

# The Impact of Schools on Juvenile Substance Initiation and Use

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We use data from the two rounds of the NLSY97 and the corresponding QED data to examine the effectiveness of school endowments and curricula in targeting juvenile use of tobacco, alcohol, and marijuana. Our results support the notion that schools matter in reducing juvenile involvement in substance use. Higher discretionary dollars per pupil are linked to reduced rates of juvenile initiation and repetitive use rates of cigarettes and marijuana. Additionally, school curricula, as indicated by the implementation of year round classes and some innovative and after-school programs—such as *gifted and talented*, *attendance monitoring*, *homework hotline*, *international baccalaureate*, *extended-day*, and *mentoring*, programs, affect both juvenile initiation to tobacco and alcohol use and juvenile repetitive use of tobacco and alcohol. In particular, we find that juvenile initiation to cigarette use is approximately between 2 percentage points and 3 percentage points lower among youths attending schools with gifted and talented and international baccalaureate programs. In addition, juvenile repetitive cigarette use is approximately 54%, 52%, and 48% lower among youths attending schools offering year round classes, international baccalaureate, and twenty-first century programs, respectively. Finally, juvenile initiation to alcohol use and juvenile repetitive use of alcohol are approximately 3% and 20% lower, respectively, among youths in schools offering gifted and talented programs. In sum, while these programs are not implemented to address substance use problems among the student body, we find that the implementation of these programs is often accompanied by a reduction in juvenile initiation and repetitive substance use.

**KEY WORDS:** schools; substance use; governance.

## INTRODUCTION

Early consumption of tobacco, alcohol, and illicit drugs by our youth has revitalized public concern regarding the role of schools in affecting juvenile participation in substance use practices. In particular, some educational initiatives, such as after-school programs, have received special attention following

the evidence on juvenile offenses peaking right after school (Substance Abuse and Mental Health Services Administration, 1997). As a result, the U.S. Department of Education has been increasing its appropriation for safe and drug-free schools through a variety of school programs. It has also expanded discretionary spending per pupil to improve infrastructures and assist in the hiring of more qualified teachers to reduce student to teacher ratios (U.S. Department of Education, web page).

We use data from the two rounds of the National Longitudinal Survey of Youth 1997 (NLSY97) and the corresponding QED data for the schools attended by the NLSY97 youth in 1996 and 1997 to examine the effectiveness of school endowments and curricula, as reflected by year round and a variety of innovative and after-school programs, in targeting juvenile use of tobacco, alcohol, and marijuana. Our results support

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the notion that schools matter in reducing juvenile involvement in illegal substance use related practices. In particular, school endowments in the form of higher discretionary dollars per pupil appear to be linked to reduced rates of juvenile initiation in cigarette and marijuana use as well as slightly lower repetitive marijuana use rates. Additionally, school curricula, as indicated by the implementation of year round classes and some innovative or after-school programs, seem to affect both juvenile initiation to tobacco use and juvenile repetitive use of tobacco and alcohol. These findings illustrate the potential of schools, schools' endowments, and schools' implementation of innovative and after-school programs on juvenile illegal substance use and, thus, have a direct policy application by informing the debate on how to most efficiently distribute educational spending.

The use of alcohol, tobacco, and other drugs (ATOD) by youth is a serious public health concern. The use of ATOD negatively impacts adolescents' motivation and cognitive abilities, and increases affective, health, and legal difficulties (Clapp & Shillington 2001, Hawkins *et al.* 1992). There have been several studies conducted documenting the epidemiology of ATOD use among high school students. Johnston *et al.* (1999) presented data from their ongoing *Monitoring the Future Study* (MFS) and reported that the lifetime prevalence rate for marijuana is 50% among high school seniors. The annual prevalence rate is somewhat lower at 38%, while the 30-day rate is 23%. Among high school seniors, the annual prevalence rate for marijuana use increased steadily during the 1990s, but leveled off during the past 3 years.

