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Number of Sexual Partners and Associations with Initiation and Intensity of Substance Use

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Abstract

We dissected associations between initiation and intensity of substance use and number of sexual partners using pooled data from high school seniors (weighted $n = 13,580$) who participated in the 1999–2007 Youth Risk Behavior Surveillance System (YRBS), a cross-sectional, nationally representative survey. In multinomial multivariable logistic regressions, number of sexual partners steadily increased as substance use intensified from never use to experimental/new user to heavy use across all substances for both male and females. Severity of substance use is more closely related to, and thus a better indicator of, higher number of sexual partners than age of substance use onset.

Keywords

Sexual behaviors; Sexual partners; Substance use; Smoking; Alcohol consumption

Introduction

The US continues to have disproportionately high rates of teenage pregnancy, abortion, and sexually transmitted diseases (STDs) when compared with other industrialized countries [1,

2]. Nearly one million teenagers in this country become pregnant each year [1]. Approximately 40% of adolescent girls, most of African American or Hispanic descent, experience pregnancy at least once before reaching the age of 20. In addition, there are approximately 19 million new cases of STDs in this country each year, approximately half of which are found in young people ages 15–24 [2].

The risk of HIV/AIDS and other STDs, unintended pregnancies, and damage to reproductive health increases as the number of sexual partners increase [3]. Yet, many adolescents have had sexual intercourse with more than one person despite the adverse health consequences resulting from this behavior. In fact, almost 10% of 9th grade adolescents have had four or more sexual partners [4]. By the time they are in 12th grade, approximately 20% of girls and 25% of boys have had at least four sexual partners. Several reports have noted an association between high number of sexual partners and substance use with alcohol being examined most systematically in this context [5, 6]. However, substance use behaviors (i.e., age of substance use onset and substance use intensity) vary considerably across populations, especially among adolescents, and these variations are likely associated with differences in risk for increased number of sexual partners. The current study extends past research by examining how age of substance use initiation and variations in use (i.e., experimental/new user, moderate, heavy versus non-user) are associated with increased number of sexual partners. For greater statistical power, we pooled data over a period of 5 years from a nationally representative sample of adolescents. We focused on alcohol, cigarette, and marijuana use, the most commonly used substances that tend to begin earliest in the sequence of substance use progression [7]; harder drugs like cocaine, PCP, heroin, or ecstasy were not examined in the present study due to their limited use during adolescence [4].

Materials and Methods

Data Source

The present study utilizes 1999–2007 data (5 years: 1999, 2001, 2003, 2005, and 2007) from the National youth risk behavior survey (YRBS), a biennial survey established by the centers for disease control and prevention (CDC) to measure health-risk behaviors among a representative sample of high school students attending public, Catholic, and other private schools in this country [8]. For each biennial survey period, the YRBS utilizes a three-stage cluster sampling design to produce a representative sample of high school students (9th through 12th grade) attending public, Catholic, and other private schools in the United States. The items related to sexual behavior were found to have substantial reliability (.63). Only data from high school seniors (12th graders age 17 and older) were examined in our study to allow enough time for exposure to substances and to provide the opportunity to accumulate sexual partners.

Variables of Interest

The dependent variable was assessed by the question “During your life, with how many people have you had sexual intercourse?” Responses were I have never had sexual intercourse, 1, 2, 3, 4, 5, or 6 or more people. Based on distributions and risk levels, categories included no sexual partners (reference group), 1 sexual partner, 2–5 sexual partners, and 6 or more sexual partners.

We combined information on age of substance use initiation and intensity of use to create the primary independent variables of interest. Age of substance use initiation categories were 12 or younger, 13–14, and 15 or older. These age categories were chosen because participants who reported ages of substance use onset younger than 12 or older than 15 years

of age were relatively low in crosstabs examining age of substance use initiation and number of sexual partners (i.e., $n < 100$ participants); these participants were not excluded from the analyses but were lumped into the categories of 12 or younger or 15 or older based on their age of substance use onset. Participants were grouped into four categories of substance use intensity: non-users, experimental/new users, moderate users, and heavy users modeled after past research that have grouped type of users into *experimental/new users* (1–9 lifetime uses) and *moderate users* (10–99 lifetime uses) [9, 10]. *Heavy users* reported 100 or more lifetime uses. In the YRBS, any cigarette use was queried but lifetime number of cigarettes smoked was not asked, so an alternative measure was, “Have you ever smoked cigarettes daily, that is, at least one cigarette every day for 30 days?” *Daily users* responded “yes”; *non-daily users* responded “no”.

