexual behavior relationship in terms of lifestyle may also allow a clearer understanding of relationships between cigarette use and sexual behavior (16), or between high levels of alcohol use and STD rates among adolescents in detention (18). In these cases, the relationship between substance use and STD-risk sexual behaviors appears less likely to be causal in the sense of substances promoting unsafe behavior.

Third, both the magnitude of covariation of substance use and sexual behavior, and its prevalence appears subject to substantial cultural variation. A few studies suggest that sexual behavior and substance use do not covary among African-American adolescents (19); other studies report patterns of covariation similar to that of whites and Hispanics (20). None of these studies address significant subcultural variations that may result, for example, from urban-rural differences, or from acculturation or immigration patterns. Since a significant proportion of adolescents in some communities initiate sexual activity without involvement with either alcohol or drugs, such finely focused research is clearly needed (21).

Relationships between substance use and sexual behavior should be interpreted with additional caution when considering specific populations of adolescents whose life circumstances are characterized by drug abuse or homelessness. In these settings, where sex is often a commodity exchanged for drugs or money, economic needs become potent mediators of the relationship between substance use and sexual behavior (21–25). STD prevention efforts for these adolescents are more complex than focused attempts to discourage substance use before sexual intercourse (26).

Many studies linking substance use and sexual activity are cross-sectional and have limited ability to address issues or developmental sequences in a manner akin to research on "gateway" substance use (27). However, a few longitudinal studies suggest a common, but not invariant, sequence of substance use preceding initiation of sexual intercourse (28–30). The probability of becoming a nonvirgin increases for those initiating monthly alcohol use or marijuana use in the preceding year, compared to those who do not initiate substance use. This increased risk is most evident among 14 and 15 year olds, in whom preceding substance use is associated with a three- to five-fold increase in the probability of subsequent nonvirginity during adolescence (29). However, the prevalence of this sequence is much higher among white or African-American adolescents, compared to Hispanics (28), and geographic variation in the prevalence of substance use preceding initiation of sexual intercourse has also been documented (31). When such a sequence does occur, early—often prepubertal—initiation of minor delinquent behavior often precedes both substance use and sexual behavior (30,31). This again suggests an important role for psychosocial unconventionality in understanding the relationship between substance use and STD risk. Such a perspective is given additional support by findings that the strength of the relationship between substance use and sexual intercourse declines over time (30). Thus, both substance use (at least that of alcohol) and sexual activity become more socially acceptable with age, and the strength of their temporal relationship diminishes.

Substance Use and Condom Use

Condom use by sexually active adolescents reduces STD risk, although the risk-reduction is not absolute and may vary among STDs (32). Other barrier contraceptives also reduce STD risk (33), but these devices are less often used by adolescents and no data exist regarding possible associations with substance use.

The relationship between substance use and condom use is not well defined. Some studies fail to find significant associations between substance use (alcohol, marijuana, cigarettes or cocaine) and nonuse of condoms (34). Others report modest bivariate correlations between alcohol use and condom nonuse that disappear in multivariate models (35). One recent study reports that higher number of drinks with sexual partners is associated with reduced condom use for Hispanic (largely Mexican-American and Puerto Rican) adolescent males, and use of marijuana with sexual partners is associated with reduced condom use for African-American adolescent females (36). Other studies have found, however, that global measures of alcohol use (i.e., measures that assess usual amounts and frequency of alcohol use)—rather than amount of alcohol consumed just before intercourse—are associated with decreased likelihood of condom use (9,10,37). In terms of change in usual condom use behaviors following substance use, most adolescents (about 75%) do not

change previous patterns of condom use when having intercourse after drinking or drug use; a modest proportion (about 16%) is less likely to use condoms after substance use, and the remainder report increased condom use after alcohol or drug use (37,38).

Substance Use and Number of Sexual Partners

Sex with multiple partners represents a third area of STD risk-behavior. Multiple sex partners not only increase STD risk on the basis of random exposure, but likely represent choice of partners with higher STD infection rates (39).

Modest association between global indicators of alcohol use and number of sexual partners has been reported in a small (165 subjects) sample of older adolescents (40). This study also reported that those who had been drinking were significantly more likely to have intercourse with a casual partner. College students who drink alcohol more than two or three times per week, smoke more than ten cigarettes per day, and use marijuana more than once per week have increased numbers of sexual partners and are more likely to have sex with a partner known less than 24 hours (34,41).

