AN EXPLORATION OF THE RELATIONSHIP BETWEEN RISKY SEXUAL BEHAVIOR AND SUBSTANCE USE BY TEENAGERS AND YOUNG ADULTS

by

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ABSTRACT

AN EXPLORATION OF THE RELATIONSHIP BETWEEN RISKY SEXUAL BEHAVIOR AND SUBSTANCE USE BY TEENAGERS AND YOUNG ADULTS

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Adviser: Distinguished Professor Michael Grossman

The purpose of this study is to evaluate the extent to which the relationship between substance use and risky sexual behavior among teenagers and young adults is causal. That is, does the use of marijuana and alcohol cause young people to be less likely to use condoms or other methods of birth control and to have had more sexual partners? Establishing a causal effect of substance use on sexual behavior is essential to the design of effective public policies targeted at improving public health by affecting sexual behavior. Using panel data from National Longitudinal Survey of Youth 1997 with four observations on each person in the period from 1997 through 2000, we take a Granger causality model to establish causality. The idea here is to see whether past substance use influences current sexual behavior, with past sexual behavior held constant. Results show that binge drinking and marijuana use cause males to have multiple sexual partners, but there is no evidence that they causally affect the number of sexual partners for female teenagers and young adults. In the case of risky sex, binge drinking increases the likelihood of having risky sex among males, while it does not causally affect the likelihood of having risky sex among females. Marijuana use, on the other hand,

increases the likelihood of having risky sex among females, while it is not causally affect that likelihood among males.

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1. Introduction and Literature Review

Risky sexual behavior among teenagers and young adults has become a public policy concern. According to Abma, J.C., et al. (2004), 47 percent of never-married females aged 15-19 (4.6 million) had ever had sexual intercourse as of 2002 and also 46 percent of never-married males aged 15-19 (4.7 million) had ever had sexual intercourse as of 2002. In regard to the total number of partners, 28 percent of females and 31 percent of males had had two or more partners. About 25 percent of females and 18 percent of males did not use any methods of contraception at first intercourse.

Mosher, W.D. et al. (2005) finds that the probability of young females (15 – 24 years old) having had a birth was 1 percent by the age of 16 and 13 percent by the age of 20 and the majority of teen births are unintended. In addition, 3.2 percent out of 6.6 million sexually experienced males aged 15 – 19 had any types of sexually transmitted infection other than HIV and 10.5 percent out of 6.2 million sexually experienced females at the same age range had any types of sexually transmitted infection other than HIV or pelvic inflammatory disease.

Graves and Leigh (1995) use the 1990 National Alcohol Survey to investigate the relationship between substance use and sexual activity among young adults in the United States. They find that young adults who drink more frequently, heavy drinkers, smoke more frequently, and use marijuana are more likely to be sexually active. They also find that binge drinkers and young adults who use marijuana are more likely to have multiple partners and heavy drinkers have smaller probability to use condoms.

Many studies have been conducted to find if alcohol and illicit drug use account for this risky sexual behavior among teenagers and young adults and to establish

causality between alcohol and illicit drug use and risky sexual behavior. The arguments are to find if risky sexual behavior is affected by alcohol and illicit drug use, or if sexual behavior affects alcohol and illicit drug use, or if both are affected by an omitted third variable. A strong positive correlation between alcohol and illicit drug use and risky sexual behavior does not provide enough evidence of causality due to the existence of the endogeneity problems. Their correlation may work in both directions or the third omitted variable may affect both substance use and risky sexual behavior.

The existence of the third omitted variable is supported by Richard Jessor and Shirley L. Jessor's (1997) problem behavior theory as quoted in Grossman, et al. (2004). They find that the outcomes of risky sexual behavior and substance use are caused by an unmeasured third variable such as a thrill-seeking personality. Thus, by controlling for this unmeasured third variable, risky sexual behavior and substance use are not correlated. M. Lynne Cooper, J.B. Skinner, and William H. George (1990) in Grossman, M. eat al. (2004) also find that teenagers who have multiple partners or engage in other risky sexual behavior may use substance to cope with society's negative view on risky sexual behavior.

Rees et al. (2001) examine the causality between marijuana and alcohol use and the probabilities of being sexually active and having sex without contraception among teenagers by using data from the first round of National Longitudinal Study of Adolescent Health. To eliminate the endogeneity problem caused by the omitted third variable, bivariate probit and two stage least squares estimations are employed. The instrumental variables they use are whether the state of residence required schools to offer alcohol and drug prevention education; per capita local and state expenditures on

police protection; the number of arrests per violent crime in the county of residence; and the number of total arrests per crime in the county of residence. The results from the bivariate probit estimation show that heavy drinking only increases the probability of having sex without contraception for male, while the results from the two stage least squares estimation show that marijuana use only increases the probability of having sex without contraception for male. The results from both estimations show that for females, substance use does not have a causal impact on sexual behavior. Neither heavy drinking nor marijuana use affects the probability of having sex for males. This study presents the evidence that the correlation between substance use and sexual behavior may not be causal.