Similar data are reported for alcohol use. The 1999 MFS data indicate that the lifetime prevalence of alcohol use is 80% for seniors, with over 62% reporting having been drunk. The annual prevalence rate for alcohol use drops slightly to about 74%, while the annual rate of reporting being drunk in the past year is 53%. Similarly, The National Household Survey on Drug Abuse reports that in 1998, 16% of 12–17 year olds and 32% of 17–25 year olds reported binge drinking during the past 30 days (NHSDA, 1998).

Finally, data from the MFS, indicate that, among those in high school and college, both current cigarette use (past 30 days) and daily smoking have increased during most of the 1990s. Nearly half of eighth graders have tried cigarettes (46%) and 19% are current smokers. Thirty-five percent of high school seniors are current smokers and 13% are smoking half a pack per day (National Institute of Drug Abuse, 1998).

While the etiology of ATOD use among adolescents is uncertain, previous literature has identified many of the risk and protective factors associated with ATOD use (Hawkins *et al.*, 1992). Common risk factors include individual factors, such as alienation and rebellion; peer factors, including peer ATOD use; family factors like cohesion; school factors such as academic achievement; community factors, including economics and crime; and alcohol and other drug use factors, including availability. Factors that protect against ATOD use include coping skills, parenting skills, school achievement, social influences, social skills, and social norms. Thus, both risk and protective factors occur at the individual and environmental levels.

Given the levels of ATOD use reported by youth and the myriad problems related to them and the multiple levels of influence of promising models of ATOD etiology, several large-scale prevention projects targeting youth have been developed, implemented, and tested in the past 20 years. The majority of these efforts have been school-based educational programs or skills training programs (Botvin, 1986; Hawkins *et al.*, 1992). Although the etiology of adolescent ATOD use is not fully understood, current research suggests that a complex mix of individual, social, and environmental variables contribute to ATOD use behavior. Consistent with this notion, youth ATOD prevention programs that target multiple factors have enjoyed the most success in reducing and preventing ATOD problems. Despite the central role of schools in the implementation of ATOD prevention projects as well as the theoretical role school-related factors have in the etiology of ATOD problems (Hawkins *et al.*, 1992), there has been no research examining the relative contribution of other school-level educational alternatives in lowering juvenile involvement in substance abuse practices. These innovative and after-school programs might help lower youth involvement in ATOD use through engaging and stimulating activities.

To date, most analyses involving the effect of school-level characteristics on juvenile outcomes have been primarily focused on different types of student outcomes, such as high school graduation rates and youth labor market earnings rather than on substance abuse (e.g. Altonji & Dunn 1996; Card & Krueger 1996; Kaestner, 1991; Loeb & Bound 1996). Furthermore, the measures of school-level inputs have been generally limited to student-to-teacher ratios and the dollar expenditures per pupil, with little to no attention paid to how the money was spent. Amuedo-Dorantes and Mach (1999) show

the importance of an efficient distribution of educational spending instead of simply augmenting schools' spending when targeting juvenile involvement in various illegal practices, including alcohol and other drug abuse. In particular, programs such as "gifted and talented," "homework hotline," and "mentoring" are found to lower juvenile criminal involvement and delinquent participation, with their effectiveness varying across specific types of offenses.

While recognizing the important value of individually based approaches to juvenile ATOD practices, we address the policy role that educational institutions play in possibly deterring and reducing juvenile substance abuse practices through the implementation of innovative and after-school programs. The *longitudinal* analysis allows us to gauge the responsiveness of students' *substance abuse practices* to various programs and schools' initiatives *over time while controlling for youth, family, and school unobservable characteristics*.

