

**Are American Eighth Graders in Schools with Older Students  
More Likely to Smoke and Drink Alcohol?**

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## **Are American Eighth Graders in Schools with Older Students More Likely to Smoke and Drink Alcohol?**

**Background:** A large amount of research suggests that the peer group environment is one of the most important factors in determining whether adolescents engage in substance use. This study examined whether 8<sup>th</sup> graders in United States schools with older students (e.g. grades 8-12) were more likely to smoke and drink alcohol than 8<sup>th</sup> graders in the usual middle school format (grades 6-8). This concern has been raised by parents and school officials in discussions about whether to include 8<sup>th</sup> graders in schools with older students, but there is no evidence on the matter to our knowledge.

**Methods:** Smoking and drinking rates were compared across school types using two nationally representative survey data sets including eighth graders: the National Educational Longitudinal Survey (1988) and the National Longitudinal Survey of Adolescent Health (1994-1995). Perceptions of problems with alcohol, drugs, weapons, and safety were also examined as secondary outcomes. Multivariate regressions were used to control for individual and school characteristics.

**Results:** For 8<sup>th</sup> graders, being in a school with older students was not associated with an increased likelihood of smoking or drinking. On the other hand, being in a school with older students was associated with an increased likelihood of perceiving serious problems at school with alcohol, drugs, and weapon possession.

**Conclusion:** 8<sup>th</sup> graders in the United States who attended schools with older students were not more likely to smoke or drink, despite the fact that they were exposed to schoolmates with much higher levels of substance use.

**Keywords:** adolescents; substance use; smoking; alcohol use; peer effects

## 1. Introduction

The early teenage years represent a critical time for the possible development of substance use behaviors [1, 2]. Steep increases in rates by age illustrate the importance of this period. For example, daily smoking prevalence in the United States in 2004 was 4.4 percent among 8<sup>th</sup> graders, 8.3 percent among 10<sup>th</sup> graders, and 15.6 percent among 12<sup>th</sup> graders [3].

A large amount of research suggests that the peer group environment is one of the most important factors in determining whether adolescents engage in substance use during these formative years.[4-8] Studies in this literature have employed a variety of sophisticated and creative empirical approaches, but they have generally shared a common theme: they have examined correlations between individual behaviors and peer group behaviors, controlling for individual and environmental confounding factors. A potential limitation of this approach is that adolescents within a peer group are likely to share unobservable characteristics and environmental influences that are at least partly responsible for their similarities in behaviors. Recent studies specifically designed to address this problem suggest that peer effects may be smaller than previously found.[9, 10] Another potential limitation of focusing on correlations between behaviors among peers is that the estimated “peer effect” could be due to any of a number of specific mechanisms (e.g. availability, information, preferences) and therefore may not have a single, unambiguous connection to a policy remedy.[11]

This study examined the effect of a specific type of peer environment. The analysis took advantage of a natural experiment involving eighth graders (who are typically 13-14 years old) in the United States school systems. In recent years most eighth graders attended middle schools (grades 6-8), but a substantial portion attended schools with different grade spans, including those with students up through 12<sup>th</sup> grade in many cases. These latter schools exposed 8<sup>th</sup> graders to older students with substance use rates several times higher than that of students in grades 6-8.

The specific research question was whether 8<sup>th</sup> graders in schools with older students were more likely to smoke and drink alcohol than 8<sup>th</sup> graders in the usual middle school setup. This concern has been raised by parents and school officials in discussions about whether to include 8<sup>th</sup> graders in schools with older students [12], but there is no evidence on the matter to our knowledge.

