

# Higher education among the “forgotten half”: The association between substance use and college completion among 2-year college students versus matched 4-year college students from a nationally representative longitudinal study

Janet E. Rosenbaum (✉ [Janet.Rosenbaum@downstate.edu](mailto:Janet.Rosenbaum@downstate.edu))

---

## Research article

**Keywords:** Young Adult, Health, Drug use, Alcohol use, College Completion, Educational Status, Propensity scores

**Posted Date:** October 3rd, 2019

**DOI:** <https://doi.org/10.21203/rs.2.15476/v1>

**License:** © ⓘ This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

---

# Abstract

**Background:** Recent policy changes have increased marijuana availability to college students. Past research has not evaluated the association between substance use and college completion among the forgotten half of disadvantaged young adults who access higher education through 2-year colleges.

**Methods:** This study uses a subsample of college-enrolled participants from the National Longitudinal Study of Adolescent and Adult Health to evaluate whether substance use in 2001 among students attending 2-year college and 4-year college predicts educational attainment in 2008. We used Mahalanobis nearest-neighbor and exact matching within propensity score calipers to identify a comparison group of 4-year college students (n=888) similar to the 2-year college students (n=1398) on 15 baseline measures including grades, test scores, and substance use. We used multivariate regression in the matched sample using a Poisson working model to estimate the relative risk of earning no post-secondary degree.

**Results:** Compared with matched 4-year college students, 2-year college students were more likely to use methamphetamines, cocaine, marijuana, and more likely to report problematic substance use, and less likely to use alcohol. Two-year college students who used methamphetamines in the past year (IRR=1.51, 95% CI (1.12, 2.04), p=0.007) or past month (IRR=1.69, 95% CI (1.09, 2.61), p=0.02), or completed alcohol abuse treatment (IRR=1.58, 95% CI (1.21, 2.07), p<0.001) were less likely to complete college. Four-year college students who reported that drugs interfered with school or work in the past year (IRR=1.84 (1.28, 2.64), p=0.001), used cocaine in the past year (IRR=1.47 (1.04, 2.08), p=0.03), and used marijuana in the past year (IRR=1.30 (1.07, 1.57), p=0.007), past month (IRR=1.31 (1.07, 1.61), p=0.01), or  $\geq 5$  times in the past month (IRR=1.44 (1.12, 1.85) p=0.005) were less likely to complete college.

**Conclusions:** Substance use interventions should target 2-year and 4-year college students. Two-year colleges that better accommodate students who complete substance use treatment may improve these students' completion. Students who use marijuana or cocaine or whose drug use impairs functioning may benefit from an incremental approach of completing a 2-year degree prior to transfer for a 4-year degree, rather than enrolling directly in a 4-year program.

## Background

Alcohol and illegal drug use is common during adolescence and emerging adulthood, but often declines with age. Many young adults (18–25) who meet criteria for problem drinking decrease alcohol consumption over 7 years (1). For other youth, alcohol and illegal drug use can interfere with or be a marker for difficulties in the transition to adulthood including the completion of schooling. The existing longitudinal research on whether substance use predicts long-term educational attainments focuses on 4-year college completion. For instance, the Coronary Artery Risk Development in Young Adults study, a random sample from 4 cities, found past-month marijuana users and heavy drinkers were less likely to

have graduated college within 10 years (2) and that high levels of alcohol consumption at ages 18–30 predicted lower chances of college graduation and lower occupational prestige 15 years later (3).

As a result of community college's lower entry barriers, community college students are highly similar to high school graduates who do not matriculate in post-secondary education, with just slightly higher pre-college socioeconomic status, grades, and test scores (4). Prior to entering college, 4-year college students have vastly higher grades and test scores, socioeconomic status, better health, and fewer health risk behaviors than adolescents who did not matriculate in 4-year colleges (4). Non-representative studies have found that community college students are at least as likely to binge drink as 4-year college students, adjusting for socioeconomic factors (5–8), although the frequencies of binge drinking vary greatly among studies, from 25% (6) to 46% (9).

Little evidence exists about associations between the incidence of substance use in community college or its association with educational attainment among community college students (10), although some pilot studies have evaluated text-messaging anti-alcohol interventions with this population (11, 12). Disadvantaged youth primarily access higher education through community college, which some regard as a promising vehicle for social mobility (13). Community colleges are affordable and have reduced traditional barriers to admission to disadvantaged youth who would be otherwise unlikely to attend college (14). Community college was formerly a negligible portion of the post-secondary educational system, but currently community college students comprise 46% of undergraduates (in the most recent available data from 2016) (15, Table 304.80). Community college has low entry barriers, including open admissions, schedules that accommodate working students including night and weekend classes, convenient locations, low tuition, and free tuition in some states (e.g., Tennessee). Completion rather than access remains the chief challenge for community college students. Among community college students, about 15% finish an associates degree or certificate within 3 years, and 45% leave school with no credential (16). Half of former community college students cite "personal reasons" as their explanation for leaving school, about twice as many as cite "family" or "finances." (17). Personal reasons could include many risk factors not measured by standard education surveys, such as current and past drug use (18). This study evaluates factors that are not even included in national education surveys.

Recent changes to the marijuana policy environment have increased the availability of marijuana to college students. Evidence from long-term longitudinal studies in the current cohort of college students is needed to show the associations between marijuana and educational attainment; the extent to which marijuana will substitute for use of other drugs; and how illegal drug use will affect educational attainment. This study supplements the literature on community college completion by using a nationally representative health dataset from a prior cohort of college students to identify associations between drug and alcohol use, matriculation in 2-year or 4-year college, and educational attainment. We evaluate whether students attending 2-year and 4-year college who also use alcohol and various drugs are less likely to have attained any post-secondary degree seven years later.

## Materials And Methods

## 2.1 Data

These hypotheses were tested in the National Longitudinal Study of Adolescent and Adult Health (Add Health), a nationally representative sample of students grades 7–12 in 1995, followed in 1996, 2001, and 2008 and surveyed in in-home interviews (19). Respondents and parents were interviewed in their homes in 1995 (baseline) and 1996, and respondents were followed in 2001 and 2008. Sensitive questions were asked by audio computer-assisted self-interview. This study used the baseline, 2001, and 2008 waves. The 1995 baseline survey was used instead of the 1996 wave 2 survey because the sample size was larger; a subset of baseline respondents were not invited to participate in wave 2, although they were asked to participate in waves 3 and 4.

