Teen Cocaine and Marijuana Demand in the 1990's

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Masters Paper
July 20, 2001

Abstract

This paper examines the effects of cocaine and marijuana prices on past month cocaine and marijuana use among 1991–1999 Youth Risk Behavior Surveys respondents. We estimate bivariate probit drug demand regressions that control for age, grade, race, and fixed state and year effects. Results indicate that cocaine prices are significantly negatively related to both cocaine and marijuana demand for females but are related to neither for males, while marijuana price effects are not related to drug demand for either gender. The strong positive correlations between error terms from cocaine and marijuana equations indicate that marijuana and cocaine demand is complementary. The female cocaine price effects persist even after controlling for previous cigarette and alcohol use.

* The author would like to thank Dr. Jeffrey DeSimone for his help with all aspects of this paper.

I. Introduction

As the annual Monitoring the Future (MTF) study of adolescent drug use reports, the prevalence of cocaine and marijuana use among high school students appears to have increased during the 1990s (Johnston et al. 2000). From 1991 to 1999, the proportion of students who have used cocaine at least once in their lifetimes increased from 4.1% to 7.7% for 10th graders and from 7.8% to 9.8% for 12th graders. The analogous increase in past month cocaine use is from 0.7% to 1.8% for sophomores and from 1.4% to 2.6% for seniors. For marijuana, the most commonly used illicit drug in the United States, the proportion of students reporting any lifetime use rose between 1991 and 1999 from 23.4% to 40.9% among 10th graders and from 36.7% to 49.7% among 12th graders. The increase in past month marijuana use during that time was from 8.7% to 19.4% among sophomores and from 13.8% to 23.1% among seniors.

These are alarming statistics considering that the use of cocaine and marijuana by teenagers often has serious and long-term economic consequences for both individual users and society in general. Evidence exists, for instance, that use of these drugs contributes to crime, decreases economic productivity, and increases required health care services. This implies that reducing teen cocaine and marijuana use would have a positive short and long run impact on those who do not even use these drugs. Economic theory suggests that if teens have downward-sloping demand curves for these drugs, one potential way to achieve these reductions in drug use is by increasing the prices of cocaine and marijuana.

With that in mind, this paper estimates the effects of cocaine and marijuana prices on cocaine and marijuana demand by high school students in the 1990s. In particular, we analyze data on past month cocaine and marijuana use among respondents to the biannual 1991–1999 Youth Risk Behavior Surveys (YRBS) that is merged with Drug Enforcement Agency (DEA) data on cocaine and marijuana prices. We estimate bivariate probit drug demand regressions that control for age, grade, race, and fixed state and year effects.

Results indicate that cocaine prices are significantly negatively related to both cocaine and marijuana demand for females but are related to neither for males, while marijuana price effects are not related to drug demand for either gender. In addition, the strong positive correlations between error terms from cocaine and marijuana equations indicate that marijuana and cocaine demand is complementary. Moreover, the significance of the female cocaine price effects persists even after controlling for previous cigarette and alcohol use and the age at which alcohol and cigarettes were initiated.

The remainder of the paper proceeds as follows. The next section reviews previous studies that examine cocaine and marijuana demand. Section III outlines the YRBS drug use and DEA drug price data that are empirically analyzed. Section IV presents the regression methodology while section V reports and interprets the estimation results. Section VI concludes by summarizing our findings, examining the limitations of our analysis, and exploring potential future research endeavors.

II. Previous Studies

A number of studies examine price elasticities of cocaine and marijuana demand among teens and young adults using price data for cocaine and marijuana obtained from the DEA. The earliest cocaine demand study was by DiNardo (1993), who found no effect of cocaine price on cocaine use by MTF high school seniors. Grossman and Chaloupka (1998) specify a rational addiction model using the MTF surveys and find cocaine price elasticities ranging from –0.70 to –1.70. Chaloupka et al. (1998) examines past year cocaine participation by high school seniors in the MTF surveys of 1982 and 1989. When both surveys were combined the estimated cocaine price elasticity was –0.88, but when the 1989 survey was analyzed separately the elasticity was only –0.24.