## **2. Methods**

### **Data Sources**

Two nationally representative data sets were used for this study: the National Educational Longitudinal Survey (NELS) and the National Longitudinal Survey of Adolescent Youth (AddHealth). The base year samples of eighth graders in each data set were included. NELS had the advantage of a larger sample (24,599 8<sup>th</sup> graders in 1019 schools) than AddHealth (10,681 8<sup>th</sup> graders in 80 schools). The larger number of schools was particularly useful for this analysis, in which the key exposure variable was at the school

level. AddHealth, on the other hand, had two advantages relative to NELS: it included information about drinking and smoking whereas NELS only had information about smoking, and it was more recent (1994-1995 compared to 1988).

NELS was administered to respondents during the months of January through June, which was the second half of the 1987-1988 school year. The majority of these surveys took place in March or April; thus, most students had experienced at least several months of exposure to their current school environment. AddHealth, by contrast, was administered to most students in October and November of 1994, meaning that students who were in their first year at school had only experienced a couple of months there.

### **Main Outcomes**

The key outcomes in the analysis were dichotomous measures of self-reported cigarette smoking and alcohol drinking. Self-reports in both data sets were obtained through self-administered paper surveys. Response validity was not assessed chemically or otherwise in either survey, but underreporting would only be a problem if it occurred at different rates across school types. With the NELS data students were categorized as smokers if they reported usually smoking at least 1-5 cigarettes per day. With the AddHealth data students were categorized as smokers if they reported smoking cigarettes in the past 12 months "nearly every day" and they were categorized as drinkers if they reported drinking alcohol once or more per month on average over the past 12 months.

**Secondary Outcomes**

Students' perceptions of problems with risky behaviors in their schools were assessed as secondary outcomes. With the NELS data, these variables included whether students perceived alcohol use, illegal drugs, and weapon possession, respectively, to be serious problems at school, and also whether students agreed with the statement "I don't feel safe at school." With the AddHealth data, a variable was constructed indicating whether students disagreed with the statement "I feel safe in my school."

**Key exposure variables**

Eighth graders' schools were coded into the following categories based on their lowest and highest grade levels: A) 5<sup>th</sup> or lower through 8<sup>th</sup>; B) 6<sup>th</sup> or 7<sup>th</sup> through 8<sup>th</sup>; C) 6<sup>th</sup>, 7<sup>th</sup>, or 8<sup>th</sup> through 9<sup>th</sup>; D) K through 12<sup>th</sup>; and E) 6<sup>th</sup>, 7<sup>th</sup>, or 8<sup>th</sup> through 12<sup>th</sup>. The main comparison of interest was category B, which included the most common setup (middle school with grades 6-8), versus categories D, and E, which each had students through 12<sup>th</sup> grade.

**Control variables**

Several individual and school characteristics were controlled for in multivariate analyses. Individual variables included sex, self-reported race categories, whether the respondent was living with each biological parent, average educational attainment of parents (in years), and family income quartile. School variables included school type (public, Catholic private, other private), 8<sup>th</sup> grade enrollment (categorized as 0-99, 100-299, or 300+), area type (urban, suburban, or rural), region of the country, and a set of variables

related to school policies for punishing substance use offenders. These school policy variables were modeled as dichotomous indicators for, respectively, whether students were expelled for first alcohol use, first drug use, and repeated smoking offenses.

### **Preliminary Analysis**

A set of short preliminary analyses was done to get a better sense of how the main analysis should be interpreted. More specifically, these preliminary analyses examined two issues: first, whether the peer environment for 8<sup>th</sup> graders really appeared to differ much across schools with different grade spans; second, how comparable these school types and their student populations were. The first issue was examined in the AddHealth data by calculating the extent to which 8<sup>th</sup> graders reported having friends in higher grades and by calculating the extent to which substance use rates increased as a function of grade level. The second issue was examined using AddHealth and NELS data separately by comparing means of the control variables listed above for the different categories of school grade spans.

### **Main Analysis**

The main analysis first consisted of a univariate cross-sectional analysis comparing outcome measures across school types as defined by the main exposure variables. Next, a multivariate analysis was conducted using cross-sectional linear regressions. In these regressions the most common school type (type B, with grades 6 or 7 through 8) was defined as the baseline (the omitted category).