#### THEORETICAL FRAMEWORK AND EMPIRICAL METHODOLOGY

As is common in this literature, students are assumed to behave as rational decision-makers (Yamada *et al.*, 1996). Each youth chooses a level of substance use so as to maximize his or her expected utility in each period given demographic, family, school, and neighborhood characteristics. Consequently, assuming that the likelihood of smoking tobacco, drinking alcohol, and using marijuana has a linear reduced form, we can estimate the probability of observing a youth using ATOD using a Probit random-effects model. The random effects estimator takes into account the group-wise heteroscedasticity introduced by using aggregate-level data in conjunction with individual-level data. This estimation technique is asymptotically equivalent to the weighted-GLS estimator, which accounts for any correlation across panels due to the use of aggregate data. The estimated coefficient vector from the random effects Probit model captures the impact of innovative and after-school programs on the youth's likelihood of substance use while controlling for the probability of arrest, and the youth's personal, family, and neighborhood characteristics.

While the Probit random-effects estimations inform us on the likelihood that the youth might smoke cigarettes, drink alcohol, or use marijuana, it is also of interest to examine the effect that school inputs have on the frequency with which such activities are

carried out. This is particularly important when trying to affect juvenile substance use in a progressive fashion. In a manner similar to that described above, we can examine the frequency of involvement in substance use practices. The data on the frequency of substance use by youths can be described as count data on the number of occurrences of an event, in this case, smoking cigarettes, drinking alcohol, or using marijuana. Therefore, we estimate our model assuming a Poisson distribution. As was the case previously, the combination of individual-level and neighborhood-level data requires us to account for the presence of possible group-wise heteroscedasticity. Thus, we estimate the count data models using a random-effects Poisson model. However, because the variation exhibited by our data is greater than that of a Poisson-like model, we estimate a random-effects negative binomial model (Greene, 2000). The time-invariant component of the random effects model is likely to capture fairly well most unobserved differences between youth attending schools offering these programs and youth who do not in our panel. Therefore, the estimated vector coefficient captures the effect of a variety of innovative and after-school programs on youths' frequency of substance use.

#### THE DATA

##### NLSY97 Rounds 1 and 2

Data on students' personal, school, and family characteristics and their involvement in delinquent and criminal practices come from the 1997 and 1998 rounds of the NLSY97. The NLSY97 is the newest of the NLS surveys. It collects information on approximately 9,000 respondents 12–16 years old as of December 31, 1996. Aside from collecting extensive information on youths' labor market participation, educational experiences, and families, the NLSY97 contains a self-administered section on criminal and delinquent practices, such as smoking tobacco, drinking alcohol, and using marijuana. Information regarding the frequency with which respondents got involved in such behaviors is collected after the respondent acknowledges participation. Studies have shown that respondents tend to honestly report about sensitive issues in the surveys self-administered supplements, providing some reassurance about using this data (Olsen, 1992). The NLSY97 also includes *general school descriptors*, such as school type (i.e. private, public, or other, such as alternative schools and home schooling), size and location (i.e. urban or

rural) that others have found to be important (Derek, 1997).

*Personal characteristics* contained in the NLSY97 include the years of schooling completed by the youth, which provides some information on the youth's ability when measured in conjunction with the youth's age. Other factors that may affect the youth's involvement in substance abuse practices and school productivity are school suspensions in the year *prior* to the current period (Grogger, 1998). Previous years' school suspensions may be indicative of a troubled youth more inclined to get involved in illegal practices. Finally, since *past* illegal behavior has been shown to be correlated with current illegal practices (Grogger, 1998), the number of times the youth has ever been arrested in the year prior to the sample period is included in the analysis.

Finally, the NLSY97 offers detailed information regarding various *household characteristics*, such as family environment, family composition, and income security, found to strongly affect youths' achievement (Neal, 1997). As shown by Grogger (1998), juvenile involvement in illegal practices may be started through exposure to siblings' own practices. We, therefore, include two dummies indicating whether the respondent has a sibling who was also interviewed and whether the sibling reported substance abuse similar in nature to the one being examined. Various studies have examined the effect that family structure might have on the youth's involvement in substance abuse practices (Garis, 1998; Johnson *et al.*, 1996). Therefore, we also control for the presence of biological parents as well as that of a father figure, regardless of their biological link to the youth. Finally, since family income has been found to be associated to juvenile involvement in substance abuse practices (Garis, 1998), we also include it, deflated using the consumer price indices at the MSA/PMSA level (U.S. Census Bureau, 2000).