Sen (2002) employs the first round of the National Longitudinal Survey of Youth 1997 (NLSY97) and the empirical model Rees (2001) previously used to investigate the causal link between alcohol use and sexual activity among adolescent. The instruments she uses are per gallon beer tax in state of residence, per pack cigarette tax in state of residence, the year in which the state of residence increased the legal drinking age to 21, per capita spending on police protection in state of residence, arrest rates for juvenile drunk driving in county of residence, and per capita alcohol consumption by adults in state of residence. She finds that light drinking has a significant causal impact on the likelihood of engaging in sex and engaging sex without contraception for both genders. However, she also finds that heavy drinking has no effect on sexual intercourse for both genders as Rees et al. do.

Grossman and Markowitz (2002) also examine the causal impact of substance use on sexual behavior among teenagers. Using data from the Youth Risk Behavior Surveys

and employing two stage least squares and reduced form models, they find that alcohol consumption does not cause teens to engage in sex or to have multiple partners, but alcohol consumption causes a lower use of birth control and condoms by sexually active teenagers. The instrumental variables used in this study are the real state-level excise tax on a gallon of beer, the real price of a pound of marijuana, the per capita number of outlets licensed to sell alcohol in each state, and the midpoints of minimum and maximum statutory fine and jail terms (in years) for possession of small amount of marijuana. They also find that the causal relationship between marijuana use and teen sexual behavior are unclear.

Grossman et al. (2004) investigate the causal relationship between substance use and teenager sexual behavior. They argue that previous research has not successfully linked substance use to sexual behavior. This study uses two statistical approaches, bivariate probit and individual, fixed effect regression models. Their data comes from the 1997 cohort of the NLSY97. In this study, a respondent is included in the sample only one time for the bivariate probit model, the first time the variables of interest are available. For the fixed effects model, a respondent with two years of information are included. The first two observations are taken if there are more than two. They find that alcohol and marijuana use is not causally related to teenager sexual behavior, even though they cannot definitely rule out the possibility.

Rashad and Kaestner (2004) evaluate studies conducted by Rees et al. (2001) and Sen (2002). Using the first waves of the National Longitudinal Survey of Adolescent Health and the NLSY97, they test the validity of the estimation strategy and the legitimacy of the instrument variables used in both studies. Rashad and Kaestner find

that the two studies have major practical problems that undermine their conclusions. Furthermore, they conclude that the causal relationship between substance use and sexual behavior remains unclear and results from previous studies are in question. To justify the problems with Rees and Sen's works, they run a specification test by looking at the relationship between cigarette smoking and sexual behavior. They argue that smoking is correlated with sexual activities among teenagers and young adults, but it is arguable that smoking cause sexual activity among teenagers and young adults. As Rashad and Kaestner (2004) indicate, attempts to establish causality by the use of two-stage least squares frequently encounter the problem of weak instruments (Bound, Jaeger, and Baker 1995). Bound, Jaeger, and Baker (1995) argue that weak instruments can cause inconsistencies in the IV estimates and in the case of finite samples, IV estimates are biased in the same direction as the ordinary least squares. They suggest that the partial R^2 and F statistic in the first-stage estimation are good indicators of the quality of the IV estimates.

The timing of alcohol and other drug use and risky sexual behavior is also crucial in determining the relationship between substance use and risky sexual behaviors among teenagers and young adults. By using the 1992 Youth Risk Behavior Survey, Santelli et al. (2001) evaluate the timing of alcohol and other drug use and sexual risk behaviors among unmarried adolescent and young adults. They differentiate the timing of substance use into three categories, i.e. substance use at last sexual intercourse, substance use in the past 30 days (recent use), lifetime substance use, and the initiation age. The outcomes they use are dummies for condom use at last intercourse and multiple sexual partners in the past three months. They find that substance use at last sexual intercourse

and recent use of substance use have strong correlation with having had multiple partners, both for unmarried male and female teenagers and young adults. However, lifetime substance use is only associated with having had multiple partners in the case of unmarried female teenagers and young adults.

Many of the previous studies have used public policy, such as real state-level excise tax on a gallon of beer, legal drinking age, and the per capita number of outlets licensed to sell alcohol in each state, as instruments to predict substance use among teenagers and young adults. However, if the first stage instruments have only modest explanatory power in predicting the endogenous right-hand side variable, the second stage estimates may be seriously biased. Some of the results in the studies above are subject to this problem. Therefore, we explore an alternative methodology. Dynamic panel data model developed by Arellano and Bond (1991), combined with notions of causality developed by Granger (1969), is used to establish causality in this study. Data for this study are from the first six rounds of National Longitudinal Survey of Youth (NLSY97).

The remainder of the paper proceeds as follows. Section 2 discusses the research approaches taken in this study. Section 3 describes the data and variables used. Section 4 discusses the estimations and results. Section 5 provides conclusions of this study.

