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Untangling the association between substance use and sexual risk-taking among adolescents and young adults, a selective review of the literature

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ABSTRACT

Among adolescents and young adults, the mechanism relating substance use and risky sexual behavior remains ambiguous. Conducting a selective review of related literature, this article examines the association between substance use and sexual risk-taking. In particular, this article explores potential mechanisms through which substance use may impact risky sexual behavior. Given the inconsistency in the literature, important, often omitted factors such as mental health and social networks may play a crucial role in mediating this relationship. The article concludes by discussing the practice and policy implications of these considerations.

KEY WORDS: Adolescent health, alcohol and substance abuse, health policy, mental health, sex behavior, social influence

INTRODUCTION

Adolescents and young adults consume and abuse alcohol and illicit drugs at alarming rates. With approximately a *tenth* of adolescents and a *quarter* of young adults in the United States identifying as current illicit drug users and similarly staggering statistics regarding alcohol use [1], researchers and practitioners must consider not only the direct impact of substance use on health, but also the unanticipated effect of alcohol and drug consumption on health and health behaviors.[1] Indeed, substance use has been linked to a variety of adverse, aggressive, and otherwise reckless behaviors, including domestic abuse [2,3] and driving under the influence [4], particularly among young people [4,5].

Substance use has also been tied to risky sexual behavior. As French *et al.* discuss [6], alcohol and illicit drug use have been linked to sexually transmitted inflections (STIs) [7], including HIV [8-10]. STIs present a particular health risk for young people given those adolescents and young adults between the ages of 15 and 30 experience the highest age-specific diagnosis rates for many STIs compared with other age groups [11]. In 2011, the highest age-specific reported rates of chlamydia and gonorrhea occurred among women ages 15-19 and 20-24 and men ages 20-24 [11]. Similarly, the highest age-specific rates of primary and secondary syphilis occurred among those ages 20-24 and 25-29 [11]. What is more, the evolution of drug-resistant strains of bacteria makes treatment of STIs increasingly difficult [12].

Risky sexual behavior and substance use together present a challenging and costly problem in adolescent and young adult populations. Among 15-24 year olds, Chesson *et al.* estimate that in 2000 the total direct medical cost associated with the nine million *new* cases of eight major STIs in the United States was $6.5 billion (in year 2000 dollars) [13].[2] CDC surveillance data indicates that rates of some STIs have increased since 2000 within this age group [11], implying that, all else equal, this cost has potentially increased. Moreover, Chesson *et al.*' estimates of cost relate to the incidence of STIs not prevalence [13]. The costs associated with the long-term treatment of STIs like HIV and herpes will accrue over many years. Along the same lines, these estimate exclude the external and nonmonetary costs. As a result, the total cost associated with sexually transmitted illness is likely higher than Chesson *et al.* estimates.

Alcohol use presents a similarly prevalent and costly scenario among this age group. For instance, while one in six Americas binge drank in 2010, those ages 18-34 bring drank with the highest

[1] According to 2011 National Survey on Drug Use and Health (NSDUH) data, which are nationally representative, age-specific rates of current illicit drug use peaked among those aged 18-20 (23.8%), with marijuana being the most popular drug of choice [1]. The same data set revealed that those aged 21-25 engaged in the highest rate of binge drinking behaviors (45.4% of 21-25 year olds binge drank; comparatively, 15.0% of 16-17 year olds reported binge drinking) [1].

[2] The eight STIs investigated include HIV, human papillomavirus, genital herpes simplex virus type 2, hepatitis B, chlamydia, gonorrhea, trichomoniasis and syphilis.

prevalence and intensity [14]. This binge drinking behavior carries a hefty price tag - "binge drinking accounts for half of the estimated 80,000 average annual deaths and three quarters of $223.5 billion in economic costs resulting from excessive alcohol consumption in the United States" [14]. Again, these estimates do no account for the indirect costs associated with alcohol use.

