

# STD-/HIV-Related Sexual Risk Behaviors and Substance Use among U.S. Rural Adolescents

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**Objectives:** The present study aims to examine the relationship between substance use and HIV/sexually transmitted disease (STD)-related sexual risk behaviors among a national sample of sexually active adolescents in rural settings.

**Methods:** Participants included 9th–12th grade rural adolescents (N=5,745) who completed the 2003 national Youth Risk Behavior Survey. The independent variables were six substance use behaviors, including alcohol, marijuana, tobacco and cocaine use. The dependent variables were unprotected sex and the number of recent sexual partners. Univariate and multivariate logistic regression models were examined.

**Results:** Smoking  $\geq 3$  days during the past 30 days was associated with unprotected sex. Alcohol or drug use before last sexual intercourse, having ever used marijuana, having ever used cocaine and drinking alcohol during the past 30 days were associated with having multiple sexual partners.

**Conclusions:** Results from the current study highlighted the need to provide youth with increased STD/HIV prevention knowledge in rural areas. Our finding confirmed that in order to achieve more effective STD/HIV prevention among high-risk substance-abusing youth, more intensive and better-tailored efforts will be needed to promote sexual risk reduction.

**Key words:** HIV/AIDS ■ sexually transmitted diseases ■ sexual history ■ substance abuse ■ children/adolescents

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## INTRODUCTION

Despite reductions in rates of sexual activity and increases in sexual risk-reduction behaviors among adolescents in the past decade,<sup>1</sup> HIV/AIDS rates among 15–24-year-olds continue to rise<sup>2</sup> and sexually transmitted disease (STD) rates remain higher for this age group than for any other.<sup>3</sup> Although the HIV/AIDS epidemic emerged in urban areas, it has

spread to rural America. By 1997, rural transmission accounted for fully one in 10 (10.2%) AIDS cases in the United States.<sup>4</sup> During 1999 and 2000, rural transmission leveled off at 7.3% of all cases.<sup>5</sup> A current Centers for Disease Control (CDC) report described an outbreak of HIV infection among young black adults living in a small town in rural Mississippi.<sup>6</sup> Among seropositive cases, five of seven were females, and the HIV-infected females were significantly younger (median age = 16 years) than the men in the study. A similar outbreak occurred in a rural county of New York, with a median age of 17.8 years at the time of HIV infection among 13 women.<sup>7</sup> These results clearly suggest that attention to rural adolescents' sexual risk behaviors is warranted.

Both unprotected sex and having multiple sexual partners are documented risk behaviors for STDs and/or HIV infection. Promoting condom use has been a major goal of programs designed to prevent HIV infection and other STDs.<sup>8</sup> Findings from the National Youth Risk Behavior Survey (YRBS) indicate that recent sexual activity among adolescents is associated with unprotected sex.<sup>9</sup> It is estimated that about 46.7% of high-school students are sexually active,<sup>10</sup> and only about 50% of those engaging in sex are using condoms consistently.<sup>11</sup> The fact that sexually active U.S. high-school student are not necessarily using condoms all of the time is compounded by their greater tendency to have sex with multiple partners than adults.<sup>9</sup> As the number and variety of new sexual partners increase, so does the risk of exposure to individuals infected with STDs, particularly if condoms are not used or are used incorrectly. In fact, the highest rates of gonorrhea, syphilis and chlamydia are found among teens aged 15–19.<sup>12</sup>

Substance use has been documented as a contributing factor to sexual risk-taking, whereby substance use impairs individual judgment and decision-making and increases a teen's risk for a sexually transmitted infection. Both casual and chronic substance users are more likely to engage in high-risk behaviors such as unprotected sex when they are under the influence of drugs or alcohol.<sup>13,14</sup> Substance use has also been shown to occur with a history of sex with multiple partners throughout the transition from adolescence to young adulthood.<sup>15-17</sup>

Von Haefen, et al. found that people are more likely to use a condom with casual sex partners than with regular partners.<sup>18</sup> As a result of risky sexual behavior, there are approximately 19 million new STD infections reported each year, and almost half of them are among youth aged 15–24.<sup>19</sup> Increased susceptibility to substance abuse and HIV infection has become prevalent in rural communities.<sup>11</sup> Rural adolescents in particular are experiencing increased problems related to substance abuse and HIV. Because rural adolescents exhibit higher rates of alcohol consumption than do adolescents in suburban and urban communities,<sup>20–22</sup> they may be more likely to engage in risky sexual behavior and therefore have increased susceptibility to STD/HIV infection.