We measured pre-college variables from the wave 1 in-home interview in 1995, when the sample was ages 12–18; college enrollment in the wave 3 in-home interview in 2001, when the sample was ages 18–24; and graduation status in the wave 4 in-home interview in 2008, when the sample was 25–31. By analyzing a 7-year span, these data can identify completion, even when degrees take more than the usual time for completion, such as BAs taking over 4 years. The sample comprises 4218 high school graduates without postsecondary credentials enrolled in 4 year or community college in 2001. High school equivalence credentials (GEDs) were not counted as high school diplomas because of observed differences in their employment and health outcomes in other studies (20).

## 2.2 Measures

### 2.2.1 Control variables

The background pre-college measures were measured in the baseline in-home interview in 1995 when the respondents were ages 12–18. The baseline control variables were socioeconomic status, demographics, education, substance use, and health status. The socioeconomic status variables were parent-reported education level, parent-reported household income (on a log scale, singly imputed with an indicator for missingness), and parent-reported response to whether the household has enough money to pay bills. Demographics were measured by whether the respondent and/or parent were born in the US, race, ethnicity, and age. Baseline substance use was number of friends who smoke cigarettes, lifetime use of alcohol while unsupervised, and lifetime use of marijuana. Educational variables were whether the respondent intends to go to college, standardized test (percentile on the Peabody Vocabulary Test), school attachment problems, history of school suspension or expulsion, and self-reported grade point average (GPA) on a 4.0 scale in English, history, science, and math. Baseline health was having ever been pregnant.

### 2.2.2 Predictor variables: substance use in 2001

Substance use was measured in 2001 at ages 18–24, and included 5 quantitative variables about alcohol use, 1 quantitative variable about marijuana use, and 11 binary variables about illegal drug use and alcohol abuse treatment. Number of episodes of alcohol use in the past year was the response to the question “During the past 12 months, on how many days did you drink alcohol?” Number of episodes of binge drinking in the past year was defined as number of times in the past year that the respondent consumed “5 or more drinks in a row.” Number of alcoholic drinks typically consumed in one episode of drinking was the response to the question “Think of all the times you have had a drink during the past 12 months. How many drinks did you usually have each time? A ‘drink’ is a glass of wine, a can of beer, a wine cooler, a shot glass of liquor, or a mixed drink.” Number of episodes of binge drinking in the past 2 weeks was defined as “five or more drinks on a single occasion, for example, in the same evening” for males and “four or more drinks on a single occasion, for example, in the same evening” for females. Number of times drunk was the response to the question “During the past 12 months, on how many days have you been drunk or very high on alcohol?” Number of episodes of marijuana use in the past month was the response to the question “During the past 30 days, how many times have you used marijuana?”

The binary variables were self-reported marijuana use in the past month and past year, cocaine use in the past month and past year, methamphetamine use in the past month and past year, injection drugs in the past month and past year (fewer than 10 cases), “other illegal drugs” in the past month and past year, whether drugs interfered with life in the past year, and obtaining treatment for alcohol abuse. “Other” illegal drugs were not listed in the survey, but it could include any illegal drug other than cocaine and marijuana, such as MDMA/ecstasy or LSD.

## **2.2.3 College enrollment in 2001**

College enrollment in 2-year versus 4-year college was measured in 2001 at ages 18–24 as the response to the question “Is this a high school, a two-year college, a four-year college, or a graduate school?”

## **2.2.2 Outcome variable: educational attainment in 2008**

Educational attainment was measured in 2008 at ages 25–31 as the highest degree listed in a detailed history of every degree attained and the date: certificate, associates degree (AA), or bachelors degree or above (BA+). Respondents attained their highest degree 3–13 years after baseline.

## **2.3 Analysis**

### **2.3.1 Bivariate analysis**

We compared substance use by 2-year and 4-year college students using the Mann-Whitney test for dichotomous substance use measures and Kruskal-Wallis test for non-dichotomous categorical

substance use measures.

## 2.3.2 Multivariate analysis

A multivariate model was used to estimate how much more common each substance use condition was among community college students than 4-year students. This model was used first in the raw data and then after matching. We used multivariate analyses in both raw and matched samples to demonstrate that matching does not change the direction of association. Multivariate regressions used a Poisson working model with robust standard errors to yield consistent and unbiased estimators that are also easily interpretable (21–24). The multivariate regressions yielded incidence rate ratios (IRRs), which can be interpreted as relative risks; they are not odds ratios.

The control variables in the regression model included gender, age, race/ethnicity (Latino, Asian, African-American), and 1995 marijuana use, friends' smoking, out-of-school suspension history, parent income, test score, grade point average (GPA), GPA missing, school attachment, ever pregnant, and college expectancies.

## 2.3.3 Matched sampling

Differences in substance use between 2-year and 4-year college students could be due to their college setting, but they could also be due to adolescents with specific pre-college drug habits choosing 2-year or 4-year colleges. This paper matched on baseline factors that may be important in students' self-selection into 2-year versus 4-year colleges, measured in 2001. We implemented matching using the MatchIt library in the R statistical package (25).

All factors used for matching were measured at baseline (1995), except age, which is computed at wave 3 (2001) from self-reported birth date and the date of the interview. We refined the matching model until there were no significant differences between the two groups of college students on key variables. We matched exactly on black race, GPA being unreported, and a binary measure of college expectancies, used 1:1 nearest-neighbor Mahalanobis matching with replacement within propensity score calipers of 0.25 standard deviations of estimated propensity score. The Mahalanobis metric estimated the distance between participants on age, grade point average (GPA), parent-reported household income, and standardized test score. The propensity score model used for estimating the propensity score calipers included binary indicators for male gender, ever being suspended, pregnant, using marijuana, using alcohol unsupervised, mother college graduation status, as well as number friends who smoke and an index for school attachment problems.

## 2.3.4 Post-matching multivariate analysis

After matching, statistical analysis used a Poisson working model and controlled for demographics (gender, age, Latino, Asian, African-American race/ethnicity); deviance (ever used marijuana, number of friends who smoke, having ever had an out-of-school suspension, ever pregnant); and socioeconomic status (parent-reported household income, test score, GPA, GPA missing, school attachment, college expectancies). As in the pre-matching multivariate analysis, the analysis used a Poisson working model, yielding estimates of incidence rate ratios, which can be interpreted as relative risks; they are not odds ratios.