In all analyses sample weights were used to adjust for non-response and over-sampled populations. Ninety five percent confidence intervals for point estimates were constructed using a linearization-based variance estimation that accounted for the stratified, clustered sampling designs.[13] All statistical analyses were done with Stata 8.0 (College Station, TX, 2003).

### **Sensitivity Checks**

The multivariate analysis was tested for sensitivity to two alternative specifications. First, logistic regressions were used instead of linear regressions. Second, the key outcomes in the AddHealth data, smoking and drinking, were constructed using different cutoff points. Students were considered smokers if they reported smoking at least "once or twice" per week over the past 12 months and likewise they were considered drinkers if they reported drinking at least "once or twice" per week over the past 12 months.

## **3. Results**

### **Preliminary Analysis**

In the AddHealth sample, of 1,497 8<sup>th</sup> graders in schools with grade levels up to 12<sup>th</sup> grade (i.e. schools of type D and E as described earlier), 495 reported having at least one close friend in 9<sup>th</sup> grade or higher. 294 reported having at least one close friend in 10<sup>th</sup> grade or higher, 194 having at least one in 11<sup>th</sup> or higher, and 121 having one in 12<sup>th</sup> grade. These numbers became even higher, of course, when considering the number of students with close friends *or close friends-of-close friends* who were in higher grades.

This degree of friendships across grades, considered with the steep rise in smoking and drinking by grade level (Table 1), suggests that 8<sup>th</sup> graders in schools with older students may have been exposed to much “worse” peer environments.

Tables 2 and 3 show mean values of individual and school characteristics across school types (A, B, C, D, and E). In the NELS sample (Table 2), students in school types B and C were similar to each other on average in nearly every respect. They were different from students in A, D, and E in that they were more likely to be of a minority race, in a public school, and in a larger school, and less likely to be in a rural school.

In the AddHealth sample (Table 3) there are only 2 schools of type C, because the shift in the United States from junior highs (grades 7-9) to middle schools (6-8) became nearly complete between 1988 and 1994. Given the smaller number of schools of certain types in AddHealth, perhaps the most meaningful comparison was school type B to school types D and E. Notable differences across these types include the following: students in school type D were more likely to be white, to attend a private school, and to attend a smaller school; students in school types D and E were more likely to attend rural schools; and students in school type E were more likely to be in the Northeast, less likely to be in the South, and less likely to be subject to expulsion policies for substance use offenses.

### **Main Analysis**

Given the many differences across school types in Tables 2 and 3, unadjusted comparisons of outcomes were likely to be confounded except in the comparison of types

B and C in the NELS sample. In this comparison (Table 4), students in type C (with older schoolmates as compared to type B) had a one percentage point higher smoking rate and were significantly more likely to perceive serious problems with alcohol, drugs, and weapons at their schools.

In the multivariate regression results (Table 5), the difference in smoking rates between school types B and C in the NELS sample was no longer significant. The higher rates of perceived problems with alcohol and drugs at school remained significant. Students in school type E in the NELS sample were no more likely to smoke than students in school type B but were more likely to perceive problems with alcohol drugs, and weapons at school. There were no significant differences in outcomes between types A or D compared to B.

In the AddHealth sample, students in school types D and E appeared, if anything, to be *less* likely to smoke and drink than those in type B, although the differences were not significant at the 95 percent confidence level. Students in school type A were clearly less likely to smoke and drink than those in type B, and also less likely to feel unsafe at school.

In sensitivity checks using logistic regressions and different cutoff points for defining smokers and drinkers, the basic pattern of results described above was unchanged.

Eighth graders in schools with older students were no more likely to smoke or drink than those in middle schools.

