Published in final edited form as:

Psychiatr Serv. 2013 February 1; 64(2): 165–172. doi:10.1176/appi.ps.201200106.

Discontinuous enrollment during college: Associations with substance use and mental health

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Abstract

Objective—To examine the prospective relationship of substance use and mental health problems with risk for discontinuous enrollment during college.

Methods—Participants were 1,145 college students interviewed annually at one large public university, beginning at college entry (year 1). Discontinuous enrollment was defined as a gap in enrollment of one or more semesters and operationalized as “early” (i.e., during the first two years) and “late” (i.e., during the second two years) versus “none” (i.e., continuously enrolled throughout college). Explanatory variables measured in year 1 were the Beck Depression Inventory (BDI), Beck Anxiety Inventory (BAI), childhood conduct problems, cannabis use, number of illicit drugs used, and alcohol consumption. In years 3–4, participants reported lifetime history of clinically diagnosed ADD/ADHD, depression, and/or anxiety, including age at diagnosis. Multinomial logistic regression models were developed to evaluate the association between the independent variables and discontinuous enrollment, holding constant background characteristics.

Results—Higher BDI scores predicted early discontinuity but not late discontinuity, whereas cannabis and alcohol use predicted late discontinuity but not early discontinuity. Receiving a depression diagnosis during college was associated with both early and late discontinuity. None of the self-reported pre-college diagnoses were related to discontinuous enrollment once background characteristics were taken into account.

Conclusion—Students experiencing depressive symptoms and/or seeking treatment for depression during college might be at risk for interruptions in their college enrollment. Cannabis use and heavy drinking appear to add to this risk. Students entering college with pre-existing psychiatric diagnoses are not necessarily at risk for enrollment interruptions.

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Disclosures:

None for any author

Keywords

Academic performance; college students; marijuana; mental health

Mental health and substance use among young adults are major public health concerns because of their impact on well-being, safety, and individual productivity. College students have high rates of excessive drinking and drug use (1,2), and counseling centers have seen increasing numbers of students with mental health problems including depression and suicidality (3) and students taking medications for psychiatric conditions (4). Nationally, one in ten college students sought counseling during the past year (4), with the most recent data showing that 28% of students “felt so depressed in the past year that it was difficult to function” (5). Regardless of college enrollment, young adulthood is a high-risk period for many psychiatric disorders (6), especially the onset of substance use disorders (7).

An understudied aspect of this problem is that psychiatric disorders and substance use might be associated with academic problems among college students, perhaps making it more difficult for students to stay enrolled and complete their degree on time. For example, stress related to academic struggles might precipitate an underlying mental health condition such as depression, or lead to escalation of substance use. Alternatively, psychiatric symptoms could negatively affect decisions to participate in both academic pursuits and extracurricular activities, thereby reducing the student’s sense of connectedness to the college environment. Also, a student experiencing the onset of a new psychiatric disorder during college might not be equipped to recognize the problem or want to talk about it, which could lead to social and academic disengagement. Moreover, heavy drinking and illicit drug use have also been linked to academic performance problems (8,9). This could be attributable to substance-related cognitive impairments that hinder the ability to retain information (10), as well as the tendency for academic pursuits to become less important relative to drug-seeking and using as severity of a substance use disorder increases (11).

Considering that psychiatric disorders and substance use often co-occur (12), it is important to disentangle any potential overlap in their associations with academic outcomes in college. We identified three studies examining the relationships between mental health, substance use, and likelihood of graduating from college. Breslau et al. (8) used survival analysis in a large national sample and found that substance use disorders were associated with early termination from college, as were bipolar, panic, and impulse control disorders, even holding constant demographics and several measures of childhood adversity. Hunt et al. (9) conducted a similar cross-sectional study simultaneously testing ten different DSM-IV diagnoses (11) as possible correlates of college non-completion. Bipolar disorder, antisocial personality disorder, and three drug use disorders (cannabis, amphetamine, and cocaine) independently predicted college non-completion. Eisenberg et al. (13) examined the longitudinal relationships of depression, anxiety, and eating disorders with subsequent grade point average (GPA) and college graduation. Both depressive symptoms and binge drinking independently predicted both lower GPA and greater likelihood of dropping out of college, and the presence of anxiety symptoms intensified the effect of depressive symptoms. However, these studies were limited in their ability to assess the effects of alcohol and other drug use. The first two only accounted for use that met DSM-IV criteria for abuse or dependence (11), which does not represent the majority of users. The third study did not examine drug use at all. Moreover, none of the studies considered the timing of a psychiatric diagnosis in the analyses, leaving open the question of whether pre-college and college-onset diagnoses are equally important in predicting college departure.

