

Research Articles

Which Comes First in Adolescence—Sex and Drugs or Depression?

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Background: The notion that adolescents “self-medicate” depression with substance use and sexual behaviors is widespread, but the temporal ordering of depression and these risk behaviors is not clear. This study tests whether gender-specific patterns of substance use and sexual behavior precede and predict depression or vice versa.

Methods: Data are from the National Longitudinal Study of Adolescent Health, weighted to produce population estimates. The sample includes 13,491 youth, grades 7 to 11, interviewed in 1995 and again 1 year later. Multivariate logistic regression analyses, conducted in 2004, tested temporal ordering, controlling for covariates. The main outcome measures were depression, as measured by a modified Center for Epidemiological Studies–Depression Scale (CES-D), and three behavior patterns: (1) abstaining from sexual intercourse and drug use, (2) experimental behavior patterns, and (3) high-risk behavior patterns.

Results: Overall, sex and drug behavior predicted an increased likelihood of depression, but depression did not predict behavior. Among girls, both experimental and high-risk behavior patterns predicted depression. Among boys, only high-risk behavior patterns increased the odds of later depression. Depression did not predict behavior in boys, or experimental behavior in girls; but it **decreased** the odds of high-risk behavior among abstaining girls (RRR=0.14) and **increased** the odds of high-risk behavior (RRR=2.68) among girls already experimenting with substance use.

Conclusions: Engaging in sex and drug behaviors places adolescents, and especially girls, at risk for future depression. Future research is needed to better understand the mechanisms of the relationship between adolescent behavior and depression, and to determine whether interventions to prevent or stop risky behaviors will also reduce the risk of later depression. (Am J Prev Med 2005;29(3):163–170) © 2005 American Journal of Preventive Medicine

Introduction

Drug use, sexual activity, and depressive symptoms are common among youth. Almost half (47%) of 9th- to 12th-grade students surveyed in the national 2003 Youth Risk Behavior Surveillance Survey¹ reported having had intercourse, 45% drank alcohol, and 22% used marijuana during the past month. About 29% reported that they felt so sad and hopeless over a 2-week period or longer during the past year that they stopped doing normal activities. Girls

were more likely than boys (35.5% vs 21.9%) to report this measure of depression.

Links between risky behavior and depression have been documented for both males and females across a broad age range. Researchers have long noted that adolescent problem behaviors tend to cluster and may have the same underlying cause, such as a mental health disorder.² Although experimentation with adult behaviors is normative among adolescents, serious consequences can occur, particularly for those who go beyond experimentation into patterns of increasing frequency and risk.³ Thus, evaluating **patterns** of behavior over time is critical in assessing the need for intervention.

Using data from Wave I of the National Longitudinal Study of Adolescent Health (Add Health), Hallfors et al.⁴ found that girls and boys who abstained from drugs and sex had equally low (about 4%) rates of depression. In contrast, youth who engaged in less normative and more risky patterns of sex and drug behaviors were at higher risk for depression and suicide. Although risk

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behavior was associated with elevated depression symptoms for both genders, the likelihood of depression was higher (OR=1.8) for girls.

Associations between risk behavior and depressive symptoms during adolescence raise the issue of whether the relationship is causal, and if so, the direction of causality—a critical issue for prevention. For example, substance abuse may be an unintended consequence of self-medicating a mental disorder.⁵ If so, aggressively identifying and treating depression may decrease later substance abuse disorders. Conversely, depression may result from the biological or psychosocial consequences of substance use⁶ or from a shared underlying mechanism that contributes to both. If a causal pathway from risk behavior to depression exists, then intervening to stop or delay the behavior could prevent or lessen subsequent depression.⁷

