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paper 62

SUBSTANCE USE AND ACADEMIC SUCCESS: RESULTS FROM THREE LONGITUDINAL PANELS, INCLUDING ANALYSES OF ADJUSTMENTS FOR PANEL ATTRITION

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Peter Freedman-Doan
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Monitoring the Future: A Continuing Study of the Lifestyle and Values of Youth

As its title suggests, this study is intended to assess the changing lifestyles, values, and preferences of American youth on a continuing basis. Each year since 1975, about 17,000 seniors have participated in the annual survey, which is conducted in some 130 high schools nationwide. Since 1991, the study's annual surveys also have included surveys of similar nationally representative samples of eighth and tenth grade students. In addition, subsamples of seniors from previously participating classes receive follow-up questionnaires by mail each year.

This Occasional Paper Series is intended to disseminate a variety of products from the study, including pre-publication (and somewhat more detailed) versions of journal articles, other substantive articles, and methodological papers.

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The mailing address of Monitoring the Future is Institute for Social Research, The University of Michigan, P.O. Box 1248, Ann Arbor, MI 48106.

SUBSTANCE USE AND ACADEMIC SUCCESS: ANALYSES OF ADJUSTMENTS FOR PANEL ATTRITION IN THREE LONGITUDINAL PANELS

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ACKNOWLEDGMENTS

This occasional paper is intended to supplement the book, *The Education–Drug Use Connection: How Successes and Failures in School Relate to Adolescent Smoking, Drinking, Drug Use, and Delinquency* (Bachman et al., 2008). It contains expanded discussions of methods and additional discussion of some of the results presented in chapter 1 of the book. It is not intended to "stand alone" apart from the book.

The primary supplements to the book are: (1) detailed documentation of our adjustments for panel attrition in both the 8th-grade and 12th-grade panels, and (2) some additional analyses of the relationship between 8th-grade GPA and substance use in the 8th-grade panels.

This research was supported by the National Institute on Drug Abuse, U.S. Department of Health and Human Services (grants R01 DA01411 and R01 DA16575). The authors thank Kathryn Johnson and Tanya Hart for editorial assistance and Nicole Ridenour for assistance with the preparation of the figures.

METHODS

Samples and Survey Methods

The analyses in this occasional paper utilized panel data from the Monitoring the Future (MTF) project. Each year since 1975, MTF has obtained a nationally representative sample of about 15,000 high school seniors located in approximately 130 schools. From 1991 onward, it has also obtained similar independent samples of 8th- and 10th-grade students. Each year, participating schools and students were selected by a multistage sampling procedure. Approximately 60–70% of schools invited to participate agreed to do so. Other schools from the same sampling area were recruited to replace virtually all refusals, thereby avoiding geographical bias. The great majority of substance use variance lies within rather than between schools, so it is unlikely that school nonparticipation seriously biased the findings (Johnston, O'Malley, Bachman, & Schulenberg, 2006a). Professional interviewers administered confidential, self-completed questionnaires, usually in regularly scheduled class periods. Student participation rates were 90% among the 8th graders in 1991–1993, and averaged 81% among 12th graders in 1976–1984. Nonparticipation was due primarily to student absenteeism—fewer than 1.5% of students refused participation.

Follow-up questionnaires were mailed to selected participants, mostly at two-year intervals, as shown in the tables and figures below. Samples for the follow-up surveys were selected using stratified random procedures; substance users were oversampled in the 12th-grade cohorts, and those at higher risk for dropping out of school were oversampled in the 8th-grade cohorts. Target samples for the follow-up surveys were selected by stratified random processes such that among the 12th-grade cohorts most respondents were weighted equally (weights of 1.0), but those who reported daily use of marijuana and/or any use of other illicit drugs during the previous 30 days were selected with probability three times higher (and thus given weights of 0.333). Among the 8th-grade cohorts, four strata were developed based on factors predictive of dropping out of high school; those with higher risk of dropping out were oversampled, and those with lower risk were undersampled. Weights to correct for these differential sampling rates are applied throughout the analyses; consequently, the samples remain representative but have an extra degree of accuracy for dropouts and illicit drug users. Full details of sampling and survey procedures are provided elsewhere (Bachman, Johnston, O'Malley, & Schulenberg 2006; Johnston, O'Malley, Bachman, & Schulenberg, 2006a, b).

For the analyses included in chapter 1 of *The Education–Drug Use Connection*, we tracked substance use prevalence rates for three separate cohorts of adolescents and young adults: (1) a cohort initially sampled in 8th grade (modal age 14) in the years 1991–1993 and followed up every two years until 1999–2001 (modal age 22; hereafter, "8th-grade cohorts"); (2) a cohort initially sampled in 12th grade (modal age 18) in the years 1976–1982 and followed up at two-year intervals (beginning in 1977 for one half of the 1976 sample and 1978 for the remainder of the 1976 sample) until 1998–2004 (modal age 40; hereafter, "earlier 12th-grade cohorts"); and (3) a cohort initially sampled in 12th grade (modal age 18) in the years 1988–1994 and followed up at two-year intervals (beginning in 1989 for one half of the 1988 sample and 1990 for the remainder of the 1988 sample) until 1998–2004 (modal ages 27–28; hereafter, "later 12th-grade cohorts"). We chose to analyze the two sets of 12th-grade cohorts separately so as to

avoid blurring important distinctions; specifically, the earlier cohorts were generally higher in substance use and lower in educational attainment compared with the later cohorts.

The analyses of the 8th-grade panels documented here were restricted in the same fashion as the analyses in *The Education–Drug Use Connection*; we included only those respondents who gave valid gender identification, and participated in either Wave 4 or 5 of the data collection. Table 1 provides full details of target sample sizes, obtained samples, and response rates. The analyses of the 12th-grade cohorts were restricted to respondents who gave valid gender identification, provided educational attainment data at the age 21–22 data collection, and participated at the final wave of data collection. Given these restrictions, panel retention rates are 70% for the 8th-grade cohorts, 55% for the earlier 12th-grade cohorts, and 48% for the later 12th-grade cohorts.

The overall weighted response rate of 70% for the 8th-grade cohorts is based on four different "risk strata." Tables A3.1a and b in *The Education–Drug Use Connection* display complete details of the response rates of each of those "risk strata." In sum, the response rate for the lowest risk stratum was 81%. The response rates for those in the next three higher risk strata were 71%, 57%, and 46% (for the highest risk stratum). This does not mean that our dropout samples reflect only 46% of the targets, because our initial sampling stratification according to risk of dropping out was by no means a perfect predictor of actual dropout; however, it does seem very likely that nearly half of those members of our original panel target sample who later dropped out of high school failed to participate in the age-22 survey. Our poststratification efforts (described below) were quite successful at reproducing base-year substance use prevalence rates (for the total target samples), but we suspect that those dropouts who did not participate in the age-22 follow-up may have been more involved in substance use than those who remained in the panel. So, if anything, the actual substance use rates among dropouts may be somewhat higher than our estimates presented here and in Bachman et al. (2008).

Panel Attrition

As in all longitudinal panel designs, differential panel attrition posed a significant threat to the descriptive value of the data collected and to the validity of all inferences. The research reported here is particularly vulnerable to the problems produced by differential panel attrition because both academic success and substance use, the main factors of interest, are correlated with panel attrition (Bachman, Wadsworth, O'Malley, Johnston, & Schulenberg, 1997; Bachman et al., 2002; Bryant, Schulenberg, Bachman, O'Malley, & Johnston, 2000; Schulenberg, Bachman, O'Malley, & Johnston, 1994). Table 2 (parts a, b, and c) illustrates the effects of differential panel attrition in our substance use data. Column 1 of Table 2 displays the substance use prevalence of each of our three cohorts for each wave of data collection. Column 2 displays the substance use prevalence for each of our cohorts as restricted by participation in later waves of data collection (as described above). Comparing the first reports of substance use prevalence in column 1 to the first reports of substance use prevalence in column 2 illustrates the effects of differential panel attrition. For example, in our 8th-grade cohorts, 8.4% of the males reported daily smoking at the first (and most representative) wave of data collection, modal age 14. Restricting our sample to those who would go on to participate in either the Wave 4 or Wave 5 data collection (modal ages 20 or 22) reduced the proportion of daily smokers left at modal age 14 to 6.5%. A similar pattern of differential panel attrition between users and nonusers is evident

in both sets of 12th-grade cohorts. We combined two strategies to address the problem of differential panel attrition: (1) poststratification reweighting of obtained data, and (2) limited imputation of missing substance use data. Poststratification reweighting applies compensatory weights to the obtained data. For our 8th-grade cohorts, we reweighted to restore (to the extent possible) the modal age 14 proportions of four factors: race, prevalence of substance use at modal age 14, and a combination of the risk-of-dropping-out score and 8th-grade GPA (see the appendix of *The Education–Drug Use Connection* for complete details). For both our earlier and later 12th-grade cohorts, we reweighted to restore three factors: the modal age 18 proportions of race (African Americans and Hispanics vs. others including missing data), 12th-grade GPA (coded into three levels: A's, B's as well as any missing data, C's and below), and a dichotomous measure of 12th-grade substance use (any heavy drinking [five or more drinks at one time] during the past two weeks, and/or daily smoking during the past 30 days, and/or any marijuana use during the past 30 days, and/or any cocaine use during the last 12 months vs. all others including missing data). Because all analyses were conducted separately by gender, all reweighting was also done separately by gender.