## Results

### 3.1 Substance use of 2-year versus 4-year college students

Community college students were more likely than 4-year college students to have used methamphetamines (past year and past month), cocaine (past year), and injection drugs (past year and past month), and used marijuana more times in the past month, according to bivariate analysis (Table 1). Four-year college students reported more frequent alcohol use, binges, and episodes of intoxication in the past year, and more alcohol binges in the past 2 weeks, but community college students were more likely to have been in alcohol abuse treatment, and reported drinking more alcoholic drinks per night.

Community college students were more likely to have used methamphetamines (past year and past month), cocaine (past year), and to have used marijuana in the past month in multivariate analysis before matching (Figure 1). Four-year college students were more likely to have used alcohol in the past year, to have been drunk in the past year, and to have had more alcohol binges in both the past year and the past 2 weeks.

Matching identified 888 4-year college students (out of 2813 4-year college students) that were most similar to the 1398 2-year college students. Before matching, community and 4 year college students differ substantially on several baseline factors: estimated propensity of attending 2-year versus 4-year college (computed with the propensity model variables listed above), GPA, whether they expect to go to college, vocabulary test score, household income, having ever been suspended, having friends who smoke, having ever been pregnant, having used marijuana, not reporting grades on the wave 1 survey, and mother having a college degree (Figure 3). After matching, these baseline variables were no longer significantly different.

After matching on baseline factors that may have otherwise confounded the relationship between drug use and college choice, 2-year college students were more likely to have used methamphetamines (past month and past year), cocaine (past year), marijuana (in the past year and past month), and other illegal drugs in the past year, and to say drugs interfered with their life in the past year, and to drink more alcoholic beverages per drinking episode than students at 4-year college (Figure 2). Matching reduced most associations between drug use and choice of 2-year versus 4-year college towards the null of no association (Figure 1).

## 3.2 Associations between substance use and educational attainment of 2-year versus 4-year college students

Most (over 60%) of the four-year college students in this sample attained a bachelors degree, and small numbers attained certificates or associate degrees, but almost 20% attained no post-secondary credential (Figure 3). Almost 40% of 2-year college students in this sample attained no post-secondary credential.

Two-year college students with the following substance use factors in 2001 were less likely to have attained any post-secondary degree by 2008, that is, within 7 years of reporting being enrolled: having been in alcohol abuse treatment (IRR = 1.58, 95% CI (1.21, 2.07),  $p < 0.001$ ), having used methamphetamines in the past year (IRR = 1.51, 95% CI (1.12, 2.04),  $p = 0.007$ ) or past month (IRR = 1.69, 95% CI (1.09, 2.61),  $p = 0.02$ ), or having used other illegal drugs in the past year (IRR = 1.29, 95% CI (1.06, 1.58),  $p = 0.01$ ) (Figure 4).

Four-year college students with the following substance use factors in 2001 were less likely to have attained any post-secondary degree by 2008, that is, within 7 years of reporting being enrolled: reporting that drugs had interfered with school or work (IRR = 1.84 (1.28, 2.64),  $p = 0.001$ ); having used cocaine in the past year (IRR = 1.47 (1.04, 2.08),  $p = 0.03$ ); injection drugs in the past year (IRR = 2.40 (0.85, 6.75),  $p = 0.097$ ); having used marijuana in the past year (IRR = 1.30 (1.07, 1.57),  $p = 0.007$ ), past month (IRR = 1.31 (1.07, 1.61),  $p = 0.01$ ), or at least 5 times in the past month (IRR = 1.44 (1.12, 1.85),  $p = 0.005$ ); having “binged” on alcohol more than 8 times in the past year (IRR = 1.23 (0.996, 1.53),  $p = 0.05$ ); reporting that usually they consume at least 5 alcoholic drinks at a time (IRR = 1.25 (1.02, 1.53),  $p = 0.03$ ); or having used “other” illegal drugs in the past month (IRR = 1.62 (1.01, 2.58),  $p = 0.04$ ) (Figure 4). Four-year college students who reported that they usually drink 1–3 alcoholic drinks were more likely to attain a post-secondary degree than students who reported that they usually do not drink alcohol (IRR 0.83, 95% CI (0.68, 1.00),  $p = 0.05$ ).

## Discussion

With recent public policy changes, marijuana is increasingly available to college students. The results in this cohort of college students find that students at 4-year colleges who use marijuana at various levels are less likely to have attained a post-secondary degree within 7 years, but the same is not true for students at 2-year colleges. Use of a variety of other drugs predict lower likelihood

However, 2-year college students engage in more drug use risk behaviors than matched 4-year college students, with greater use of methamphetamines, cocaine, marijuana, and greater life impairment from substance use, but lower likelihood of binge-drinking alcohol, even after matching on pre-college substance use, test scores, grades, socioeconomic, and demographic factors that may have affected students’ self-selection into 2-year versus 4-year colleges. Substance use appears to reduce the chances of graduation from 4-year college more than from 2-year college, even after using matched sampling to adjust for observed factors that predict selection into 2-year versus 4-year college. Marijuana use predicts

lower likelihood of graduation from 4-year college but not 2-year college, which is particularly important with increased availability of marijuana and changed social norms due to decriminalization or legalization.

Despite serving students from more socioeconomically disadvantaged backgrounds who may have greater health needs and lower health care access, 2-year colleges generally do not have as many resources or services to help students with substance use (13).

Past research in Add Health finds that high school students diagnosed with depression are more likely to select into 2-year college than 4-year college (26). The greater substance use among 2-year college students could be partially explained by some 2-year college students with depression self-medicating with substance use.

The finding that alcohol abuse treatment predicts greater risk of non-completion for 2-year college students is consistent with past research that non-childbirth hospital admissions predicts 44% lower risks of completing an associates degree (26). Two-year colleges need to better accommodate students' health needs and help students resume college after medical treatment.

Students who attend 4-year college engage in more alcohol use, especially binge drinking. Four-year college students may have adopted these alcohol use patterns at college. A longitudinal study of beginning college students at the University of Texas found social motives (agreeing that e.g., attending social events is important) predicts greater alcohol use, and that academic motives are protective against alcohol use for females during the second year of college (27).

Moderate alcohol use may be protective for 4-year college students' college graduation relative to no use because in some cases, moderate alcohol use may signal greater social integration at college, consistent with Tinto's theory that students who become well-integrated, both academically and socially, are more likely to persist in college than students who are not well-integrated (28). Alcohol use is central to the social life at many residential 4-year colleges, and students who are able to navigate these social spheres while engaging in moderate alcohol use may have greater social integration at these colleges, and thus maintain the social connections needed to graduate college. This evidence is consistent with past research finding that moderate alcohol use predicts higher wages (29, 30), including a study in the Add Health data that explains the association between moderate alcohol use and wages by sociability (31) and the results of social network analysis in Add Health that alcohol use is associated with greater popularity (32). Alternatively, moderate alcohol use may signal resilience or greater executive function that also increases likelihood of 4-year college graduation.