Despite widespread recognition that substance abuse is associated with HIV/STD risk behaviors such as unprotected sex and having multiple sexual partners, few studies among adolescents have examined this association in a nationally representative sample, particularly in rural areas. In addition, most HIV and substance abuse prevention interventions have targeted adolescents in urban settings.<sup>23,24</sup> When studies of differences between urban and rural settings have been conducted, variations in the trends and patterns among rural and urban adolescents relative to substance abuse and HIV exposure were found.<sup>20,25</sup> These variations included increased sexual and drug use behaviors among rural adolescents when compared to their urban counterparts.

The purpose of this investigation was to examine the relationship between substance use—including alcohol, marijuana, cigarettes and cocaine—and unprotected sex and multiple recent sexual partners among sexually active adolescents in rural settings. It was hypothesized that substance use would be associated with STD-/HIV-related sexual risk behaviors in rural adolescents. Findings from this study will provide empirical data to further understand STD-/HIV-related sexual risk behaviors among rural adolescents and will help in the justification and development of school- and community-based prevention programs designed for adolescents residing in rural communities.

## METHOD

### Data Collection and Sampling Methodology

Data from the 2003 YRBS were used for this analysis. The YRBS utilized a three-stage (county, school and classroom) cluster sampling design to ensure that students in the survey are representative of high-school students in the United States. The first sampling stage consisted of selecting large counties, subareas of large counties or groups of small, adjacent counties. In the second sampling stage, 195 schools were randomly selected with probability proportional to school enrollment size. Schools with substantial numbers of black and Hispanic students were sampled at higher rates than all other schools in order to enable sep-

arate analysis of data for black and Hispanic students. The third stage of sampling consisted of randomly selecting one or two intact classes of a required subject (e.g., English or social studies) from grades 9–12 at each chosen school. All students in the selected classes were eligible to participate in the survey. Of 195 sampled schools, 158 participated in the YRBS 2003. The school response rate was 81%, and the student response rate was 67%. Comprehensive design and sampling procedures are available from the CDC's *Morbidity and Mortality Weekly Report*.<sup>10</sup> In the 2003 YRBS, students are classified as urban, suburban or rural based on the location of the school attended by that student.<sup>10</sup> Rural designations were made by the CDC and based on the size of the county in which the school was located. "Rural" was defined as being outside a large or small metropolitan statistical area (MSA); thus, counties of <50,000 people were considered rural areas.<sup>10</sup> For the purpose of this study, all analyses included only sexually active adolescents who attended rural high schools.

## MEASURES

### Dependent Variables

Two dependent measures of STD-/HIV-related behaviors were examined: unprotected sex and the number of sexual partners in the past three months. Unprotected sex was a dichotomous variable derived from the question, "The last time you had sexual intercourse, did you or your partner use a condom?" Responses were coded as "yes" or "no"; those who indicated that they had never had sexual intercourse were excluded from the analyses. Number of sexual partners during the past three months was worded, "During the past three months, with how many people did you have sexual intercourse?" Response categories were coded as "have had sexual intercourse but 0 partners during the past three months," "one partner," and ">1 partner." Respondents who indicated that they "have never had sexual intercourse" were excluded from the analyses.

### Independent Variables

The independent variables included a total of six substance use behaviors, which represented students' risk profiles: 1) number of days cigarettes were smoked in the past 30 days; 2) lifetime use of marijuana; 3) number of days  $\geq 1$  alcoholic drink was consumed in the past 30 days; 4) number of days  $\geq 5$  alcoholic drinks in a row were consumed in the past 30 days; 5) lifetime use of any form of cocaine, including powder, crack or free-base; and 6) alcohol or drug use before sexual intercourse. The response categories of smoking, alcohol use and binge drinking were scored on a three-point scale representing increasing frequency of a behavior in the past month: "0 days," "1–2 days" and " $\geq 3$  days." The response categories for lifetime marijuana use and lifetime cocaine use were coded as "never" or "ever." Alco-

hol or drug use before last sexual intercourse, a potential antecedent of HIV/STD sexual risk behavior,<sup>20</sup> was measured by the question, "Did you drink alcohol or use drugs before you had sexual intercourse the last time?" The response categories were coded as "yes" or "no." In addition, four self-reported demographic variables, including age, gender, grade in school (9th–12th), and race/ethnicity were included in the analyses. Race/ethnicity was categorized into four groups (white, black, Hispanic and other ethnicities).