For the two cohorts of 12th graders, an earlier multiple classification analysis including all three factors listed above had indicated somewhat lower response rates among those individuals who had originally been oversampled by a factor of 3.0 (because of their reported use of illicit drugs during their senior year of high school). We first considered including this in our cross-tabulations for stratification; however, the increase from 24 to 48 cells proved too cumbersome. Moreover, it appeared that the poorer response among those originally oversampled did not interact importantly with the other stratification dimensions. Accordingly, we carried out an additional stratification step: using the new poststratification weights described above, we calculated how much we would need to adjust the weights of the originally oversampled individuals in order to maintain their contribution proportionate to their representation in the initial (weighted) target sample. This adjustment changed their weights only slightly; specifically, they were multiplied by a factor of 1.081, which had the effect of increasing a weight of 0.333 to 0.360.

Table 2 (parts a, b, and c) also displays the effects of the reweighting schemes on substance use measures. Comparing Wave 1 substance use data in column 2 (our sample restricted to those who participated in the final wave) to Wave 1 substance use data in column 3 (our restricted sample, now reweighted) shows the effects of applying our compensatory weights. Poststratification reweighting raises the prevalence of substance use back to near the levels in the Wave 1 obtained sample in column 1. This reweighting was undertaken in order to make our prevalence findings as *descriptively accurate* as possible. The reweighting did not, however, result in any appreciable changes in the *relationships* between academic attainment and the various substance use measures. Specifically, the correlations shown in Table 2a–c (comparing columns 1–4) are mostly quite similar; indeed, among the 12th-grade panels, the correlations across columns were often identical and rarely differed by more than 0.02. No respondent in the 12th-grade panels was given a weight higher than 2.0, and none in the 8th-grade panel was given

a weight higher than 1.5.[1] Table 2 shows that, in every category of substance use, the reweighted numbers of cases did not exceed the original weighted numbers of cases (which were also less than the actual numbers of original unweighted observations). We also note later (see Table 4) that in no category of educational attainment do the weighted numbers of cases exceed the actual numbers of original (unweighted) observations.

In addition to poststratification reweighting, we also employed data imputation to fill in missing data in the substance use measures. Table 3 shows the extent of missing data in the panels analyzed here. To fill in these missing data, we used IVEware software to conduct multiple imputation. The IVEware imputation process allowed us to specify explicit replacement models for variables with missing data and to condition the resulting imputed values on values in fully observed variables. Thus, in the 12th-grade panels, we were able to specify that our missing substance use variables were to be imputed as continuous variables with a nonzero probability mass at zero substance use ("mixed" type variables in the nomenclature of IVEware). In the 8th-grade panels, we used a slightly different procedure for imputing missing substance use variables. First, we specified that our missing substance use variables were to be imputed as two-level categorical variables: "use" or "nonuse." Every missing observation that IVEware imputed as "use" was then imputed again as a categorical variable to estimate level of use. In both the 8th-grade and 12th-grade panels, IVEware imputed plausible sets of missing values in the incomplete data set, resulting in ten completed data sets. Each data set was analyzed separately, and the resulting point estimates and correlations were combined (averaged). In addition, we carried out extensive computations in which all standard errors were adjusted to account for the range of missing values imputed by the IVEware software (Raghunathan, Lepkowski, VanHoewyk, & Solenberger, 2001). These calculations satisfied us that our "downweighting" of sample sizes, in the weighting scheme described above, was sufficient so that simple random statistics computations could be used to assess significance of product-moment and eta correlations. Specifically, 0.01 significance tests (two-tailed) were computed as 2.579 divided by the square root of weighted *N*-1.

Measures

In the analyses for chapter 1 of *The Education–Drug Use Connection*, we tracked substance use prevalence rates for adolescents and young adults, grouped according to the levels

[1]For the 8th-grade panel, we initially capped all weights at 2.0, as we did with the 12th-grade panels. However, because the target samples for the 8th-grade panels were initially selected so as to overrepresent those at greatest risk for dropping out of high school, the initial weights and also the initial poststratification reweighting resulted in larger numbers of weighted cases compared to actual numbers of observations in certain categories. (Most notably, those who later completed three or more years of college were initially undersampled to a considerable degree, and thus were originally assigned weights considerably larger than 1.0. Even after taking account of their higher-than-average panel participation, we found that those in these categories would have had weights averaging somewhat higher than 1.0.) In order to avoid weighted numbers of cases in any educational attainment category larger than the actual numbers of underlying observations, we multiplied all initial weights including poststratification (those initially capped at 2.0) by a factor of 0.75. As a result, 8th-grade panel weights were effectively capped at 1.5. This resulted in relatively conservative weighted numbers of cases for the 8th-grade panels overall. (Incidentally, the 12th-grade weighted numbers of cases are also conservative, albeit to a lesser extent, because the initial weights before poststratification were 1.0 for most individuals but 0.33 for those who had reported above-average illicit drug use in the 12th-grade survey; thus the initial 12th-grade panel weights averaged less than 1.0, and that remained true for their poststratification weights.)

of education they attained by modal ages 21–22. For our 8th-grade panel, we distinguished four levels of educational attainment: (1) high school dropouts (including those with a GED), (2) high school graduates with no college, (3) those with 1–2 years of college, and (4) those with three or more years of college. For both of our 12th-grade cohorts, we could distinguish only three levels, because virtually all dropouts had left school prior to the surveys administered late in senior year. This scale was developed from two measures, one asking about highest degree/diploma attained, and the other asking about number of years of schooling completed. Variations on this scale were examined, collapsing some categories, but such variations yielded no appreciable differences in correlations. Table 4 shows the frequency distributions of educational attainment in our cohorts. Further details are included in *The Education–Drug Use Connection*.

The following three dichotomous measures were used for reporting substance use prevalence: (1) daily use of cigarettes during the past 30 days, (2) any use of marijuana during the past 30 days, and (3) any consumption of five or more alcoholic drinks in a row on at least one occasion during the past two weeks. Full-scale versions of the measures (i.e., frequencies of each behavior during the past 30 days or two weeks) were used in correlational analyses. The measures are identical across all surveys and are described in detail in other publications (Bachman et al., 2006; Johnston et al., 2006a, b). Other analyses of Monitoring the Future panel data have found that patterns of cross-time correlations for substance use measures, including estimates of reliability, have been largely consistent over several decades (Bachman et al., 1997, 2002).

RESULTS

Chapter 1 of *The Education–Drug Use Connection*, and relevant sections of the appendix, contain results of our analyses of how educational success and attainment correlate with substance use (see Figures 1, 2, and 3). Here we provide additional data and a few comments about how early educational success and later educational success are linked to substance use. First, we should note that the "before" and "after" indicators of educational success (i.e., 8th-grade GPA, and educational attainment at age 22, respectively) are closely related; grade point average at the end of 8th grade predicted educational attainment eight years later, with product-moment correlations of 0.44 for males and 0.41 for females (data shown in Tables 4.1a and b of *The Education–Drug Use Connection*). Moreover, the two indicators, as Table 5 in this paper shows, had virtually identical correlations with the age-14 measures of substance use. We ran similar sets of correlations between our measures of academic success and substance use, this time excluding those who dropped out of high school in order to provide better comparability with the sample in our 12th-grade cohorts. Excluding dropouts reduces the size of all correlations. Nevertheless, the correlations between 8th-grade GPA and substance use from age 18 to age 22 showed a considerable degree of similarity to the correlations between age 21–22 academic attainment and substance use in the 12th-grade cohorts. Despite significant shifts in overall use rates over more than two decades, the relationships between academic success (measured at age 14 or at ages 21–22) and substance use appear robust.

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Table 1
Response Rates*

	Males			Females			Combined		
	Target	Obtained	%	Target	Obtained	%	Target	Obtained	%
12th-Grade Panels									
Base Years 1976–1984	5937.3	2957.0	49.8	6273.7	3763.0	60.0	12211.0	6720.0	55.0
Base Years 1988–1994	7190.0	2972.7	41.3	7597.7	4110.0	54.1	14787.7	7082.7	47.9
8th-Grade Panels									
Base Years 1991–1993	2885.4	1818.6	63.0	3050.4	2322.0	76.1	5935.8	4140.6	69.8

*All frequencies are weighted numbers of cases. Weights are standard selection weights as described in the text.

Table 2a
Comparison of Prevalence Rates of Substance Use: Numbers of Cases, and Correlations with Age-22 Academic Attainment (Modal Age 14, 1991–1993)