Since the DEA is mostly interested in the harsher illicit drugs like cocaine, there has been inadequate data on marijuana prices in the past. Nisbet and Vakil (1972) surveyed UCLA students regarding quantities of marijuana purchased at current prices and estimated price elasticities ranging from -0.40 to –1.51. The first study to use actual marijuana price data was Pacula et al. (2001), who used MTF data on high school seniors from 1985 to 1996 and estimated a past year participation elasticity of –0.33. DeSimone and Farrelly (2001) estimate equations for past year cocaine and marijuana use among 12–17 year olds in the 1990–1997 National Household Surveys on Drug Abuse and fail to find a significant effect of either cocaine or marijuana prices on the demand for either drug.

A limitation of many existing studies is that they do not control for state fixed effects. In particular, only DeSimone and Farrelly (2001) include fixed effects for both states and years, while Grossman and Chaloupka (1998) control for individual fixed effects. [Pacula et al. (2001) controls for state fixed effects but does not include time effects.] The concern with the remaining studies is that unobservable state-level factors, such as public willingness to accept alternative behaviors or the political environment, simultaneously affect both illegal drug consumption and the price of cocaine and marijuana. The inclusion of state fixed effects controls for variation in unobservable state-level characteristics, thus reducing the likelihood that differences in cocaine and marijuana use across states resulting from unobserved variation in attitudes and preferences are incorrectly attributed to variation in drug prices.

III. Data

This study analyzes data from the biannual Youth Risk Behavior Surveys (YRBS), which were administered to high school students in odd years between 1991 and 1999. The CDC established these surveys to monitor youth behaviors that influence health. Each survey employs a three-stage cluster sample design to produce a nationally representative sample of students in grades 9 thru 12. The students completed the self-administered questionnaire in their classrooms during a regular class period, recording their responses directly on a computer-scannable answer sheet.

The number of observations analyzed in our pooled 1991–1999 data set is 66,568, representing 34,674 females and 32,917 males. Females and males are analyzed separately because the results of the Chow test indicated that female and male price effects are significantly different. We specify two dependent variables, one corresponding to cocaine use and the other to marijuana use. Both are binary indicators of past month drug consumption. Independent variables constructed from the YRBS include indicators of each age between 14 and 18 (with ages 12–13 excluded because there are so few of each), each grade between 10 and 12 (with grade 9 excluded), and Asian, black, Hispanic, and other race (with white excluded).

The main independent variables are measures of cocaine and marijuana prices constructed from DEA data. Cocaine price data is collected by undercover drug agents, mostly from the Drug Enforcement Administration (DEA), and recorded by the DEA in their System to Retrieve Information from Drug Evidence (STRIDE). These prices are likely to be accurate because the agent making the purchase must make a legitimate price offer so the drug dealer does not become suspicious that the buyer is an agent.

We construct a per gram measure of the cocaine price that varies by state and year. To control for quantity (weight) and quality (purity) discounts, we estimate the following ordinary least squares regression to impute cocaine prices from STRIDE data:

$$\log Price = b_0 + b_1(\log Predicted\ Purity + \log Weight) + b_2\ State + b_3\ Year +$$
$$b_4\,(State \times Year) + e.$$

In this equation, *Purity* represents the weight of actual cocaine in the purchase divided by the total weight, *Predicted Purity* is the predicted value from a regression of purity on the other explanatory variables, *Weight* is the total gram weight of the purchase, *State* is a vector of state indicators, and *Year* is a vector of year indicators. For a particular state and year, the predicted cocaine price, which is the median price of one gram of 100% pure cocaine in that state and year, is $\exp(b_0+b_2+b_3+b_4)$, with corresponding indicators set equal to one in the state and year vectors (DeSimone and Farrelly 2001). Since a price could not be constructed for Connecticut, Delaware, and Vermont in the one year in which the YRBS sampled each of those states, the 583 observations from respondents in those states were dropped from the analysis sample.

Since DEA agents focus on cocaine and heroin traffickers, STRIDE contains insufficient marijuana price information to construct an accurate state price estimate. We instead follow DeSimone and Farrelly (2001) by constructing a marijuana price estimate from prices listed in the *Illegal Drug Price/Purity Report*, a publication of the DEA Intelligence Division. This report contains quarterly estimates of the minimum and maximum prices in the nineteen main DEA district offices for both pound and ounce purchases of commercial grade and sinsemilla grade marijuana. We use the annual average minimum price per gram of a pound purchase of commercial grade marijuana (though results for the annual average of the quarterly minima and maxima are similar). Each state is assigned the price of the district office to which regional offices in the state report. For example, North Carolina DEA offices report to the Atlanta office, so the price of marijuana assigned to YRBS respondents from North Carolina is that constructed from the listing for Atlanta in the *Illegal Drug Price/Purity Report*. Appendix Table A lists the states that are assigned the price from each of the 19 DEA districts. States not listed were not sampled by the YRBS.