The frequency distributions of study variables were examined. Categories with small percentages were combined with the adjacent categories based on previous literature. Due to small cell sizes, the data did not allow for coding of drug use-related independent variables any finer than as di- or trichotomized categories.

## Data Analysis

All statistical analyses were conducted using SAS<sup>®</sup> version 9.1.2 (SAS Institute Inc., Cary, NC). The SAS statistical software (Proc survey procedures) can account for a multistage sampling option by including the design factor (i.e., the stratum and primary sampling unit levels) and the weight in the analytical model. The analyses consisted of three steps. First, rates of unprotected sex and the number of sexual partners (single and multiple) in the past three months were calculated for the total sample and for each risk factor. Rao-Scott Chi-squared tests were used to examine the strength of the association between the hypothesized independent variables and adolescent STD-/HIV-related sexual risk behaviors. Second, the data were analyzed using a univariate logistic model between the dependent variables (unprotected sex and multiple sexual partners) and each independent variable to examine the relationships. Two univariate logistic models were used for modeling multiple sexual partner behavior: a) having multiple sexual partners was compared with having no sexual partner during the past three months and b) having multiple sexual partners was compared with having one sexual partner during the past three months. The unadjusted odds ratios (ORs) and 95% confidence intervals (CIs) as well as Chi-squared tests were examined. Finally, multivariate logistic regression was conducted to identify the most significant variables in relation to each of the STD-/HIV-related sexual risk behaviors. The original models included all statistically significant independent variables ( $p < 0.05$ ) from the univariate logistic regression tests. A backward stepwise elimination procedure was used to sequentially remove variables that were not significant at the  $p < 0.05$  level in the logistic models. Adjusted OR and 95% CI were examined to assess the significance of the relationships. Age, gender, grade and race/ethnicity were included in the final model as important potential confounders regardless of their significance levels.

## RESULTS

### Sample

The sample consisted of 5,745 adolescents attending rural high schools, of whom 48.2% were female, 35.1% were white, 26.2% were black, 24.6% were Hispanic and 14.0% were other ethnic groups. At the time of the 2003 YRBS administration, approximately 32.8% of respondents were in ninth grade, followed by 26.0% in 10th grade, 22.4% in 11th grade and 18.8% in 12th grade. The participants ranged in age from 12–18. The mean age was 16.1 (SD=1.24).

Table 1 presents the prevalence of unprotected sex and single and multiple sexual partners in the past three months. Among sexually active adolescents, 70.08% reported having a single sexual partner in the past three months. Approximately one in three (29.92%) sexually active rural adolescents reported having multiple sexual partners in the past three months. A similar percentage (31.60%) reported not using a condom during their last sexual intercourse. Experiences of having multiple sexual partners were reported by 37.12% of those who reported using alcohol or drugs before their last sexual intercourse ( $p < 0.0001$ ). Smoking in the past 30 days and lifetime marijuana use were strongly associated with all the sexual risk behaviors examined. Unprotected sex occurred in 37.95%, 21.26% and 19.07% of adolescents who reported having used alcohol  $\geq 3$  days in the past 30 days, binge drinking (1–2 days in the past 30 days) and lifetime cocaine use, respectively. Finally, almost half (48.39%) of adolescents who reported having  $> 3$  days in the past 30 days in which they drank alcohol had multiple sexual partners in the past three months. Having multiple sexual partners was also associated with binge drinking ( $p < 0.05$ ) and lifetime cocaine use ( $p < 0.0001$ ). Females were more likely to report not using a condom during their last sexual intercourse and were less likely to have multiple sexual partners than males. Students in higher grades were more likely to have unprotected sex than those in lower grades ( $p < 0.01$ ). Compared to other ethnic groups, black adolescents (42.99%,  $p < 0.0001$ ) had the highest prevalence of multiple sexual partners.

### Bivariate Relationships between STD-/HIV-Related Sexual Risk Behaviors and Risk Factors

Table 2 shows the unadjusted ORs for the bivariate analyses, which identified significant associations ( $p < 0.05$ ) among drug use before sex, substance use demographic factors (e.g., grade and ethnicity), and STD-/HIV-related sexual risk behaviors.