This study builds upon our previous research with a longitudinal cohort of individuals originally enrolled as college students. Earlier findings showed that drug use was associated with skipping class and lower grades (14). In the present study, our outcome variable is discontinuous enrollment, meaning a gap in enrollment of one or more semesters, which may or may not be followed by re-enrollment and degree completion. Discontinuous enrollment has been regarded as a negative outcome by educational researchers because it represents a setback in one's academic career and places one at risk for dropout, even if the student transfers to a different school (15,16). For instance, in a five-year national study of students who left college during their first year, one-third never returned, and only 17% of those who did return earned their bachelor's degree, as compared with 61% among students who persisted into their second year (17).

In this prospective study, we examine the interrelationships between substance use and psychiatric conditions among college students as they relate to risk for discontinuous college enrollment. Analyses aim to: identify the differences between students who do and do not experience interruptions in college enrollment, with respect to substance use, psychiatric diagnoses, psychiatric symptoms, and background characteristics; develop an explanatory model predicting enrollment interruptions during the first four years of college on the basis of student characteristics in year 1 (e.g., substance use, psychiatric symptoms, pre-college and college psychiatric diagnoses); and develop an explanatory model predicting "early" and "late" enrollment interruptions during college (i.e., years 1–2 and years 3–4 of college) on the basis of year 1 substance use and psychiatric symptoms, pre-college and college psychiatric diagnoses, and background characteristics. This study focuses on three broad psychiatric diagnoses: depression, anxiety, and attention deficit disorders (ADD/ADHD).

Methods

Sample

Data were collected in the College Life Study, an ongoing longitudinal study of health-risk behaviors in 1,253 young adults originally ascertained as incoming first-time first-year students at one large, public university in the mid-Atlantic region (18,19). After screening 82% ($N=3,401$) of the incoming cohort during the summer before college entry in 2004, a sample were selected for longitudinal follow-up (87% response rate), beginning with a two-hour personal interview sometime during their first year of college (year 1). Students who ever used illicit drugs before college were purposively oversampled to ensure adequate statistical power for drug-related analyses. Participants were followed-up annually in similar assessments (years 2–4; 2005–2008), regardless of continued college attendance, with follow-up rates exceeding 87% annually. Interviewers were trained extensively in assessment procedures and human subjects protections. Participants received cash incentives. After giving participants a complete description of the study, we obtained written informed consent via institutional review board-approved protocols. A federal Certificate of Confidentiality was obtained.

The analytic sample consisted of 1,145 individuals [53% ($n=604$) female; 73% ($n=834$) white; ages 17 to 20 in year 1] who completed annual assessments in years 3 and/or 4, during which details of psychiatric diagnoses were captured. Compared with the inclusion sample, the 108 excluded individuals (i.e., not assessed in year 3 or 4) were similar with respect to neighborhood income and race, but were more likely to be male, experience gaps in college enrollment, and have lower high school GPAs.

Outcome measure

Discontinuous enrollment—Data on credit hours earned and degrees granted were obtained from the home university for eight semesters comprising the first four years of college (i.e., fall 2004 through spring 2008), per participants' informed consent. Continuous enrollment was defined as being enrolled for at least one credit during all eight semesters or until graduation, whichever came first. Individuals earning zero credits in at least one semester were coded as discontinuously enrolled. For the 63 individuals who graduated before spring 2008 (6% of inclusion sample), discontinuous enrollment referenced only the semesters prior to graduation. Because enrollment disruptions are likely to occur early in college, and because persistence early in college is regarded as a strong indicator of later persistence and completion of college (20), we further distinguished between "early" and "late" discontinuity (i.e., during the first two years and last two years of college, respectively). Individuals with both early and late discontinuity were coded for "early" discontinuity.