The premise that comorbid disorders result from attempts to “self-medicate” a pre-existing psychiatric illness emerged from clinical observations of addicted patients.⁸ Retrospective epidemiologic research from the National Comorbidity Study lent further support with findings that 86% of people with comorbid disorders recalled the mental health condition preceding addiction, and that both disorders usually emerged in adolescence.⁹ Longitudinal studies, however, have provided less support for depression as the primary disorder. Although the Dunedin longitudinal study¹⁰ reported a gender-specific pathway from early male depression to substance use at age 15, the Oregon longitudinal study¹¹ found no temporal relation between depression and alcohol abuse and no gender difference in timing. Findings from the Great Smoky Mountain Study were mixed and inconclusive.¹²

In contrast, Brook et al.⁷ found that alcohol, marijuana, and other illegal drug use in adolescence and young adulthood significantly predicted later major depressive disorder, even after statistically controlling for age, gender, parental education, family income, and episodes of previous psychiatric symptoms. Likewise, in a longitudinal study of young women from three high schools, Rao et al.¹³ found that substance use disorders predicted major depressive disorders over time, but not the reverse. Goodman and Capitman,⁶ using Add Health data, found that having smoked cigarettes in the past 30 days was a strong predictor of developing high depressive symptoms 1 year later, even after controlling for covariates. However, major depression at baseline did not predict moderate to heavy cigarette smoking at Wave II when other covariates were entered into the model.

The temporal link between adolescent sexual behaviors and depression has been studied less, and only indirectly. Joyner and Udry¹⁴ found that females and males who became involved romantically between interviews were more likely to experience depression than those who did not become romantically involved.

Furthermore, females experienced significantly greater depressive vulnerability to romantic involvement than males.¹⁴ Shrier et al.¹⁵ found that a self-reported sexually transmitted disease (STD) diagnosis at baseline was associated with high levels of depression at re-interview for both boys and girls. Higher baseline depressive symptoms predicted increased risk of an STD for boys, but not for girls, after controlling for STD history. Although both of these studies suggest that adolescent sexual activity may have significant implications for depressive symptoms, neither study directly examined a potential role in depression.

The present study uses longitudinal data from Add Health to test whether gender-specific patterns of substance use and sexual behavior predict depression or vice versa. This work extends previous knowledge in several ways. First, the direction of the relationship between depression and patterns of both drug use and sexual intercourse was prospectively tested. Other longitudinal studies have focused on individual risk behaviors, but none have considered **patterns** that are typically found in adolescence. Second, differences by gender were examined, since depression rates for females have long been known to increase in adolescence compared to males, and persist through adulthood. Add Health data allowed us to control for pubertal timing, considered a critical factor for understanding these differences,^{16–18} and also provided the large sample size and longitudinal design to examine the temporal ordering among a nationally representative sample of U.S. adolescents.

Methods

Sample

Data are from Waves I (collected in 1995) and II (1996) of the contractual data set of Add Health, a large nationally representative probability sample of adolescents in the United States. Wave I included 18,924 respondents with valid sample weights; Wave II included 13,570 respondents. Most of the sample loss was due to the design decision not to reinterview Wave I 12th graders. After excluding this group, the Wave II response rate was 88%. Sampling weights were readjusted at Wave II to take attrition into account. The current sample includes 13,491 youth who were in 7th to 11th grade at Wave I, and 8th to 12th grade at Wave II. Loss due to missing data on key variables (79 cases) was negligible. Interviews were conducted using laptop computers and audio computer-assisted self-interviewing (ACASI) technology to collect information on sensitive topics such as sexual activity, substance use, and depression.

Measures

Sociodemographic measures. **Gender** was a self-reported dichotomous variable, with male as the referent. **Chronological age** in years was determined by subtracting the date of birth from the date of the interview, rounded to two decimal places. **Race** was based on respondent’s self-report. For anal-

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yses, two dichotomous variables were created: black versus white, and other (mostly Asian) versus white. **Hispanic ethnicity** reflected respondent's self-report of Hispanic origin, with non-Hispanic as the referent. Two measures served as proxies for socioeconomic status (SES). **Highest parental education** was the adolescent's report of the highest education level attained by either resident parent, with categories of less than high school (referent), high school graduate/GED, some college, and college graduate or higher. **Family structure** reflected household roster information,¹⁹ grouped into the following categories: two resident parents (referent), single mother, and other. All items were measured at Wave I.