Some data from adolescent samples suggest the relationship between substance use and sex with multiple partners is part of a larger pattern of behaviors characterized by higher levels of aggressive and reckless behavior, less regular exercise, poor academic performance, as well as greater involvement with cigarettes, alcohol, and illicit drugs (42). Thus, groups of adolescents with high STD rates have complex behavioral characteristics that include multiple sex partners and low levels of condom use (43).

Substance Use and STD-Risk Behaviors at an Event Level

Study of event level associations of substance use and STD-risk behavior allows a much more detailed understanding of the relationships and the extent to which substance use may promote STD-risk behavior.

A significant proportion of adolescents report some alcohol use immediately before intercourse. The most commonly reported pattern is the use of alcohol two to four hours before sexual intercourse; more than half of those using alcohol have five or more drinks. Adolescents whose first intercourse is unplanned are more likely to report prior use alcohol (44); those who use alcohol immediately before their first sexual experience are also less likely to have used birth control than those not using alcohol (45). Adolescent women who are not planning intercourse but are drinking are least likely to use contraception. However, women who plan intercourse and drink before intercourse are most likely to use contraception (45). These findings suggest that substance use is associated with risky sexual behavior for some adolescents; however, specific contexts may alter the nature of the association. None of the available studies have examined the type of relationship between sexual partners and its influence on substance use and sexual activity.

Conclusion

Available data support the following conclusions: First, some relationship between substance use and critical STD-risk behaviors undoubtedly exists. However, such relationships are not consistently identified, and their magnitude is quite variable among subgroups of adolescents. An assumption that substance use in some fashion directly promotes STD risk behaviors is not strongly supported by data. A more useful theoretical perspective suggests that the covariation of substance use and STD-risk behaviors is due to an underlying psychosocial unconventionality and tendency to transgress social norms (5); substance use and STD risk behaviors are then seen as elements of a lifestyle that contains significant elements of health risk. Clarification will require application of theoretical frameworks that encompass both health-protective and health-harming behaviors (and their development) (4,46).

Second, developmental sequencing (substance use preceding transition to non-virginity) is a common but not invariant pattern. Since a substantial proportion of adolescents initiate sexual activity without substance involvement, their causal role in STD-risk behavior is unlikely. Longitudinal studies of STD-risk behaviors (and STD rates) among adolescents with different patterns of behavioral sequencing could be useful.

Third, some event-level evidence supports the common assumption that substance use increases the probability of STD-risk behaviors. These data are neither extensive or robust, however, and are limited by small, non-representative samples of older adolescents, as well as methodologic and analytic deficiencies. Additional research in this area

should also address the contexts of the sexual relationship.

Research on substance use–STD risk relationships has suffered from lack of testable theories to explain observed associations. Although risk-taking (47), expectations for substance enhancement of sexuality (48), cognitive immaturity (11,47), and impaired motor coordination (7) have been suggested, each suffers from conceptual and empirical inadequacies. While substance use per se may have some direct effect on STD-risk behaviors, it seems equally plausible that a couples' relationship, their antecedent involvement with both behaviors, as well as the context of the substance use and sexual behavior interact in complex ways to define STD risk. Associations between substance use and STD-risk behavior may be an artefact of the relationship between the frequency of intercourse and risky behavior (48); for some adolescent couples, the choice of substance and the timing of its use reflect a priori decisions for intercourse.

The distinction between understanding the substance use/STD-risk connection in terms of lifestyle rather than cause-effect is important. If substance use is identified as a causal behavior related to STD-risk, then interventions aimed at preventing or reducing substance use are logical. If substance use cannot be shown to be causally related to STD-risk behaviors, such focused interventions seem less efficient, and are unlikely to affect the prevalence of STD-risk behavior among adolescents.

Finally, conclusions drawn from specific groups of adolescents such as "crack" addicts, prostitutes, or runaways should not be applied to general populations of adolescents who are less likely to be involved in high-risk behaviors.

Substance use may be associated with risky sexual behavior for some groups of adolescents but it is has not been demonstrated to be an important general phenomenon. A careful, comprehensive and theoretically sound research agenda is required to assure continued progress in efforts to promote healthy adolescent behaviors (49).

Preparation of this paper was supported in part by grants from the National Institutes of Child Health and Human Development (KD11HD00858), the National Institute of Allergy and Infectious Diseases (U01AI31494), and the Maternal-Child Health Bureau (MCJIN189596).

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