Explanatory variables

Psychiatric diagnoses—In years 3 and 4, participants were asked about their history of being diagnosed with ADD/ADHD, anxiety, and/or depression, and their age at first diagnosis. For each diagnosis, we compared the age at diagnosis with the age at year 1 assessment to construct a three-level categorical variable representing the timing of diagnosis as before or after starting college, with "never diagnosed" as the reference category.

Psychiatric symptoms—In year 1, the Beck Depression Inventory (BDI; 21) and Beck Anxiety Inventory (BAI; 22), were self-administered to assess depression and anxiety symptoms, respectively. For both scales, possible scores range from 0 to 63, with higher scores indicating greater symptoms.

Substance use—Participants were asked in year 1 about their past-year use of alcohol and illicit drugs (i.e., cannabis, inhalants, hallucinogens, cocaine, amphetamine/methamphetamine, heroin, ecstasy) and nonmedical use of prescription stimulants, tranquilizers, and analgesics. The typical number of drinks consumed per drinking day was assessed, as was the number of days of cannabis use during the past year. The number of illicit drugs used during the past year was computed as an index of overall drug involvement.

Childhood conduct problems—An adapted 18-item version of the Conduct Disorder Screener (23–25) was administered in year 1, corresponding to DSM-IV criteria for conduct disorder (11) with the sole exception of forgery. Behaviors were weighted by severity (23) and a summary score was computed (range 0 to 26).

Background characteristics—High school GPA was obtained from the home university. Race was self-reported in year 3 (supplemented where missing with administrative data) and later dichotomized as white versus non-white due to the preponderance of non-Hispanic whites. The mean adjusted gross income for participants' home ZIP code during their last year of high school was captured from publicly available data (26) and denoted herein as "neighborhood income." The highest level of educational attainment of either parent was self-reported. Gender was recorded in year 1.

Statistical analysis

Sample characteristics were compared between the subsets of participants with early, late, and no discontinuity in their college enrollment. Intercorrelations were examined amongst all the hypothesized predictors. Next, a series of logistic regression models were assessed to explain the association between the predictor variables and discontinuous versus continuous enrollment. The following steps were devised to isolate the additive contribution, if any, of drug use and drinking over and above the contribution from the psychiatric variables. After examining bivariate relationships, a combined model was fit including the variables on psychiatric diagnoses (ADD/ADHD, depression, anxiety), psychiatric symptoms (BDI, BAI), childhood conduct problems, and background characteristics (gender, race, neighborhood income, high school GPA, parents' education). To find the most parsimonious model, non-significant diagnosis and symptom variables were dropped from the model and reintroduced one by one to evaluate the potential for statistical significance ($\alpha=.05$). Then the substance use variables were introduced. Finally, the logistic regression analyses were replicated using the multinomial dependent variable on early and late discontinuity, with continuous enrollment as the reference group. In all regression analyses, background characteristics were retained regardless of statistical significance. The following hypothesized first-order interactions were evaluated: between gender and each of the diagnosis, symptom, and substance use variables; between BDI and BAI, based on Eisenberg et al. (13); and between cannabis use frequency and depression diagnosis. Analyses were conducted using SAS version 9.2 (27).

Results

By year 4, 14% of participants were diagnosed with depression, 13% with anxiety, and 10% with ADD/ADHD (Table 1). The timing of diagnoses was somewhat evenly distributed between pre-college and college ages. Illicit drug use was highly prevalent: 62% of the sample used cannabis in year 1, and 24% used two or more illicit drugs. Several significant bivariate differences in participant characteristics by enrollment status were also found (Table 1). Intercorrelations amongst the psychiatric and substance use variables are presented in Table 2.

In the regression predicting overall discontinuous enrollment (Table 3), college depression diagnosis was associated with more than a two-fold increase in risk for discontinuity, even controlling for gender, high school GPA, and other background characteristics. Additionally, BDI score and cannabis use frequency were independently associated with increased risk for discontinuity, on the order of 3% for each one-point increase in BDI score, and 4% for each additional 10 days of cannabis use. None of the other variables tested were significant in the final model.