Perceived physical maturity. Perceived physical maturity, measured at Wave I for both boys and girls, reflected the response to "How advanced is your physical development compared to other boys/girls your age?" Answers "I look older than some," and "I look older than most" were coded as 1 (advanced); all other answers were coded as 0. (Menarche and years menstruating were tested in initial models and found to be nonsignificant.)

Depression. Depression was measured at Waves I and II using all 20 items of the Center for Epidemiological Studies-Depression Scale (CES-D), with four Add Health modifications: two items measured symptoms in past year rather than past week, and two items used slightly different wording than the CES-D.²⁰ Depression scores were dichotomized at ≥ 22 for males and ≥ 24 for females to maximize the sensitivity and specificity for detecting major depressive disorder in adolescents.^{21,22}

Cluster membership. K-means cluster analysis was used to group respondents at each wave into homogeneous clusters based on responses to 12 risk behavior items. Similar to factor analysis, which groups variables together, cluster analysis groups **individuals**, based on the assumption that risk behaviors often occur together and interact with each other. By combining individuals with similar behavior patterns, cluster analysis allows for the interaction of all the variables (in the present case, up to 11-way interactions), resulting in a more parsimonious model, and a more holistic way of considering youth behavior.^{23,24}

Four clusters were defined a priori based on the complete absence of risk behavior (abstainers), or engagement in highly distinctive risk behaviors for HIV and other STDs (IV drug users, sex for drugs or money, and males who have sex with males).²⁵ Since K-means analysis becomes unreliable with extreme observations, these less common behaviors were examined first. Next, using K-means cluster analysis to identify the modal risk patterns, all other participants were grouped into 12 clusters based on the following self-reported risk behaviors: cigarette use, alcohol consumption, binge drinking, marijuana use, other illicit drug use, sexual intercourse, condom use, number of sexual partners, and engaging in sex while under the influence of alcohol or drugs. The resulting 16 clusters accounted for almost 80% of the total variation in behavior patterns. Analyses were performed at both Waves I and II. Virtually identical cluster patterns emerged at both waves. (See Table 1 for cluster descriptions and frequencies for each wave.)

Each respondent was assigned to only one risk profile at each wave, but could move to any cluster between Waves I and

II with one exception: by definition, nonabstainers at Wave I could not become abstainers at Wave II. For two analyses (Models 2 and 3 described below), the original 16 clusters were collapsed into three categories, as follows: (1) abstainers; (2) experimental behavior patterns (substance experimenters, drinkers, and sex experimenters); (3) high-risk behavior patterns (all other clusters; see Table 1). Experimental behavior patterns showed low substance use (e.g., once or less in the past month) and few, if any, sex partners. High-risk clusters were marked by either high-frequency use of any substance, very risky sexual behavior, or both.

Statistical Analyses

Three longitudinal regression models were examined. The first used the entire sample and addressed the question of whether risk behavior predicts later depression. Model 1 used the 16 risk clusters at Wave I to predict Wave II depression (yes/no) controlling for depression at Wave I, age, biological sex, race/ethnicity, highest parental education, family structure, and perceived physical maturity.

The next two models addressed whether depression predicts later risk behavior. To control for behavior, Model 2 was limited to Wave I Abstainers and addressed the question of whether Wave I depression, in the absence of previous risk behavior, predicts movement to patterns of sexual activity and/or drug use. The analysis was a multinomial logistic regression with depression at Wave I predicting movement to experimental or high-risk behavior patterns at Wave II, controlling for age, race/ethnicity, highest parental education, family structure, and perceived physical maturity. Model 3 was limited to substance experimenters at Wave I, and addressed the question of whether depression predicts patterns of further experimentation (i.e., sex experimenters or drinkers), or escalation to high-risk patterns.

All models were run stratified by gender. All regressions were conducted in 2004 using Stata, version 8.0 (Stata Corp, College Station TX, 2003). Analyses incorporated sampling weights to yield national population estimates. In addition, survey commands were used to adjust standard errors for survey design effects resulting from Add Health's complex sampling. Missing data in the regressions were handled using listwise deletion.