Students with greater levels of illegal drug use or past alcohol abuse may be more likely to enroll in 2-year college, or they may have initiated greater levels of illegal drug use after beginning 2-year college. Students who began greater levels of substance use after our pre-college variables were measured may have chosen to enroll in 2-year college, perhaps after 4-year college. Regardless of the reasons for the

higher substance use among 2-year college students, 2-year colleges need greater resources to help their students.

## 4.1 Strengths and Limitations

This study uses the Add Health dataset to study 2-year college students because information about substance use not available in standard Department of Education datasets, such as the Beginning Postsecondary Studies (BPS) data. The sample is more diverse than previous studies of risk behaviors among 2-year college students because it is derived from a nationally representative sample of students enrolled in high school in 1995. The estimates of proportion of 2-year college students obtaining no degree are comparable to estimates from other national data including BPS and the Educational Longitudinal Study (16, 34).

Matched sampling identified students from 2-year and 4-year colleges who were comparable on baseline variables including pre-college substance use; grades and test scores; and socioeconomic status. Matching reduces the likelihood that differences between 2-year and 4-year college students were due to selection into 2-year college by students with greater substance use earlier in adolescence.

The sample comprised youth enrolled in 2-year and 4-year college in 2001, so these findings may not apply to the current cohort of students enrolled in 2-year and 4-year college. These delays are a necessary disadvantage for obtaining long-term outcomes. In this case, graduation/educational attainment was measured 7 years after the measurement of college enrollment. The most recent BPS dataset with completion data was the cohort that entered college in the 2003–04 school year and was followed through 2009, which is only 2 years more recent than Add Health. (BPS has a new cohort that began college in 2012 and had follow-up assessments at 2 years and 5 years after baseline.)

Add Health only measures educational enrollments at the time of the interview, so students' full educational trajectories are unavailable. Students have many trajectories into 2-year college. Some differences in substance use patterns between 2-year and 4-year students could be explained by transfers from 4-year colleges to 2-year colleges due to drug use, rather than initial selection into 2-year college. Regardless, a wider range of drug use predicted lower chances of earning a post-secondary credential 7 years later for 4-year college students, whereas the same was not true of 2-year college students.

## Conclusion

Two-year college students engage in a wider variety of substance use behaviors than comparable 4-year college students, and require appropriate substance use education or interventions. These results suggest that substance use education and interventions for 2-year college students should include substances beyond alcohol, including methamphetamines, cocaine, and marijuana. Although few 2-year colleges can provide alcohol treatment, this research suggests that students who have received alcohol treatment may

need their college's help for returning to classes and integrating socially and academically after the treatment.

Substance use is germane to college choice and college completion, which is a key social determinant of health. The changing marijuana policy environment has increased marijuana availability, including to college students, making it particularly important to collect data about substance use in the post-secondary educational datasets used by policy-makers, 2-year and 4-year colleges, and public health officials.

## Declarations

grade point average = GPA

associates degree = AA

bachelors degree or above = BA+

Beginning Postsecondary Studies (dataset) = BPS

Incidence rate ratios = IRR

Confidence interval = CI

- Declarations
- Ethics, consent and permissions (ethics approval)
- This study was ruled exempt by the institutional review board of SUNY Downstate Medical Center (FWA# 00003624 Study #[440410-1].)
- Consent for publication
- Not applicable. The paper does not include individual participants' data.
- Disclosure statement / Competing Interests

*The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.*

- Authors' Contributions

JR contributed conception and design of the data analysis, organized the database, performed the statistical analysis, wrote all drafts of the manuscript, and approved the submitted version.

- Funding

This work was supported by the American Institutes for Research under a subcontract; the Eunice Kennedy Shriver National Institute for Child Health and Human Development under grant R24-HD041041

to the Maryland Population Research Center; and a grant from the American Educational Research Association which receives funds for its “AERA Grants Program” from the National Science Foundation under Grant #DRL–0941014. Opinions reflect those of the author and do not necessarily reflect those of the granting agencies.

This research uses data from Add Health, a program project directed by Kathleen Mullan Harris and designed by J. Richard Udry, Peter S. Bearman, and Kathleen Mullan Harris at the University of North Carolina at Chapel Hill, and funded by grant P01-HD31921 from the Eunice Kennedy Shriver National Institute of Child Health and Human Development, with cooperative funding from 23 other federal agencies and foundations. Special acknowledgment is due Ronald R. Rindfuss and Barbara Entwisle for assistance in the original design. Information on how to obtain the Add Health data files is available on the Add Health website (<http://www.cpc.unc.edu/addhealth>). No direct support was received from grant P01-HD31921 for this analysis.

## Availability of data

These analyses use the restricted Add Health dataset, available by request from <https://www.cpc.unc.edu/projects/addhealth/> and described on ICPSR [https://www.icpsr.umich.edu/icpsrweb/DSDR/search/studies?q = Add+Health+restricted](https://www.icpsr.umich.edu/icpsrweb/DSDR/search/studies?q=Add+Health+restricted)

## References

- [1] Delucchi KL, Matzger H, Weisner C. Alcohol in emerging adulthood: 7-year study of problem and dependent drinkers. *Addictive Behaviors*. 2008;33:134–142. ☒
- [2] Braun BL, Hannan P, Wolfson M, Jones-Webb R, Sidney S. Occupational attainment, smoking, alcohol intake, and marijuana use: ethnic-gender differences in the CARDIA study. *Addictive Behaviors*. 2000;25:399–414. ☒
- [3] Sloan FA, Malone P, Kertész SG, Wang Y, Costanzo PR. Racial differences in the relationship between alcohol consumption in early adulthood and occupational attainment at midlife. *American Journal of Public Health*. 2009;99:2261– 2267. ☒
- [4] Rosenbaum JE. Degrees of health disparities: Health status disparities between young adults with high school diplomas, sub-baccalaureate degrees, and baccalaureate degrees. *Health services & outcomes research methodology*. 2012;12:156– 168. ☒
- [5] Wall AF, Bailey Shea C, McIntosh S. Community College Student Alcohol Use: Developing Context-Specific Evidence and Prevention Approaches. *Community College Review*. 2012;40:25–45.
- [6] Sheffield FD, Darkes J, Del Boca FK, Goldman MS. Binge Drinking and Alcohol-Related Problems Among Community College Students: Implications for Prevention Policy. *Journal of American College*