While the NLSY97 provides extensive information on the youths' substance-abuse practices, personal, and family characteristics, it lacks detailed information regarding the endowments and curricula offered by the schools attended by the NLSY97 youth. Therefore, we combine the NLSY97 data with QED data.

#### QED Database

The QED is a comprehensive national database of schools containing information on all public and nonpublic schools in the U.S., including K-12, elemen-

tary, middle/junior high, senior high, and special education/adult education schools. This study makes use of the data on the schools attended by the NLSY97 youth. The QED survey provides school instructional and noninstructional expenditures per pupil capturing the magnitude of school spending. Additionally, it contains information regarding any special, unique, or innovative programs implemented by the school or district, such as extended day or after-school programs. Lastly, since 47% of juvenile illegal activities are committed during nonschool hours, with this number particularly rising during vacation periods (Snyder & Sickmund, 1997), a dummy variable identifying those schools offering classes year round is also included to examine its contribution to lowering juvenile participation in substance-abuse practices.

#### PRELIMINARY EVIDENCE ON JUVENILE SUBSTANCE USE

Tables 1 through 3 summarize juvenile patterns of substance use for the NLSY97 youth. According to Table 1, the percentage of youths who had ever smoked increased by 25% from 1997 to 1998. Furthermore, up to 39% of youths smoked in the last 30 days in 1998, which amounts to a 113% increase from the previous year. Among the youths who had ever smoked, the average youth started when he was about 12 years old. The addictive nature of cigarettes

Table 1. Cigarette Smoking Initiation and Frequency

	1997	1998
Ever smoked	0.391	0.489
Smoked in last 30 days	0.181	0.385
Average age first smoked	12.221 (2.513)	12.181 (2.536)
<i>Number of the past 30 days smoked</i>		
1 Day	17.27	13.18
2-3 Days	14.97	13.05
4-5 Days	8.14	7.82
6-10 Days	6.50	6.90
More than 10 days	53.13	59.05
average	15.449 (12.414)	17.459 (12.450)
<i>Average number of cigarettes smoked per day in last 30 days</i>		
1 Cigarette	32.89	28.32
2-5 Cigarettes	33.84	31.25
6-10 Cigarettes	18.31	20.07
10-20 Cigarettes	13.04	17.63
More than 20 cigarettes	1.92	2.72
average	5.514 (6.038)	6.615 (7.334)

Table 2. Alcoholic Beverage Initiation and Frequency

	1997	1998
Ever drank	0.430	0.608
Drank in last 30 days	0.193	0.443
Average age first drank	12.555 (2.683)	12.528 (2.712)
<i>Number of the past 30 days drank</i>		
1 Day	33.62	29.36
2-3 Days	33.15	30.39
4-5 Days	14.22	16.78
6-10 Days	10.51	13.28
More than 10 days	8.50	10.19
Average	4.073 (4.832)	4.715 (5.451)
<i>Average number of drinks consumed per day in last 30 days</i>		
1 Drink	29.60	25.80
2-3 Drinks	31.98	31.43
4-5 Drinks	16.51	18.28
6-7 Drinks	8.10	8.68
More than 7 drinks	13.81	15.81
Average	4.556 (7.581)	4.623 (6.550)
<i>Average number of days where more than 5 drinks were consumed</i>		
	2.091 (3.871)	1.927 (3.670)

is reflected by the increasing percentage of youths smoking more than 10 days per month and smoking more than 5 cigarettes per day as we move from 1997 to 1998.

Table 2 also depicts growing juvenile involvement in dangerous binge drinking from 1997 to 1998.