Results

Sample Description

Table 1 describes the risk behavior clusters, and provides raw numbers and weighted percentages of respondents who comprise each cluster at each wave. Wave I gender differences in behavior clusters were <1 percentage point except for abstainers (27.8% of girls vs 23.2% of boys) and binge drinkers (3% of girls vs 5.1% of boys). Most high-risk clusters had more boys than girls. Although some individuals changed cluster membership over time, cluster behavior patterns were almost identical across both waves, confirming method reliability. The abstainer cluster decreased in membership from 26% at Wave I to 16% at Wave II. Most other

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Table 1. Behavioral patterns, with sample numbers at Wave I and Wave II, for participants with valid Wave II sample weights

Cluster name	Description of behavior patterns of sexual behavior and substance use	n at Wave I	Weighted % at Wave I ^a	n at Wave II	Weighted % at Wave II ^b
Abstainers	Never engaged in any ATOD use ● None have had sexual intercourse	3388	25.51	2213	16.47
Substance experimenter	Some lifetime ATOD use, but low or no current use ● None have had sexual intercourse	3525	27.62	3608	27.18
Sex experimenter	All have had sexual intercourse ● Median sex partners=1 ● No or low ATOD use	2022	12.61	2247	14.12
Drinkers	All report some past-year alcohol use ● Half report occasional binge drinking ● Infrequent or no illegal drug use ● None report sexual intercourse	1063	7.98	1094	8.90
Smokers and sex	All are daily cigarette smokers ● Most report low AOD use ● Majority have had sexual intercourse	756	6.17	885	7.22
Alcohol and sex	All report alcohol use and all have had sexual intercourse ● 68% report binge drinking ● Median sex partners=2	664	4.53	800	5.74
Binge drinkers	All report frequent binge drinking ● More than half binge weekly or more ● About half have had sexual intercourse ● One third smoked pot in last month	578	4.07	637	4.78
Combination: sex and drug use	All have had sexual intercourse and all report alcohol or illegal drug use at most recent intercourse	363	2.77	521	4.03
Heavy substance use and sex	All report smoking, drinking, and binge drinking ● Half use marijuana; 15% use other illegal drugs ● Almost all report sexual intercourse ● Median sex partners=2	354	2.83	455	3.72
Marijuana users	All use marijuana frequently in past month; few use other illegal drugs ● Almost all drink alcohol ● Most smoke cigarettes ● 75% have had sexual intercourse ● Median sex partners=2	201	1.60	261	2.03
Multiple partners	All report ≥14 sex partners ● Moderate ATOD use	138	1.03	80	0.53
Sex for drugs/money	All report sex for drugs or money ● Most are moderate ATOD users ● Median sex partners=3	128	0.92	313	2.27
High marijuana and sex	All use marijuana frequently in past month and all have had sexual intercourse ● All report AOD use at last intercourse ● Most report multiple partners (median=6)	114	0.81	182	1.47
Marijuana and other drug users	Most report heavy marijuana use and all report other illegal drug use ● Two thirds have had sexual intercourse ● One third report drug use during intercourse	79	0.62	43	0.40
IV drug users	All have injected drugs ● Over 80% have had sexual intercourse ● Median number of partners=4	63	0.54	73	0.62
MSM	All are males who have had sex with other males ● Most have had multiple partners (median=5) ● 40% have used marijuana in last 30 days ● Most are occasional drinkers ● 17% have had sex for drugs or money	55	0.39	79	0.53
Total		13,491	100.00	13,491	100.00

Sample numbers are based on the unweighted data. Samples may not add up to total N due to missing data.

^aWeighted percents represent national population estimates of 7th to 11th grade youth in 1995.

AOD, alcohol or drug; ATOD, alcohol, tobacco or drug; MSM, males who have sex with males.