Statistical Analyses

Multinomial multivariable logistic regression analyses were performed using SAS-callable SUDAAN version 9.0.1, a software program that uses Taylor series linearization to adjust for design effects of complex sample surveys like the YRBS [11]. Ordinal logistic regression was not used because the proportional odds assumption was violated for many of the independent variables of interest. Because data were pooled over several years, analyses took into account all stages of clustering (year, stratum, and primary sampling unit). To adjust for nonresponse and oversampling of African Americans and Hispanics in the sample, each student received a weighting factor. The overall weights were scaled to ensure that the weighted count of students was equivalent to the entire sample size, and the weighted proportions of students in each grade corresponded with the national population proportions for each survey year. Sample weights were also applied to all analyses. Descriptive statistics were used to summarize the data.

All substance use variables were included in the models simultaneously, along with age and race/ethnicity. Final models were run separately for males and females because of interactions found between gender and substance use variables and between gender and race/ethnicity.

Results

Caucasians, African Americans, and Hispanics were included in the analyses; other racial/ethnic groups were excluded due to small sample size. Participants were also excluded from the study due to missing data ($N = 2,312$); excluded participants were more likely to be male ($P = 0.028$) and African American ($P < 0.001$). This left 11,268 high school seniors for analysis (5,541 males and 5,727 females). No significant differences in number of sexual partners were found across survey years ($P = 0.560$).

The majority of participants were Caucasians (76% males and 73% females) while approximately a quarter of the sample was either African American (11% males and 14% females) or Hispanic (13% males and 14% females). Most participants had not yet engaged in sexual intercourse (37% males and 35% females) or had sexual intercourse with only one person during their lifetime (22% of males and females). About one-third of males (28%) and females (34%) had 2–5 sexual partners while 13% of males and 9% of females had 6 or more sexual partners. Most participants had used alcohol (85% males and 86% females), cigarettes (58% males and 55% females), and marijuana (57% males and 50% females) at least once.

In the male model shown in Table 1, as intensity of alcohol, cigarette, and marijuana use increased so did the magnitude of odds of higher number of sexual partners. A stepwise increase from experimental/new user to moderate to heavy alcohol and marijuana use was

associated with a higher number of sexual partners. For example, for 6 or more sexual partners versus 0 partners, odds ratios ranges were 1.4–2.8 for experimental/new users of alcohol, 6.2–10.5 for moderate alcohol users, and 16.3–19.7 for heavy alcohol users. Similar results were noted as males' use of cigarettes intensified from non-daily cigarette use to daily cigarette use. This was most evident for males who had 2–5 sexual partners versus 0 partners, odds ratios ranges were 1.3–2.1 for non-daily cigarette smokers and 1.9–2.9 for daily cigarette smokers. Age of onset of alcohol and cigarette use had little effect on number of sexual partners. For marijuana users, odds of a higher number of sexual partners increased with younger age of onset of use. For example, the odds of heavy marijuana users who initiated marijuana use at age 15 or older versus non-users to have 2–5 sexual partners was 2.5, while the odds for those who initiated marijuana use at age 12 or younger was 8.9 (reference group was having 0 sexual partners).