Health. 2005;54:137–141. ☒

[7] McAloon DT. The Effect of Alcohol Abuse on Academic Achievement on Two-Year Campuses. *Community College Review*. 1994;22:12–18. ☒

[8] Coll KM. An Assessment of Drinking Patterns and Drinking Problems among Community College Students: Implications for Programming. *Journal of College Student Development*. 1999;40:98–100. ☒

[9] Blowers J. Common Issues and Collaborative Solutions: A Comparison of Student Alcohol Use Behaviors at the Community College and Four-year Institutional Levels. *Journal of Alcohol and Drug Education*. 2009;53:65. ☒

[10] Pokhrel P, Little M. A, Herzog T. A. Current Methods in Health Behavior Research Among U.S. Community College Students: A Review of the Literature. *Evaluation & the Health Professions*. 2014;37:178. ☒

[11] Bock BC, Barnett NP, Thind H, et al. A text message intervention for alcohol risk reduction among community college students: TMAP. *Addictive Behaviors*. 2016;63:107–113. ☒

[12] Lewis MA, Cadigan JM, Cronce JM, et al. Developing Text Messages to Reduce Community College Student Alcohol Use. *American Journal of Health Behavior*. 2018;42:70–79.

[13] Lenk KM, Nelson TF, Erickson DJ, Toomey TL. How Are 2-Year US Colleges Addressing Student Alcohol Use and Related Problems? *Journal of College Student Development*. 2015;56:380–385. ☒

[14] Settersten R, Ray BE. *Not Quite Adults: Why 20-Somethings Are Choosing a Slower Path to Adulthood, and Why It's Good for Everyone*. Bantam, 2010. ☒

[15] Rosenbaum JE, Rosenbaum JE. Beyond BA Binders: Lessons from Occupational Colleges and Certificate Programs for Nontraditional Students. *Journal of Economic Perspectives*. 2013;27:153–172. ☒

[16] Snyder TD, Brey C, Dillow SA. *Digest of Education Statistics, 2017*. National Center for Education Statistics. 2019. ☒

[17] Provasnik S, Planty M. *Community Colleges Special Supplement to The Condition of Education 2008*. NCES 2008–033. National Center for Educational Statistics 2008. ☒

[18] Horn L. *On Track to Complete? A Taxonomy of Beginning Community College Students and Their Outcomes 3 Years After Enrolling: 2003–04 through 2006*. National Center for Educational Statistics 2009. ☒

[19] Currie E. *Road to Whatever: Middle-Class Culture and the Crisis of Adolescence*. New York: Howard Holt 2004. ☒

- [20] Udry JR. The National Longitudinal Study of Adolescent Health (Add Health), Waves I & II, 1994–1996; Wave III, 2001–2002 [machine-readable data file and documentation]. Chapel Hill, NC: Carolina Population Center, University of North Carolina at Chapel Hill 2003. ☒
- [21] Barbeau EM, Krieger N, Soobader M. Working class matters: socioeconomic disadvantage, race/ethnicity, gender, and smoking in NHIS 2000. *American Journal of Public Health*. 2004;94:269–278. ☒
- [22] Cummings P. The Relative Merits of Risk Ratios and Odds Ratios. *Arch Pediatr Adolesc Med*. 2009;163:438–445. ☒
- [23] Lumley T, Kronmal R, Ma S. Relative Risk Regression in Medical Research: Models, Contrasts, Estimators, and Algorithms. Biostatistics Working Paper Series 293. University of Washington 2006. ☒
- [24] McNutt L, Wu C, Xue X, Hafner JP. Estimating the Relative Risk in Cohort Studies and Clinical Trials of Common ☒Outcomes. *American Journal of Epidemiology*. 2003;157:940 –943. ☒
- [25] Zou G. A Modified Poisson Regression Approach to Prospective Studies with Binary Data. *American Journal of Epidemiology*. 2004;159:702 –706. ☒
- [26] Ho D, Imai K, King G, Stuart E. MatchIt: Nonparametric Preprocessing for Parametric Causal Inference, software version 2.4–21. Harvard Institute for Quantitative Social Sciences 2018. ☒
- [27] Rosenbaum JE. Disabilities and Degrees: Identifying Health Impairments that Predict Lower Chances of College ☒Enrollment and Graduation in a Nationally Representative Sample. *Community College Review*. 2018;46:145–175. ☒
- [28] Vaughn MG, Beaver KM, Wexler J, DeLisi M, Roberts GJ. The effect of school dropout on verbal ability in adulthood: ☒a propensity score matching approach. *Journal of Youth and Adolescence*. 2011;40:197–206. ☒
- [29] TintoV. Dropout from Higher Education: A Theoretical Synthesis of Recent Research. *Review of Educational Research*.1975;45:89–125. ☒
- [30] French MT, Zarkin GA. Is moderate alcohol use related to wages? Evidence from four worksites. *Journal of Health Economics*. 1995;14:319–344. ☒
- [31] Barrett GF. The Effect of Alcohol Consumption on Earnings. *Economic Record*. 2002;78(240):79–96. DOI: 10.1111/1475–4932.00041 ☒
- [32] Mundt MP, French MT. Adolescent alcohol use, sociability and income as a young adult. *Applied Economics*. 2013;45:3329–3339. ☒

[33] Ali MM, Amialchuk A, Nikaj S. Alcohol consumption and social network ties among adolescents: evidence from Add Health. *Addictive Behaviors*. 2014;39:918–922. ☒

[34] Rosenbaum JE, Ahern CE, Rosenbaum JE. *Bridging the gaps: College pathways to career success*, Russell Sage Foundation, 2017.

## Tables

Table 1: Comparison of substance use (measured in 2001) by two and four-year college students in full sample (n=4218).