2. Research Design

The purpose of this study is to evaluate the extent to which the relationship between substance use and risky sexual behavior among teenagers and young adults is

causal. That is, does the use of alcohol and illicit drug cause teenagers and young adults to be more likely to engage in risky sexual behavior?

The empirical model employed in this study follows the notions of causality developed by Granger (1969). The idea here is to see whether past substance use affects current sexual behavior, with past sexual behavior held constant. Let y_t be sexual behavior in year t, x_t be substance use in year t, z_t be other regressors in that year, ε_{it} be random disturbance term, and the subscripts of i^{th} be individuals for year t. Intercepts are suppressed for convenience.

(1) $$y_{it} = \alpha_1 y_{i(t-1)} + \alpha_2 x_{i(t-1)} + \alpha_3 z_{it} + \varepsilon_{1it}$$

Now, let's assume that the ε_{it} follows a one-way error component model, i.e.

(2) $$\varepsilon_{it} = \mu_i + \rho_{it}$$

where μ_i represents the unobservable individual characteristics that do not vary over time, and ρ_{it} represents idiosyncratic factors. Thus, the equations (1) can be written as

(3) $$y_{it} = \alpha_1 y_{i(t-1)} + \alpha_2 x_{i(t-1)} + \alpha_3 z_{it} + \mu_i + \rho_{it}$$

However, estimation of equation (3) by ordinary least squares (OLS) leads to biased and inconsistent coefficients for three reasons. First, the lagged dependent variable ($y_{i(t-1)}$) and the lagged value of substance use ($x_{i(t-1)}$) are correlated with the

unobserved fixed effect (μ_i). Second, the lagged value of sexual behavior is a predetermined variable since it is correlalated with $\rho_{i(t-1)}$ and further lags of the time-varying disturbance. Third, lagged substance use variable ($x_{i(t-1)}$) may not be strictly exogenous but predetermined since past shocks to sexual behavior ($\rho_{i(t-1)}$) may be correlated with past substance use. Nickell (1981), Baltagi (2001), and others show that the coefficients of predetermined variables are inconsistent in a fixed-effects model applied to panel data because these variables are correlated with the error term which includes the mean error.

Arellano and Bond (1991) develop an estimator to solve the problems above. They argue that by exploiting the orthogonality conditions that exist between $y_{i(t-1)}$ and ρ_{it}, we can get additional instruments. First differencing transformation is needed in order to eliminate the unobserved fixed effects. The generalized method of moments estimator is then used to estimate the first difference equations. This estimator is consistent for $N \rightarrow \infty$ and T fixed.

(4) $$y_{it} - y_{i(t-1)} = \alpha_1 (y_{i(t-1)} - y_{i(t-2)}) + \alpha_2 (x_{i(t-1)} - x_{i(t-2)}) + \alpha_3 (z_{it} - z_{i(t-1)}) + (\rho_{it} - \rho_{i(t-1)})$$

With four observations (t = 4) for every individual in this study, we have

(4a) $$y_{i3} - y_{i2} = \alpha_0 + \alpha_1 (y_{i2} - y_{i1}) + \alpha_2 (x_{i2} - x_{i1}) + \alpha_3 (z_{i3} - z_{i2}) + (\rho_{i3} - \rho_{i2}),$$ and

(4b) $$y_{i4} - y_{i3} = \alpha_0 + \alpha_1 (y_{i3} - y_{i2}) + \alpha_2 (x_{i3} - x_{i2}) + \alpha_3 (z_{i4} - z_{i3}) + (\rho_{i4} - \rho_{i3})$$

for every individual. In the case of equation (4a), y_{i1} is a valid instrument for $(y_{i2} - y_{i1})$ because it is highly correlated with $(y_{i2} - y_{i1})$ but not correlated with $(\rho_{i3} - \rho_{i2})$. Valid instruments for $(y_{i3} - y_{i2})$ in equation (4b) are y_{i1} and y_{i2} since they are not correlated with $(\rho_{i4} - \rho_{i3})$.

If the lagged of substance use is a predetermined variable with $E(x_{it}\rho_{is}) \neq 0$ for s <= t, and zero otherwise, x_{i1} is a valid instrument for $(x_{i2} - x_{i1})$ in equation (4a) since it is not correlated with $(\rho_{i3} - \rho_{i2})$. Similarly, valid instruments for $(x_{i3} - x_{i2})$ in equation (4b) are x_{i1} and x_{i2} since they are not correlated with $(\rho_{i4} - \rho_{i3})$.

3. Data

In this dynamic panel data study, we employ the first six rounds of National Longitudinal Survey of Youth 1997 (NLSY97), which are from 1997 to 2002. NLSY97 is one of the surveys in the National Longitudinal Surveys (NLS) program. The NLSY97 surveys 8,984 individuals who lived in the United States in 1997 and were born between the years of 1980 and 1984. Thus, the respondents were between the ages of 12 and 16 as of December 31, 1996. The respondents in this survey can be categorized into two groups of sample. The first group is a cross-sectional sample which consists of 6,748 respondents to represent people who lived in the United States during the initial survey period and born between January 1, 1980 and December 31, 1984. The second group is a supplemental sample which consists of 2,236 respondents to oversample Hispanic and black people living in the US during the same period as the first group.