The results were similar for females. Like males, a stepwise increase from experimental/new user to moderate to heavy alcohol and marijuana use was associated with a higher number of sexual partners. For example, for 6 or more sexual partners versus 0 partners, odds ratios ranges were 6.9–12.0 for experimental/new users of alcohol, 7.0–16.5 for moderate alcohol users, and 20.0–40.5 for heavy alcohol users. Similar results were noted as females' use of cigarettes intensified from non-daily cigarette use to daily cigarette use. For females who had 6 or more sexual partners versus 0 partners, odds ratios ranges were 2.1–2.9 for non-daily cigarette smokers and 5.6–9.7 for daily cigarette smokers. Age of onset of alcohol and cigarette use had little effect on number of sexual partners. Odds of a higher number of sexual partners increased with younger age of heavy marijuana onset. For example, the odds of heavy marijuana users who initiated marijuana use at age 15 or older versus non-users to have 2–5 sexual partners was 6.2, while the odds for those who initiated marijuana use at age 12 or younger was 22.1 (reference group was having 0 sexual partners).

Discussion

In a combined model examining alcohol, cigarettes, and marijuana across initiation and intensity of use, we found that number of sexual partners steadily increased as substance use intensified from never use to experimental/new user to heavy use across all substances for both male and female high school seniors. This is the first known study to use a nationally representative sample and show such a stepwise and seemingly uniform increase in likelihood for number of sexual partners corresponding with the severity of substance use across alcohol, cigarettes, and marijuana use. These findings persisted even while simultaneously controlling for age of substance use initiation as well as race/ethnicity and age of participant. For marijuana users only, odds of higher number of sexual partners also steadily increased as age of initiation decreased. The overall findings of our study further suggest that severity of alcohol and cigarette use is a better indicator of higher number of sexual partners than age of initiation. In contrast, intensity and age of initiation are both important in their associations with number of sexual partners when examining marijuana use.

Specifically, alcohol use was associated with having more sexual partners across all outcome categories (i.e., 1, 2–5, 6 or more sexual partners versus no sexual partners) for both males and females. In general, the risk for higher number of sexual partners increased as alcohol use intensified from experimental to moderate to heavy use. Age of initiation did not appear to be associated with increasing risk of having more sexual partners. The association between alcohol use intensity and having more sexual partners was greater for females than males.

For males, cigarette use was associated with having more sexual partners (2–5 partners and 6 or more partners versus no partners) when it occurred regularly (i.e., at least once a day for 1 month). In fact, the risk was about twofold when daily cigarette smokers initiated cigarette use at age 13 or above but was about threefold when initiated at age 12 or younger. For females, cigarette use was associated with having more sexual partners irrespective of intensity of use; however, the risk was greater for daily users, especially when comparing 6 or more sexual partners versus those who had not yet had sexual intercourse.

Marijuana use was associated with having more sexual partners across all outcome categories (i.e., 1, 2–5, 6 or more sexual partners versus no partners) for females and for 2–5 and 6 or more sexual partners (versus no partners) for males. Like alcohol use, the risk for higher number of sexual partners (i.e., more than 1 partner) generally increased as marijuana use intensified from experimental to moderate to heavy use. Age of marijuana initiation appeared to be associated with having more sexual partners (i.e., more than 1 partner) for male users across all intensity levels (i.e., experimental, moderate, and heavy use) and females who became heavy marijuana users. In addition, heavy marijuana use appeared to have a stronger association with increasing risk of having more sexual partners for females than males.

While our findings correspond with past reports that link substance use with risky sexual behaviors, this study makes significant contributions to the existing literature on this topic. Specifically, the large sample size in the present study enabled us to improve the measurement of substance use and its association with number of sexual partners. Since risk for higher number of sexual partners occurred across multiple substances, these results do not support alcohol-induced disinhibitions which has been alleged to cause risky sexual behaviors via impaired decision making [12]. While our findings do not necessarily contradict associations between alcohol-induced disinhibitions and risky sexual behaviors, we assert that the association of high number of sexual partners and alcohol use found in past reports could likewise be explained by risk behaviors that cross multiple domains which also drive cigarette smoking and marijuana use. We further add to the existing literature the important finding that risk behavior associations between substance use and number of sexual partners appear to trend in a stepwise direction. That is, the likelihood for having more sexual partners steadily increased as substance use behaviors became more severe. Lastly, an association between age of initiation and number of sexual partners was found for marijuana use only but not for alcohol or cigarette initiation. This finding might be due to unique environmental and/or biological vulnerability factors that differ with each of the substances initiated and their influence on risky sexual behaviors. Our findings might also reflect the tendency for alcohol and cigarette initiation to be a common occurrence during adolescence while marijuana initiation (especially when it occurs at an earlier age) is not and thus indicates a proneness to deviant behaviors.