	Column 1			Column 2			Column 3			Column 4		
	Obtained sample Standard sampling weight		Pearson correlation with attainment	Restricted sample* Standard sampling weight		Pearson correlation with attainment	Restricted sample* Poststratification weight		Pearson correlation with attainment	Restricted sample* Imputation and poststratification weight		Pearson correlation with attainment
	Prevalence	No. of cases		Prevalence	No. of cases		Prevalence	No. of cases		Prevalence	No. of cases	
MALES												
Daily cigarette use: Modal age 14	8.4%	2822.5	-0.22	6.5%	1785.2	-0.22	7.8%	1334.4	-0.22	8.0%	1361.0	-0.20
Daily cigarette use: Modal age 16	14.0%	2215.1	-0.31	12.4%	1660.1	-0.31	13.8%	1222.1	-0.32	14.5%	1361.0	-0.26
Daily cigarette use: Modal age 18	24.5%	1693.2	-0.32	23.8%	1455.0	-0.32	25.0%	1071.6	-0.31	25.2%	1361.0	-0.25
Daily cigarette use: Modal age 20	28.0%	1568.2	-0.32	28.0%	1568.2	-0.32	29.7%	1165.0	-0.32	31.0%	1361.0	-0.25
Daily cigarette use: Modal age 22	29.5%	1408.1	-0.31	29.5%	1408.1	-0.31	30.3%	1036.1	-0.31	32.7%	1361.0	-0.25
Heavy drinking: Modal age 14	14.6%	2706.7	-0.20	12.4%	1729.3	-0.20	14.9%	1287.7	-0.21	15.5%	1361.0	-0.18
Heavy drinking: Modal age 16	21.3%	2171.2	-0.19	20.5%	1623.2	-0.19	21.8%	1191.5	-0.18	23.4%	1361.0	-0.16
Heavy drinking: Modal age 18	35.8%	1657.6	-0.12	35.5%	1425.2	-0.12	36.6%	1044.1	-0.13	36.0%	1361.0	-0.09
Heavy drinking: Modal age 20	48.4%	1540.6	0.03	48.4%	1540.6	0.03	48.4%	1141.3	0.02	47.7%	1361.0	0.02
Heavy drinking: Modal age 22	54.5%	1384.4	0.01	54.5%	1384.4	0.01	54.5%	1016.8	0.01	53.1%	1361.0	0.01
30-day marijuana use: Modal age 14	4.5%	2825.9	-0.14	3.1%	1792.6	-0.14	4.1%	1338.0	-0.15	4.6%	1361.0	-0.12
30-day marijuana use: Modal age 16	12.5%	2212.9	-0.19	11.5%	1664.4	-0.19	12.7%	1224.1	-0.19	12.6%	1361.0	-0.17
30-day marijuana use: Modal age 18	23.1%	1678.8	-0.25	22.3%	1441.0	-0.25	23.7%	1058.8	-0.25	23.6%	1361.0	-0.18
30-day marijuana use: Modal age 20	26.1%	1557.6	-0.15	26.1%	1557.6	-0.15	26.9%	1154.6	-0.15	27.6%	1361.0	-0.13
30-day marijuana use: Modal age 22	25.1%	1397.0	-0.10	25.1%	1397.0	-0.10	25.5%	1026.9	-0.10	25.2%	1361.0	-0.08
FEMALES												
Daily cigarette use: Modal age 14	8.0%	2980.9	-0.27	6.6%	2271.8	-0.27	7.8%	1698.2	-0.27	7.9%	1738.5	-0.23
Daily cigarette use: Modal age 16	15.8%	2528.6	-0.31	15.1%	2174.4	-0.31	16.3%	1616.1	-0.31	17.2%	1738.5	-0.27
Daily cigarette use: Modal age 18	23.7%	2208.4	-0.28	22.6%	2020.0	-0.28	23.5%	1495.7	-0.29	23.4%	1738.5	-0.25
Daily cigarette use: Modal age 20	25.7%	2117.8	-0.25	25.7%	2117.8	-0.25	26.4%	1577.7	-0.25	27.7%	1738.5	-0.21
Daily cigarette use: Modal age 22	25.6%	1954.4	-0.25	25.6%	1954.4	-0.25	26.1%	1444.7	-0.24	27.5%	1738.5	-0.21
Heavy drinking: Modal age 14	13.4%	2864.2	-0.18	12.1%	2201.0	-0.18	13.9%	1637.1	-0.19	14.3%	1738.5	-0.17
Heavy drinking: Modal age 16	16.8%	2498.4	-0.13	15.9%	2154.1	-0.13	16.6%	1596.8	-0.14	17.6%	1738.5	-0.14
Heavy drinking: Modal age 18	24.9%	2189.7	-0.05	25.0%	2002.1	-0.05	25.3%	1480.0	-0.06	25.3%	1738.5	-0.05
Heavy drinking: Modal age 20	32.3%	2108.0	0.07	32.3%	2108.0	0.07	31.8%	1567.1	0.06	31.2%	1738.5	0.06
Heavy drinking: Modal age 22	36.9%	1950.1	0.11	36.9%	1950.1	0.11	36.1%	1439.7	0.11	35.2%	1738.5	0.05
30-day marijuana use: Modal age 14	3.9%	3012.4	-0.11	3.2%	2297.8	-0.11	3.9%	1717.4	-0.12	4.5%	1738.5	-0.11
30-day marijuana use: Modal age 16	12.4%	2533.2	-0.14	11.6%	2176.4	-0.14	12.3%	1616.8	-0.14	12.3%	1738.5	-0.12
30-day marijuana use: Modal age 18	17.3%	2204.4	-0.11	16.7%	2016.1	-0.11	17.1%	1494.6	-0.11	17.1%	1738.5	-0.10
30-day marijuana use: Modal age 20	20.1%	2112.4	-0.07	20.1%	2112.4	-0.07	20.2%	1573.3	-0.07	19.7%	1738.5	-0.06
30-day marijuana use: Modal age 22	19.8%	1937.9	-0.07	16.8%	1937.9	-0.07	16.9%	1432.0	-0.07	16.9%	1738.5	-0.05

*Sample restricted to those respondents who gave valid data at either modal age 20 or modal age 22.

Table 2b
Comparison of Prevalence Rates of Substance Use: Numbers of Cases, and Correlations with Age-22 Academic Attainment (Modal Age 18, 1976–1982)

MALES	Column 1			Column 2			Column 3			Column 4		
	Obtained sample Standard sampling weight		Pearson correlation with attainment	Restricted sample* Standard sampling weight		Pearson correlation with attainment	Restricted sample* Poststratification weight		Pearson correlation with attainment	Restricted sample* Imputation and poststratification weight		Pearson correlation with attainment
	Prevalence	No. of cases		Prevalence	No. of cases		Prevalence	No. of cases		Prevalence	No. of cases	
Daily cigarette use: Modal age 18	22.0%	5786.3	-0.24	18.4%	2893.7	-0.23	21.5%	2850.7	-0.23	20.9%	2895.4	-0.23
Daily cigarette use: Modal ages 19–20	24.1%	4460.3	-0.24	20.9%	2649.7	-0.24	23.6%	2538.8	-0.25	24.2%	2895.4	-0.23
Daily cigarette use: Modal ages 21–22	25.7%	4325.3	-0.23	23.4%	2848.0	-0.23	26.1%	2742.4	-0.24	25.3%	2895.4	-0.22
Daily cigarette use: Modal ages 23–24	25.7%	4245.3	-0.21	21.9%	2738.3	-0.21	24.3%	2629.1	-0.21	24.4%	2895.4	-0.20
Daily cigarette use: Modal ages 25–26	25.0%	4061.0	-0.22	21.2%	2728.7	-0.21	23.3%	2615.8	-0.22	23.4%	2895.4	-0.20
Daily cigarette use: Modal ages 27–28	24.6%	3907.7	-0.22	21.0%	2731.3	-0.21	23.3%	2614.7	-0.22	23.7%	2895.4	-0.21
Daily cigarette use: Modal ages 29–30	22.7%	3746.3	-0.22	19.7%	2728.3	-0.20	21.9%	2615.6	-0.21	21.6%	2895.4	-0.20
Daily cigarette use: Modal ages 31–32	21.9%	3557.3	-0.22	19.2%	2688.0	-0.22	21.5%	2580.5	-0.22	21.3%	2895.4	-0.21
Daily cigarette use: Modal age 35	21.3%	3420.0	-0.24	18.6%	2678.3	-0.22	20.9%	2559.7	-0.22	20.9%	2895.4	-0.22
Daily cigarette use: Modal age 40	18.5%	3178.0	-0.21	17.6%	2897.3	-0.21	19.7%	2792.4	-0.22	19.3%	2895.4	-0.21
Heavy drinking: Modal age 18	50.7%	5514.3	-0.15	48.5%	2798.3	-0.15	50.0%	2700.5	-0.15	49.4%	2895.4	-0.15
Heavy drinking: Modal ages 19–20	52.3%	4514.3	-0.04	52.1%	2673.0	-0.03	52.5%	2558.5	-0.05	51.7%	2895.4	-0.05
Heavy drinking: Modal ages 21–22	54.6%	4355.7	-0.02	55.4%	2878.0	-0.01	55.6%	2774.8	-0.03	55.1%	2895.4	-0.03
Heavy drinking: Modal ages 23–24	50.1%	4260.0	-0.05	49.9%	2747.0	-0.06	50.2%	2632.1	-0.08	49.8%	2895.4	-0.07
Heavy drinking: Modal ages 25–26	45.8%	4073.3	-0.06	46.1%	2745.3	-0.05	46.8%	2635.4	-0.06	46.0%	2895.4	-0.06
Heavy drinking: Modal ages 27–28	41.9%	3918.0	-0.09	40.8%	2736.7	-0.08	41.3%	2615.1	-0.09	41.0%	2895.4	-0.09
Heavy drinking: Modal ages 29–30	38.2%	3725.0	-0.09	37.6%	2716.7	-0.09	38.7%	2603.2	-0.09	37.9%	2895.4	-0.09
Heavy drinking: Modal ages 31–32	35.9%	3543.3	-0.08	35.3%	2683.7	-0.08	36.2%	2578.5	-0.09	35.7%	2895.4	-0.09
Heavy drinking: Modal age 35	31.2%	3392.0	-0.10	30.5%	2665.7	-0.09	31.5%	2546.9	-0.10	31.2%	2895.4	-0.09
Heavy drinking: Modal age 40	29.1%	3140.7	-0.10	28.9%	2871.0	-0.10	29.9%	2758.4	-0.11	29.7%	2895.4	-0.10
30-day marijuana use: Modal age 18	37.5%	5679.0	-0.16	32.3%	2865.3	-0.16	35.2%	2763.7	-0.16	34.8%	2895.4	-0.15
30-day marijuana use: Modal ages 19–20	35.6%	4512.0	-0.06	33.5%	2678.7	-0.05	35.4%	2559.6	-0.06	35.8%	2895.4	-0.07
30-day marijuana use: Modal ages 21–22	34.5%	4364.3	-0.06	32.7%	2882.7	-0.05	34.6%	2772.2	-0.06	34.3%	2895.4	-0.05
30-day marijuana use: Modal ages 23–24	29.9%	4229.7	-0.07	28.3%	2739.7	-0.07	30.0%	2624.9	-0.07	30.3%	2895.4	-0.06
30-day marijuana use: Modal ages 25–26	24.2%	4074.7	-0.07	22.9%	2738.3	-0.07	24.3%	2621.5	-0.07	24.8%	2895.4	-0.07
30-day marijuana use: Modal ages 27–28	20.4%	3910.7	-0.09	19.2%	2742.0	-0.08	20.7%	2623.8	-0.08	21.1%	2895.4	-0.08
30-day marijuana use: Modal ages 29–30	16.7%	3747.3	-0.07	15.7%	2733.7	-0.06	16.9%	2617.9	-0.07	17.8%	2895.4	-0.06
30-day marijuana use: Modal ages 31–32	14.2%	3558.7	-0.04	13.3%	2696.7	-0.05	14.3%	2584.4	-0.05	15.5%	2895.4	-0.04
30-day marijuana use: Modal age 35	12.6%	3416.7	-0.03	12.1%	2686.3	-0.03	12.9%	2568.0	-0.03	14.4%	2895.4	-0.04
30-day marijuana use: Modal age 40	10.6%	3201.0	-0.03	10.6%	2917.0	-0.03	11.6%	2808.0	-0.03	11.7%	2895.4	-0.02