Table 3. Marijuana Initiation and Frequency

	1997	1998
Ever smoked marijuana	0.200	0.303
Smoked marijuana in last 30 days	0.087	0.213
Age first smoked marijuana	13.321 (2.090)	13.279 (2.158)
<i>Number of the past 30 days smoked marijuana</i>		
1 Day	24.36	26.41
2-3 Days	21.78	22.03
4-5 Days	11.84	11.51
6-10 Days	10.98	12.02
More than 10 days	31.05	28.04
Average	9.003 (9.542)	8.897 (10.003)
<i>Number of times smoked marijuana before or during school or work in last 30 days</i>		
1 Time	28.29	27.92
2-5 Times	32.68	31.70
6-10 Times	12.68	11.32
10-20 Times	15.12	12.83
More than 20 times	11.22	16.23
Average	8.176 (12.221)	8.417 (9.541)

Over this period, the percentage of youths who had tried alcohol grew by approximately 41%. The drinking initiation age remains the same as for smoking, that is, between 12 and 13 years of age. Finally, the percentage of youths drinking 4 days or more per month and having 4 or more drinks per day increased substantially from 1997 to 1998, reflecting, as in the case of tobacco, the addictive nature of alcohol.

As with tobacco and alcohol use, the percentage of youths who had ever smoked marijuana or had smoked marijuana in the last 30 days rose considerably from 1997 to 1998 by approximately 52% (see Table 3). In particular, 21% percent of youths used marijuana during the last month in 1998. Youths' repetitive use of marijuana, however, did not increase as much as that of tobacco or alcohol.

#### JUVENILE INITIATION IN THE USE OF TOBACCO, ALCOHOL, AND MARIJUANA

Table 4 displays the estimated coefficients and marginal effects from the random effects probit models of the likelihood of juvenile use of tobacco, alcohol, and marijuana in the last 30 days. The marginal effects provide information on the magnitude of the effect that a change in each of our independent variables has on the likelihood of substance use by the youth. Given the focus of this analysis, we will center our discussion on the significant role of schools on juvenile initiation to ATOD use. Even after controlling for personal, family, and neighborhood characteristics, results indicate that schools can affect the individual decision to consume any of the three substances. This is reflected by the significant role played by the type of school, general school endowments, and the school programs. However, the relative size of these estimates is small compared to that of other factors, in particular demographic and family characteristics. In the interest of space, only the results pertaining to schools are reported in the tables and discussed.

The first interesting result is the lower rate of juvenile initiation into cigarette and alcohol use in public schools relative to nonpublic schools. Rates are approximately 2% points lower in public schools than in nonpublic schools. Second, school endowments, as reflected by the discretionary dollars per pupil, also affect juvenile involvement in substance abuse practices. In particular, an increase in *per pupil* spending of \$100 decreases the probability of smoking by approximately 3% and the likelihood of marijuana use by less than 1%. Third, the offering of year round

Table 4. Estimated Coefficients and Marginal Effects from Random Effects Probit Models

	Smoked cigarettes past 30 days		Drank alcohol in past 30 days		Smoked marijuana in past 30 days	
	Coefficient	Marginal effect	Coefficient	Marginal effect	Coefficient	Marginal effect
School characteristics						
Public School	-0.265*** (0.084)	-0.024	-0.105* (0.063)	-0.019	-0.098 (0.112)	0.000
DDP ( <i>t</i> -1)	-0.358*** (0.129)	-0.031	-0.097 (0.073)	-0.017	-0.610*** (0.224)	-0.001
Year round ( <i>t</i> -1)	-0.939*** (0.348)	-0.038	0.016 (0.212)	0.003	-0.085 (0.392)	0.000
Attendance monitoring ( <i>t</i> -1)	0.060 (0.144)	0.005	-0.113 (0.112)	-0.019	0.092 (0.193)	0.000
Gifted and talented ( <i>t</i> -1)	-0.247* (0.130)	-0.018	-0.198** (0.099)	-0.033	-0.149 (0.173)	0.000
Homework hotline ( <i>t</i> -1)	0.033 (0.170)	0.003	0.053 (0.130)	0.010	0.214 (0.221)	0.000
International baccalaureate ( <i>t</i> -1)	-0.745** (0.375)	-0.034	-0.284 (0.262)	-0.043	-0.426 (0.477)	0.000
Mentoring ( <i>t</i> -1)	0.046 (0.168)	0.004	0.049 (0.129)	0.009	0.262 (0.220)	0.001
Outcomes ( <i>t</i> -1)	-0.165 (0.207)	-0.012	-0.015 (0.156)	-0.003	0.045 (0.260)	0.000
Progress reports ( <i>t</i> -1)	0.026 (0.153)	0.002	0.060 (0.118)	0.011	0.009 (0.205)	0.000
Extended ( <i>t</i> -1)	0.170 (0.198)	0.017	0.179 (0.151)	0.036	0.213 (0.256)	0.000
21st century ( <i>t</i> -1)	-0.409 (0.271)	-0.025	0.163 (0.201)	0.032	0.163 (0.331)	0.000
Number of obs	6,618		6,619		6,619	
Number of groups	5,666		5,667		5,667	
Wald chi2(35)	104.59		205.28		70.61	
Log likelihood	-2937.01		-3167.61		-1864.25	