#### 4. Discussion

For 8<sup>th</sup> graders, being in a school with older students was not associated with an increased likelihood of smoking or drinking, even after adjusting for observable individual and school characteristics. These results were consistent with recent findings suggesting that peer effects related to youth substance use may be smaller than commonly thought [9,10], although it should be noted that the present study examined a specific type of peer effect that is not directly comparable to those in previous studies.

On the other hand, being in a school with older students *was* associated with an increased likelihood of perceiving serious problems at school with alcohol use and drug use. This latter finding was not surprising considering the much higher rates of substance use by students in grades 9-12. It would be useful to know whether these increased perceptions of problems translated into decreased quality of life (through heightened anxiety for example) or whether they represented more benign observations of older schoolmates' behaviors. On this point there was some marginally significant evidence in the NELS sample that 8<sup>th</sup> graders in schools with older classmates were more likely to feel unsafe at school.

The main limitation of this study was the nonrandomized nature of the natural experiment comparing students across school types. Multivariate analysis was used to control for observable differences, but there may have been important unobservable differences. Thus, alternative interpretations of the results could not be ruled out. One possible

interpretation is that older schoolmates did not have substantial negative influences on 8<sup>th</sup> graders. Another is that these negative influences existed but were offset by protective measures that could not be observed in the data, such as more vigilant schools and parents, or even physical barriers on school grounds. More detailed data on such measures would permit these alternatives to be disentangled. These additional analyses, however, would not change the basic conclusion of this study, which school officials, parents, and others should find reassuring: 8<sup>th</sup> graders in the United States who attended schools with older students were not more likely to smoke or drink, despite the fact that they were exposed to schoolmates with much higher levels of substance use.

*Conflicts of Interest Statement: There were no conflicts of interest to report in this study.*

*Ethical Background:* This study was approved by the local institution's Health Sciences Institutional Review Board.

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**Table 1: Smoking and Drinking Prevalence (%) by Grade in AddHealth (1994-1995)**

Grade	7th	8th	9th	10th	11th	12th
N	9,865	9,856	15,891	15,383	13,701	12,228
Smoking	3.3	5.1	11.8	13	14.5	16.7
Drinking	9.8	18	28.8	34.2	40	46.2

a) Smoking defined as smoking "nearly every day" over the past 12 months

b) Drinking defined as drinking alcohol at least "once or twice a month" over the past 12 months

**Table 2: Student-level Means of Characteristics, by School Type, NELS (1988)**

School type:	A	B	C	D	E	ALL
	5th or lower -> 8th	6th or 7th -> 8th	6th, 7th, or 8th -> 9th	K -> 12th	6th, 7th, or 8th -> 12th	
N (students)	5,407	10,498	3,820	1,518	2,352	24,599
N (schools)	248	438	164	72	97	1,019
<i>Student Characteristics</i>						
Age	14.3	14.4	14.4	14.4	14.4	14.4
Female	49.6	50.1	50.0	50.5	49.2	49.9
White	74.8	64.1	66.9	83.3	82.4	68.6
Black	10.6	14.9	16.0	2.5	6.4	13.2
Hispanic	7.9	13.2	9.3	3.7	3.3	10.4
Asian or Pacific Islander	2.9	3.5	4.1	4.0	1.9	3.5
American Indian	3.7	4.4	3.7	6.5	6.0	4.2
Lives with Father	73.1	66.2	66.8	79.5	74.6	68.8
Lives with Mother	92.7	90.9	91.4	94.4	91.8	91.6
Parents' Education (Average)	13.2	13.0	13.1	13.8	12.8	13.1
<i>School Characteristics</i>						
Public	60.3	99.3	99.3	50.6	89.5	88.0
Private, Catholic	31.7	0.5	0.5	0.0	5.1	7.6
Private, Other Religion	6.4	0.1	0.0	28.3	3.2	2.9
Private, Non-religious	1.5	0.1	0.2	21.1	2.2	1.5
8th grade enrollment: 0-99	72.9	5.5	3.6	88.8	59.7	28.2
8th grade enrollment: 100-299	26.8	56.7	53.0	8.7	36.6	45.0
8th grade enrollment: 300+	0.4	37.8	43.5	2.5	3.7	26.7
Urban	26.7	23.1	32.3	23.7	9.5	25.1
Suburban	42.4	48.8	40.3	26.5	32.6	43.6
Rural	30.8	28.1	27.4	49.8	57.9	31.3
Northeast	30.6	13.9	14.5	18.0	22.7	19.2
Northcentral	34.4	22.4	20.1	23.2	41.9	25.7
South	24.0	40.2	39.2	43.8	27.7	35.4
West	11.0	23.4	26.2	15.0	7.7	19.7
Expulsion for First Alcohol Use	32.7	14.6	11.7	43.5	15.6	19.3
Expulsion for First Drug Use	38.5	22.7	19.9	52.4	27.5	27.4
Expulsion for Repeated Smoking	40.8	14.9	13.8	48.3	14.4	21.4