In the multinomial regression (Table 4), early discontinuity was 7% more likely for each one-point increase in BDI score and over 3 times more likely among students diagnosed with depression during college, holding constant high school GPA and other background characteristics. While substance use was not related to early discontinuity, both cannabis use frequency and number of drinks per drinking day independently predicted late discontinuity, on the order of 5% for each additional 10 days of cannabis use and 9% for each additional drink per drinking day. Additionally, college-onset depression diagnosis was associated with a more than two-fold increase in risk for late discontinuity. None of the other variables tested were significant in the final model.

None of the hypothesized interactions were statistically significant in either the binomial or multinomial regression.

Discussion

In this study, being diagnosed with depression during college was strongly associated with interruptions in college enrollment, independent of other psychiatric diagnoses, psychiatric symptoms, and background characteristics. Moreover, first-year students with high levels of depressive symptoms were at increased risk for missing one or more semesters during their first two years of college. Students entering college with a prior diagnosis of depression, anxiety, or ADD/ADHD were not at increased risk for interruptions in enrollment over four years, after accounting for high school GPA and other background characteristics. These findings extend prior evidence that depressive symptoms in college students—but not necessarily depressive disorders—predict increased risk for college non-completion (8,9,13). Our ability to differentiate between diagnoses that occurred before and during college provide new information about this association.

The present findings suggest that year 1 depressive symptoms might be an important indicator of risk for retention problems, and comport with the notion that early departures from college are often attributable to difficulties with adjusting to college (17,28). Unlike Eisenberg et al. (13), we did not find any evidence of an interaction between anxiety and depressive symptoms, possibly due to differences in symptom and outcome measures. The fact that both BDI score and depression diagnosis during college independently predicted discontinuous enrollment suggests that poorly controlled symptoms present an added risk factor for students being treated for depression. The absence of an interaction between gender and BDI score suggests that depressive symptoms are equally problematic for men and women with respect to college retention.

Both alcohol quantity and cannabis use frequency during year 1 predicted discontinuous enrollment during the last two years of college, but not during the first two years. One possible explanation for this finding is that substance use problems might escalate with time and lead to academic problems later in college. Alternatively, cannabis use and very heavy drinking might be related to other variables that predict premature departure from college, such as disengagement (17), yet further study is needed to understand the relative importance of these factors for early and late departures. It is tempting to speculate that the correlates and causes of enrollment disruptions might differ depending on when the disruption occurs. For instance, depressive symptoms early in college might indicate poor adjustment to the demands of college and consequent high risk for non-completion, whereas drug use might indicate a lack of commitment or focus that presents less of a barrier to persistence but results in delayed degree completion. Future research on postsecondary educational attainment should integrate substance use and mental health risk factors.

Results must be interpreted in light of several limitations. First, data on enrollment at other institutions were not available; therefore, we cannot say how many participants coded as “discontinuous” were enrolled elsewhere during an enrollment gap at the home university. Thus, our measure should be regarded as conservative, with greater relevance for understanding retention at the home institution, rather than as a thorough summary of each individual’s enrollment patterns. Second, in the absence of clinical assessments, our self-reported psychiatric diagnoses are likely a proxy for treatment-seeking, which tends to favor females and whites (29). We mitigated this limitation somewhat by controlling for gender and race, and by assessing symptoms. Third, although we included a large number of possibly confounding variables, the observed associations still might be attributable to other unmeasured factors. Finally, generalizability of results to students in other higher education settings is unknown.

The above limitations notwithstanding, the study has several strengths. First, discontinuous enrollment is a more subtle outcome than college completion, which has been the focus of most prior studies of academic outcomes. Understanding which students are at greater risk for experiencing interruptions in their education—whether from temporarily stopping out, transferring to another institution, or permanently dropping out of college—is advantageous for university administrators interested in achieving high retention and graduation rates. Secondly, our longitudinal design permits the identification of risk factors that preceded disruptions in enrollment, and therefore could be identified early while students are in their first year of college. Thirdly, whereas prior educational research has emphasized non-traditional students as being at risk for discontinuous enrollment (e.g., older, married, parenting, employed; 17,30,31), our study focuses on traditional-age college students, and thus sheds new light on the risk factors for discontinuity among the majority of students at four-year institutions.