*Note.* \*\*\* indicates significance at the 1% level, \*\* indicates significance at the 5% level, and \* indicates significance at the 10% level. Standard errors are shown in parentheses. Marginal effects calculate the probability of a positive outcome assuming that the random effect for the observation's panel is zero. All models also control for gender, race, Hispanic ethnicity, Piat scores, age, education, previous suspensions and arrests, household composition and income, parental religious upbringing, sibling involvement in similar activities, whether the youth lives in an urban area or MSA, and a measure of juvenile arrests within the county. Full results are available from the authors upon request.

schooling is associated with a decrease in juvenile initiation to cigarette smoking of approximately 4%. Finally, some school programs appear to play a role in juvenile initiation into ATOD use. Specifically, schools offering gifted and talented programs display 2% and 3% lower likelihood of juvenile initiation in smoking cigarettes and in drinking alcohol, respectively, than schools lacking these programs. Similarly, juvenile initiation into cigarettes is 3% less likely in schools offering international baccalaureate programs than in schools not offering this program. In sum, gifted and talented and international baccalaureate programs appear to be effective at lowering the likelihood of juvenile initiation to smoking cigarettes. However, none of the innovative programs being examined seems to significantly affect the likelihood of juvenile initiation into marijuana use. We now examine whether any of

these programs can be effective at deterring juvenile repetitive use of these illegal substances over time.

#### JUVENILE REPETITIVE USE OF TOBACCO, ALCOHOL, AND MARIJUANA

Table 5 contains the estimated coefficients, their standard errors, as well as the computed incidence rate ratios (IRR) of the random-effects negative binomial models of juvenile frequency of cigarette, alcohol, and marijuana use. These IRR tell us how the youth's ATOD use rate changes as a variable changes by one unit, holding all other independent variables constant. For instance, the IRR for the public school dummy in the negative binomial regression for the youth's cigarette use of 0.858 can be interpreted

Table 5. Estimated Coefficients and Incidence Rate Ratios From Random Effects Negative Binomial Regression Models