IV. Empirical Methodology

Since the dependent variables are binary indicators and demand for the two drugs may be related – i.e. the error terms in the cocaine and marijuana demand equations may be correlated – the equations are estimated using bivariate probit regressions. The equations

$$Y^C_i = \beta_0 + \beta_1 P^C_i + \beta_2 P^M_i + \beta_3 X_i + \beta_4 Z_i + \varepsilon_i,$$

$$Y^M_i = \beta_0 + \beta_1 P^C_i + \beta_2 P^M_i + \beta_3 X_i + \beta_4 Z_i + \varepsilon_i,$$

are jointly estimated for each gender. For respondent i, Y^C_i and Y^M_i are binary indicators of past month cocaine and marijuana use, respectively; P^C_i and P^M_i are prices of cocaine and marijuana, respectively; and X_i is a vector that contains indicators for age, grade, and race (as described previously) along with indicators for each survey year and state, and ε_i is a random error term. The Z_i vector that consists of potentially endogenous measures of alcohol and cigarette consumption: indicators for whether the teen has previously used alcohol or cigarettes and the age at which the teen first tried alcohol or cigarettes. However, β_4 is set to zero in our basic specifications. All regressions are weighted using the YRBS sampling weights and with a robust estimator in which the residual covariance matrix is clustered by primary sampling unit.

V. Results

Summary statistics, weighted using YRBS sample weights, are found in table 1. The percentage of respondents that have used cocaine in the past month is approximately 2% among females and 3.5% among males. The percentage of respondents that have used marijuana in the past month is approximately 18.5% for females and 26% for males. These overall averages mask a similar increase in prevalence of both drugs over the 1990s to that reported in the introduction for the MTF survey. From 1991 to 1999, the proportion of respondents using cocaine increased from 1.2% to 2.8% for females and from 2.3% to 5.1% for males, while the analogous increase for marijuana use was from 13.0% to 22.3% for females and from 18.1% to 30.4% for males. Meanwhile, the average cocaine price over the period is about $142 per pure gram and the average marijuana price is approximately $1.80 per gram. [Prices are inflated to 1999 constant dollars using the CPI for all urban consumers.] As expected, the majority of respondents are evenly divided between ages 15–17, and respondents are evenly divided between the four grade levels. More three-quarters of respondents of each gender have previously used alcohol or cigarettes, with average initiation ages of just above 12 for men and just below 13 for women.

Table 2 is a cross-tabulation, for each gender, of cocaine and marijuana use. Comparing the rows reveals that while most marijuana users are not cocaine users, most cocaine users are also marijuana users. For females, the top row indicates that only 0.5% of marijuana non-users consumed cocaine, while the bottom row indicates that 10.6% of marijuana users consumed cocaine. Similarly, for males, 0.9% of marijuana non-users consumed cocaine, while 14.8% of marijuana users consumed cocaine. Comparing columns leads to a similar conclusion. Among cocaine users, 81% of females and 85% of males also use marijuana, while marijuana use propensities among cocaine non-users are 15% for females and 28.9% among males.

Table 3 presents bivariate probit regression results for females. The top two rows show marginal effects of prices on past month use as well as implied elasticities. Model (1) regressions include state fixed effects, model (2) excludes state effects but include fixed effects for each of the 16 marijuana price regions, and model (3) excludes all geographic fixed effects. [State fixed effects are jointly significant for both females and males.] With state effects, female use of both cocaine and marijuana are significantly negatively related to the cocaine price, with an elasticity of –1.63 for cocaine and –.44 for marijuana. However, neither type of drug use is significantly related to the marijuana price. The chi-squared statistic in the third row shows that despite the insignificance of the marijuana price, the two prices are jointly significant in the two drug use equations at the 95% level. This means that overall cocaine and marijuana prices affect the demand of the two drugs by females. The error term correlation is significant at the 99% level. This suggests that cocaine and marijuana demand vary directly, rather than inversely, meaning that cocaine and marijuana are complements rather than substitutes.