Results have implications for health providers, campus administrators, and parents. If replicated, findings might point to a need for greater cooperation between campus health services and academic assistance, which might help some struggling students complete college on time, or even avoid dropping out of college. Further study is needed to evaluate the effectiveness of coordinated approaches to academic assistance that integrate substance use and mental health screening. Finally, parents should be vigilant for signs of depression and substance use in their college-attending child and encourage early help-seeking when they suspect a problem.

Conclusions

Findings underscore the importance of depressive symptoms, depression diagnosis, and substance use as independent predictors of college retention problems. Screening for drug use, heavy drinking, and depressive symptoms, especially during the first year of college, might be useful for identifying students at risk for stopout or dropout. It is encouraging that students entering college with a pre-existing diagnosis of depression or anxiety fared just as well as their counterparts with respect to maintaining college enrollment.

Acknowledgments

Funding for this study was received from the National Institutes of Health, National Institute on Drug Abuse (R01-DA14845).

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Table 1
Comparison of sample characteristics by enrollment status during the first four years of college ($N=1,145$)

Characteristics	Total sample ($N=1,145$)		College enrollment path					
			Continuously enrolled ($n=805$)		Early discontinuity ($n=107$)		Late discontinuity ($n=233$)	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Female	604	53	414	51	51	48	139	60
White	834	73	581	72	72	67	181	78
Neighborhood income ^a ($M \pm SD$)	7.3 $\pm$ 3.4		7.2 $\pm$ 3.2		7.2 $\pm$ 3.6		7.8 $\pm$ 3.9	
High school GPA ($M \pm SD$)	3.87 $\pm$.40		3.90 $\pm$.39		3.78 $\pm$.43		3.84 $\pm$.42	
Parents' education								
High school, GED, or less	88	8	74	10	6	6	8	4
Some college or technical	63	6	54	7	3	3	6	3
Bachelor's degree	309	29	218	29	32	32	59	28
Graduate degree	611	57	412	54	59	59	140	66
Childhood conduct problems	6.7 $\pm$ 4.7		6.6 $\pm$ 4.6		6.6 $\pm$ 4.6		7.7 $\pm$ 5.2	
Beck Depression Inventory ($M \pm SD$)	5.4 $\pm$ 5.2		5.1 $\pm$ 4.7		7.4 $\pm$ 7.6		5.5 $\pm$ 5.5	
Beck Anxiety Inventory ($M \pm SD$)	7.6 $\pm$ 7.0		7.3 $\pm$ 6.5		8.0 $\pm$ 7.2		8.4 $\pm$ 8.3	
Depression diagnosis, by year 4	162	14	96	12	26	24	40	17
Pre-college	93	8	63	8	14	13	16	7
College	69	6	33	4	12	11	24	10
Anxiety diagnosis, by year 4	149	13	93	12	23	22	33	14
Pre-college	53	5	32	4	8	8	13	6
College	96	8	61	8	15	14	20	9
ADD/ADHD diagnosis, by year 4	113	10	67	8	20	19	26	11
Pre-college	68	6	43	5	12	11	13	6
College	45	4	24	3	8	8	13	6
Used cannabis in the past year, year 1	708	62	470	59	67	63	171	73
Cannabis use frequency, year 1 ($M \pm SD$)	22.8 $\pm$ 55.5		18.8 $\pm$ 46.7		34.7 $\pm$ 76.9		27.4 $\pm$ 57.3	
Number of illicit drugs used, year 1 ($M \pm SD$)	1.1 $\pm$ 1.4		1.1 $\pm$ 1.3		1.4 $\pm$ 1.3		1.3 $\pm$ 1.5	

Characteristics	Total sample (N=1,145)		College enrollment path					
			Continuously enrolled (n=805)	Early discontinuity (n=107)	Late discontinuity (n=233)			
	n	%	n	%	n	%	n	p
Used 0 illicit drugs	399	35	311	39	30	28	58	25 <.001
Used 1 illicit drug	468	41	316	39	40	38	112	48
Used 2 or more illicit drugs	277	24	178	22	36	34	63	27
Typical number of drinks/day, year 1 (M±SD)	4.4 ± 2.9		4.3 ± 2.9	4.3 ± 3.0	4.9 ± 2.6			.030

Note. Discontinuous enrollment defined as not enrolled for 1 or more of the first 8 semesters of college, before graduating. Pre-college and college diagnoses sum to lifetime diagnoses within rounding error. With the exception of self-reported race and psychiatric diagnoses, all other variables were captured in year 1.