The respondents were interviewed from 1997 to 2002 annually. Questions regarding our variables of interests, alcohol and marijuana use, for all individuals were

asked in 1997 for the first time and re-asked in every round until 2002. However, respondents were asked about their sexual activities at the first time when they were at least 14 years old in rounds 1 and 2. All respondents were eligible in later rounds. Since the same respondents were interviewed annually, we can utilize this NLSY97 for our dynamic panel analysis.

Following the research design, the sample in this study is teenagers and young adults who were between 14 and 21 years old in 1997 – 2002 with no missing observations for four years in a row. A respondent aged 13 as of December 31, 1996 but had not been 14 years old on the date of interview in the first round (1997), for example, would not be asked about his/her sexual activities. However, if the respondent had been 14 years old on the date of interview in the second round (1998), he/she would be eligible to be asked about his/her sexual activities. This respondent, given no observations are missing for four years in a row, will still enter the sample even though he/she started to be eligible for questions about sexual activities in the second round. Thus, the sample in the first period is teenagers and young adults between the ages of 14 and 18 as of the date of interview from all of the six rounds of NLSY97. In the following periods, we have teenagers and young adults as of the dates of interview between the ages of 15 and 19, 16 and 20, and 17 and 21 for the second, third, and forth periods, respectively. As a result, the size of our sample is 5,374 teenagers and young adults, where 2,611 of them are males and 2,763 of them are females.

As the outcome of the analysis, two measures of risky sexual behavior are analyzed in this study. The first measure is a polychotomous variable of the number of sexual partners in the past 12 months. It is equal to zero if the respondent did not have

sex in the past 12 months, equal to one if the respondent had sex and had single partner in the past 12 months, and equal to two if the respondent had sex and had two or more partners in the past 12 months. The second measure is a polychotomous variable of risky sex in the past 12 months. This risky sex variable is equal to zero if the respondent did not have sex in the past 12 months or had sex and used any form of birth control, including condoms at least 90 percent of the time, the ratio of the number of times birth control used to the number of occasions sexual intercourse the respondent had. It is equal to one if the respondent had sex, used any form of birth control less than 90 percent of the time, and had single partner in the past 12 months. It is equal to two if the respondent had sex, used any form of birth control less than 90 percent of the time, and had two or more sexual partner in the past 12 months. Grossman et al. (2002), however, define risky sex as a dichotomous variable, which is equal to one if the respondent was sexually active and used any form of birth control less than 90 percent of the time, as measured by the ratio of the number of times used birth control to the number of occasions of sexual intercourse. It is equal to zero if the respondent was not sexually active in the past one year, or if the respondent had sex, they used any form of birth control at least 90 percent of the time. Goldman et al. (2004) has defined sexual activity differently. They define it as a polychotomous variable, which is equal to zero if the individual does not have any sexual partner, equal to one if the individual has one sexual partner, and equal to two if the individual has more than one sexual partner.

The explanatory variables of interest in this study are the use of alcohol and marijuana as measures of substance use. The measure of alcohol use is whether the respondent had binge drinking in the past 30 days. A respondent is said to have binge

drinking if the respondent had five or more drinks on the same occasion. The measure of marijuana use is whether the respondent used marijuana in the past 30 days.

The strategy of using the dynamic panel data analysis developed by Arellano Bond has an advantage in solving the timing problems of substance use and risky sexual behavior among teenagers and young adults. The substance use, binge drinking and marijuana use in our study, is based on the past 30 days, whereas risky sexual behavior, number of sexual partners and risky sex, is based on the past one year. By taking the first lag of substance use as the explanatory variable of interest, we can be sure that substance use takes place before risky sexual behavior does.

Other explanatory variables employed are to describe respondent and family characteristics. However, our choices of variables in this study are relatively limited. Due to the nature of the dynamic panel data model employed in this study, we require variables that vary over time. They are age of respondents in months, highest grade respondents completed, respondents' household size, two dummy variables for whether respondent think that he/she is underweight or overweight, dummy variable for whether respondent lives in a metropolitan statistical area, and period dummies.

4. Estimations and Results

4.1. Descriptive Analysis

Table 1 and 2 presents the respondents' selected characteristics by gender and the two measures of substance use, binge drinking and marijuana use. Table 1, specifically, presents the sample means of respondents' selected characteristics by gender and alcohol use, in this case is whether respondents had binge drinking in the past 30 days. From the

table we can see that binge drinkers, both males and females, significantly have higher number of sexual partners than non-binge drinkers. Male and female binge drinkers are also more likely to engage in risky sex than non-binge drinkers. Around 48 percent of male binge drinkers and 47 percent of female binge drinkers engage in risky sex, while only 19 percent of male and 21 percent of female non-binge drinkers engage in risky sex. Interestingly, female teenage and young adult binge drinkers are statistically more likely to report that they are either underweight or overweight than their peers who are not binge drinkers. While, male teenage and young adult binge drinkers are statistically more likely to report that they are overweight than their peers who are not binge drinkers. Male teenage and young adult binge drinkers are also more likely to live in metropolitan statistical area.