	Cigarettes smoked on past 30 days		Alcoholic drinks in past 30 days		Times smoked marijuana in past 30 days	
	Coefficient	Incidence rate ratio	Coefficient	Incidence rate ratio	Coefficient	Incidence rate ratio
School characteristics						
Public school	-0.153* (0.089)	0.858	-0.100 (0.077)	0.904	-0.079 (0.198)	0.924
DDP ( <i>t</i> -1)	-0.005*** (0.002)	0.995	0.000 (0.001)	1.000	-0.008* (0.005)	0.992
Year round ( <i>t</i> -1)	-0.829** (0.384)	0.436	-0.055 (0.265)	0.947	-1.395 (1.070)	0.248
Attendance monitoring ( <i>t</i> -1)	-0.015 (0.161)	0.985	0.019 (0.134)	1.019	-0.414 (0.358)	0.661
Gifted and talented ( <i>t</i> -1)	-0.201 (0.144)	0.818	-0.233** (0.121)	0.792	-0.093 (0.318)	0.911
Homework hotline ( <i>t</i> -1)	0.274 (0.189)	1.316	0.042 (0.161)	1.042	0.282 (0.417)	1.326
International baccalaureate ( <i>t</i> -1)	-0.732* (0.401)	0.481	-0.238 (0.306)	0.788	-0.815 (0.867)	0.442
Mentoring ( <i>t</i> -1)	-0.153 (0.231)	0.858	-0.065 (0.186)	0.937	0.424 (0.451)	1.528
Outcomes ( <i>t</i> -1)	-0.051 (0.170)	0.950	0.037 (0.142)	1.038	-0.191 (0.381)	0.826
Progress reports ( <i>t</i> -1)	0.008 (0.225)	1.008	0.249 (0.183)	1.282	0.656 (0.464)	1.928
Extended ( <i>t</i> -1)	0.291 (0.186)	1.337	0.145 (0.154)	1.156	-0.230 (0.419)	0.795
21st century ( <i>t</i> -1)	-0.660** (0.336)	0.517	-0.021 (0.236)	0.979	0.361 (0.580)	1.435
Number of obs	6,174		6,226		6,269	
Number of groups	5,350		5,407		5,413	
Wald chi2(35)	1032.65		3232.48		2398.85	
Log likelihood	-4971.84		-5681.58		-1268.90	
			Likelihood ratio test of Poisson specification			
Chibar2(01)	1.10E + 04		1.00E + 04		1.60E + 04	
Prob >= chibar2	0.000		0.000		0.000	

Note. \*\*\* indicates significance at the 1% level, \*\* indicates significance at the 5% level, and \* indicates significance at the 10% level. Standard errors are shown in parentheses. All models also control for gender, race, Hispanic ethnicity, Piat scores, age, education, previous suspensions and arrests, household composition and income, parental religious upbringing, sibling involvement in similar activities, whether the youth lives in an urban area or MSA, and a measure of juvenile arrests within the county. Full results are available from the authors upon request.

as 14% less smoking in public versus other types of schools, ceteris paribus.

The results indicate that most of the factors affecting our youth's initiation into ATOD use also affect juvenile repetitive use of these substances. A \$100 increase in discretionary spending per pupil lowers the number of cigarettes smoked by the youth by approximately 0.5% as well as the number of times the youth smoked marijuana during the past month by about 1%.

In addition, a variety of school programs affect juvenile substance use. First, juvenile cigarette use is reduced by up to 56% in schools offering year round programs relative to schools without year round classes. A reduction of 56% in the average

number of cigarettes smoked by youths reporting underage cigarette use represents up to 2 fewer packs of cigarettes per month. Second, gifted and talented programs appear effective at reducing juvenile repetitive use of alcohol. Therefore, gifted and talented programs not only seem to limit juvenile initiation into cigarette smoking and drinking as discussed in the previous section, but also help reduce juvenile alcohol use by approximately 20%. Among youths reporting underage drinking, this reduction amounts to approximately 4 fewer alcoholic drinks per month. Lastly, twenty-first century and international baccalaureate programs not only help diminish youths' initiation into smoking, but also reduce their repetitive use of cigarettes by about 50% each. Among

youths reporting underage cigarette use, these reductions amount to approximately 2 packs of cigarettes per month.

Such reductions have important health implications. In addition to its association to increased morbidity and mortality due to cancer, cigarette smoking has been identified as an early stage of substance use related to later involvement in both legal and illegal substance use (Bailey, 1992). In particular, a pattern of substance use progression in which cigarettes preceded the use of marijuana and prescribed psychoactive drugs has been found in men (Yamaguchi, 1984; Yamaguchi & Kandel, 1984). Among women they found cigarette use preceded the use of marijuana and other illicit drugs (Yamaguchi, 1984; Yamaguchi & Kandel, 1984).