In a world of finite resources, available funds need to be spent as effectively as possible. Clearly, among adolescents and young adults, risky sexual behavior and substance use (and the co-occurrence of the two) are both prevalent and expensive. Understanding the intricacies of this relationship might help us develop more targeted and effective policy.

Conducting a selective review of related literature regarding substance use and risky sexual behavior among adolescents and young adults, this paper explores three main themes. First, this paper provides an overview of the literature. Second, this paper outlines several theoretical mechanisms linking substance use and risky sexual behavior. Third, given the inconsistency in the literature, many additional, related, and often omitted factors may mediate the observed relationship. This paper discusses several factors worth considering when investigating the association between substance use and sexual risk-taking, namely mental health and social networks.

REVIEWING THE ASSOCIATION BETWEEN SUBSTANCE USE AND RISKY SEXUAL BEHAVIOR

Overview of Literature

Most researchers agree that substance use and risky sexual behavior are positively correlated. That said, the strength and significance of this association vary across adolescent and young adult populations as well as across definitions of substance use and sexual risk-taking.

While some researchers find evidence associating heavy alcohol and marijuana use with increased sexual activity among young adults [15], others find little evidence of such a link [16]. Given the high prevalence of STIs within this age group, an increase in sexual activity presents a risk in and of itself [11]. Investigating the impact of alcohol and marijuana use on a variety of risky sexual behaviors, some studies have concluded that a direct association between substance use and risky behaviors is unlikely [17,18]. Not surprisingly, the literature indicates that the association depends on the quantity of a substance consumed. For instance, some literature suggests that the impact of alcohol use on the probability of engaging in sexual intercourse depends on the volume of alcohol one consumes [19]. Among college students, binge drinking has also been linked to measures of risky sexual behavior, including sex with multiple partners, both with and without a condom [20].

Implications of the Varying Measures and Sample Populations

Not only do findings vary across studies, but the definition of substance use and risky sexual behavior varies as well. The variable classification of risky sexual behavior and substance use may partially explain the inconsistency in the results. The literature considers a variety of risky sexual behaviors, including but not limited to the risk of STI [7], sexual partnering [20], unprotected sexual intercourse [21], and use of birth control [16]. In turn, each of these concepts of sexual risk taking can be operationalized in a variety of ways. For instance, unprotected sexual behavior is characterized by a lack of contraception. Fontanet *et al.* define an unprotected sex act as any sexual act in which condoms are not used or sexual acts in which a condom tore or slipped in or out [22]. Does using birth control count as a "protected" sexual encounter? While it will help guard against unplanned pregnancy, birth control alone does not protect against all risks associated with sexual intercourse - namely STIs, which are a central concern for this age group [11].

While more focused than sexual behavior measures, definitions of substance use also vary across studies. Although the current literature focuses almost exclusively on alcohol and marijuana, relying on varying measures of "heavy" use, explicit measures differ. For instance, Rees *et al.* measure excessive alcohol consumption using a dummy variable, equaling one if an individual reports having "gotten drunk or 'very, very high' on alcohol in the 12 months prior to being interviewed" [16]. On the other hand, DeSimone gauges heavy alcohol use with a binary indicator of whether a respondent binge drank at least once in the past month [20]. Once again, this subjectivity may also contribute to the variation in findings. In terms of alcohol use, medical literature suggests that binge drinking might be the most appropriate measure of heavy alcohol use and abuse for this age group [23].[3]

Finally, in addition to varying measures of substance use and risky sexual behavior, sample populations differ across studies. Returning to the comparison between Rees *et al.* and DeSimone, Rees *et al.* focus on an adolescent population (grades 7 through 12), using wave I of the National Longitudinal Study of Adolescent Health (Add Health) data; DeSimone focuses on college students, drawing on the National College Health Risk Behavior Survey (NCHRBS) data [16,20]. Clearly, the relationship between substance use and risky sexual behavior likely differs across and within the adolescent and young adult populations. Certainly, in the case of DeSimone, the findings cannot be generalized to non-college populations of the same age.