Sample means of respondents' selected characteristics by gender and use of marijuana, in this case whether respondents used marijuana in the past 30 days, are shown in Table 2. It shows that marijuana users, both males and females, significantly have higher number of sexual partners than non-marijuana users. Marijuana users are also more likely to engage in risky sex than non-marijuana users, 52 percent of male marijuana users and 57 percent of female marijuana users engage in risky sex, while only 18 percent of male and also 18 percent of female marijuana users engage in risky sex. Marijuana users, both males and females, are also more likely to report that they are overweight and only female marijuana users are more likely to report that they are underweight. As the case in binge drinking, male teenage and young adult marijuana users are also more likely to live in metropolitan statistical area.

4.2. OLS Estimates

Table 3 and 4 shows ordinary least squares (OLS) estimates of equation (4) on the effects of past binge drinking in the past 30 days on current risky sexual behavior. Both models are estimated separately by gender. One-tailed t-test is used to determine the significance of coefficients for binge drinking and marijuana use. In Tables 3 and 4, all of the coefficients of past binge drinking are positive and statistically significant at one-tailed 5-percent level. It means that binge drinking among teenagers and young adults increases the likelihood of having multiple partners and engaging in risky sex. These results are consistent with previous studies that alcohol use does affect teenager and young adult sexual behavior.

The OLS estimates of the effects of past marijuana use in the past 30 days on current risky sexual behavior among teenagers and young adults are in Table 5 and 6. Again, both models are estimated by gender. The coefficients of marijuana use in the case of current number of partners and current risky sex are positive and one-tailed t-test at 5-percent level shows that these coefficients are statistically significant. Similar to the case of binge drinking, OLS estimates also show that marijuana use among teenagers and young adults increases the likelihood of having multiple partners and engaging in risky sex. These results are also consistent with previous studies that marijuana use affects sexual behavior among teenagers and young adults.

However, as we discussed earlier, the OLS estimates in Tables 3 through 6 are biased and inconsistent. In order to deal with this problem, an Arellano-Bond estimator is employed to estimate equation (4). Tables 7 through 10 show the effects of past binge drinking and marijuana use on current risky sexual behavior. Both models are also

estimated separately by gender. Again, one-tailed t-test is used to determine the significance of coefficients for binge drinking and marijuana use.

4.3. Arellano-Bond Estimates

Table 7 and 8 presents the results of the Arellano-Bond estimation on the effects of past binge drinking in the past 30 days on current risky sexual behavior. In this procedure we treat binge drinking as a predetermined variable since past shocks to sexual behavior ($\rho_{i(t-1)}$) may be correlated with past substance use. As we can see in Table 7 for the case of number of sexual partners, coefficients for binge drinking are positive and statistically significant at one-tailed 5-percent level, both for males and females. In Table 8, however, both coefficients of binge drinking for males and females in the case of risky sex are also positive, but only the coefficient for males is statistically significant at one-tailed 5-percent level. All of the models in Table 7 and 8, except in the case of the number of sexual partners for females, pass Sargan overidentifying test at the 5-percent level. This indicates that the exclusion restrictions are valid.

The results in Table 7 and 8 show that the causal relationship between substance use and risky sexual behavior among teenagers and young adults is not as clear as previous studies found. In the case of binge drinking, we find that binge drinking only affects risky sexual behavior among male teenagers and young adults. Male teenagers and young adults tend to have multiple partners and engage in risky sex. However, there is no evidence that binge drinking will affect female teenagers and young adults' risky sexual behavior.

The results of the Arellano-Bond estimation on the effects of past marijuana use in the past 30 days on current risky sexual behavior are shown in Table 9 and 10. In the case of number of sexual partners in Table 9, both coefficients of marijuana use for males and females are positive and statistically significant at one-tailed 5-percent level. In the case of risky sex in Table 10, the coefficient of marijuana use for males is negative, but statistically insignificant, while the coefficient of marijuana use for females is positive and significant at one-tailed 5-percent level. All of the models, except for the number of sexual partners for females, pass the Sargan overidentifying test at the 5-percent level. This indicates that the exclusion restrictions are valid.

Again, the results in Table 9 and 10 show that the causal relationship between marijuana use and risky sexual behavior among teenagers and young adults is not as clear as previous studies found. In case of marijuana use, we find that marijuana use does increase the number of partners among male teenagers and young adults and increase the likelihood of having risky sex among female teenagers and young adults.