Thus, the implications of our findings are relevant. Specifically, the varying levels of substance use behaviors examined in our study can provide warning signs to parents and/or a variety of professionals such as school counselors, nurses and physicians who are in contact with adolescents and can potentially measure risk for pregnancy and STD transmission and deliver prevention messages. Moreover, we provide further justification for interventions that cross multiple domains of risk (i.e., substance use and risky sexual behaviors) and target substance users, especially those who are heavier users.

The findings of this study were limited by several factors. The YRBS is cross-sectional, preventing the determination of causal relationships, and the survey does not provide information on potential explanatory variables such as socioeconomic status, social class, family structure, and/or relationships with friends or intimate partners that are needed for

more in-depth analyses. In addition, YRBS is a school-based survey which does not include data from high school dropouts or adolescents schooled at home. We also rely on participants' self-report for all of the data which contain some unknown level of reporting error. Substances, including cocaine, heroin, and methamphetamines, were omitted from our analyses due to limited use.

Nevertheless, our findings demonstrated a clear pattern of increased odds for higher number of sexual partners associated with increase of substance use. Importantly, the same was not found for age of substance use, with the exception of age of onset for marijuana use. While we recognize that age of substance use initiation is an important indicator of adolescent risk behaviors, in general, our findings suggest that severity of substance use is more strongly associated with number of sexual partners among adolescent high school seniors. In summary, our study improves the measurement of substance use and enables prevention efforts to more accurately assess and target adolescents who are at high risk for pregnancy and STD transmission and need preventive intervention.

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Table 1
Multinomial multivariable models examining associations with number of sexual partners

No. of sexual partners	Males			Females		
	1 vs. 0	2-5 vs. 0	6+ vs. 0	1 vs. 0	2-5 vs. 0	6+ vs. 0
Alcohol user^d						
Nonuser	1.0	1.0	1.0	1.0	1.0	1.0
Experimental/new user						
≥15	2.0 (1.4-2.9)	1.5 (1.1-2.1)	2.3 (1.4-3.9)	2.2 (1.6-3.0)	4.6 (3.1-6.6)	6.9 (3.3-14.4)
13-14	1.8 (1.0-3.3)	2.2 (1.3-3.7)	1.4 (0.6-3.6)	2.4 (1.5-3.9)	7.3 (4.1-13.0)	12.0 (4.8-30.4)
≤12	1.7 (1.0-2.9)	1.7 (1.0-3.0)	2.8 (1.5-5.2)	1.4 (0.8-2.4)	2.0 (1.2-3.5)	10.8 (4.7-24.6)
Moderate						
≥15	2.4 (1.7-3.3)	3.9 (2.7-5.7)	6.2 (3.7-10.3)	2.8 (2.0-3.8)	7.3 (5.1-10.4)	16.5 (7.5-36.4)
13-14	2.7 (1.8-4.2)	5.6 (3.7-8.3)	7.4 (4.3-13.0)	2.1 (1.3-3.3)	5.6 (3.8-8.2)	10.9 (4.8-24.6)
≤12	3.9 (2.5-6.0)	6.9 (4.2-11.4)	10.5 (5.6-19.8)	1.8 (1.1-2.9)	6.8 (4.3-10.9)	7.0 (2.9-17.0)
Heavy						
≥15	2.9 (1.5-5.6)	7.9 (4.3-14.6)	16.3 (7.4-36.0)	3.2 (1.5-6.7)	10.3 (5.0-21.0)	40.5 (14.2-115.2)
13-14	2.2 (1.2-3.8)	6.1 (3.4-10.9)	19.7 (9.4-41.1)	3.2 (1.8-5.5)	9.8 (5.4-17.7)	30.9 (11.8-81.1)
≤12	3.2 (1.8-5.8)	7.5 (4.4-12.8)	19.7 (10.2-38.2)	2.6 (1.4-5.0)	9.9 (5.3-18.6)	20.0 (8.2-48.8)
Cigarette user^d						
Nonuser	1.0	1.0	1.0	1.0	1.0	1.0
Non-daily						
≥15	0.9 (0.7-1.2)	1.3 (1.0-1.8)	0.9 (0.6-1.4)	1.4 (1.0-1.8)	1.7 (1.2-2.3)	2.1 (1.2-3.5)
13-14	1.3 (0.9-1.8)	1.5 (1.0-2.3)	1.2 (0.7-2.0)	1.5 (1.0-2.3)	1.9 (1.2-2.9)	2.2 (0.9-5.7)
≤12	1.5 (1.0-2.4)	2.1 (1.3-3.2)	1.5 (0.9-2.6)	1.7 (1.1-2.6)	1.9 (1.2-3.3)	2.9 (1.4-6.1)
Daily						
≥15	1.3 (0.8-2.4)	1.9 (1.1-3.4)	2.3 (1.2-4.3)	2.2 (1.1-4.3)	3.9 (2.4-6.3)	5.6 (2.6-11.7)
13-14	1.1 (0.6-2.1)	2.0 (1.1-3.5)	1.8 (0.9-3.4)	3.2 (1.8-5.7)	4.6 (2.7-7.8)	9.2 (4.1-20.7)
≤12	1.5 (0.8-2.8)	2.9 (1.4-5.7)	2.8 (1.4-5.9)	1.5 (0.7-3.2)	3.1 (1.8-5.3)	9.7 (4.5-21.2)
Marijuana user^d						
Nonuser	1.0	1.0	1.0	1.0	1.0	1.0
Experimental/new user						