	4-year college	2-year college	P
Marijuana use in the past year (%)	32.2	34.3	0.17
Cocaine use in the past year (%)	4.91	6.83	0.01
Cocaine use in the past month (%)	1.03	1.49	0.19
Methamphetamines in the past year (%)	1.10	3.35	<0.001
Methamphetamines in the past month (%)	0.28	1.14	<0.001
Other illegal drugs in the past year (%)	9.81	10.8	0.34
Other illegal drugs in the past month (%)	2.10	2.21	0.82
Injection drugs in the past year (%)	0.21	0.57	0.06
Injection drugs in the past month (%)	0	0.36	<0.001
Drugs interfered with work or school in the past year (%)	3.23	3.91	0.26
Alcohol abuse treatment in the past year (%)	2.60	3.91	0.02
No. episodes marijuana use in the past month (Mean (SD))	2.17 (7.83)	2.73 (8.69)	0.04
No. episodes of 5+ alcoholic drinks in past year (Mean (SD))	20.5 (45.7)	15.6 (39.6)	<0.001
No. episodes of inebriation in the past year (Mean (SD))	18.3 (38.7)	13.2 (34.5)	<0.001
No. episodes of alcohol use in the past year (Mean (SD))	45.1 (64.5)	34.5 (56.8)	<0.001
No. episodes of 5+ alcoholic drinks in the past 2 weeks (Mean (SD))	1.03 (2.02)	0.78 (1.68)	<0.001
Usual no. alcoholic drinks in a drinking episode (Mean (SD))	4.13 (2.59)	4.35 (2.98)	0.15

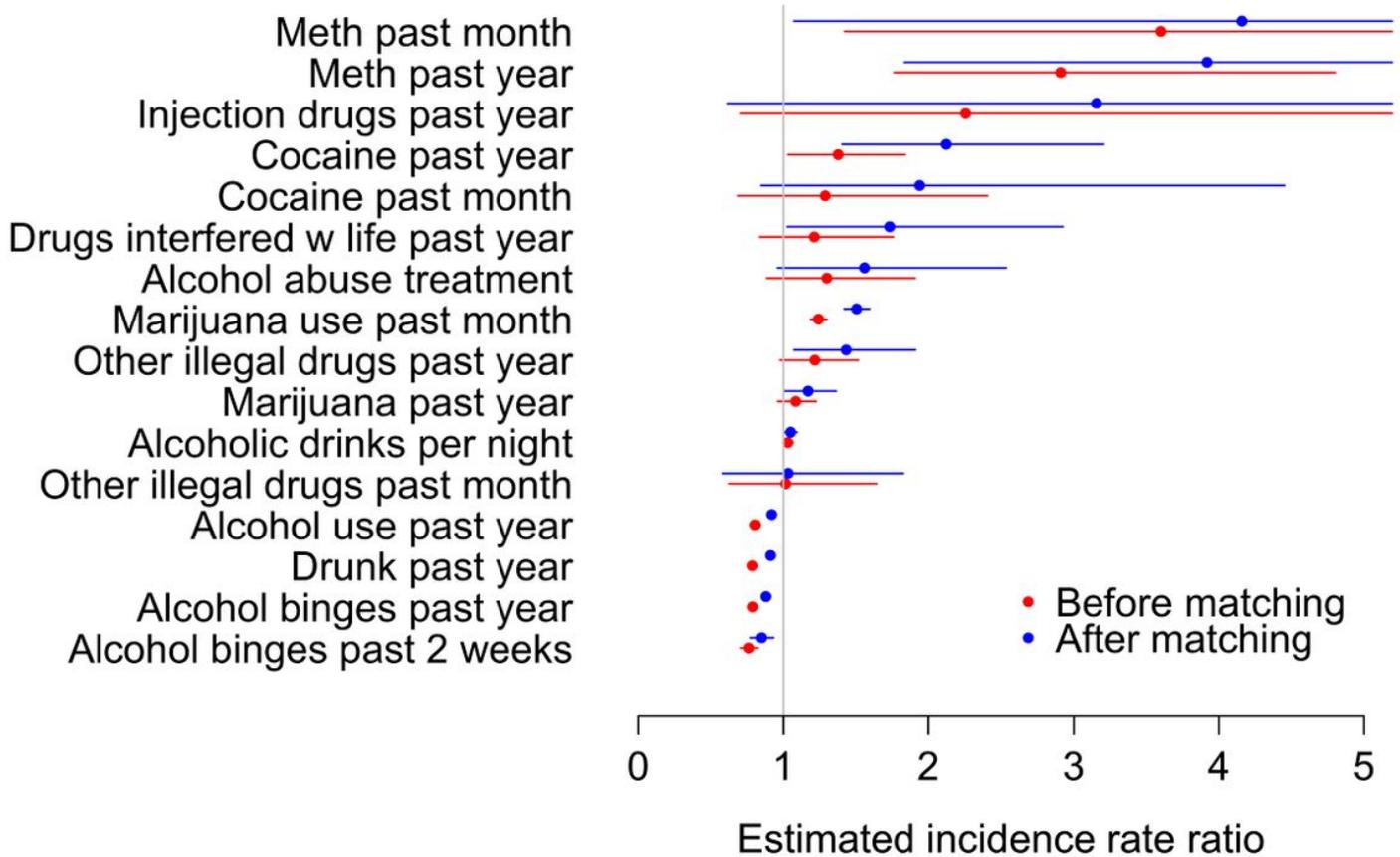
Rounded to 3 significant figures. Significance was assessed with the Mann-Whitney (dichotomous substance use measures) and Kruskal-Wallis (non-categorical substance use measures) tests.

Table 1: Comparison of substance use (measured in 2001) by two and four-year college students in full sample (n=4218).

	4-year college	2-year college	P
Marijuana use in the past year (%)	32.2	34.3	0.17
Cocaine use in the past year (%)	4.91	6.83	0.01
Cocaine use in the past month (%)	1.03	1.49	0.19
Methamphetamines in the past year (%)	1.10	3.35	<0.001
Methamphetamines in the past month (%)	0.28	1.14	<0.001
Other illegal drugs in the past year (%)	9.81	10.8	0.34
Other illegal drugs in the past month (%)	2.10	2.21	0.82
Injection drugs in the past year (%)	0.21	0.57	0.06
Injection drugs in the past month (%)	0	0.36	<0.001
Drugs interfered with work or school in the past year (%)	3.23	3.91	0.26
Alcohol abuse treatment in the past year (%)	2.60	3.91	0.02
No. episodes marijuana use in the past month (Mean (SD))	2.17 (7.83)	2.73 (8.69)	0.04
No. episodes of 5+ alcoholic drinks in past year (Mean (SD))	20.5 (45.7)	15.6 (39.6)	<0.001
No. episodes of inebriation in the past year (Mean (SD))	18.3 (38.7)	13.2 (34.5)	<0.001
No. episodes of alcohol use in the past year (Mean (SD))	45.1 (64.5)	34.5 (56.8)	<0.001
No. episodes of 5+ alcoholic drinks in the past 2 weeks (Mean (SD))	1.03 (2.02)	0.78 (1.68)	<0.001
Usual no. alcoholic drinks in a drinking episode (Mean (SD))	4.13 (2.59)	4.35 (2.98)	0.15