5. Conclusions

Ordinary Least Square (OLS) estimates in this study are consistent with results from previous studies that binge drinking and marijuana use have a strong statistical correlation with risky sexual behavior, i.e. the number of sexual partners and risky sex. However, those results are biased and inconsistent. By using Arellano Bond estimation, this study shows mixed results on the causality between alcohol and marijuana use and risky sexual behavior among teenagers and young adults. The result for males provides evidence that binge drinking causes teenagers and young adults to have multiple sexual

partners, while the result for females is questionable due to the failures in the overidentification test. The results in risky sex are also mixed. Binge drinking causes the likelihood for male teenagers and young adults to engage in risky sex, while it does not affect the likelihood for female teenagers and young adults to engage in risky sex.

Marijuana use also causes male teenagers and young adults to have multiple sexual partners, while the result for females is questionable due to the failures in the overidentification test. In risky sex, marijuana use does not affect the likelihood for males to engage in risky sex. However, it does cause the likelihood for female teenagers and young adults to engage in risky sex.

Table 1. Sample Means of Selected Characteristics by Gender and Past 30 Day Binge Drinking

Variables	Males Binge Drinker Past 30 Days Yes		Males Binge Drinker Past 30 Days No	Females Binge Drinker Past 30 Days Yes		Females Binge Drinker Past 30 Days No
Number of Partners Past 12 Months	1.11	**	0.53	1.09	**	0.5
Risky Sex Past 12 Months	0.48	**	0.19	0.47	**	0.21
Age (in months)	216.46	**	207.2	215.33	**	208.17
Highest Grade Completed	10.68	**	9.96	10.81	**	10.23
Household Size	4.12	**	4.38	4.01	**	4.37
Self Reported Underweight	0.18		0.18	0.09	**	0.1
Self Reported Overweight	0.24	**	0.22	0.44	**	0.39
Live in Metropolitan Statistical Area	0.79	**	0.8	0.81		0.82
Number of Observations	2,667		7,777	2,027		9,025

Note:

** indicates that the difference between binge drinker and non-binge drinker is statistically significant ($p<0.05$)

Table 2. Sample Means of Selected Characteristics by Gender and Past 30 Day Marijuana Use

Variables	Males			Females		
	Marijuana User Past 30 Days			Marijuana User Past 30 Days		
	Yes		No	Yes		No
Number of Partners Past 12 Months	1.15	**	0.53	1.17	**	0.46
Risky Sex Past 12 Months	0.52	**	0.18	0.57	**	0.18
Age (in months)	213.74	**	208.24	213.01	**	208.59
Highest Grade Completed	10.38	**	10.07	10.60	**	10.27
Household Size	4.11	**	4.38	4.00	**	4.38
Self Reported Underweight	0.19		0.18	0.10		0.10
Self Reported Overweight	0.21		0.22	0.45	**	0.38
Live in Metropolitan Statistical Area	0.81	**	0.80	0.82		0.82
Number of Observations	2,505		7,939	2,235		8,817

Note:

** indicates that the difference between marijuana users and non-marijuana users is statistically significant ($p<0.05$)

Table 3. OLS Estimates of the Effects of Past Binge Drinking on Current Number of Partners

	Current Number of Partners Past 12 Months	
	Males	Females
Lagged Number of Partners Past 12 Months	0.594 **	0.577 **
	(0.01)	(0.01)
Lagged Binge Drinking Past 30 Days	0.177 ^^	0.154 ^^
	(0.019)	(0.02)
Age (in months)	0.009 **	0.007 **
	(0.001)	(0.001)
Highest Grade Completed	-0.039 **	-0.017 **
	(0.008)	(0.008)
Household Size	-0.008	-0.03 **
	(0.005)	(0.004)
Self Reported Underweight	-0.036 *	-0.013
	(0.02)	(0.025)
Self Reported Overweight	-0.059 **	-0.011
	(0.019)	(0.015)
Live in Metropolitan Statistical Area	-0.01	-0.02
	(0.019)	(0.018)
Third Period	-0.106 **	-0.084 **
	(0.021)	(0.019)
Fourth Period	-0.157 **	-0.13 **
	(0.026)	(0.024)
R-squared	0.4	0.37

Notes:

1. Numbers of observations are 7,833 for males and 8,295 for females.
2. Standard deviations are in parantheses and intercepts are not shown.
3. ** statistically significant at the 5-percent level (two-tailed test)
4. * statistically significant at the 10-percent level (two tailed test)
5. ^^ statistically significant at the 5-percent level (one-tailed test)
6. ^ statistically significant at the 10-percent level (one-tailed test)

Table 4. OLS Estimates of the Effects of Past Binge Drinking on Current Risky Sex