History of alcohol use, particularly age of first use, is an important conceptual predictor of current alcohol use (Kandel, 1975, 1980). When viewed from a developmental perspective, onset of drinking represents a pathway into heavier drinking and other risk behaviors (Kandel, 1980).

Finally, marijuana use has also been found to be associated with problem behaviors among adolescents. In particular, marijuana users who begin their use before age 14 were found to be over seven times more likely to report using other drugs compared to those who use at a later age (Merrill *et al.*, 1999). In addition, Brook *et al.* (1999) found that early onset of marijuana use among adolescents was associated with not graduating from high school, delinquency, having multiple sex partners, perceiving drugs as not harmful, and associating with more peers with deviant behaviors. Furthermore, any lifetime use of marijuana has been found to be associated with both experimental and regular alcohol use for both male and female adolescents (Epstein *et al.*, 1998) as well as of other illicit substances (Kandel *et al.*, 1986).

#### CONCLUSION AND FUTURE RESEARCH

The current research adds to the existing literature on juvenile substance use practices by examining the role that schools might play in reducing early initiation and repetitive use. While schools are a poor substitute for parental involvement, our youths do spend nearly a third of their day at school and it makes sense to ensure that the programs they are introduced to are as effective as possible. This paper investigates the potential spillover effects the implementation of these programs may have on youth ATOD behavior. Our results indicate the Department

of Education's proposed initiative to improve the nation's schools through increased school funding and implementation of after-school and innovative programs has had some success in reducing the probability of juvenile initiation and use of cigarettes, alcohol, and marijuana. With respect to schools' funding, we find that higher discretionary dollars per pupil are typically linked to reduced rates of juvenile initiation and repetitive use rates of cigarettes and marijuana. Additionally, school curricula, as indicated by the implementation of year round classes and some innovative or after-school programs, can affect both juvenile initiation to tobacco and alcohol use and juvenile repetitive use of tobacco and alcohol possibly by keeping our youth safe and learning with programs that combine academic and formative activities along with extended student supervision. We examine *year round*, *gifted and talented*, *attendance monitoring*, *homework hotline*, *international baccalaureate*, *extended-day*, and *mentoring*, programs. While these programs are not implemented to address substance use problems among the student body, we do find that the implementation of these programs is often accompanied by a reduction in juvenile initiation and repetitive substance use. In particular, we find that juvenile initiation to cigarette use is approximately between 2% and 3% lower among youths attending schools with gifted and talented and international baccalaureate programs. Furthermore, some of these programs are also linked to lower rates of juvenile repetitive cigarette use. For instance, juvenile repetitive cigarette use is approximately 54%, 52%, and 48% lower among youths attending schools offering year round classes, international baccalaureate, and twenty-first century programs, respectively. Similarly, juvenile initiation to alcohol use and juvenile repetitive use of alcohol are approximately 3% and 20% lower, respectively, among youths in schools offering gifted and talented programs.

In general, our results support the notion that schools do matter in reducing juvenile involvement in ATOD use, although they are definitely not the most important determinant. In particular, schools' endowments and curricula, as captured by their year round instruction and implementation of innovative and after-school programs, may help keep our youth safe and learning with programs that combine academic and formative activities along with extended student supervision. These findings illustrate the potential of schools, schools' endowments, and schools' implementation of year round classes as well as innovative and after-school programs on juvenile substance

abuse practices. Therefore, the results have a direct policy application by informing the debate on how to most efficiently employ educational spending.

However, because the data do not contain information on the quality of the programs, the level of youth involvement in each case, or the cost of implementing and maintaining them, these results should be interpreted with care. More information on the quality and other program specifics than are currently available, as well as future research examining the differential impact of school curricula on juvenile substance use by gender, race, or geographic area in the country, would be useful for further program evaluation and policy suggestions on how to most efficiently distribute educational spending when targeting specific juvenile offenses.

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