^aThe mean adjusted gross income for each participant's home ZIP code during their last year in high school, measured in ten thousands.

* p-value for overall chi-square test of independence is reported for the multinomial variable.

Table 2

Correlation coefficients (*r*) amongst explanatory variables (*N*=1,145)

Explanatory variables	Depression diagnosis		Anxiety diagnosis		ADD/ADHD diagnosis		Beck Depression Inventory	Beck Anxiety Inventory	Childhood conduct problems	Used cannabis, past year at year 1	Cannabis use frequency, year 1	Number of illicit drugs used, year 1	Typical number of drinks/day, year 1
	Pre-college	College	Pre-college	College	Pre-college	College							
Depression diagnosis													
Pre-college		-.075	.452	.048	.196	.088	.175	.103	.049	.029	.092	.098	-.016
College			-.021	.400	.014	.194	.112	.104	.029	.002	.049	.057	-.005
Anxiety diagnosis													
Pre-college				-.067	.121	.062	.138	.148	.012	.053	.076	.084	-.013
College					.017	.166	.148	.170	-.003	.068	.081	.117	.059
ADD/ADHD diagnosis													
Pre-college						-.051	.032	.021	.143	.037	.038	.063	.110
College							.067	.108	.041	.057	.057	.167	.045
Beck Depression Inventory								.559	.144	-.022	.046	.048	-.081
Beck Anxiety Inventory									.096	.005	.013	.069	-.052
Childhood conduct problems													
Used cannabis, past year at year 1										.094	.170	.237	.259
Cannabis use frequency, year 1											.323	.598	.440
Number of illicit drugs used, year 1												.579	.267
Typical number of drinks/day, year 1													.384

Note. All $|r| > .057$ are statistically significant at $\alpha = .05$. All $|r| > .098$ are statistically significant at $\alpha = .001$.

Table 3

Results of logistic regression analyses predicting discontinuous enrollment during four years of college ($N=1,145$)

Explanatory variables	Bivariate associations			Final multivariate model		
	OR	95%CI	p	AOR	95%CI	p
Gender=male	.84	.65–1.08	.168	.73	.54–.98	.036
Race=white	1.12	.84–1.50	.437	1.11	.78–1.56	.574
Neighborhood income ^a	1.04	1.00–1.08	.048	1.03	.99–1.07	.180
High school GPA	.62	.45–.85	.003	.62	.43–.89	.010
Parents' education (ref.=graduate school)						
High school, GED, or less	.39	.22–.71	.002	.35	.19–.67	.002
Some college or technical	.35	.17–.71	.004	.32	.15–.69	.004
Bachelor's degree	.86	.64–1.16	.336	.83	.61–1.13	.230
Childhood conduct problems	1.02	.99–1.05	.248			
Beck Depression Inventory	1.03	1.01–1.06	.012	1.03	1.01–1.06	.014
Beck Anxiety Inventory	1.02	1.00–1.04	.052			
Depression diagnosis (ref.=never)						
Pre-college	1.23	.78–1.95	.370	.85	.50–1.41	.522
College	2.82	1.73–4.62	<.001	2.47	1.43–4.27	.001
Anxiety diagnosis (ref.=never)						
Pre-college	1.65	.93–2.90	.085			
College	1.44	.93–2.23	.104			
ADD/ADHD diagnosis (ref.=never)						
Pre-college	1.46	.88–2.43	.147			
College	2.20	1.20–4.01	.010			
Cannabis use frequency, year 1 ^b	1.04	1.02–1.07	.001	1.04	1.01–1.07	.011
Number of illicit drugs used, year 1	1.14	1.03–1.27	.010	.97	.84–1.13	.716
Typical number of drinks/day, year 1	1.05	1.01–1.09	.019	1.05	1.00–1.12	.063

Note. Results for final multivariate model adjusted for all effects shown. Lifetime psychiatric diagnoses were self-reported in years 3–4, with “never diagnosed” as the reference category. All psychiatric symptom and substance use measures were captured in year 1. None of the hypothesized interactions (i.e., gender by each psychiatric diagnosis, psychiatric symptom, and substance use variable; Beck Depression Inventory by Beck Anxiety Inventory; cannabis use frequency by depression diagnosis) were statistically significant when introduced into the final model.