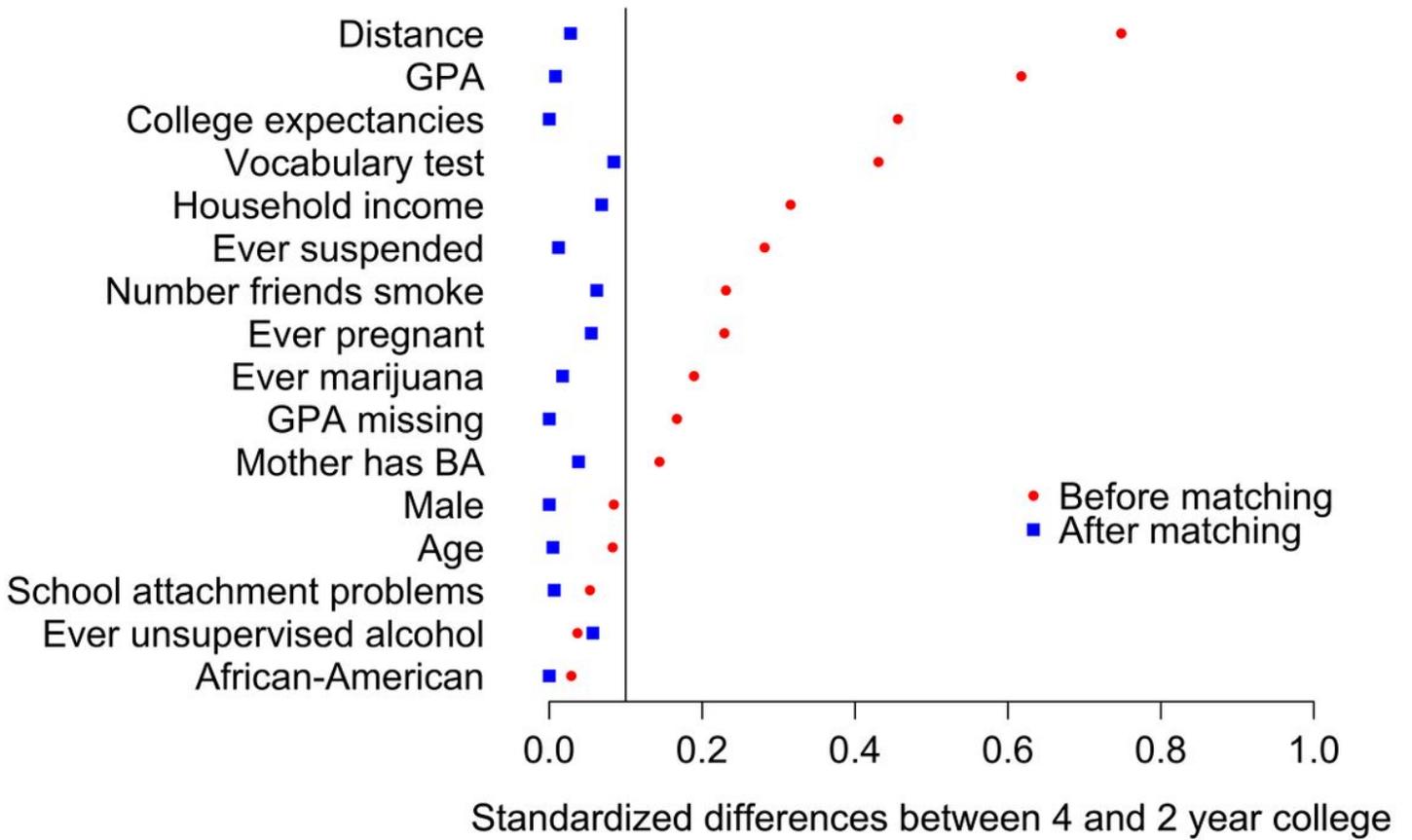
Rounded to 3 significant figures. Significance was assessed with the Mann-Whitney (dichotomous substance use measures) and Kruskal-Wallis (non-categorical substance use measures) tests.