*Sample restricted to those respondents who gave valid data for academic attainment at modal age 22 (Wave 3) and provided data at modal age 40 (Wave 10).

Table 2b, cont.

FEMALES	Column 1			Column 2			Column 3			Column 4		
	Obtained sample Standard sampling weight		Pearson correlation with attainment	Restricted sample* Standard sampling weight		Pearson correlation with attainment	Restricted sample* Poststratification weight		Pearson correlation with attainment	Restricted sample* Imputation and poststratification weight		Pearson correlation with attainment
	Prevalence	No. of cases		Prevalence	No. of cases		Prevalence	No. of cases		Prevalence	No. of cases	
Daily cigarette use: Modal age 18	25.3%	6163.0	-0.22	22.6%	3706.0	-0.21	25.1%	3696.0	-0.21	24.4%	3730.6	-0.21
Daily cigarette use: Modal ages 19–20	27.2%	5256.7	-0.18	24.5%	3468.7	-0.17	26.8%	3387.6	-0.16	26.1%	3730.6	-0.16
Daily cigarette use: Modal ages 21–22	27.7%	5123.7	-0.17	25.0%	3660.3	-0.16	27.2%	3588.8	-0.16	26.4%	3730.6	-0.15
Daily cigarette use: Modal ages 23–24	26.7%	5016.0	-0.18	24.0%	3567.3	-0.17	26.1%	3492.5	-0.16	25.5%	3730.6	-0.16
Daily cigarette use: Modal ages 25–26	25.1%	4847.3	-0.18	22.7%	3571.3	-0.17	24.6%	3490.5	-0.17	24.1%	3730.6	-0.16
Daily cigarette use: Modal ages 27–28	22.9%	4683.7	-0.19	20.6%	3575.7	-0.18	22.5%	3497.9	-0.18	22.1%	3730.6	-0.17
Daily cigarette use: Modal ages 29–30	21.4%	4500.3	-0.19	19.3%	3550.3	-0.19	21.1%	3470.6	-0.18	20.7%	3730.6	-0.17
Daily cigarette use: Modal ages 31–32	20.6%	4311.3	-0.18	18.5%	3500.7	-0.18	20.0%	3417.4	-0.17	19.7%	3730.6	-0.17
Daily cigarette use: Modal age 35	19.2%	4201.3	-0.19	17.8%	3490.0	-0.19	19.3%	3402.9	-0.18	18.7%	3730.6	-0.17
Daily cigarette use: Modal age 40	17.3%	3925.3	-0.19	16.7%	3682.0	-0.19	18.2%	3605.7	-0.19	17.8%	3730.6	-0.18
Heavy drinking: Modal age 18	29.7%	5926.7	-0.10	28.4%	3603.0	-0.10	29.2%	3536.1	-0.09	28.6%	3730.6	-0.09
Heavy drinking: Modal ages 19–20	31.9%	5295.3	0.02	32.0%	3502.3	0.02	32.1%	3425.2	0.02	31.3%	3730.6	0.01
Heavy drinking: Modal ages 21–22	30.0%	5167.7	0.03	29.8%	3694.7	0.04	29.7%	3621.3	0.04	29.6%	3730.6	0.04
Heavy drinking: Modal ages 23–24	25.8%	5030.3	-0.04	25.8%	3573.3	-0.03	26.2%	3492.4	-0.04	26.2%	3730.6	-0.04
Heavy drinking: Modal ages 25–26	20.7%	4869.0	-0.05	20.3%	3585.0	-0.03	20.8%	3504.7	-0.03	20.6%	3730.6	-0.03
Heavy drinking: Modal ages 27–28	19.1%	4674.3	-0.06	18.0%	3568.7	-0.05	18.6%	3484.4	-0.06	18.7%	3730.6	-0.06
Heavy drinking: Modal ages 29–30	15.7%	4497.3	-0.10	14.8%	3553.0	-0.10	15.4%	3472.4	-0.10	15.7%	3730.6	-0.09
Heavy drinking: Modal ages 31–32	15.1%	4297.7	-0.07	14.0%	3486.3	-0.07	14.6%	3395.5	-0.07	14.8%	3730.6	-0.07
Heavy drinking: Modal age 35	12.8%	4111.0	-0.09	12.2%	3414.3	-0.09	12.7%	3325.3	-0.09	13.0%	3730.6	-0.08
Heavy drinking: Modal age 40	12.7%	3868.0	-0.09	12.5%	3631.0	-0.09	13.1%	3556.8	-0.08	13.0%	3730.6	-0.08
30-day marijuana use: Modal age 18	28.5%	6082.3	-0.12	26.2%	3680.7	-0.12	27.9%	3617.4	-0.12	27.6%	3730.6	-0.12
30-day marijuana use: Modal ages 19–20	27.4%	5319.0	-0.07	25.8%	3519.0	-0.06	26.8%	3443.8	-0.06	26.8%	3730.6	-0.07
30-day marijuana use: Modal ages 21–22	24.6%	5169.7	-0.06	23.2%	3697.7	-0.05	24.1%	3628.2	-0.05	24.0%	3730.6	-0.05
30-day marijuana use: Modal ages 23–24	20.3%	5030.0	-0.07	19.0%	3576.0	-0.06	19.9%	3499.8	-0.06	20.1%	3730.6	-0.07
30-day marijuana use: Modal ages 25–26	15.6%	4858.3	-0.08	13.9%	3578.3	-0.07	14.7%	3499.3	-0.07	15.1%	3730.6	-0.07
30-day marijuana use: Modal ages 27–28	11.9%	4689.7	-0.08	11.0%	3583.3	-0.07	11.7%	3499.1	-0.07	12.1%	3730.6	-0.07
30-day marijuana use: Modal ages 29–30	9.0%	4527.7	-0.07	8.3%	3565.0	-0.07	8.9%	3491.7	-0.06	9.4%	3730.6	-0.06
30-day marijuana use: Modal ages 31–32	8.0%	4344.0	-0.08	7.4%	3523.3	-0.07	7.9%	3439.7	-0.07	8.7%	3730.6	-0.07
30-day marijuana use: Modal age 35	6.3%	4190.7	-0.07	5.8%	3484.3	-0.07	6.3%	3396.0	-0.07	7.2%	3730.6	-0.07
30-day marijuana use: Modal age 40	5.4%	3961.7	-0.05	5.2%	3719.7	-0.05	5.5%	3647.6	-0.05	5.6%	3730.6	-0.06

*Sample restricted to those respondents who gave valid data for academic attainment at modal age 22 (Wave 3) and provided data at modal age 40 (Wave 10).