Alcohol or drug use before sexual intercourse, lifetime marijuana use and lifetime cocaine use were associated with all STD/HIV risk behaviors examined. Binge drinking behavior increased the odds of youth reporting unprotected sex. In addition, youth who had recent unprotected sex were 81% more likely to report lifetime

cocaine use. Boys were less likely (OR=0.52, CI: 0.46–0.58) than girls to report unprotected sexual intercourse. Compared to their peers who had no sexual partners during past three months, youth who had multiple sexual partners were 3.5 times as likely to use alcohol or drugs before the most recent sexual intercourse (OR=3.5, CI: 2.58–4.77) and almost five times as likely (OR=4.72, CI: 2.92–7.62) to report binge drinking  $\geq 3$  days in the past month. When comparing youth who had  $\geq 2$  recent

sexual partners with those who had one, having multiple partners was associated with alcohol or drug use before sex, smoking ( $\geq 3$  days), marijuana, alcohol and cocaine use. Compared to their counterparts who had single sexual partners, rural youth who had multiple sexual partners were three times as likely (OR=3.1, CI: 2.43–3.95) to use alcohol or drugs before the most recent sexual intercourse, 80% more likely to use marijuana, 2.19 times as likely (CI: 1.66–2.90) to use alco-

**Table 1. Prevalence of risk factors in rural U.S. high-school students for STD-/HIV-related sexual risk behaviors among U.S. rural adolescents**

Reported Behaviors	Noncondom Use at Last Sex	Number of Sexual Partners in Previous 3 Months	
	N <sup>†</sup> (%) <sup>§</sup>	Single	Multiple
Alcohol or Drug Use before Last Sexual Intercourse	201 (24.06)	<b>212 (16.00)***</b>	<b>263 (37.12)***</b>
Smoked Past 30 Days			
0 days	<b>576 (63.13)**</b>	<b>1,044 (71.17)**</b>	<b>371 (60.57)**</b>
1–2 days	66 (7.48)	105 (7.05)	56 (6.68)
$\geq 3$ days	237 (29.39)	266 (21.78)	198 (32.45)
Lifetime Used Marijuana			
Never	<b>277 (29.27)*</b>	<b>558 (34.93)***</b>	<b>152 (23.00)***</b>
Ever	639 (70.73)	917 (65.07)	511 (77.00)
Use Alcohol Past 30 Days			
0 days	<b>338 (37.34)**</b>	<b>620 (42.10)***</b>	<b>174 (29.60)***</b>
1–2 days	223 (27.70)	397 (26.51)	128 (22.01)
$\geq 3$ days	317 (37.95)	408 (31.39)	308 (48.39)
Binge Drinking Past 30 Days			
0 days	<b>560 (28.83)**</b>	<b>1000 (63.95)*</b>	<b>342 (53.34)*</b>
1–2 days	184 (21.26)	281 (19.36)	138 (20.22)
$\geq 3$ days	166 (19.90)	198 (16.69)	169 (26.45)
Lifetime Used Cocaine			
Never	<b>751 (80.93)***</b>	<b>1,320 (88.61)***</b>	<b>516 (75.69)***</b>
Ever	170 (19.07)	166 (11.39)	154 (24.31)
Age			
$\leq 12$ –14 years	38 (6.07)	58 (6.02)*	<b>34 (6.47)*</b>
15 years	121 (16.76)	215 (18.07)	125 (25.21)
16 years	234 (26.92)	387 (26.92)	173 (26.79)
17 years	305 (29.79)	503 (30.35)	182 (21.89)
$\geq 18$ years	231 (20.46)	335 (18.65)	169 (19.64)
Gender			
Female	<b>543 (57.40)***</b>	<b>639 (43.54)***</b>	<b>189 (28.95)***</b>
Male	386 (42.60)	859 (56.46)	494 (71.05)
Grade			
9th	<b>122 (19.83)**</b>	200 (19.17)	<b>132 (27.91)*</b>
10th	195 (24.63)	317 (24.51)	152 (26.53)
11th	260 (22.83)	444 (25.70)	169 (19.34)
12th	350 (32.71)	536 (30.62)	227 (26.21)
Ethnicity			
White	<b>200 (29.92)**</b>	330 (31.85)	<b>102 (21.96)***</b>
Black	289 (27.55)	545 (31.41)	323 (42.99)
Hispanic	330 (26.88)	466 (23.78)	186 (22.13)
Other	105 (15.65)	150 (12.96)	69 (12.91)
Total	929 (31.60)	1,498 (70.08) <sup>a</sup>	683 (29.92) <sup>a</sup>

† Unweighted data; § Weighted data (prevalence); a: Denominator was the number of sexually active youth in the past three months; Bold type indicates significant results; \* p<0.05; \*\* p<0.01; \*\*\* p<0.0001

hol for  $\geq 3$  days and 2.5 times (CI: 2.05–3.05) as likely to use cocaine. Males were less likely to have unprotected sex than females, but were more likely to report having multiple sexual partners. In addition, black and other ethnic students were more likely to have had a multiple recent sexual partners rather than one as compared to white students.