Important and Uninvestigated Substance Use Categories

The dearth of research examining the impact of harder drug use and off-label prescription drug use represents a huge gap in the literature. The influence of these drugs on sexual risk-taking remains largely unknown. According to 2011 NSDUH data, 5 percent of 18-25 year olds engaged in nonmedical use of psychotherapeutic drugs, 3.6% engaged in nonmedical use of pain relievers, and 1.4% currently used cocaine [1]. While representative of relatively small portion of the total of illicit

[3]Some physicians argue that adolescents and young adults suffer from a problem of over consumption in a single sitting [21], suggesting that binge drinking is the best measure of alcohol use within this age group.

drug users, this population constitutes an important and comparatively understudied at-risk group, especially given that these substances have different behavioral effects than substances like alcohol or marijuana.

REVIEW OF POSSIBLE MECHANISMS ASSOCIATING SUBSTANCE USE AND RISKY SEXUAL BEHAVIOR

Researchers have proposed several mechanisms linking substance use and risky sexual behavior. Some hypothesize that alcohol and marijuana use may increase the likelihood of these risky behaviors by increasing sexual aggression, lowering inhibitions, and/or diminishing an individual's ability to assess risk [16].

Investigating the link between substance use and domestic violence, Markowitz hypothesizes an alternative mechanism - individuals may use alcohol or drugs to remove responsibility for otherwise unacceptable behavior [2]. Carpenter and Dobkin refer to this as the "excuse motive" [24]. Within this paradigm, individuals may use alcohol consumption to diminish the personal blame incurred from domestic violence and other otherwise inappropriate behaviors [2]. This hypothesis can easily extend to sexual risk-taking - some individuals may use alcohol and illicit drugs to justify or excuse their risky sexual behavior. This hypothesis suggests that while substance use and risky behaviors are associated, substance use might not directly lead to risky sexual behavior.

Grossman, Kaestner, and Markowitz [17] and Grossman and Markowitz [18] argue that Jessor and Jessor's problem behavior theory may be a key piece of the puzzle [25]. The theory suggests that a common third variable causes both substance use and risky sexual behavior. Grossman and Markowitz give the example of the tendency towards thrill seeking [18]. From a statistical standpoint, excluding these variables from the analysis would produce omitted variable bias. This is one reason why Grossman, Kaestner, and Markowitz [17] as well as Grossman and Markowitz [18] use individual-level fixed effects analyses in their work, which would help control for a variable like thrill seeking assuming that tendency towards thrill seeking is time invariant. Similar to the "excuse motive" regime, Jessor and Jessor's problem behavior theory also hints that substance use might not influence sexual risk taking directly.

Importantly, the durational effects of these mechanisms remain understudied. Most work focuses only on short-term consequences relating to substance use and risky behaviors. Exploring the employment literature, some researchers find a positive association between past substance use and current unemployment [26], suggesting that the effects of substance use may linger over several years. Nevertheless, the durational effects of substance use in the context of risky sexual behavior and the associated mechanism(s) remain uncertain.

ADDITIONAL FACTORS WORTH EXPLORING

The aforementioned works [17,18,25] underscore the importance of other consequential, often omitted factors that mediate this relationship. In particular, a variety of left out common causal variables may influence the observed association between substance use and risky sexual behavior; moreover, these third variables may have heterogeneous effects. While thrill seeking may explain the sexual and substance use behaviors of one individual, another factor, such as mental health or neighborhood characteristics, may help explain the behaviors of another. Again, assuming these third variables are time invariant, individual-level fixed effects will be helpful in controlling for their influence, even if these factors vary across individuals and are unobservable.

Given the ambiguity of the empirical literature and the hypothesized mechanisms associating substance use and sexual risk-taking, it is impossible to definitively conclude that, among adolescent and young adult populations, substance use is directly associated with risky sexual behavior. Resultantly, researchers must consider mediating factors. If uncontrolled for in quantitative models, these factors might result in omitted variable bias, leading to biased estimates of this relationship [27]. While such factors vary from analysis to analysis, this paper discusses two important variables: Mental health and social networks.