Table 2c
Comparison of Prevalence Rates of Substance Use: Numbers of Cases, and Correlations with Age-22 Academic Attainment (Modal Age 18, 1988–1994)

	Column 1			Column 2			Column 3			Column 4		
	Obtained sample Standard sampling weight		Pearson correlation with attainment	Restricted sample* Standard sampling weight		Pearson correlation with attainment	Restricted sample* Poststratification weight		Pearson correlation with attainment	Restricted sample* Imputation and poststratification weight		Pearson correlation with attainment
	Prevalence	No. of cases		Prevalence	No. of cases		Prevalence	No. of cases		Prevalence	No. of cases	
MALES												
Daily cigarette use: Modal age 18	17.9%	7075.0	-0.20	13.5%	2938.0	-0.19	17.7%	2861.6	-0.19	16.4%	2896.6	-0.19
Daily cigarette use: Modal ages 19–20	18.8%	4695.0	-0.20	15.5%	2615.0	-0.19	18.6%	2511.2	-0.21	19.0%	2896.6	-0.19
Daily cigarette use: Modal ages 21–22	21.3%	4288.7	-0.19	18.9%	2918.0	-0.16	21.5%	2847.2	-0.18	20.8%	2896.6	-0.17
Daily cigarette use: Modal ages 23–24	20.6%	3877.0	-0.17	17.8%	2562.3	-0.16	20.3%	2473.7	-0.17	20.6%	2896.6	-0.17
Daily cigarette use: Modal ages 25–26	19.9%	3495.0	-0.19	17.6%	2529.7	-0.19	20.0%	2438.9	-0.20	19.7%	2896.6	-0.17
Daily cigarette use: Modal ages 27–28	17.0%	3276.0	-0.18	16.1%	2925.7	-0.18	18.3%	2860.9	-0.19	17.8%	2896.6	-0.18
Heavy drinking: Modal age 18	38.0%	6763.3	-0.09	34.7%	2853.3	-0.08	36.8%	2771.2	-0.09	36.4%	2896.6	-0.09
Heavy drinking: Modal ages 19–20	42.3%	4619.0	0.03	41.9%	2586.3	0.03	42.7%	2482.0	0.01	41.1%	2896.6	0.01
Heavy drinking: Modal ages 21–22	50.7%	4241.3	0.05	50.5%	2889.0	0.06	50.9%	2815.2	0.04	50.1%	2896.6	0.03
Heavy drinking: Modal ages 23–24	47.3%	3819.7	0.03	46.7%	2527.7	0.04	47.5%	2431.8	0.04	45.8%	2896.6	0.01
Heavy drinking: Modal ages 25–26	43.6%	3467.0	0.00	42.4%	2515.0	0.01	43.3%	2420.9	-0.01	41.8%	2896.6	-0.01
Heavy drinking: Modal ages 27–28	41.9%	3243.3	-0.03	41.8%	2900.7	-0.03	43.1%	2826.1	-0.04	42.5%	2896.6	-0.04
30-day marijuana use: Modal age 18	17.2%	6998.3	-0.09	13.4%	2928.0	-0.08	15.6%	2855.8	-0.08	15.5%	2896.6	-0.08
30-day marijuana use: Modal ages 19–20	16.7%	4729.0	-0.04	15.1%	2644.3	-0.03	16.1%	2549.1	-0.03	17.0%	2896.6	-0.04
30-day marijuana use: Modal ages 21–22	17.6%	4316.3	0.00	16.4%	2937.0	0.02	17.2%	2865.3	0.02	17.2%	2896.6	0.02
30-day marijuana use: Modal ages 23–24	16.0%	3861.7	-0.03	13.9%	2553.7	-0.01	15.3%	2460.5	-0.01	15.8%	2896.6	-0.04
30-day marijuana use: Modal ages 25–26	14.7%	3494.3	-0.06	13.2%	2532.7	-0.05	14.3%	2449.4	-0.05	14.9%	2896.6	-0.05
30-day marijuana use: Modal ages 27–28	11.8%	3279.3	-0.04	11.3%	2934.0	-0.04	12.5%	2866.0	-0.04	12.4%	2896.6	-0.05
FEMALES												
Daily cigarette use: Modal age 18	18.3%	7478.0	-0.21	16.0%	4066.7	-0.20	18.1%	4008.1	-0.19	17.0%	4054.1	-0.19
Daily cigarette use: Modal ages 19–20	19.5%	5873.0	-0.16	17.8%	3819.0	-0.16	19.5%	3740.4	-0.16	18.8%	4054.1	-0.16
Daily cigarette use: Modal ages 21–22	19.9%	5468.0	-0.16	18.8%	4060.7	-0.16	20.0%	3999.5	-0.15	19.2%	4054.1	-0.15
Daily cigarette use: Modal ages 23–24	19.0%	5034.0	-0.16	17.5%	3692.7	-0.16	18.6%	3599.2	-0.15	18.3%	4054.1	-0.15
Daily cigarette use: Modal ages 25–26	18.2%	4660.7	-0.20	16.5%	3639.0	-0.20	17.8%	3547.9	-0.20	16.4%	4054.1	-0.18
Daily cigarette use: Modal ages 27–28	16.4%	4427.7	-0.21	15.8%	4050.7	-0.21	17.0%	3988.6	-0.21	16.4%	4054.1	-0.20
Heavy drinking: Modal age 18	22.2%	7297.0	-0.06	21.4%	3985.0	-0.06	21.9%	3920.9	-0.06	21.4%	4054.1	-0.06
Heavy drinking: Modal ages 19–20	27.4%	5782.7	0.08	28.0%	3770.7	0.08	27.5%	3686.3	0.09	27.2%	4054.1	0.06
Heavy drinking: Modal ages 21–22	30.0%	5381.0	0.12	30.2%	4002.7	0.13	29.7%	3930.9	0.13	29.2%	4054.1	0.12
Heavy drinking: Modal ages 23–24	25.5%	4985.0	0.07	25.6%	3661.0	0.07	25.2%	3570.8	0.07	24.9%	4054.1	0.06
Heavy drinking: Modal ages 25–26	21.8%	4612.3	0.04	21.4%	3597.7	0.05	21.6%	3505.4	0.04	20.8%	4054.1	0.04
Heavy drinking: Modal ages 27–28	19.9%	4383.0	0.01	20.1%	4017.0	0.01	20.5%	3950.7	0.01	20.1%	4054.1	0.01
30-day marijuana use: Modal age 18	12.8%	7476.0	-0.08	11.1%	4062.3	-0.07	12.0%	4004.2	-0.07	11.8%	4054.1	-0.07
30-day marijuana use: Modal ages 19–20	12.4%	5890.0	-0.02	11.9%	3829.3	-0.02	12.4%	3751.6	-0.02	12.7%	4054.1	-0.03
30-day marijuana use: Modal ages 21–22	12.4%	5492.0	-0.01	12.0%	4073.0	0.00	12.3%	4012.9	0.00	12.2%	4054.1	0.00
30-day marijuana use: Modal ages 23–24	10.0%	5045.0	-0.02	9.2%	3699.0	-0.01	9.6%	3609.4	-0.01	9.8%	4054.1	-0.02
30-day marijuana use: Modal ages 25–26	8.5%	4663.0	-0.04	7.2%	3644.0	-0.02	7.6%	3554.0	-0.03	8.3%	4054.1	-0.03
30-day marijuana use: Modal ages 27–28	7.6%	4434.3	-0.05	7.2%	4058.7	-0.05	7.7%	3999.7	-0.06	7.7%	4054.1	-0.06

*Sample restricted to those respondents who gave valid data for academic attainment at modal age 22 (Wave 3) and data at modal age 28 (Wave 6).

Table 3
Weighted Numbers of Cases of Substance Use Imputed

MALES	8th-grade cohorts (Age 14, 1991–1993) Numbers of imputed cases (wtd.)	Earlier 12th-grade cohorts (Age 18, 1976–1982) Numbers of imputed cases (wtd.)	Later 12th-grade cohorts (Age 18, 1988–1994) Numbers of imputed cases (wtd.)
Total (observed and imputed) weighted cases for analysis	*1361*	*2895*	*2897*
30-day cigarette use Wave 1	27	45	35
30-day cigarette use Wave 2	139	357	385
30-day cigarette use Wave 3	289	153	49
30-day cigarette use Wave 4	196	266	423
30-day cigarette use Wave 5	325	280	458
30-day cigarette use Wave 6		281	36
30-day cigarette use Wave 7		280	
30-day cigarette use Wave 8		315	
30-day cigarette use Wave 9		336	
30-day cigarette use Wave 10		103	
Heavy drinking Wave 1	73	195	125
Heavy drinking Wave 2	169	337	415
Heavy drinking Wave 3	317	121	81
Heavy drinking Wave 4	220	263	465
Heavy drinking Wave 5	344	260	476
Heavy drinking Wave 6		280	70
Heavy drinking Wave 7		292	
Heavy drinking Wave 8		317	
Heavy drinking Wave 9		348	
Heavy drinking Wave 10		137	
30-day marijuana use Wave 1	23	132	41
30-day marijuana use Wave 2	137	336	347
30-day marijuana use Wave 3	302	123	31
30-day marijuana use Wave 4	206	270	436
30-day marijuana use Wave 5	334	274	447
30-day marijuana use Wave 6		272	31
30-day marijuana use Wave 7		278	
30-day marijuana use Wave 8		311	
30-day marijuana use Wave 9		327	
30-day marijuana use Wave 10		87	

Table 3, cont.