	Current Risky Sex Past 12 Months	
	Males	Females
Lagged Risky Sex Past 12 Months	0.315 **	0.354 **
	(0.012)	(0.012)
Lagged Binge Drinking Past 30 Days	0.141 ^^	0.137 ^^
	(0.018)	(0.018)
Age (in months)	0.009 **	0.006 **
	(0.001)	(0.001)
Highest Grade Completed	-0.07 **	-0.063 **
	(0.007)	(0.007)
Household Size	-0.005	-0.014 **
	(0.005)	(0.004)
Self Reported Underweight	0.02	0.02 *
	(0.019)	(0.023)
Self Reported Overweight	-0.018	0.035
	(0.017)	(0.014)
Live in Metropolitan Statistical Area	0.007 *	-0.002
	(0.018)	(0.017)
Third Period	-0.045 **	-0.036 **
	(0.019)	(0.018)
Fourth Period	-0.028	0.006
	(0.024)	(0.022)
R-squared	0.14	0.14

Notes:

1. Numbers of observations are 5,222 for males and 5,526 for females.
2. Standard deviations are in parantheses and intercepts are not shown.
3. ** statistically significant at the 5-percent level (two-tailed test)
4. * statistically significant at the 10-percent level (two tailed test)
5. ^^ statistically significant at the 5-percent level (one-tailed test)
6. ^ statistically significant at the 10-percent level (one-tailed test)

Table 5. OLS Estimates of the Effects of Past Marijuana Use on Current Number of Partners

Table 5
OLS Estimates of the Effects of Past Marijuana Use on Current Number of Partners

	Current Number of Partners Past 12 Months	
	Males	Females
Lagged Number of Partners Past 12 Months	0.585 **	0.557 **
	(0.01)	(0.01)
Lagged Marijuana Use Past 30 Days	0.21 ^^	0.21 ^^
	(0.019)	(0.019)
Age (in months)	0.009 **	0.008 **
	(0.001)	(0.001)
Highest Grade Completed	-0.033 **	-0.016 **
	(0.008)	(0.008)
Household Size	-0.007	-0.028 **
	(0.005)	(0.004)
Self Reported Underweight	-0.039 *	-0.015
	(0.02)	(0.025)
Self Reported Overweight	-0.057 **	-0.013
	(0.019)	(0.015)
Live in Metropolitan Statistical Area	-0.022	-0.026
	(0.019)	(0.018)
Third Period	-0.122 **	-0.099 **
	(0.021)	(0.019)
Fourth Period	-0.173 **	-0.145 **
	(0.026)	(0.024)
R-squared	0.41	0.38

Notes:

1. Numbers of observations are 7,833 for males and 8,295 for females.
2. Standard deviations are in parantheses and intercepts are not shown.
3. ** statistically significant at the 5-percent level (two-tailed test)
4. * statistically significant at the 10-percent level (two tailed test)
5. ^^ statistically significant at the 5-percent level (one-tailed test)
6. ^ statistically significant at the 10-percent level (one-tailed test)

Table 6. OLS Estimates of the Effects of Past Marijuana Use on Current Risky Sex

	Current Risky Sex Past 12 Months	
	Males	Females
Lagged Risky Sex Past 12 Months	0.305 **	0.331 **
	(0.012)	(0.012)
Lagged Marijuana Use Past 30 Days	0.196 ^^	0.206 ^^
	(0.017)	(0.017)
Age (in months)	0.009 **	0.006 **
	(0.001)	(0.001)
Highest Grade Completed	-0.066 **	-0.061 **
	(0.007)	(0.007)
Household Size	-0.003	-0.012 **
	(0.005)	(0.004)
Self Reported Underweight	0.017	0.018
	(0.019)	(0.023)
Self Reported Overweight	-0.015	0.033 **
	(0.017)	(0.014)
Live in Metropolitan Statistical Area	-0.004	-0.007
	(0.018)	(0.017)
Third Period	-0.061 **	-0.051 **
	(0.019)	(0.018)
Fourth Period	-0.043 *	0.009
	(0.024)	(0.022)
R-squared	0.14	0.15

Notes:

1. Numbers of observations are 5,222 for males and 5,526 for females.
2. Standard deviations are in parantheses and intercepts are not shown.
3. ** statistically significant at the 5-percent level (two-tailed test)
4. * statistically significant at the 10-percent level (two tailed test)
5. ^^ statistically significant at the 5-percent level (one-tailed test)
6. ^ statistically significant at the 10-percent level (one-tailed test)

Table 7. Arrelano Bond Estimates of the Effects of Past Binge Drinking on Current Number of Partners

	Current Number of Partners Past 12 Months	
	Males	Females
Lagged Number of Partners Past 12 Months	0.432 **	0.404 **
	(0.036)	(0.035)
Lagged Binge Drinking Past 30 Days	0.09 ^^	0.135 ^^
	(0.054)	(0.048)
Age (in months)	0.03 **	0.037 **
	(0.008)	(0.007)
Highest Grade Completed	0.047 **	0.077 **
	(0.022)	(0.022)
Household Size	0.005	-0.025 **
	(0.011)	(0.01)
Self Reported Underweight	0.009	-0.075 *
	(0.036)	(0.042)
Self Reported Overweight	-0.009	0.011
	(0.04)	(0.03)
Live in Metropolitan Statistical Area	0.152 *	0.083
	(0.086)	(0.08)
Fourth Period	0.033	0.012
	(0.031)	(0.028)
Overidentification Test	5.88	18.45
	[0.21]	[0.00]