Models (2) and (3) are estimated primarily to evaluate the reasons for the insignificance of the marijuana price coefficient. Replacing state indicators with region indicators does not affect the marijuana price results. However, with no state or region effects, marijuana prices significantly affect both types of drug use. This implies that marijuana prices are lower in regions in which cocaine and marijuana use is more prevalent, but this negative correlation arises because of unobserved differences in attitudes and policies towards drug use rather than a causal effect of marijuana prices on drug use. Results for joint significance are stronger for models (2) and (3) since price effects are stronger (standard errors are smaller), and the error term correlation is almost identical. However, model (1) is the preferred model since state effects are highly significant as a group.

Table 4 shows bivariate probit results for males and is set up identically to table 3. This table reveals that neither cocaine nor marijuana use is responsive to cocaine or marijuana prices for males. Removing state fixed effects and geographic effects altogether makes no difference. Naturally, the prices variables are jointly insignificant in the two equations in each case. The error term correlation in all three columns is similar to that in table 3 and is again highly significant, indicating complementarity between cocaine and marijuana demand.

It is unclear why cocaine price effects are significant for females but not males. A potential explanation is that females not only are less likely to use cocaine and marijuana but also are more casual users when they do consume the drugs. This could be the case if they consume lesser amounts or if they use drugs less frequently. Although we do not observe consumption amounts, the YRBS does record information about the number of times respondents used each drug in the past month. Indeed, average past month frequency of use is 8.6 for cocaine and 11.5 for marijuana among female users, but is 13.9 for cocaine and 18.9 for marijuana among male users.

As for the marijuana price results, insignificance in models (2), as well as model (3) for males, implies that the lack of significant effects in model (1) is not simply because state indicators are included while the price is measured at the regional level. Although the matching procedure likely produces measurement error that biases the estimated price effects towards zero, the fact that Pacula et al. (2001) and DeSimone and Farrelly (2001) estimate significant marijuana price effects in specifications that do not include state fixed effects suggest that the marijuana price measure is not simply too crude to detect any effects on drug use.

Table 5 reestimates the state fixed effects models of tables 3 and 4 with the four alcohol and cigarette use measures included. The estimated price effects change little from tables 3 and 4, although female cocaine price elasticities increase to –2.52 for cocaine and –.50 for marijuana. The error term correlation is lower than previously but still positive and highly significant. Previous use of alcohol and cigarettes are each strongly related to cocaine and marijuana use for both females and males. Estimated elastcities are also quite similar for females and males, with higher elasticities for the alcohol than cigarette variable and for cocaine than marijuana. Ages of initiation are significantly negatively related to cocaine use for both genders, but are unrelated to female marijuana use and only related to male marijuana use for alcohol. These results support the gateway hypothesis that youth who use drugs first initiate less harmful drugs like alcohol and cigarettes that are legal for adults, and then over time progress to illegal drugs like marijuana and cocaine. A possible reason for the initiation age results is that marijuana tends to be initiated prior to cocaine, so that the gateway sequence is more pronounced for cocaine than for marijuana. Since these variables are likely endogenous, in that there are likely unmeasured factors related to not only cocaine and marijuana use but alcohol and cigarette use as well, the estimated effects must be interpreted as correlations rather than causal effects of alcohol and cigarette use on cocaine and marijuana use.

Table 6 examines the effects of the year, age, grade, and race indicators for the equations in tables 3 and 4 models (1), with state fixed effects. The year effects indicate that, other than female cocaine use, drug use prevalences jumped in 1995 and have since remained higher than in 1991. The age variables are mostly insignificant, although female marijuana use is highest among 17 and 18 year olds and male cocaine use is lowest among 14 and 15 year olds. Grade has no effect for females, but male 10th graders are least likely to use cocaine, and males become successively less likely to use marijuana as they progress through high school. Asians are less likely to use marijuana than whites, while Hispanics are more likely to use cocaine than whites. Blacks are less likely than whites to use cocaine but black males are more likely than whites to use marijuana. Male respondents of other races are more likely to use both cocaine and marijuana than whites.

VI. Conclusion

The results of this analysis indicate that, controlling for various demographic measures as well as fixed state and year effects, the cocaine and marijuana demand of female high school students is sensitive to the price of cocaine. However, cocaine prices have no effect on the cocaine demand of male high school students, and marijuana prices are not related to demand for either drug by students of either gender. The female price effects persist even when potentially endogenous indicators of cigarette and alcohol use are included in the regression. For both genders, the cigarette and alcohol measures indicate support for the gateway theory that initiation of less harmful legal (for adults) drugs like tobacco and alcohol precedes use of harsher illicit drugs like marijuana and cocaine.