FEMALES	8th-grade cohorts (Age 14, 1991–1993) Numbers of imputed cases (wtd.)	Earlier 12th-grade cohorts (Age 18, 1976–1982) Numbers of imputed cases (wtd.)	Later 12th-grade cohorts (Age 18, 1988–1994) Numbers of imputed cases (wtd.)
Total (observed and imputed) weighted cases for analysis	*1462*	*3731*	*4054*
30-day cigarette use Wave 1	40	35	46
30-day cigarette use Wave 2	122	343	314
30-day cigarette use Wave 3	243	142	55
30-day cigarette use Wave 4	161	238	455
30-day cigarette use Wave 5	294	240	506
30-day cigarette use Wave 6		233	66
30-day cigarette use Wave 7		260	
30-day cigarette use Wave 8		313	
30-day cigarette use Wave 9		328	
30-day cigarette use Wave 10		125	
Heavy drinking Wave 1	101	195	133
Heavy drinking Wave 2	142	305	368
Heavy drinking Wave 3	259	109	123
Heavy drinking Wave 4	171	238	483
Heavy drinking Wave 5	299	226	549
Heavy drinking Wave 6		246	103
Heavy drinking Wave 7		258	
Heavy drinking Wave 8		335	
Heavy drinking Wave 9		405	
Heavy drinking Wave 10		174	
30-day marijuana use Wave 1	21	113	50
30-day marijuana use Wave 2	122	287	302
30-day marijuana use Wave 3	244	102	41
30-day marijuana use Wave 4	165	231	445
30-day marijuana use Wave 5	307	231	500
30-day marijuana use Wave 6		232	54
30-day marijuana use Wave 7		239	
30-day marijuana use Wave 8		291	
30-day marijuana use Wave 9		335	
30-day marijuana use Wave 10		83	

Table 4
Unweighted and Weighted Numbers of Cases, by Academic Attainment at Modal Ages 21–22

	Males				Females			
	Unweighted observations	%	Weighted cases	%	Unweighted observations	%	Weighted cases	%
8th Graders in 1991–1993[a]								
3+ years of college	476	27.1	418	30.7	690	34.1	675	38.8
1–2 years of college	483	27.5	381	28.0	529	26.1	454	26.1
High school diploma	502	28.5	364	26.7	508	25.1	399	22.9
Dropout	297	16.9	198	14.6	297	14.7	210	12.1
Total	1758	100	1361	100	2024	100	1739	100
12th Graders in 1976–1982[b]								
3+ years of college	1083	27.5	808	27.9	1230	25.0	928	24.9
1–2 years of college	1395	35.4	1018	35.1	1861	37.8	1441	38.6
High school diploma	1461	37.1	1070	36.9	1834	37.2	1362	36.5
Total	3939	100	2896	100	4925	100	3731	100
12th Graders in 1988–1994[b]								
3+ years of college	873	25.4	778	26.9	980	21.2	924	22.8
1–2 years of college	1244	36.1	1073	37.0	1718	37.2	1518	37.4
High school diploma	1325	38.5	1046	36.1	1924	41.6	1612	39.8
Total	3442	100	2897	100	4622	100	4054	100

Note: All analyses used weighted data and took into account design effects from the complex sampling design, as well as poststratification to correct for differential sample attrition (see text). Table entries show numbers of actual observations, as well as numbers of weighted cases.

[a]Follow-up surveys of 8th graders occurred at two-year intervals. The present analyses include four follow-ups, yielding a modal age span from 14 to 22.

[b]First follow-up surveys of 12th graders occurred for random halves of the samples at one or two years after high school (modal ages 19–20), then at two-year intervals until modal ages 31–32, then at modal ages 35 and 40, as shown in the figures.

Table 5
Comparison of Correlations Between Substance Use and Eighth-Grade GPA and Substance Use and Academic Attainment in the Eighth-Grade Cohorts

	Correlations between substance use and 8th-grade GPA Class years 1991–1993				Correlations between substance use and academic attainment at age 22 Class years 1991–1993			
	MALES		FEMALES		MALES		FEMALES	
	Pearson product-moment correlation	Pearson product-moment correlation (Dropouts excluded)	Pearson product-moment correlation	Pearson product-moment correlation (Dropouts excluded)	Pearson product-moment correlation	Pearson product-moment correlation (Dropouts excluded)	Pearson product-moment correlation	Pearson product-moment correlation (Dropouts excluded)
Daily smoking								
Age 14	-0.20	-0.15	-0.24	-0.19	-0.20	-0.11	-0.23	-0.15
Age 16	-0.22	-0.17	-0.22	-0.18	-0.26	-0.15	-0.27	-0.16
Age 18	-0.21	-0.17	-0.18	-0.14	-0.25	-0.17	-0.25	-0.17
Age 20	-0.22	-0.18	-0.16	-0.12	-0.25	-0.17	-0.21	-0.13
Age 22	-0.19	-0.15	-0.15	-0.12	-0.25	-0.17	-0.21	-0.16
Heavy drinking								
Age 14	-0.18	-0.13	-0.20	-0.16	-0.18	-0.10	-0.17	-0.11
Age 16	-0.14	-0.12	-0.11	-0.09	-0.16	-0.12	-0.14	-0.08
Age 18	-0.09	-0.08	-0.06	-0.07	-0.09	-0.07	-0.05	-0.05
Age 20	-0.02	0.01	0.01	0.02	0.02	0.05	0.06	0.10
Age 22	-0.01	0.02	0.02	0.00	0.01	0.06	0.05	0.07
30-day marijuana use								
Age 14	-0.14	-0.08	-0.14	-0.13	-0.12	-0.04	-0.11	-0.06
Age 16	-0.14	-0.08	-0.14	-0.14	-0.17	-0.07	-0.12	-0.08
Age 18	-0.14	-0.11	-0.10	-0.09	-0.18	-0.12	-0.10	-0.07
Age 20	-0.11	-0.07	-0.07	-0.06	-0.13	-0.05	-0.06	-0.01
Age 22	-0.07	-0.03	-0.06	-0.04	-0.08	-0.01	-0.05	-0.01

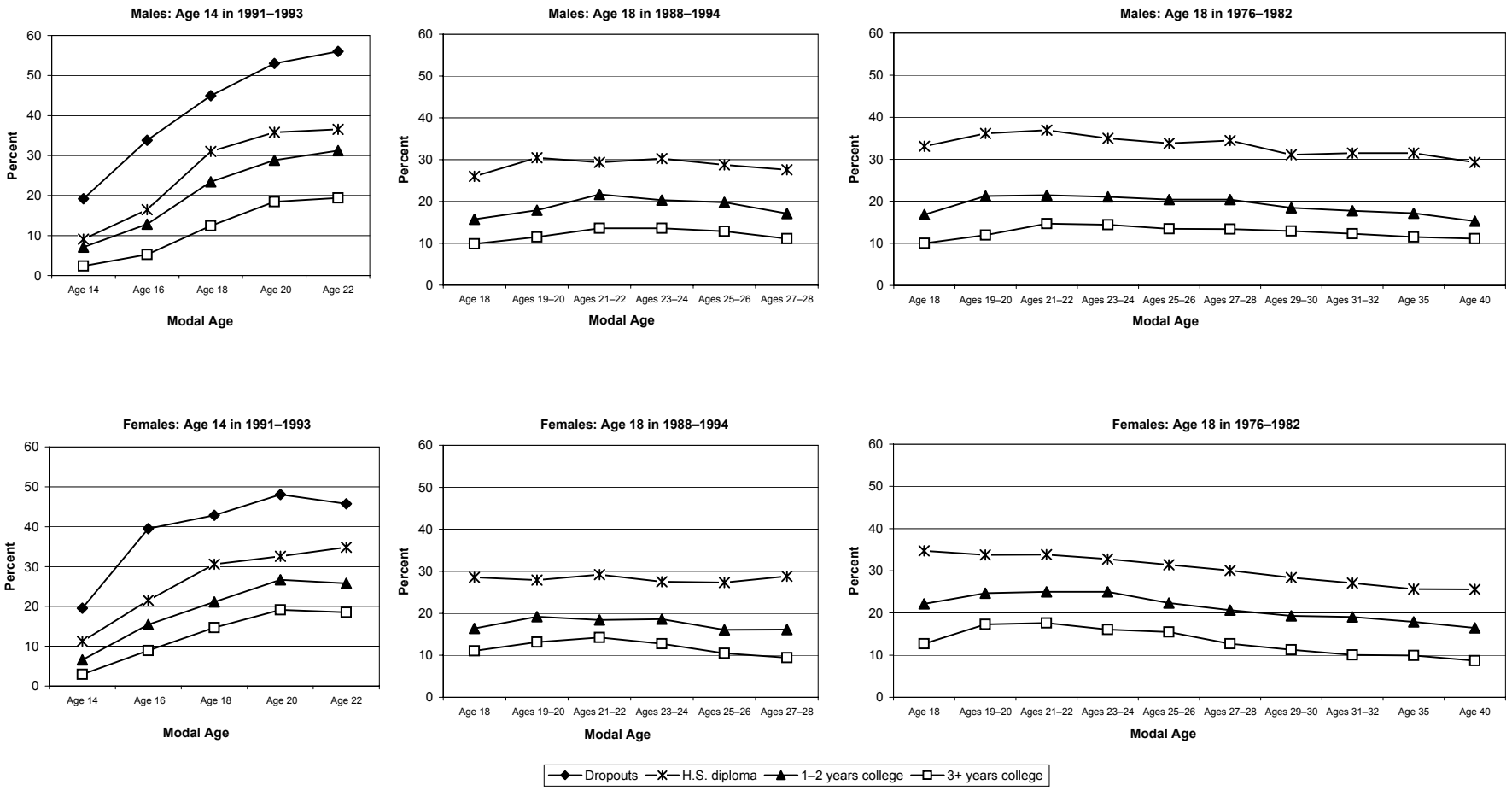

Figure 1. Percent reporting any daily smoking in the last 30 days by academic attainment at modal ages 21–22.