Table 2. Characteristics of analytical sample at Wave I ($n = 13,568$)^a

Characteristic	<i>n</i>	Weighted %
Gender		
Female	6,962	49.79
Male	6,606	50.21
Race/ethnicity		
White	9,057	76.75
Black	2,980	16.13
Other	1,531	7.12
Hispanic ethnicity		
Hispanic	2,298	12.32
Not Hispanic	11,226	87.68
Parent education		
Less than high school	1,654	12.50
High school graduate/ GED	3,830	32.12
Some college	2,638	21.50
College graduate or higher	4,741	33.88
Family structure		
Two parents	9,575	71.50
Single mother	2,911	20.75
Other	1,082	7.75
Age (in years)		
mean		15.56
range		11.56–21.16
Perceived physical maturity		
Advanced	5,279	40.77
Not advanced	8,091	59.23
Menarche (females)		
Yes	6,223	88.95
No	645	11.05
Years menstruating		
mean		3.19
range		0–11.0

^aWeighted percents represent national population estimates of 7th to 11th grade youth in 1995. Sample numbers are based on the unweighted data. Samples may not add up to total N due to missing data.

clusters increased by $\leq 1\%$; the sex experimenter cluster increased by 2%.

T2 Table 2 presents the demographic characteristics of the analytic sample at Wave I, including the raw number and weighted percentages of population estimates. Males and females are equally represented in the sample. The mean age at Wave I was 15.6 years and at Wave II, 16.5 years. Overall rates of depression were 10.2% at Wave I and 10.6% at Wave II. About 40% of the total sample reported being ahead of their peers with respect to physical development.

Does Wave I Risk Behavior Predict Wave II Depression?

T3 Table 3 shows the odds ratios (ORs) and 95% confidence intervals (CIs) for Model 1, the gender-specific logistic regressions predicting Wave II depression by Wave I risk behavior, controlling for Wave I depression, physical maturity, race, Hispanic ethnicity, age, highest parental education, and family structure. Compared to abstainers, membership in most risk behavior clusters

at Wave I was significantly predictive of depression at Wave II.

Differences by gender were observed. Girls in the experimental behavior clusters (substance experimenters, sex experimenters, and drinkers), were two to three times as likely to be depressed 1 year later, compared to abstainer girls, while boys in these clusters showed no significant increase in depression. Girls in the multiple partner and IV drug clusters were much more likely than abstainers to be depressed at Wave II (OR=10.9 and 7.5, respectively), but these behavior patterns were not significant for boys. Boys in the marijuana and high marijuana and sex clusters were three to four times as likely to become depressed as abstainers, but these cluster patterns were not significant predictors of depression for girls.

Does Wave I Depression Among Abstainers Predict Wave II Behavior?

T4 Table 4 displays the relative risk ratios (RRRs) and 95% CIs for Model 2, the multinomial regressions for both male and female abstainers. Among girls, depression did not increase the likelihood of engaging in experimental behavior patterns, and it greatly lowered the likelihood of engaging in high-risk behavior patterns (RRR=0.14) at Wave II. Depression did not predict movement to either experimental or high-risk behavior patterns among boys.

Does Wave I Depression Among Substance Experimenters Predict Wave II Behavior?

T5 Table 5 displays Model 3, the multinomial regressions for Wave I substance experimenters. For girls, depression did not predict further experimental behavior, but **did** increase the likelihood (RRR=2.68) of moving to a high-risk behavior cluster. Depression did not predict other experimental or high-risk behavior clusters at Wave II for boys.

To check whether cut-off points for depression on the modified CES-D were too high to significantly predict behaviors of either abstainers or substance experimenters, analyses were conducted a second time (available from Martha Waller) using a continuous measure of depression to examine if lower subclinical levels of depressive symptoms were associated with movement to higher risk behavior. Results were essentially unchanged.