# Figures



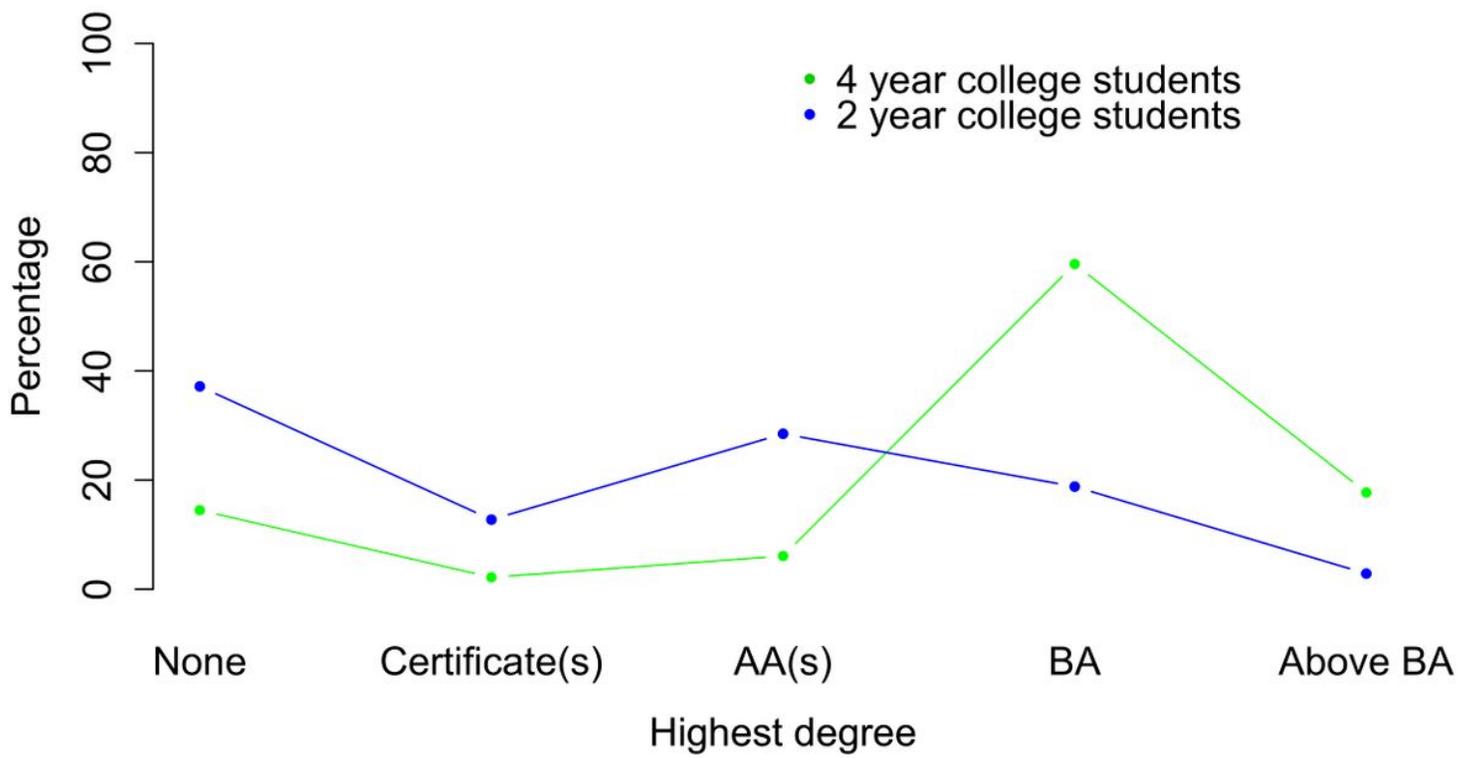
**Figure 1**

Comparison of substance use (measured in 2001) among two versus four-year college students in full and matched samples (n=4218 before matching and n=2286 after matching). Ratio greater than 1 means that frequency is higher among community college students than 4 year college students. Incidence rate ratios were estimated by a Poisson working model in full and matched samples. Multivariate results are shown in red for the raw data and in blue for the matched sample. Control variables were gender, age, race/ethnicity (Latino, Asian, African-American), and 1995 marijuana use, friends' smoking, out-of-school suspension history, parent income, test score, grade point average (GPA), GPA missing, school attachment, ever pregnant, and college expectancies.



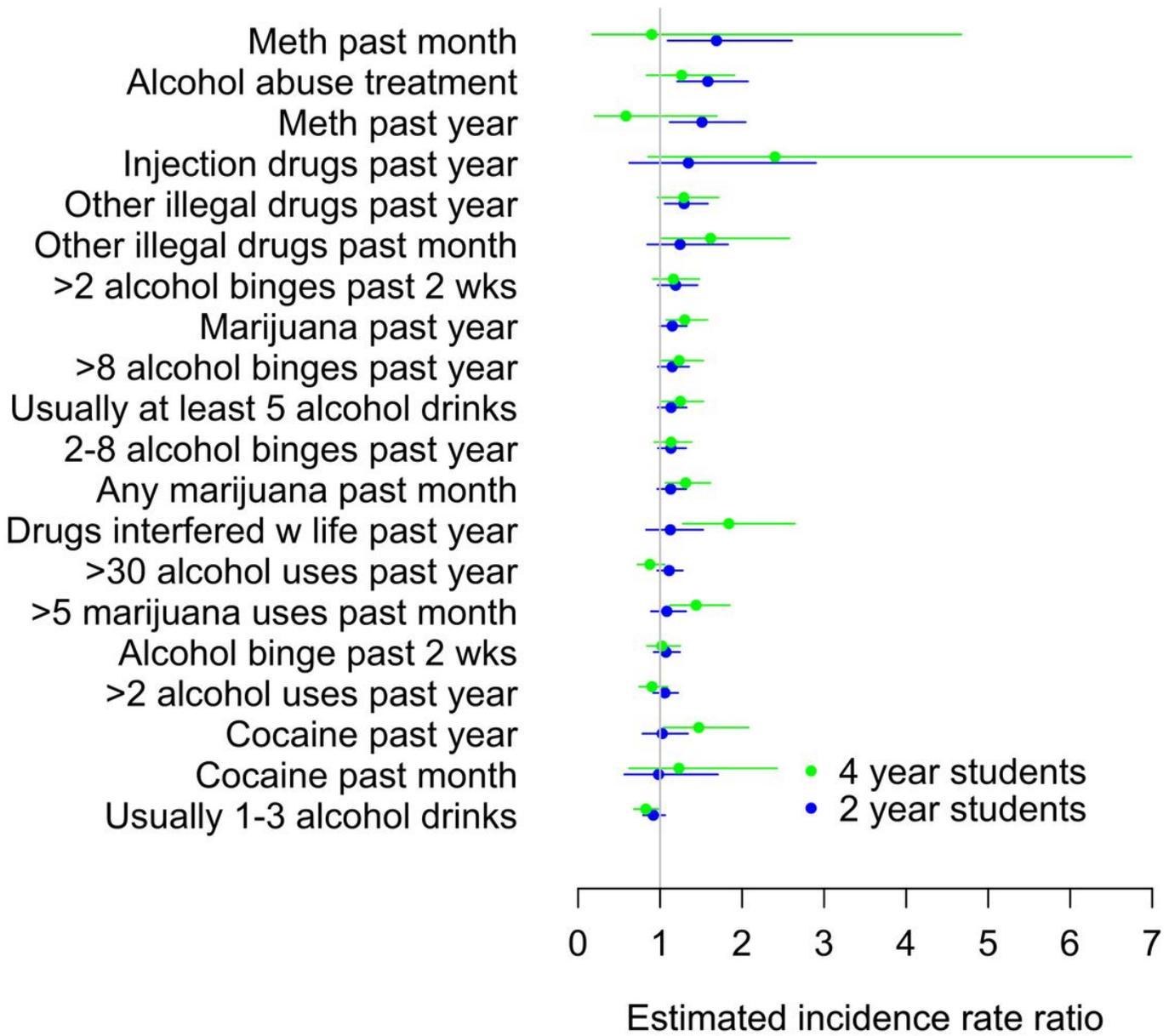
**Figure 2**

Comparison of pre-college variables for 2-year and 4-year students, before and after matching. The absolute value of standardized differences are plotted. <0.1 are not significant.



**Figure 3**

Distribution of educational attainment in 2008 by two and four-year college students in full sample (n=4218).



**Figure 4**

Substance use factors that predict non-completion (attaining no post-secondary degree by 2008), in community college students (blue) and 4 year college students (green) in matched sample (n=2286).