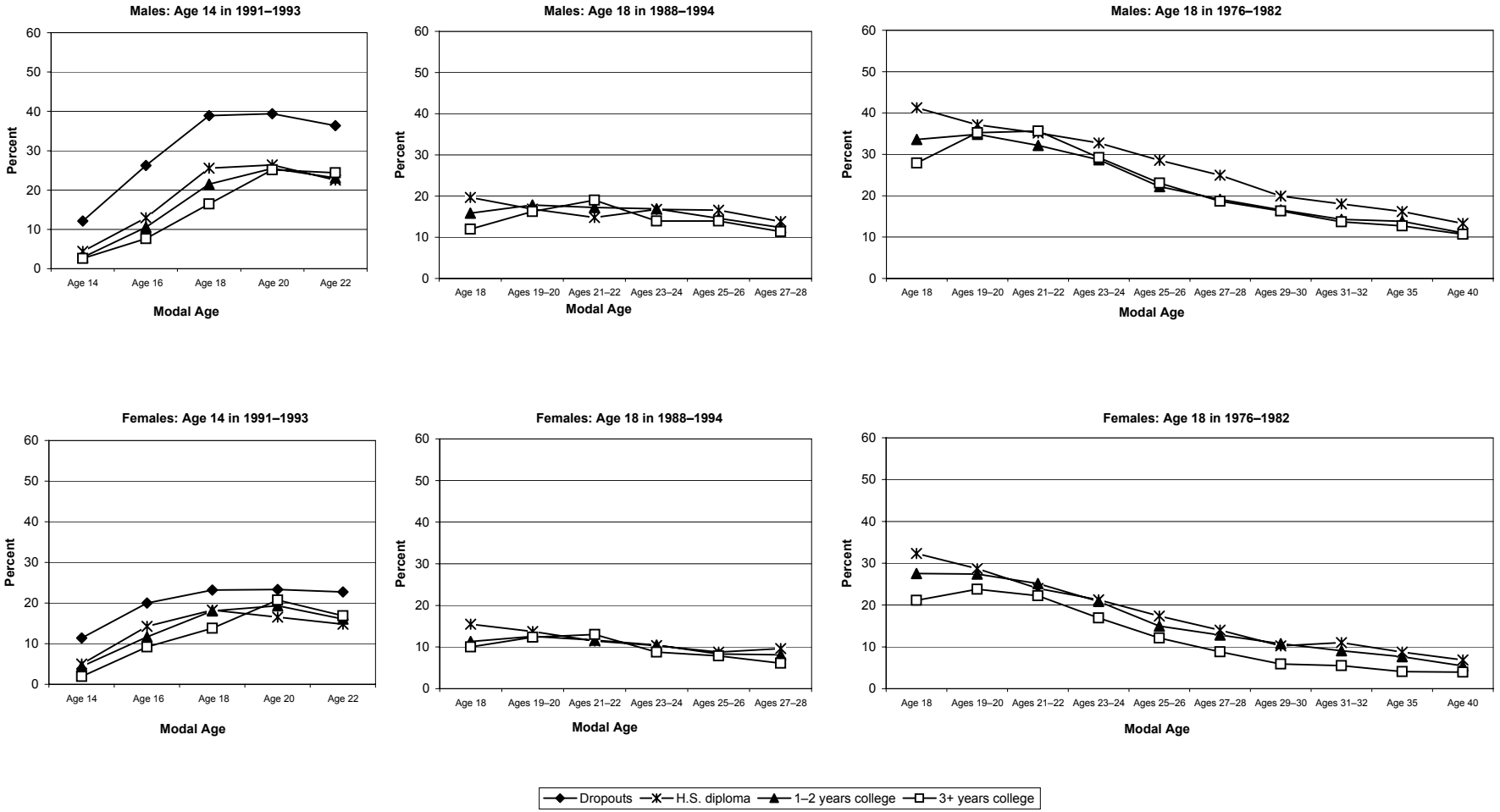

Figure 2. Percent reporting any marijuana use in the last 30 days by educational attainment at modal ages 21–22.

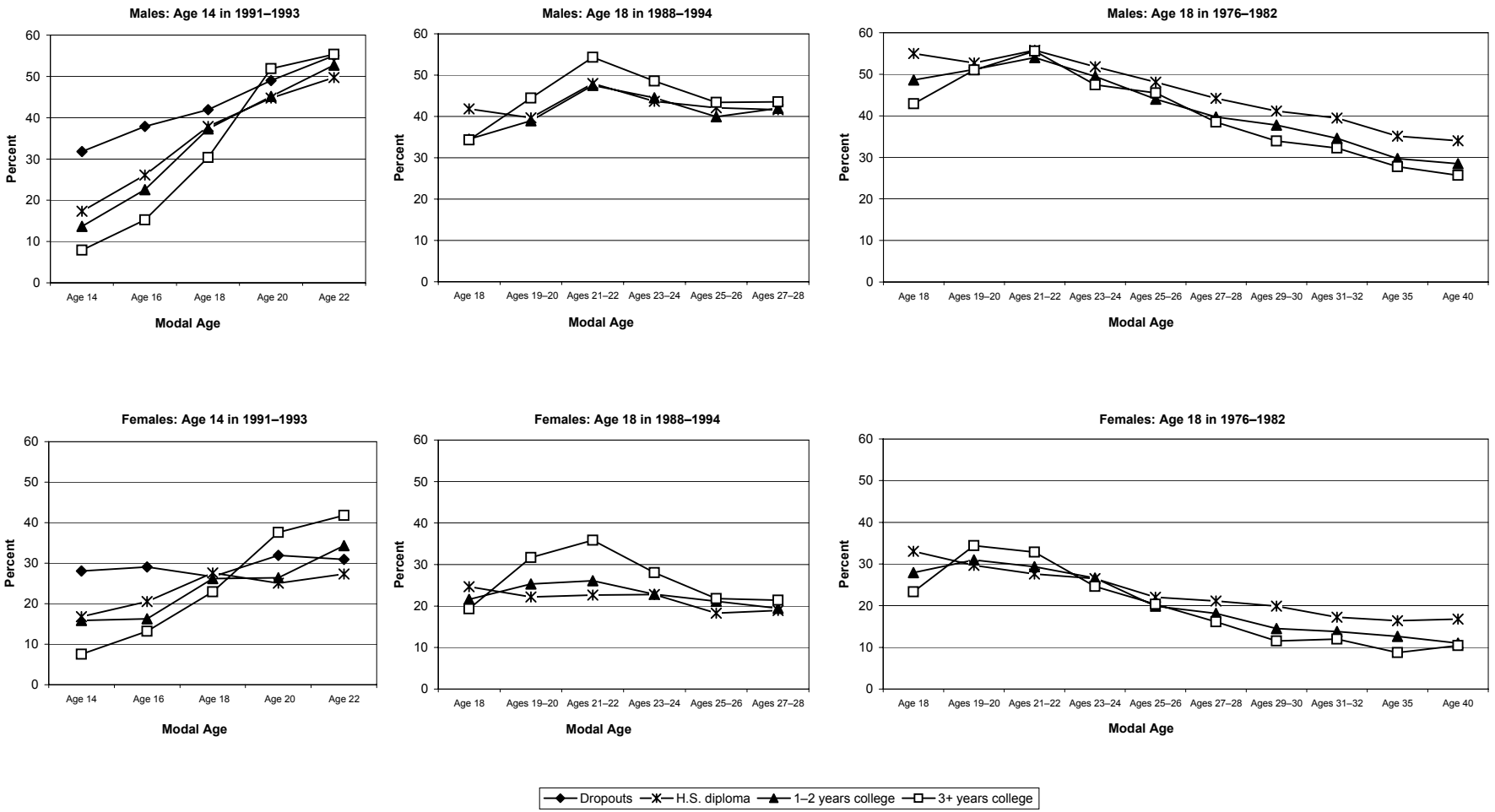

Figure 3. Percent reporting any heavy drinking in the last two weeks by educational attainment at modal ages 21–22.

APPENDIX

Table A1a
Percentages of Substance Users by Academic Attainment at Age 22 (Class Years 1991–1993)

MALES

Weighted *N*	*198*	*364*	*381*	*418*			*1361*
% in subgroups	14.6	26.7	28.0	30.7			100.0
	Dropouts	**H.S. diploma**	**1–2 years college**	**3+ years college**	**Pearson product-moment correlation***	**Pearson product-moment correlation* (No dropouts)**	**Total males**
Daily smoking							
Age 14	19.2	9.1	7.1	2.4	-0.20	-0.11	8.0
Age 16	33.8	16.5	12.9	5.3	-0.26	-0.15	14.5
Age 18	44.9	31.0	23.4	12.4	-0.25	-0.17	25.2
Age 20	53.0	35.8	28.9	18.4	-0.25	-0.17	31.0
Age 22	56.1	36.5	31.2	19.4	-0.25	-0.17	32.7
Heavy drinking							
Age 14	31.8	17.3	13.6	7.9	-0.18	-0.10	15.5
Age 16	37.9	26.1	22.6	15.3	-0.16	-0.12	23.5
Age 18	41.9	37.9	37.3	30.4	-0.09	-0.07	36.0
Age 20	49.0	44.8	45.1	51.9	0.02	0.05	47.7
Age 22	55.1	49.7	52.8	55.4	0.01	0.06	53.1
30-day marijuana use							
Age 14	12.1	4.4	2.9	2.6	-0.12	-0.04	4.6
Age 16	26.3	12.9	10.5	7.6	-0.17	-0.07	12.6
Age 18	38.9	25.5	21.5	16.5	-0.18	-0.12	23.6
Age 20	39.4	26.4	25.5	25.1	-0.13	-0.05	27.6
Age 22	36.4	22.5	23.1	24.4	-0.08	-0.01	25.3

FEMALES

Weighted *N*	210	399	454	675			*1738*
% in subgroups	12.1	23.0	26.1	38.8			100.0
	Dropouts	**H.S. diploma**	**1–2 years college**	**3+ years college**	**Pearson product-moment correlation***	**Pearson product-moment correlation* (No dropouts)**	**Total females**
Daily smoking							
Age 14	19.5	11.3	6.6	3.0	-0.23	-0.15	7.8
Age 16	39.5	21.6	15.4	8.9	-0.27	-0.16	17.2
Age 18	42.9	30.6	21.1	14.7	-0.25	-0.17	23.4
Age 20	48.1	32.6	26.7	19.1	-0.21	-0.13	27.7
Age 22	45.7	34.8	25.8	18.5	-0.21	-0.16	27.4
Heavy drinking							
Age 14	28.1	16.8	15.9	7.6	-0.17	-0.11	14.3
Age 16	29.0	20.6	16.3	13.2	-0.14	-0.08	17.6
Age 18	26.7	27.6	26.2	23.0	-0.05	-0.05	25.3
Age 20	31.9	25.1	26.4	37.6	0.06	0.10	31.1
Age 22	31.0	27.3	34.4	41.8	0.05	0.07	35.2
30-day marijuana use							
Age 14	11.4	5.0	4.4	1.9	-0.11	-0.06	4.4
Age 16	20.0	14.3	11.6	9.2	-0.12	-0.08	12.3
Age 18	23.2	18.3	18.1	13.8	-0.10	-0.07	17.1
Age 20	23.3	16.5	19.3	20.7	-0.06	-0.01	19.7
Age 22	22.7	14.8	16.0	16.9	-0.05	-0.01	16.9

*Correlation between academic attainment and the full scale of the substance use variable.