Mental Health

Within adolescent and young adult populations, mental health intertwines with sexual and substance use behaviors; however, researchers often omit indicators of mental health from analyses of substance use and risky sexual behavior. Unlike a majority of the literature, DeSimone incorporates measures of perceived weight and suicidality as proxies for depression in examining the impact of binge drinking on risky sexual behavior among college students [20]; nevertheless, he finds limited evidence that depression is significant.[4] Despite DeSimone's findings, a large body of evidence supports the importance of mental health within this context.

Much of the literature demonstrates that poor mental health appears to be positively associated with sexual risk-taking. Research suggests that, among young people, stress and depressed mood increase the probability of having sex without a condom [28,29]. Emotional distress, including depression, may predispose an individual towards a variety of risky sexual behavior, including unprotected sex and unplanned pregnancy [30]. In addition to unprotected sexual activity and unplanned pregnancy, evidence indicates that the number of sexual partners and psychological disturbance are positively associated [31].

Poor mental health and substance use are also associated. Much of the existing literature surrounds cannabis use, schizophrenia, and psychosis in adolescents and young adults. In particular, researchers have explored whether cannabis use during youth prompts poor mental health later in life. Research hints that cannabis use may be related to schizophrenia [32,33], poor

[4]Of importance, DeSimone relies on proxy measures, which lack a clinical foundation and may not accurately gauge depressive tendencies [18].

mental health [34,35], and psychosis [36,37]. Moreover, results indicate a "dose-response relationship" among cannabis use and poor mental health [35] and psychosis [37]. While the statistical methodology used in some of these studies prevents any statements about causality,[5] mental health and substance use are clearly associated.

Social Networks

While both sexual and substance use behaviors can be described in the context of social networks, this section focuses on the role of peer substance use in shaping individual substance use behaviors.[6] Peer substance use likely relates to individual substance use, as the work of Ramirez *et al.* suggests [38].

Social interaction theory provides a framework for studying peer effects. The theory hypothesizes that individuals react to those closest to them in the social space [39]. Within this framework, individuals respond positively or negatively to those around them. Positive reactions reflect a desire to "conform" with the behavior of one's social group; negative reactions indicate a need to "distance" oneself.

While Akerlof explains the details of this theoretical framework [39], the implications of the theory are clear - individual behaviors reflect both an individual and social decision-making process; that is to say, to an extent, one's behaviors reflect one's social environment. Under social interaction theory, family and peer groups influence individual behaviors. In the context of substance use, if an individual's family and peers engage in alcohol and other drug use, perhaps an individual will be more likely to participate in these behaviors him or herself.

The literature documents the importance of social networks in shaping substance use behaviors. As Ramirez *et al.* note, "social networks, both families and friends, play a critical role in the development of adolescent (alcohol and other drugs) problems, their access to treatment, and their treatment outcomes (Kosterman, Hawkins, Guo, Catalano, and Abbott, 2000; Lindsey, Barksdale, Lambert, and Ialongo, 2010)," [38]. In their analysis of adolescent substance use, Ramirez *et al.* find that peer substance use is significantly associated with abstinence from alcohol and other drugs [38]. Peer substance use potentially indirectly impacts individual substance use as well. For instance, not surprisingly, adolescent drug use is associated with availability [40]; furthermore, evidence suggests that peers mediate access to alcohol and drugs [41].

The relative weight of varying social influences remains unclear. While Ramirez *et al.* conclude that family environmental factors have only a limited impact on substance use [38], Norton *et al.* suggest that some family effects supersede peer effects - among junior high students, the authors find that "living in a single-parent family was by far the strongest predictor of adolescent drinking and smoking," [42].

While many factors could drive the observed differences across analyses, endogeneity may be one culprit. Individual and peer substance could be endogenous; consequently, results will vary depending on how this potential endogeneity is addressed, if at all. For instance, Norton *et al.* treat peer substance use as endogenous [42]; Ramirez *et al.* do not [38].