The estimated price effects imply that increases in cocaine prices would reduce female demand for both cocaine and marijuana. In particular, the estimates from table 3 indicate that a 10% increase in the cocaine price would reduce past female marijuana use by 4% and past month female cocaine use by 16%. This would likely have many positive social effects, such as reduced crime, unemployment, and health care resources expended, in both the short and long run. The increase in enforcement resources required to increase cocaine prices by 10%, however, is not clear.

When considering the implications of this analysis, several data limitations should be kept in mind. To begin with, teens are likely to underreport illegal drug use for obvious reasons. Also, the imprecision of the marijuana price measures might make it difficult to detect a marijuana price effect. In addition, cocaine prices likely vary by metropolitan area size even within states, but the lack of consistent information on metropolitan area size in the YRBS makes it impossible to control for this. Moreover, although the most important variable for demand curves to hold constant is income, the YRBS does not include any income measures. Finally, the YRBS does not measure the use of other drugs, such as heroin (except for 1999) and methamphetamines, that became popular among teens in the 1990s.

Potential related future research projects include analyses of the effects of cocaine prices on illegal drug use and other risky behavioral outcomes for older high school students and for college students. Evidence that initiation of cocaine often occurs several years after marijuana initiation, coupled with the MTF figures in the introduction showing that cocaine prevalence is much higher among 12^{th} graders than 10^{th} graders. This suggests that a significant cocaine price effect among older high school students might possibly be masked by the inclusion of younger students who mostly do not use cocaine. If so, cocaine prices might also affect other risky behaviors measured in the YRBS, such as drinking, drunk driving, weapon possession, fighting, and suicide attempts. Similarly, college students might have more elastic behavioral responses to cocaine price changes than do high school students because they are often in new environment away from home and their families, and as such are more likely to live on a fixed income and to face greater pressures and temptations than high school students.

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Table 1
Descriptive Statistics

Variable	**Females (N= 34,674)**		**Males (N= 32,917)**	
	Mean	Std. Dev.	Mean	Std. Dev.
Cocaine use	.019	.013	.035	.185
Marijuana use	.185	.391	.259	.438
Cocaine price	142	39.6	142	40.2
Marijuana price	1.80	.607	1.81	.605
Age 14	.103	.304	.087	.283
Age 15	.239	.427	.222	.416
Age 16	.258	.437	.264	.441
Age 17	.258	.437	.254	.435
Age 18	.138	.345	.168	.374
Grade 10	.247	.429	.247	.431
Grade 11	.244	.429	.248	.431
Grade 12	.258	.437	.255	.436
Year 1993	.228	.419	.228	.419
Year 1995	.157	.363	.154	.361
Year 1997	.219	.414	.244	.429
Year 1999	.230	.421	.216	.412
Asian	.031	.174	.036	.186
Black	.151	.359	.127	.333
Hispanic	.095	.293	.091	.287
Other	.082	.274	.075	.263
Previously used alcohol	.775	.417	.785	.410
Previously used cigarettes	.569	.495	.583	.492
Age first consumed alcohol	12.9	2.53	12.2	2.83
Age first tried cigarettes	12.9	2.33	12.4	2.58

Source: Youth Risk Behavior Survey (1991-1999).
Notes: Statistics are weighted using YRBS sample weights. The sample size for previous use of cigarettes and alcohol is 31,115 for females and 29,714 for males. Statistics for age of first cigarette and alcohol use are for respondents who have previously used the corresponding drug.

Table 2
Marijuana and Cocaine Use Cross-Tabulations

Females

	Did Not Use Cocaine	Used Cocaine	Total
Did Not Use Marijuana	28,762	141	28,903
Used Marijuana	5,158	613	5,771
Total	33,920	754	34,674

Males

	Did Not Use Cocaine	Used Cocaine	Total
Did Not Use Marijuana	24,418	218	24,636
Used Marijuana	7,059	1,222	8,281
Total	31,477	1,440	32,917

Source: Youth Risk Behavior Survey (1991-1999).