Table A1b
Percentages of Substance Users by Academic Attainment at Ages 21–22 (Class Years 1976–1982)

MALES

Weighted *N*	*1069.9*	*1017.8*	*807.7*		*2895.4*
% in subgroups	37.0%	35.2%	27.9%		100%
	H.S. diploma	**1–2 years college**	**3+ years college**	**Pearson product-moment correlation***	**Total males**
Daily smoking					
Age 18	33.1	16.8	10.0	-0.23	20.9
Ages 19–20	36.1	21.2	12.0	-0.23	24.2
Ages 21–22	36.9	21.5	14.7	-0.22	25.3
Ages 23–24	35.0	21.1	14.4	-0.20	24.4
Ages 25–26	33.8	20.4	13.4	-0.20	23.4
Ages 27–28	34.5	20.4	13.4	-0.21	23.7
Ages 29–30	31.0	18.5	12.9	-0.20	21.6
Ages 31–32	31.5	17.7	12.3	-0.21	21.3
Age 35	31.4	17.2	11.5	-0.22	20.9
Age 40	29.2	15.3	11.1	-0.21	19.3
Heavy drinking					
Age 18	55.0	48.6	42.9	-0.15	49.4
Ages 19–20	52.7	51.1	51.0	-0.05	51.7
Ages 21–22	55.8	54.0	55.6	-0.03	55.1
Ages 23–24	51.8	49.5	47.5	-0.07	49.8
Ages 25–26	48.1	44.0	45.5	-0.06	46.0
Ages 27–28	44.2	39.7	38.5	-0.09	41.0
Ages 29–30	41.1	37.8	33.9	-0.09	37.9
Ages 31–32	39.5	34.6	32.2	-0.09	35.7
Age 35	35.1	29.7	27.7	-0.09	31.2
Age 40	34.0	28.5	25.7	-0.10	29.7
30-day marijuana use					
Age 18	41.3	33.6	27.9	-0.15	34.8
Ages 19–20	37.1	34.9	35.2	-0.07	35.8
Ages 21–22	35.2	32.1	35.7	-0.05	34.2
Ages 23–24	32.7	28.7	29.2	-0.06	30.3
Ages 25–26	28.5	22.2	23.1	-0.07	24.8
Ages 27–28	25.0	19.1	18.6	-0.08	21.1
Ages 29–30	19.9	16.6	16.3	-0.06	17.8
Ages 31–32	18.0	14.3	13.7	-0.04	15.5
Age 35	16.2	13.8	12.7	-0.04	14.4
Age 40	13.3	11.0	10.7	-0.02	11.7

*Correlation between academic attainment and the full scale of the substance use variable.

Table A1b, cont.

FEMALES

Weighted *N*	*1362.1*	*1440.6*	*927.9*		*3730.6*
% in subgroups	36.5%	38.6%	24.9%		100%
	H.S. diploma	**1–2 years college**	**3+ years college**	**Pearson product-moment correlation***	**Total females**
Daily smoking					
Age 18	34.7	22.2	12.7	-0.21	24.4
Ages 19–20	33.8	24.7	17.3	-0.16	26.2
Ages 21–22	33.8	25.0	17.6	-0.15	26.4
Ages 23–24	32.8	25.0	16.1	-0.16	25.6
Ages 25–26	31.4	22.3	15.5	-0.16	24.0
Ages 27–28	30.0	20.7	12.7	-0.17	22.1
Ages 29–30	28.4	19.3	11.3	-0.17	20.6
Ages 31–32	27.1	19.0	10.0	-0.17	19.7
Age 35	25.6	17.9	9.9	-0.17	18.7
Age 40	25.6	16.5	8.7	-0.18	17.9
Heavy drinking					
Age 18	33.0	27.9	23.3	-0.09	28.6
Ages 19–20	29.7	31.0	34.4	0.01	31.3
Ages 21–22	27.6	29.3	32.9	0.04	29.6
Ages 23–24	26.5	26.6	24.6	-0.04	26.1
Ages 25–26	22.0	19.9	20.4	-0.03	20.8
Ages 27–28	21.1	18.1	16.1	-0.06	18.7
Ages 29–30	19.9	14.5	11.6	-0.09	15.7
Ages 31–32	17.2	13.8	12.0	-0.07	14.6
Age 35	16.4	12.6	8.7	-0.08	13.0
Age 40	16.8	11.0	10.4	-0.08	13.0
30-day marijuana use					
Age 18	32.3	27.5	21.1	-0.12	27.7
Ages 19–20	28.7	27.4	23.8	-0.07	27.0
Ages 21–22	24.0	25.1	22.2	-0.05	24.0
Ages 23–24	21.2	20.9	16.9	-0.07	20.0
Ages 25–26	17.4	15.0	12.1	-0.07	15.1
Ages 27–28	14.0	12.8	8.8	-0.07	12.2
Ages 29–30	10.3	10.7	5.9	-0.06	9.4
Ages 31–32	11.0	9.1	5.5	-0.07	8.9
Age 35	8.7	7.6	4.1	-0.07	7.2
Age 40	6.9	5.4	4.0	-0.06	5.6

*Correlation between academic attainment and the full scale of the substance use variable.

Table A1c
Percentages of Substance Users by Academic Attainment at Ages 21–22
(Class Years 1988–1994)

MALES

Weighted *N*	*778.3*	*1072.7*	*1045.5*		*2896.6*
% in subgroups	26.9%	37.0%	36.1%		100%
	H.S. diploma	**1–2 years college**	**3+ years college**	**Pearson product-moment correlation***	**Total males**
Daily smoking					
Age 18	26.0	15.8	9.8	-0.19	16.4
Ages 19–20	30.5	17.9	11.5	-0.19	19.0
Ages 21–22	29.4	21.7	13.6	-0.17	20.8
Ages 23–24	30.2	20.3	13.6	-0.18	20.6
Ages 25–26	28.7	19.8	12.9	-0.17	19.7
Ages 27–28	27.6	17.1	11.1	-0.18	17.8
Heavy drinking					
Age 18	41.9	34.5	34.3	-0.09	36.4
Ages 19–20	39.7	38.9	44.5	0.01	41.1
Ages 21–22	48.0	47.5	54.3	0.03	50.1
Ages 23–24	43.7	44.5	48.6	0.01	45.8
Ages 25–26	42.1	39.9	43.4	-0.01	41.8
Ages 27–28	41.6	42.0	43.5	-0.03	42.4
30-day marijuana use					
Age 18	19.7	15.8	12.0	-0.09	15.5
Ages 19–20	16.8	17.8	16.3	-0.04	17.0
Ages 21–22	14.8	17.2	19.0	0.02	17.2
Ages 23–24	16.8	16.9	13.9	-0.03	15.8
Ages 25–26	16.6	14.6	14.0	-0.05	14.9
Ages 27–28	13.8	12.3	11.4	-0.05	12.4

FEMALES

Weighted *N*	*924.2*	*1517.6*	*1612.3*		*4054.1*
% in subgroups	22.8%	37.4%	39.8%		100%
	H.S. diploma	**1–2 years college**	**3+ years college**	**Pearson product-moment correlation***	**Total females**
Daily smoking					
Age 18	28.6	16.4	11.1	-0.19	17.0
Ages 19–20	27.9	19.2	13.1	-0.16	18.8
Ages 21–22	29.2	18.4	14.2	-0.15	19.2
Ages 23–24	27.5	18.6	12.8	-0.15	18.3
Ages 25–26	27.3	16.1	10.5	-0.18	16.4
Ages 27–28	28.9	16.1	9.4	-0.20	16.4
Heavy drinking					
Age 18	24.7	21.6	19.3	-0.06	21.4
Ages 19–20	22.2	25.3	31.7	0.06	27.2
Ages 21–22	22.6	26.1	35.8	0.12	29.2
Ages 23–24	22.8	22.9	28.0	0.06	24.9
Ages 25–26	18.3	21.2	21.8	0.04	20.8
Ages 27–28	18.9	19.5	21.4	0.01	20.1
30-day marijuana use					
Age 18	15.5	11.3	10.0	-0.07	11.8
Ages 19–20	13.7	12.5	12.4	-0.03	12.7
Ages 21–22	11.4	11.7	13.0	0.00	12.1
Ages 23–24	10.3	10.5	8.8	-0.02	9.7
Ages 25–26	8.8	8.3	7.9	-0.03	8.3
Ages 27–28	9.6	8.1	6.1	-0.06	7.7

*Correlation between academic attainment and the full scale of the substance use variable.

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