In addition, the impact of social networks is likely heterogeneous. Consequently, the relative importance of peer and family factors may vary across certain groups. For instance, are peer influences relatively stronger among high school students? Do parental or sibling factors carry more weight for individuals with a family history of substance use? These are important questions worthy of further exploration. Nevertheless, researchers clearly need to consider the role of peer substance use when examining the link between substance use and risky sexual behavior.

DISCUSSION

Most researchers agree that substance use and risky sexual behavior are positively correlated. That said, the strength and significance of this association may vary across adolescent and young adult populations as well as across definitions of substance use and sexual risk-taking. The precise mechanism by which alcohol and drug use influences riskiness remains uncertain and likely varies across individuals. Importantly, many omitted variables potentially confound the relationship (e.g., mental health and social networks), making causality difficult to assess [17,18].

In a world of finite resources, available funds need to be spent as effectively as possible. Clearly, among adolescents and young adults, risky sexual behavior and substance use (and the co-occurrence of the two) are both prevalent and expensive. Accordingly, effective policy and interventions must not only be robust but cost-effective. In understanding the nuances of the relationship between substance use and risky sexual behavior, clinicians, practitioners, policymakers and other players can better assess how available funds may best be spent. Given the large number of factors at play and the relative ambiguity of the relationship, intervention strategies may target common cause factors important in shaping observed outcomes, as well as individual substance use and reproductive behaviors.

Future research and policy efforts might also explore the relative homogeneity of the substance use/risky sexual behavior mechanism within narrowly defined at-risk populations. Researchers might also investigate the relative weight of varying social networks (e.g. family and peers) within these more narrowly defined populations.

Several policy recommendations emerge from this work. The key findings suggest that (1) policy and interventions addressing substance use and risky sexual behavior should be flexible,

[5]Many unobserved and omitted variables confound the estimation process. Some researchers fail to use appropriate statistical procedures to establish causality [30,32,35]. Therefore, the directionality of the relationship remains unclear.

[6]Relative to substance use, sexual behaviors and associated risks reflect a more private process. From a legal standpoint, an individual's birth control choices occur in a private sphere (e.g., Griswold v. Connecticut, 381 U.S. 479 [1965]; Roe v. Wade, 410 U.S. 113 [1973]).

reflecting the fact that the mechanism associating substance use and sexual risk-taking likely varies across groups; (2) other factors, such as mental health and social networks, should be considered in tandem with sexual risk-taking and substance use; and, (3) given the importance of these other factors, treatment and intervention strategies should be multifaceted, taking into account the complexities of this process.

Taken together, the literature suggests that targeting substance use or mental health alone will not produce the desired reduction in risky sexual behavior for some groups (e.g. those who both engage in substance use and are depressed). Successful interventions must treat the often co-occurring issues of substance use and sexual risk-taking.

School-based clinics represent a viable example of an integrated approach. Popularized in the 1990s, school clinics address the complicated and often entangled issues of substance abuse, reproductive health, and depression within adolescent populations [43]. In the extreme, assertive community treatment (ACT) programs for severe mental illness also reflect an interdisciplinary approach to a multifaceted problem. Comprised of medical and behavioral health professionals, as well as rehabilitation specialists, ACT teams engage in outpatient treatment and help promote successful in tegration into the community [44]. What is more, evidence suggests that these teams could benefit from further specialization. As a minimum requirement, Moser *et al.* argue that "since many people with severe mental illness also have a co-morbid substance use disorder, ACT teams should have at least one qualified team member designated as a substance abuse or dual disorders specialist" [44].

Nevertheless, developing a successful treatment strategy is only half the battle. A treatment strategy can only be successful if it is adopted. Discussing the relative resilience of school clinics against the tide of opposing cultural forces, Morone writes, "advocates employed that classical political wisdom: Build a constituency. As children started receiving treatment, parents, teachers, and health providers rallied around the centers, countering moral complaints with down-to-earth descriptions of kids getting care," [43]. Indeed, the constituency is key to any public health outreach effort, particularly when it comes to behavioral health; effective policy draws from community partnership and community conceptions of health [45].

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