Table 3
Probit Regressions for Past Month Drug Use by Females
(N = 34,674)

Variable	**(1)**		**(2)**		**(3)**	
	Cocaine	**Marijuana**	**Cocaine**	**Marijuana**	**Cocaine**	**Marijuana**
Cocaine Price	-.016***	-.056**	-.014***	-.034***	-.013***	-.016
(x 100)	(.008)	(.025)	(.004)	(.012)	(.004)	(.012)
	[-1.63]	[-.438]	[-1.39]	[-.266]	[-1.17]	[-.123]
Marijuana Price	-.170	.847	.008	.513	-.656***	-1.18*
(x 100)	(.425)	(1.45)	(.423)	(1.42)	(.223)	(.733)
	[-.220]	[.083]	[.010]	[.050]	[-.760]	[-.113]
Chi-Squared for Joint Sig.	10.17 (.037)		16.5 (.003)		37.5 (.000)	
Error Term Correlation	.726*** (.021)		.719*** (.021)		.714*** (.021)	
Log Likelihood	-17,340		-17,405		-17,519	
Geographic fixed effects	State		Region		None	

Source: Youth Risk Behavior Survey (1991-1999).
Notes: For cocaine and marijuana prices, the first row indicates the marginal effect on the probability of drug use, the second row indicates the standard error (in parentheses), and the third row indicates the implied elasticity [in brackets]. *, **, *** indicate significance at the 90%, 95%, and 99% levels, respectively. The chi-squared statistic tests the joint significance of the two drug price variables in the two drug demand equations, with p-values reported in parentheses beneath statistics. Standard errors are reported in parentheses beneath error term correlation coefficients. All regressions include the year, age, grade, and race variables listed in table 6.

Table 4
Probit Regressions for Past Month Drug Use by Males
(N = 32,917)

Variable	**(1)**		**(2)**		**(3)**	
	Cocaine	**Marijuana**	**Cocaine**	**Marijuana**	**Cocaine**	**Marijuana**
Cocaine Price (x 100)	-.003 (.013) [-.149]	-.060 (.054) [-.334]	-.003 (.006) [-.121]	.018 (.026) [.099]	-.003 (.002) [-.127]	.008 (.023) [.045]
Marijuana Price (x 100)	.698 (.488) [.413]	1.69 (2.14) [.118]	.664 (.507) [.385]	1.48 (2.24) [.102]	-.058 (.320) [-.032]	-.195 (.977) [-.013]
Chi-Squared for Joint Sig.	3.15 (.534)		2.33 (.676)		.930 (.920)	
Error Term Correlation	.744*** (.018)		.739*** (.018)		.737*** (.018)	
Log Likelihood	-22,756		-22,913		-23,094	
Geographic fixed effects	State		Region		None	

Source: Youth Risk Behavior Survey (1991-1999).

Notes: For cocaine and marijuana prices, the first row indicates the marginal effect on the probability of drug use, the second row indicates the standard error (in parentheses), and the third row indicates the implied elasticity [in brackets]. *, **, *** indicate significance at the 90%, 95%, and 99% levels, respectively. The chi-squared statistic tests the joint significance of the two drug price variables in the two drug demand equations, with p-values reported in parentheses beneath statistics. Standard errors are reported in parentheses beneath error term correlation coefficients. All regressions include the year, age, grade, and race variables listed in table 6.

Table 5
Probit Regressions Including Previous Alcohol and Cigarette Use

Variable	Females		Males	
	Cocaine	**Marijuana**	**Cocaine**	**Marijuana**
Cocaine price	-.009***	-.045**	-.001	-.040
(x 100)	(.003)	(.019)	(.006)	(.047)
	[-2.52]	[-.492]	[-.060]	[-.281]
Marijuana price	-.134	.603	.004	2.75
(x 100)	(.181)	(1.31)	(.270)	(1.92)
	[-.499]	[.082]	[.503]	[.241]
Previously used alcohol	.013***	.161***	.027***	.245***
	(.002)	(.019)	(.004)	(.019)
	[3.51]	[1.31]	[2.77]	[1.38]
Previously used cigarettes	.026***	.183***	.067***	.277***
	(.005)	(.022)	(.007)	(.023)
	[2.31]	[.801]	[2.53]	[.895]
Age first consumed alcohol	-.001***	-.002	-.002***	-.007***
	(.0002)	(.002)	(.0003)	(.002)
	[-2.40]	[-.129]	[-1.56]	[-.327]
Age first tried cigarettes	-.0007**	.002	-.003***	-.0007
	(.0002)	(.002)	(.0004)	(.002)
	[-1.11]	[.138]	[-1.50]	[-.026]
Error Term Correlation	.643***		.666***	
	(.028)		(.023)	
Log Likelihood	-14,123		-18,199	
Sample Size	31,115		29,714	