Notes:

1. Numbers of observations are 5,222 for males and 5,526 for females.
2. Standard deviations are in parantheses, P-values are in brackets, and intercepts are not shown.
3. ** statistically significant at the 5-percent level (two-tailed test)
4. * statistically significant at the 10-percent level (two tailed test)
5. ^^ statistically significant at the 5-percent level (one-tailed test)
6. ^ statistically significant at the 10-percent level (one-tailed test)

Table 8. Arrelano Bond Estimates of the Effects of Past Binge Drinking on Current Risky Sex

	Current Risky Sex Past 12 Months	
	Males	Females
Lagged Risky Sex Past 12 Months	0.088 **	0.091 **
	(0.026)	(0.026)
Lagged Binge Drinking Past 30 Days	0.087 ^^	0.049
	(0.048)	(0.042)
Age (in months)	0.005	0.001
	(0.007)	(0.007)
Highest Grade Completed	-0.046 **	0.03
	(0.02)	(0.02)
Household Size	-0.001	-0.011
	(0.01)	(0.009)
Self Reported Underweight	0.007	-0.05
	(0.032)	(0.037)
Self Reported Overweight	-0.021	0.03
	(0.035)	(0.027)
Live in Metropolitan Statistical Area	0.03	-0.092
	(0.076)	(0.07)
Fourth Period	0.055 **	0.069 **
	(0.027)	(0.025)
Overidentification Test	5.48	3.73
	[0.24]	[0.44]

Notes:

1. Numbers of observations are 5,222 for males and 5,526 for females.
2. Standard deviations are in parantheses, P-values are in brackets, and intercepts are not shown.
3. ** statistically significant at the 5-percent level (two-tailed test)
4. * statistically significant at the 10-percent level (two tailed test)
5. ^^ statistically significant at the 5-percent level (one-tailed test)
6. ^ statistically significant at the 10-percent level (one-tailed test)

Table 9. Arellano Bond Estimates of the Effects of Past Marijuana Use on Current Number of Partners

	Current Number of Partners Past 12 Months	
	Males	Females
Lagged Number of Partners Past 12 Months	0.42 **	0.395 **
	(0.036)	(0.035)
Lagged Marijuana Use Past 30 Days	0.17 ^^	0.211 ^^
	(0.053)	(0.056)
Age (in months)	0.032 **	0.037 **
	(0.008)	(0.008)
Highest Grade Completed	0.046 **	0.076 **
	(0.022)	(0.022)
Household Size	0.005	-0.025 **
	(0.011)	(0.01)
Self Reported Underweight	0.008	-0.072 *
	(0.036)	(0.042)
Self Reported Overweight	-0.012	0.013
	(0.04)	(0.03)
Live in Metropolitan Statistical Area	0.152 *	0.068
	(0.085)	(0.08)
Fourth Period	0.045	0.027
	(0.031)	(0.029)
Overidentification Test	8.6	20.26
	[0.07]	[0.00]

Notes:

1. Numbers of observations are 5,222 for males and 5,526 for females.
2. Standard deviations are in parantheses, P-values are in brackets, and intercepts are not shown.
3. ** statistically significant at the 5-percent level (two-tailed test)
4. * statistically significant at the 10-percent level (two tailed test)
5. ^^ statistically significant at the 5-percent level (one-tailed test)
6. ^ statistically significant at the 10-percent level (one-tailed test)

Table 10. Arrelano Bond Estimates of the Effects of Past Marijuana Use on Current Risky Sex

	Current Risky Sex Past 12 Months	
	Males	Females
Lagged Risky Sex Past 12 Months	0.1 **	0.087 **
	(0.026)	(0.026)
Lagged Marijuana Use Past 30 Days	-0.03	0.118 ^^
	(0.047)	(0.049)
Age (in months)	0.005	0.001
	(0.007)	(0.007)
Highest Grade Completed	-0.045 **	0.028
	(0.02)	(0.02)
Household Size	-0.001	-0.011
	(0.01)	(0.009)
Self Reported Underweight	0.007	-0.048
	(0.032)	(0.037)
Self Reported Overweight	-0.026	0.031
	(0.035)	(0.027)
Live in Metropolitan Statistical Area	0.036	-0.099
	(0.076)	(0.07)
Fourth Period	0.052 *	0.077 **
	(0.028)	(0.025)
Overidentification Test	8.4	4.5
	[0.08]	[0.34]

Notes:

1. Numbers of observations are 5,222 for males and 5,526 for females.
2. Standard deviations are in parantheses, P-values are in brackets, and intercepts are not shown.
3. ** statistically significant at the 5-percent level (two-tailed test)
4. * statistically significant at the 10-percent level (two tailed test)
5. ^^ statistically significant at the 5-percent level (one-tailed test)
6. ^ statistically significant at the 10-percent level (one-tailed test)

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