No. of sexual partners	Males			Females		
	1 vs. 0	2-5 vs. 0	6+ vs. 0	1 vs. 0	2-5 vs. 0	6+ vs. 0
≥15	1.8 (1.3-2.5)	2.1 (1.5-2.8)	2.9 (1.9-4.5)	1.5 (1.1-2.0)	2.2 (1.6-2.9)	3.4 (1.8-6.3)
13-14	1.5 (0.9-2.5)	2.7 (1.6-4.7)	5.4 (2.5-12.0)	2.4 (1.3-4.2)	2.5 (1.4-4.6)	6.3 (3.4-11.8)
≤12	2.3 (0.6-9.1)	8.3 (2.9-23.3)	12.7 (4.2-38.2)	2.1 (0.5-8.2)	4.9 (1.7-13.8)	1.3 (0.2-10.3)
Moderate						
≥15	1.3 (0.9-2.0)	2.1 (1.4-3.1)	3.0 (1.8-5.0)	1.8 (1.2-2.7)	3.3 (2.2-4.8)	6.7 (3.3-13.7)
13-14	1.6 (0.8-3.0)	3.5 (2.0-6.2)	6.4 (3.3-12.6)	1.6 (1.0-2.5)	3.1 (2.0-4.9)	11.2 (5.0-25.2)
≤12	1.8 (0.6-4.9)	3.7 (1.5-9.1)	8.1 (3.2-20.9)	1.0 (0.3-3.3)	2.2 (0.8-6.0)	6.8 (1.8-26.3)
Heavy						
≥15	1.5 (0.8-2.9)	2.5 (1.4-4.4)	5.8 (2.9-11.3)	1.9 (0.9-4.2)	6.2 (3.2-12.0)	9.2 (2.9-28.5)
13-14	3.2 (1.8-5.6)	4.0 (2.3-6.9)	10.4 (6.1-17.5)	4.4 (1.7-11.8)	10.3 (5.0-21.2)	30.3 (9.0-101.4)
≤12	3.5 (1.6-7.8)	8.9 (3.8-20.7)	29.0 (11.6-72.6)	5.1 (1.7-14.8)	22.1 (8.5-57.2)	57.5 (16.8-197.1)

Models control for race/ethnicity and age at interview

No. number, *CI* confidence interval, *OR* odds ratio

^a Age of initiation by intensity of use