## Multivariate Relationships between STD-/HIV-Related Sexual Risk Behaviors and Risk Factors

Three multivariate logistic regression analyses were conducted modeling three STD-/HIV-related sexual risk behaviors: no condom use at last sexual intercourse, having multiple sexual partners versus no partners and having multiple sexual partners versus one partner. Each

**Table 2. Unadjusted odds ratios for relationship between STD/HIV-related sexual risk behaviors and risk factors<sup>a</sup> among U.S. rural adolescents in the 2003 National Youth Risk Behavior Survey**

Risk Factors	Noncondom Use at Last Sex	Multiple Sex Partner versus None	Multiple Sex Partner versus 1
	OR (95% CI)	OR (95% CI)	OR (95% CI)
Alcohol or Drug Use before Last Sexual Intercourse			
Yes	<b>1.4 (1.04–1.88)*</b>	<b>3.5 (2.58–4.77)***</b>	<b>3.1 (2.43–3.95)***</b>
No	1.00	1.00	1.00
Smoked Past 30 Days			
1–2 days	1.25 (0.83–1.87)	1.22 (0.7–2.1)	1.16 (0.71–1.91)
$\geq 3$ days	<b>1.67 (1.29–2.17)***</b>	<b>2.28 (1.64–3.16)***</b>	<b>1.75 (1.43–2.14)***</b>
0 days	1.00	1.00	1.00
Lifetime Used Marijuana			
Ever	<b>1.39 (1.08–1.8)*</b>	<b>2.52 (1.83–3.49)***</b>	<b>1.8 (1.53–2.12)***</b>
Never	1.00	1.00	1.00
Use Alcohol Past 30 Days			
1–2 days	1.18 (0.98–1.41)	<b>1.59 (1.16–2.18)**</b>	1.18 (0.92–1.52)
$\geq 3$ days	<b>1.54 (1.2–1.98)**</b>	<b>4.19 (2.88–6.09)***</b>	<b>2.19 (1.66–2.9)***</b>
0 days	1.00	1.00	1.00
Binge Drinking Past 30 Days			
1–2 days	<b>1.43 (1.2–1.7)***</b>	<b>1.78 (1.3–2.44)**</b>	1.25 (0.81–1.93)
$\geq 3$ days	<b>1.55 (1.15–2.09)**</b>	<b>4.72 (2.92–7.62)***</b>	<b>1.9 (1.33–2.72)**</b>
0 days	1.00	1.00	1.00
Lifetime Used Cocaine			
Ever	<b>1.81 (1.46–2.24)***</b>	<b>3.15 (2.16–4.6)***</b>	<b>2.5 (2.05–3.05)***</b>
Never	1.00	1.00	1.00
Age			
15 years	0.89 (0.49–1.63)	1.38 (0.67–2.81)	1.3 (0.71–2.39)
16 years	1.18 (0.64–2.16)	1.25 (0.73–2.16)	0.93 (0.56–1.53)
17 years	1.52 (0.94–2.46)	1.4 (0.73–2.69)	0.67 (0.41–1.11)
$\geq 18$ years	1.6 (0.83–3.09)	<b>2.12 (1.35–3.33)**</b>	0.98 (0.59–1.62)
$\leq 12$ –14 years	1.00	1.00	1.00
Gender			
Male	<b>0.52 (0.46–0.58)***</b>	<b>1.74 (1.31–2.32)**</b>	<b>3.18 (2.48–4.09)***</b>
Female	1.00	1.00	1.00
Grade			
10th	1.18 (0.93–1.51)	0.97 (0.65–1.45)	0.74 (0.51–1.08)
11th	1.24 (0.91–1.68)	0.88 (0.61–1.28)	<b>0.52 (0.39–0.69)***</b>
12th	<b>1.82 (1.38–2.4)***</b>	<b>1.48 (1.1–1.99)**</b>	<b>0.59 (0.46–0.75)***</b>
9th	1.00	1.00	1.00
Ethnicity			
Black	<b>0.72 (0.55–0.94)*</b>	<b>1.74 (1.31–2.31)**</b>	<b>1.99 (1.46–2.69)***</b>
Hispanic	1.24 (0.98–1.57)	1.33 (0.96–1.83)	1.35 (0.91–2.01)
Other	<b>1.43 (1.07–1.92)*</b>	1.45 (0.96–2.19)	<b>1.45 (1.01–2.06)*</b>
White	1.00	1.00	1.00