Source: Youth Risk Behavior Survey (1991-1999).
Notes: For price, alcohol, and cigarette variables, the first row indicates the marginal effect on the probability of drug use, the second row indicates the standard error (in parentheses), and the third row indicates the implied elasticity [in brackets]. *, **, *** indicate significance at the 90%, 95%, and 99% levels, respectively. Standard errors are reported in parentheses beneath error term correlation coefficients. All regressions include fixed state effects along with the year, age, grade, and race variables listed in table 6.

Table 6
Full Probit Regression Results

Variable	Females		Males	
	Cocaine	**Marijuana**	**Cocaine**	**Marijuana**
Cocaine price	-.016***	-.056**	-.003	-.060
(x 100)	(.008)	(.025)	(.013)	(.054)
Marijuana price	-.170	.847	.698	1.69
(x 100)	(.425)	(1.45)	(.488)	(2.14)
Year 1993	-.004	.011	-.003	.042*
	(.004)	(.015)	(.007)	(.023)
Year 1995	-.001	.081***	.023***	.110***
	(.005)	(.020)	(.009)	(.031)
Year 1997	-.0003	.077***	.017**	.125***
	(.006)	(.019)	(.008)	(.033)
Year 1999	.004	.098**	.029***	.134***
	(.006)	(.018)	(.009)	(.035)
Age 14	-.011	.020	-.034**	-.125
	(.008)	(.073)	(.013)	(.085)
Age 15	-.012	.091	-.040**	-.065
	(.010)	(.076)	(.017)	(.095)
Age 16	-.009	.125	-.034	.022
	(.011)	(.079)	(.021)	(.103)
Age 17	-.009	.161**	-.032	.070
	(.012)	(.080)	(.021)	(.105)
Age 18	-.008	.159*	-.028	.093
	(.011)	(.083)	(.018)	(.108)
Grade 10	-.003	-.00008	-.016***	-.037**
	(.003)	(.008)	(.006)	(.016)
Grade 11	-.002	-.020	-.012	-.055***
	(.005)	(.021)	(.008)	(.019)
Grade 12	-.004	-.019	-.010	-.072***
	(.006)	(.024)	(.008)	(.025)
Asian	-.005	-.116***	-.012	-.134***
	(.004)	(.024)	(.008)	(.024)
Black	-.012***	-.014	-.022***	.041***
	(.002)	(.013)	(.004)	(.015)
Hispanic	.010***	-.012	.022***	.024
	(.004)	(.012)	(.005)	(.015)
Other	.004	.013	.016**	.071***
	(.004)	(.019)	(.008)	(.027)
Error Term Correlation	.726***		.744***	
	(.021)		(.018)	
Log Likelihood	-17,340		-22,756	
Sample Size	34,674		32,917	

Source: Youth Risk Behavior Survey (1991-1999).
Notes: These estimates correspond to models (1) of tables 3 and 4. Variable coefficients indicate the marginal effect on the probability of drug use. Standard errors are reported in parentheses. *, **, *** indicate significance at the 90%, 95%, and 99% levels, respectively. All regressions include fixed state effects.

Appendix
Table A1
Census Divisions and Marijuana Price Regions

City or state in which marijuana price is reported	**States assigned marijuana price from this city/state**
Atlanta	Georgia, North Carolina, South Carolina, Tennessee
Boston	Maine, Massachusetts, New Hampshire, Rhode Island
California (Los Angeles, San Diego, San Francisco)	California, Hawaii
Chicago	Illinois, Indiana, Minnesota, Wisconsin
Denver	Colorado
Detroit	Michigan, Ohio
Miami	Florida
New Orleans	Alabama, Arkansas, Louisiana, Mississippi
New York City	New York
Newark	New Jersey
Philadelphia	Pennsylvania
Phoenix	Arizona, New Mexico
Seattle	Oregon, Washington
St. Louis	Iowa, Kansas, Missouri, Nebraska, South Dakota
Texas (Dallas, Houston)	Oklahoma, Texas
Washington DC	DC, Maryland, Virginia, West Virginia