**Table 3: Student-level Means of Characteristics, by School Type, AddHealth (1994-1995)**

School type:	A 5th or lower -> 8th	B 6th or 7th -> 8th	C 6th, 7th, or 8th -> 9th	D K -> 12th	E 6th, 7th, or 8th -> 12th	ALL
N (students)	422	8,313	449	241	1,256	10,681
N (schools)	8	46	2	12	12	80
<i>Student Characteristics</i>						
Age	13.4	13.5	13.3	13.4	13.5	13.4
Female	50.4	48.2	50.0	47.0	48.2	48.5
White	81.3	59.3	22.3	82.0	63.8	62.2
Black	6.5	26.8	63.1	10.4	11.2	23.3
Asian or Pacific Islander	3.7	3.3	4.8	3.5	10.5	4.0
American Indian	5.4	7.6	11.3	5.4	9.8	7.6
Other Race	7.5	8.7	10.1	6.4	10.9	8.7
Lives with Father	82.1	73.0	63.7	80.9	76.7	74.5
Lives with Mother	92.9	91.1	88.4	95.0	88.8	91.2
Parents' Education (Average)	13.2	13.2	13.3	13.6	13.3	13.2
<i>School Characteristics</i>						
Public	83.3	98.4	100.0	48.7	100.0	94.3
Private, Catholic	16.7	1.6	0.0	0.0	0.0	3.1
Private, Non-Catholic	0.0	0.0	0.0	51.3	0.0	2.6
8th grade enrollment: 0-99	100.0	12.2	0.0	100.0	9.8	26.3
8th grade enrollment: 100-299	0.0	72.7	100.0	0.0	57.6	60.1
8th grade enrollment: 300+	0.0	15.0	0.0	0.0	32.6	13.7
Urban	16.7	26.7	60.0	40.1	15.4	26.2
Suburban	71.3	63.2	40.0	0.0	39.2	58.0
Rural	12.0	10.1	0.0	59.9	45.4	15.7
West	9.5	15.2	40.0	11.2	17.7	15.4
Midwest	41.8	29.6	0.0	32.4	32.8	30.5
Northeast	22.6	6.7	0.0	9.9	41.5	11.7
South	26.1	48.6	60.0	46.5	8.0	42.4
Expulsion for First Alcohol Use	17.8	26.5	60.0	41.8	17.8	26.5
Expulsion for First Drug Use	55.6	46.6	60.0	58.9	8.0	45.0
Expulsion for Repeated Smoking	30.5	8.3	0.0	23.3	0.0	10.5