a: The last category was used as the reference; CI: Confidence intervals; Bold type indicates significant results in each risk factor; \*  $p < 0.05$ ; \*\*  $p < 0.01$ ; \*\*\*  $p < 0.0001$

model included all statistically significant variables from the univariate logistic regression models (Table 3).

Rural adolescents who reported having smoked  $\geq 3$  days in the past month had greater odds (OR=1.43, CI: 1.06–1.91) of not using a condom during their most recent sexual intercourse. Rural youth who had reported lifetime marijuana and cocaine use and use of alcohol were more likely to have had a recent sexual partner rather than none. When the comparison was between youth who had multiple sexual partners and those who had one, alcohol or drug use before their last sexual intercourse, use of alcohol and lifetime cocaine use were important predictors. Black students were at higher risk of having multiple sexual partners (data not shown) compared with students in other ethnic groups.

## DISCUSSION

This study examined the relationships between STD-/HIV-related sexual risk behaviors and substance use behaviors among a representative group of rural adolescents in the United States. Specifically, the model examined two major outcome variables, condom use and multiple sexual partners. The independent variables were derived from the literature, which identified substance use as one of the most predictive factors for sexual risk behaviors.<sup>8,9,11,26,27</sup> To our knowledge, our paper is one of

the few studies that has exclusively examined sexual risk behaviors and substance use behaviors among a national sample of rural adolescents.

Several major observations emerged from this study. First, the findings indicate that substance use was significantly associated with unprotected sexual behaviors. Adolescents who reported alcohol or drug use before their last sexual intercourse, smoking  $\geq 3$  days during the past 30 days, ever using marijuana, ever using cocaine, drinking alcohol  $\geq 3$  days during the past 30 days and binge drinking during the past 30 days were more likely not to use condoms at their last sexual intercourse. These empirical data are consistent with the previous findings among adolescents, although most of the previous studies used nonrural adolescents.<sup>28-32</sup> It is important to note that in the multivariate model, only one variable remained significantly related to not using condoms: smoking  $\geq 3$  days during the past 30 days. Elsewhere, Horn and colleagues also indicated that adolescent smoking is associated with alcohol and illicit drug use, violence, suicide, stress, depression and unprotected sex.<sup>33</sup> Our finding paralleled the existing literature. However, future research is needed to determine factors, especially psychosocial-related determinants, which may help explain this finding.

When we examined demographic factors of the youth, there appeared to be a positive, linear relation-

**Table 3. Adjusted odds ratios for relationship between STD-/HIV-related sexual risk behaviors and risk factors<sup>a,b</sup> among U.S. rural adolescents in the 2003 National Youth Risk Behavior Survey**

Risk Factors	Noncondom Use at Last Sex	Multiple Sex Partner versus None	Multiple Sex Partner versus 1
	OR (95% CI)	OR (95% CI)	OR (95% CI)
Alcohol or Drug Use before Last Sexual Intercourse			
Yes	1.31 (0.9–1.92)	1.46 (0.89–2.39)	<b>2.28 (1.67–3.12)***</b>
No	1.00	1.00	1.00
Smoked Past 30 Days			
1–2 days	0.96 (0.6–1.53)	0.99 (0.56–1.77)	0.98 (0.53–1.81)
$\geq 3$ days	<b>1.43 (1.06–1.91)*</b>	0.95 (0.59–1.55)	1.27 (0.86–1.89)
0 days	1.00	1.00	1.00
Lifetime Used Marijuana			
Ever	1.17 (0.84–1.62)	<b>1.45 (1.11–1.89)**</b>	1.13 (0.85–1.5)
Never	1.00	1.00	1.00
Use Alcohol Past 30 Days			
1–2 days	1.04 (0.81–1.32)	<b>1.6 (1.07–2.38)*</b>	<b>1.46 (1.07–1.99)*</b>
$\geq 3$ days	1.04 (0.68–1.61)	<b>2.45 (1.33–4.52)**</b>	<b>2.16 (1.08–4.34)*</b>
0 days	1.00	1.00	1.00
Binge Drinking Past 30 Days			
1–2 days	1.05 (0.72–1.53)	0.99 (0.56–1.74)	0.93 (0.57–1.53)
$\geq 3$ days	0.92 (0.55–1.56)	1.8 (0.74–4.39)	0.76 (0.4–1.45)
0 days	1.00	1.00	1.00
Lifetime Used Cocaine			
Ever	1.24 (0.85–1.8)	<b>2.68 (1.59–4.52)**</b>	<b>2.5 (1.96–3.18)***</b>
Never	1.00	1.00	1.00