Discussion

Depression is a complex problem that is determined by both proximal and distal biological and experiential factors.^{26–29} The present analyses provide strong evidence to support the hypothesis that adolescent sex and drug behaviors may play a causal or mediating role

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Table 3. Odds ratios and CI for Wave I risk behavior profiles predicting Wave II depression, by gender^a

Variables	Males (n = 6104)		Females (n = 6489)	
	Odds ratio	95% CI	Odds ratio	95% CI
Risk behavior profile				
Experimental behavior	Referent		Referent	
Abstainers	1.56	0.94-2.57	2.07***	1.47-2.93
Substance experimenter	1.59	0.90-2.81	3.07***	1.97-4.77
Sex experimenter	1.62	0.81-3.23	2.42***	1.54-3.82
Drinkers	3.05***	1.56-5.97	2.72***	1.70-4.37
High-risk behavior	2.83**	1.38-5.82	2.61***	1.52-4.49
Smokers and sex	4.56***	2.39-8.65	2.03*	1.16-3.55
Alcohol and sex	2.84*	1.28-6.33	4.50***	2.44-8.27
Binge drinkers	2.69*	1.12-6.46	2.43**	1.26-4.68
Combination sex and drugs	3.37**	1.53-7.41	1.99	0.75-5.28
Heavy substance use and sex	2.35	0.87-6.31	10.90***	4.47-26.59
Marijuana users	4.79**	1.50-15.26	2.71*	1.05-6.99
Multiple partners	4.43*	1.25-15.69	2.11	0.77-5.81
Sex for drugs/money	8.90***	3.29-24.06	5.81***	2.28-14.79
High marijuana and sex	2.47	0.94-6.49	7.53*	1.41-40.28
Marijuana and other drugs	4.10*	1.36-12.39	NA	NA
IV drug users				
MSM				

*p ≤ 0.05 (bolded);
**p ≤ 0.01 (bolded);
***p ≤ 0.001 (bolded).

^aModel was adjusted for depression at Wave I, age, race/ethnicity, Hispanic ethnicity, highest parental education, family structure, and advanced physical development.

CI, confidence interval; MSM, males who have sex with males; NA, not applicable; RRR, relative risk ratio.

in the development of adolescent depressive disorders. Our findings, based on nationally representative data, are consistent with longitudinal studies indicating that adolescent substance use contributes to depression.^{6,7,9-12,14} Our results also add new evidence that patterns of sex and drug behaviors during adolescence pose depression risks, particularly for girls. Further, present findings do not support the theory that youth initiate sex and drug behaviors to "self-medicate" depression.

Previous examinations of adolescent depression, and attempts to explain gender differences in depression prevalence, have not systematically considered sexual experimentation and drug use. Instead, earlier work has focused primarily on hormonal and morphologic changes related to puberty, and psychological/affective reactions to these physical changes and to other life

events.^{18,30-33} Our findings, however, indicate that experimentation with substance use and sexual activity play an important role in depression, regardless of pubertal timing or status. They also offer insight into sex differences in depression. For females, even modest involvement in substance use and sexual experimentation elevates depression risk. In contrast, boys show little added risk with experimental behavior, but binge drinking and frequent use of marijuana contribute substantial risk.

Our findings are consistent with theoretical perspectives³⁴ suggesting that girls' greater interpersonal sensitivity contributes to higher levels of interpersonal stress during adolescence. Substance use and sexual activity likely contribute to experienced stress. The greater exposure to stress due to risk behavior, and girls' more negative reactivity to interpersonal stress

Table 4. Relative risk ratios of depression at Wave I predicting movement to low- and high-risk behavior profiles at Wave II among abstainers at Wave I^a

Behavior cluster	Males (n = 1375)		Females (n = 1807)	
	RRR	95% CI	RRR	95% CI
Experimental behavior	1.05	0.46-2.37	1.24	0.71-2.14
High-risk behavior	2.02	0.58-6.99	0.14*	0.03-0.63

*p = 0.01 (bolded).

^aAbstainers comprise the referent outcome group, controlling for race, Hispanic ethnicity, age, highest parental education, family structure, and advanced physical development.

CI, confidence interval; RRR, relative risk ratio.