**Table 4: Prevalence (%) of Smoking, Drinking, Perceived Problems, by School Type**

School type:	A 5th or lower -> 8th	B 6th or 7th -> 8th	C 6th, 7th, or 8th -> 9th	D K -> 12th	E 6th, 7th, or 8th -> 12th	ALL
<i>National Educational Longitudinal Survey (1988)</i>						
Smoking	<b>5.7*</b>	6.81	<b>7.9*</b>	<b>5.6*</b>	7.82	6.73
Perceptions of "Serious Problems" at School:						
Alcohol Use	<b>10.2*</b>	15.40	<b>19.4*</b>	<b>13.1*</b>	<b>21.1*</b>	15.32
Drug Use	<b>9.0*</b>	14.62	<b>19.2*</b>	<b>10.0*</b>	<b>16.5*</b>	14.20
Weapon Possession	<b>8.7*</b>	11.63	<b>13.7*</b>	<b>8.4*</b>	12.15	11.28
Do Not Feel Safe	<b>9.0*</b>	12.64	12.88	<b>8.9*</b>	12.07	11.83
<i>Add Health (1994-1995)</i>						
Smoking	4.07	5.12	3.22	4.42	<b>7.6*</b>	5.05
Drinking	16.71	17.92	<b>11.1*</b>	18.34	<b>15.6*</b>	17.98
Do Not Feel Safe	<b>9.6*</b>	13.85	17.04	<b>6.1*</b>	13.21	12.63

a) \* indicates the estimate is different from that of school type B at the 95 percent confidence level

b) Smoking in NELS data is defined as smoking at least 1-5 cigarettes per day on average over the past month

c) Smoking in AddHealth data is defined as smoking "nearly every day" over the past 12 months

d) Drinking is defined as drinking alcohol at least once or twice a month over the past 12 months

**Table 5: Regression-Adjusted Differences in Outcomes, Relative to School Type B**

School type:	A	B	C	D	E
	5th or lower - > 8th	6th or 7th -> 8th	6th, 7th, or 8th -> 9th	K -> 12th	6th, 7th, or 8th -> 12th
<i>National Educational Longitudinal Survey 1988</i>					
Smoking	-0.25 (-1.99, 1.48)		1.03 (-3.42, 2.39)	-0.51 (-3.82, 2.80)	0.42 (-1.51, 2.36)
Perceived "Serious Problems" at School:					
Alcohol Use	-1.28 (-4.03, 1.47)		<b>3.48*</b> (1.42, 5.53)	1.17 (-2.89, 5.23)	<b>7.52*</b> (4.23, 10.81)
Drug Use	-1.3 (-3.41, 0.82)		<b>4.51*</b> (2.57, 6.44)	0 (-2.90, 2.91)	<b>5.16*</b> (2.59, 7.73)
Weapon Possession	-0.44 (-2.43, 1.55)		1.33 (-0.39, 3.05)	-1.14 (-3.64, 1.37)	<b>2.89*</b> (0.62, 5.17)
Do Not Feel Safe	0.025 (-1.80, 1.85)		-0.084 (-1.76, 1.59)	2.69 (-0.61, 6.00)	2.07 (-0.13, 4.28)
<i>Add Health (1994-1995)</i>					
Smoking	<b>-5.84*</b> (-8.94, -2.74)		0.09 (-2.19, 2.37)	<b>-3.33*</b> (-6.35, -0.31)	-0.5 (-3.21, 2.22)
Drinking	<b>-11.4*</b> (-21.0, -1.70)		-3.93 (-10.3, 2.42)	-7.45 (-15.7, 0.83)	-3.23 (-6.80, 0.33)
Do Not Feel Safe	<b>-5.23*</b> (-10.5, 0.00)		-0.95 (-6.64, 4.73)	<b>-8.51*</b> (-15.1, -1.91)	-1.59 (-5.17, 1.98)

a) Each row presents a separate regression with estimated coefficients for each school type dummy (B is the omitted category).

b) Regressions include all independent variables shown in Tables 2 and 3 as well as SES quartile indicators

c) 95 percent confidence intervals are shown in parentheses below each point estimate

d) \* indicates the estimate is different from zero at the 95 percent confidence level

e) Smoking and drinking are defined as in Table 4