^aThe mean adjusted gross income for each participant's home ZIP code during their last year in high school, measured in ten thousands.

^b Cannabis use frequency was divided by 10 to enhance interpretability of results.

Table 4
Results of multinomial logistic regression predicting “early” and “late” enrollment discontinuity ($N=1,145$)

Explanatory variables	Early discontinuity versus continuous enrollment				Late discontinuity versus continuous enrollment			
	Bivariate associations		Final multivariate model		Bivariate associations		Final multivariate model	
	OR	95%CI	p	AOR	95%CI	p	AOR	95%CI
Gender=male	1.16	.78–1.74	.465	1.39	.86–2.23	.176	.72	.53–.96
Race=white	.79	.52–1.22	.293	.76	.46–1.26	.287	1.34	.95–1.89
Neighborhood income ^a	1.00	.94–1.07	.903	.99	.93–1.06	.843	1.05	1.01–1.10
High school GPA	.50	.30–.83	.007	.55	.32–.96	.034	.69	.47–1.00
Parents' education (ref.=graduate school)								
High school, GED, or less	.57	.24–1.36	.203	.43	.16–1.16	.096	.32	.15–.68
Some college or technical	.39	.12–1.28	.120	.29	.08–1.02	.054	.33	.14–.78
Bachelor's degree	1.03	.65–1.63	.916	1.01	.62–1.63	.976	.80	.56–1.13
Childhood conduct problems	1.05	1.01–1.09	.019				1.00	.97–1.04
Beck Depression Inventory	1.07	1.03–1.11	<.001	1.07	1.03–1.11	<.001	1.02	.99–1.05
Beck Anxiety Inventory	1.01	.99–1.04	.326				1.02	1.00–1.04
Depression diagnosis (ref.=never)								
Pre-college	1.95	1.04–3.63	.036	1.42	.70–2.89	.331	.93	.53–1.65
College	3.18	1.58–6.41	.001	3.07	1.44–6.54	.004	2.67	1.54–4.63
Anxiety diagnosis (ref.=never)								
Pre-college	2.12	.95–4.75	.068				1.45	.75–2.81
College	2.08	1.13–3.83	.018				1.17	.69–1.98
ADD/ADHD diagnosis (ref.=never)								
Pre-college	2.37	1.20–4.66	.013				1.08	.57–2.04
College	2.83	1.23–6.49	.014				1.93	.97–3.86
Cannabis use frequency, year 1 ^b	1.03	.99–1.07	.130	1.00	.96–1.05	.961	1.05	1.02–1.07
Number of illicit drugs used, year 1	1.20	.99–1.46	.065	1.14	.93–1.40	.208	1.12	.95–1.30
Typical number of drinks/day, year 1	1.00	.93–1.08	.968	.99	.90–1.08	.744	1.07	1.02–1.12

Note. Early discontinuity occurred during the first two years of college, and late discontinuity during the second two years. Results for final multivariate model adjusted for all effects shown. Lifetime psychiatric diagnoses were self-reported in years 3–4, with “never diagnosed” as the reference category. All psychiatric symptom and substance use measures were captured in year 1. None of the

hypothesized interactions (i.e., gender by each psychiatric diagnosis, psychiatric symptom, and substance use variable; Beck Depression Inventory by Beck Anxiety Inventory; cannabis use frequency by depression diagnosis) were statistically significant when introduced into the final model.

^aThe mean adjusted gross income for each participant's home ZIP code during their last year in high school, measured in ten thousands.

^bCannabis use frequency was divided by 10 to enhance interpretability of results.