Table 5. Relative risk ratios of depression at Wave I predicting movement to moderate- and high-risk behavior profiles at Wave II among substance experimenters at Wave I^a

Behavior cluster	Males (n = 1630)		Females (n = 1697)	
	RRR	95% CI	RRR	95% CI
Experimental behavior	0.47	0.21-1.07	0.95	0.56-1.62
High-risk behavior	0.75	0.30-1.85	2.62*	1.56-4.41

*p < 0.001 (bolded).

^aSubstance experimenters are referent outcome group, controlling for race, Hispanic ethnicity, age, highest parental education, family structure, and advanced physical development.

CI, confidence interval; RRR, relative risk ratio.

sors,³⁵ may partially account for demonstrated gender differences in depression.

Others have suggested that experimentation with problematic behaviors may result from the gap between biological maturity and social maturity.^{36,37} Present findings indicate that experimentation has greater depressive consequences for girls than boys. More research is needed to understand the different biological and psychosocial implications of experimental behavior for girls versus boys, and the degree of stress that is experienced by boys and girls in the context of behavioral risk taking.

Because patterns of relationships between risk behaviors and depression vary for boys and girls, implications for prevention, intervention, and treatment also vary. Our findings indicate that patterns of substance abuse, especially binge drinking and frequent marijuana use, increase the likelihood of depression in boys by more than four-fold. Thus, boys who are heavy users should be counseled to reduce or stop use, and screened for depression. Present findings also imply that when boys present with depression, clinicians should screen for and aggressively treat substance abuse and addiction. More research is needed, however, to test best treatment approaches to comorbid depression and substance use disorders in adolescent males.

Given the present findings, girls who are engaging in substance use or sexual intercourse should be screened for depression, and provided with anticipatory guidance about the mental health risks of these behaviors. Girls who are depressed should be carefully assessed for involvement in these behaviors, and treatment should include counseling about cessation and sexual decision making. Management plans for both boys and girls may also need to address issues related to sexually transmitted infections, HIV, unintended pregnancy, injury prevention, and depression and/or suicide risk.

Although many professional organizations recommend routine screening for depression during adolescent health visits,³⁸ there has been a lack of consensus regarding these recommendations. For example, based on a systematic review of the literature, the U.S. Preventive Services Task Force³⁹ concludes there is insufficient evidence to recommend for or against routine screening of asymptomatic adolescents for depression. Present data can contribute to policy formation through guidelines that prioritize youth with specific patterns of behavior for more cost-effective depression screening.

Several limitations apply to our findings. First, the information on risk behaviors and depression is based on self-reported data and thus subject to unknown error; audio computer-assisted self-interviewing (ACASI) technology was used to increase the probability of accurate reporting. Missing data were minimal with ACASI, except for items on parent education (about 5% missing). With respect to measures, the

What This Study Adds . . .

It has long been recognized that depression prevalence increases in adolescence, particularly for girls, and that links exist between depression and risk behaviors.

Prevailing theories have assumed that hormonal changes put females at greater risk, and that youth "self-medicate" depression with drugs and sex.

We found little support for these theories; rather, risk behaviors **precede** depression.

Even experimentation with sex and drugs makes girls more vulnerable to depression, while boys become more vulnerable with binge drinking and heavy marijuana use.

CES-D was developed to screen for depression in large population studies. Therefore, a score above the cut-off point is meant to be predictive of, but not diagnostic of, major depressive disorder. Finally, although temporal ordering suggests a directional and causal relationship between risk behavior and depression, these analyses cannot rule out unidentified predisposing factors that may cause both.

Further research is needed to understand the mechanisms that place some, but not all youth, at greater risk for depression when they engage in sex and drug behaviors. More theory-driven longitudinal research is needed that includes repeated measurements of risk behavior and depressive symptoms over time to identify the causal pathways that exist, and the factors that protect some adolescents from escalating patterns of risk. Finally, findings suggest that efforts to reduce or stop risk-taking behaviors among those who are engaging in them will reduce the risk for later depression. But more research is needed to confirm this, and to examine how co-occurring depression should be treated in youth who are engaging in risky behavior patterns.

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