a: The last category was used as the reference; b: Age, gender, grade and ethnicity were treated as covariates in the final model; CI: Confidence intervals; Bold type indicates significant results in each risk factor; \*  $p < 0.05$ ; \*\*  $p < 0.01$ ; \*\*\*  $p < 0.0001$

ship between advancing grades and the risk of engaging in unprotected sex. Our finding was different from that of Howard and Wang,<sup>34</sup> who found an inverse linear relationship between grade and unprotected sex. Models of risk-taking behavior in adolescents have identified a developmental trajectory for teens engaging in risky behaviors, which was confirmed by our findings. Based on the model, rates of sexual activity, substance use, reckless vehicle use and delinquency have been shown to increase with age during adolescence.<sup>35</sup>

Second, substance use was significantly associated with having multiple sexual partners. For this paper, we compared having multiple sexual partners with having no sexual partners during the past 30 days and also compared having multiple sexual partners with having a single sexual partner during the past 30 days. The comparisons were somewhat similar, although, as expected, the magnitude of association was generally stronger for multiple sexual partners versus none than for multiple sexual partners versus a single sexual partner. Adolescents who reported alcohol or drug use before their last sexual intercourse, smoking  $\geq 3$  days during the past 30 days, ever using marijuana, ever using cocaine, drinking alcohol during the past 30 days and binge drinking during the past 30 days were significantly more likely to have multiple sexual partners. These findings support the literature that has repeatedly shown the relationship between substance use (tobacco, alcohol, cocaine) and having multiple sexual partners.<sup>9,32,36</sup> Results from the adjusted multivariate analysis revealed that the substance use profile of youth who reported having multiple sexual partners was different from those who reported unprotected sex. Alcohol or drug use before last sexual intercourse, ever using marijuana, ever using cocaine and drinking alcohol during the past 30 days were associated with having multiple sexual partners but not unprotected sex. Particularly, drinking alcohol and lifetime cocaine use were strongly associated with having multiple sexual partner behavior, regardless of whether the comparison is with no sexual partners or with a single partner.

Alcohol use appeared to be correlated with a high level of sexually risky behavior, particularly having multiple sexual partners. This finding is consistent with Santelli and colleagues,<sup>37</sup> who found that as the number of reported alcohol-related behaviors increased, the adjusted proportion of respondents who had recently had multiple partners rose from 8% to 48% among women and from 23% to 61% among men. A study conducted in South Africa<sup>38</sup> also demonstrated that greater alcohol use was associated with multiple sexual partners in the past month and other STD-/HIV-related sexual risk behaviors. This finding may underscore the fact that encounters that lead to sex may originate when alcohol is accessible.<sup>9</sup> Another possible explanation is the disinhibiting effects of alcohol.<sup>39</sup> Rural youth who reported use of more illicit substances (i.e., cocaine) were more likely

to engage in multiple sexually risky behaviors. Certain substances, such as heroin and cocaine, have been associated with higher prevalence of HIV/STDs. A possible explanation is that “harder” drug use may signal engagement in multiple sexual risky behaviors among high-school students. Milhausen et al. pointed out that a lack of recreational opportunities in rural communities leads to boredom and substance abuse, which contribute to sexual risk behaviors among rural youth.<sup>20</sup> The current study tends to agree with Griffin and colleagues,<sup>40</sup> who revealed that the relationship between social competence and substance use was fully mediated by social benefit expectancies of use. Poorly competent rural youth may turn to substance use because they perceive that there are important social benefits to doing so, such as having more friends, looking grown up and “cool,” and having more fun.

Findings from our study also suggest that the patterns of engaging in sexual risk behaviors are different between male and female adolescents. It appeared that rural males are at higher risk for STDs due to a greater number having multiple sexual partners than their female counterparts. Female adolescents, however, were less likely to use condoms than males. The findings are not entirely surprising. Binson, Dolcini, Pollack and Catania<sup>41</sup> found that young men are more than twice as likely as young women to have multiple partners. Elsewhere, Kaplan et al. also found that females report less frequent use of condoms during intercourse than males.<sup>42</sup> A possible explanation for this gender difference in condom use is that many adolescent females are sexually active with older partners. Furthermore, on average, women—especially young women—are more at risk of contracting HIV/AIDS because they have a hard time talking to their male partners about safer sex practices such as condom use.<sup>43</sup> Many believe that it is the norm for women to have less power in sexual relationships and to rely heavily on their male partners to initiate safe-sex behavior. Thus, women may feel forced to take part in unsafe sexual practices. In addition to this perception of gender roles in sexual risk behavior, many rural residents perceive that they have a lower risk of becoming infected with STD/HIV, which can lead to risky behaviors such as not using condoms. Rural black women, for example, are twice as likely as urban women to believe they have little risk of contracting HIV. For these reasons, rates of pregnancies and HIV/STDs in females are unlikely to decrease beyond current levels unless condom use by adolescents and young adults continues to increase significantly in the years ahead.

## Limitations

Our data are limited by several factors. First, as is the case with all self-reported data, validity can be questioned. However, the YRBS utilized administration methods that may encourage truthful responding, and it has good test-

retest reliability.<sup>20</sup> Second, the cross-sectional study design as well as the timeframe of behaviors (e.g., condom use at last sexual intercourse and substance use during the past 30 days) do not allow the authors to determine temporal or causal relationship between the independent and the dependent variables. Third, the adolescents' socioeconomic variables (e.g., poverty, household income, parent education, etc.) were not collected. Socioeconomic factors have frequently been identified as associated with adolescent risk behaviors.<sup>44</sup> Sociological research on youth health behavior suggests that patterns of sexual risk behavior and their consequences are jointly shaped by socioeconomic factors, which include neighborhood context, family structure and class position, race and gender. Fourth, the YRBS collected only behavior variables; no psychosocial variables were collected. Consequently, no theoretical models can be examined in this context.

## Implication

Despite these limitations, the present study has contributed new empirical information to the existing literature regarding sexual risk behaviors among rural adolescents. These findings have implications for rural prevention research and practitioners. First, it highlights the need to provide youth with increased STD/HIV prevention knowledge in rural areas, given the fact that rural adolescents may perceive less susceptibility to and severity of STD/HIV infection. Confidentiality issues; geography; and a limited supply of medical facilities, healthcare providers and social services are among the obstacles to providing adequate care to people living with HIV/AIDS in rural areas. Because fewer AIDS cases have been reported in rural than in urban areas, community leaders and residents may not recognize that HIV is a problem that needs to be addressed. Healthcare providers are a key source of prevention counseling in rural areas, but providers who do not perceive HIV as a local problem may fail to conduct proper risk assessments or properly diagnose cases.

Sexual self-efficacy, or the confidence in one's ability to initiate and engage in safe-sex practices, has been identified as a strong factor that increases the likelihood of adolescents practicing safer sex or postponing sex.<sup>46</sup> Our findings suggest that interventions should include components that increase condom use self-efficacy, build skills for communicating with sexual partners about STD prevention and address behaviors associated with STD risk behaviors.<sup>45</sup>

Additionally, our findings about gender differences for rural adolescents engaging in risky sexual behaviors suggest implementing gender-specific intervention programs that can include strengthening problem-solving skills and sexual decision-making.<sup>47</sup> Further studies are clearly needed to examine developmental or gender differences in the relationships between psychosocial factors and risky sexual behavior.

In practice, state-mandated sexual risk reduction

prevention efforts do not appear to be associated with reduced sexual risk behaviors.<sup>29</sup> Use of a "one-size-fits-all" approach is likely inadequate for different sexual risk practices across substance-using groups. Our finding of different associations between sexual risk behaviors and substance use profiles confirmed that to be maximally effective, preventive interventions should be guided by empirical knowledge on the nature of the relationships between substance use and behaviors that lead to STDs in sexually active populations.<sup>48</sup> In order to achieve more effective STD/HIV prevention among high-risk substance abuse youth, more intensive and better-tailored efforts will be needed to promote sexual risk reduction.

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