The influence of behavioral and emotional health, and student involvement, on college student retention over time

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Abstract

Student attrition in higher education is a pervasive problem. In the current analyses, we use a longitudinal sample of nearly 10,000 university students to examine the relative importance of social, behavioral, and interpersonal factors on student retention over time. Increased depressive symptoms, antisocial behaviors, exposure to stressful events, and substance use were consistently related to increased risk of drop out across college. Protective factors related to student involvement were most protective in students’ earlier years of college. These findings support administrative efforts to both engage newer students and address student behavioral health concerns in order to maximize student retention.
Introduction

Student attrition in higher education is a pervasive problem. Only 62% of students enrolled in public 4-year universities graduate within 6 years (Shapiro et al., 2017). Attrition is associated with high societal costs, including an estimated $2.9 billion in state and federal education grants issued from 2003 to 2008 to students who did not return for a second year of school (American Institutes for Research, 2010). There are also institutional consequences for non-retention, as the majority of states have funding for higher education tied to performance-based measures including retention (National Conference of State Legislatures, 2015). At the individual level, there are also tremendous benefits associated with college completion. College graduates earn higher salaries, report a greater frequency of job satisfaction, and are more likely to have health insurance (Perna, 2005). The salaries of college graduates also increase more rapidly as these individuals age, suggesting that the benefits of attending college may continue to accumulate over time (Baum, Ma, & Payea, 2013). Beyond direct benefits of increased salaries, those with greater levels of education also tend to benefit in terms of better physical and mental health (Mirowsky & Ross, 2017). Given the combined individual and societal benefits to college graduation, identifying actionable risk factors associated with attrition will provide valuable insights for policy makers.

Current attempts to address problem in universities

Presently, the majority of programming aimed at increasing student retention addresses academic aspects of the college experience. A meta-analysis conducted by Robbins, Oh, Le, & Button (2009) identifies 4 broad categories of common retention strategies: Academic skills (study skills, learning strategies, mnemonic devices), self-management (anxiety reduction,
desensitization, stress management/prevention programs), socialization (acclimating students to
the novel university environment), and first year experience (a more intensive and long-term
intervention towards socialization). Evidence for the efficacy of these common forms of
retention programming is mixed. Retention programs of wider scope are typically oriented
towards fostering personal characteristics and traits—such as academic self-confidence,
achievement motivation, institutional commitment, and broader goals—that still mark improving
academic performance as the primary focus (Lotkowski, 2004; Veenstra, 2009). Although
academic success is known to coincide closely with student retention, other factors related to the
institutional environment are also critical in shaping student retention.

*Student Behavioral/Emotional Health and Retention*

Despite the wide-range of academically focused interventions to increase retention in
higher education, the problem of high rates of attrition remains. One area of growing concern is
the increasing prevalence of behavioral and emotional health problems in college students,
especially as socio-emotional difficulties with adjustment to university life are known to predict
attrition as well as academic performance (Gerdes & Mallinckrodt, 1994). National surveys of
college counseling center directors have reported dramatic increases in the prevalence,
complexity and severity of those problems (Gallagher, 2012). According to data from the
American College Health Assessment, one in three students report “feeling so depressed it was
difficult to function” at least once in the previous year (American College Health Association,
2009). Diagnosis of depression in college is associated with discontinuous enrollment (Arria et
al., 2013), particularly when coinciding with a comorbid anxiety disorder (Eisenberg,
Golberstein, & Hunt, 2009). Risky substance use among college students is also widespread,
with 39% of students reporting that they are binge drinkers, defined as having 5 or more drinks
on one occasion for men or 4 or more drinks for women (Lipari & Jean-Francois, 2016), and 41% of students reporting illicit drug use in the past year (Johnston, O’Malley, Bachman, Schulenberg, & Miech, 2016). One longitudinal study of a cohort of incoming students found that nearly half (47%) of all students met criteria for an alcohol or marijuana use disorder at least once in the first three years of college (Caldeira et al., 2009). Both quantity of alcohol use and frequency of cannabis use are associated with discontinuous enrollment in the later years of college (Arria et al., 2013), with earlier onset cannabis use presenting particular risk (Silins et al., 2014). Lastly, college students are also at heightened risk of exposure to negative events; with 84.5% of college students experiencing at least 1 adverse life event and, subsequently, 20% reporting post-traumatic stress disorder (PTSD) symptomatology (Smyth, Hockemeyer, Heron, Wonderlich, & Pennebaker, 2008). PTSD symptomatology also increases risk of dropout, particularly by students’ second year in school (Duncan, 2000; Boyraz, Horne, Owens, & Armstrong, 2013; Boyraz, Granda, Baker, Tidwell, & Waits, 2016), making exposure to stressful events an important consideration in understanding student retention.

Risk factors increase the probability of a negative behavior or outcome, while protective factors decrease the probability of the behavior or outcome (Clayton, 1992). For example, depressive symptoms, substance use, and PTSD symptoms represent risk factors for drop out, while institutional environments which encourage student involvement represent protective factors for drop out. Past analyses provide support for associations between behavioral and emotional health and student retention; however, few analyses have comprehensively examined the relative importance of various risk and protective factors over the course of students’ time in college. By utilizing direct measures of student involvement, this study provides additional insight into the relationship between student mental health, involvement, and persistence.
Theoretical Model

Astin’s (2001) Input-Environment-Output (IEO) model provides the theoretical framework to consider the relationship between potential risk factors (e.g., anxiety, depression, and so on) and protective factors (e.g., student involvement) associated with integration into university life and subsequent retention patterns. Risk factors related to individual behavioral and emotional health were identified in line with the supposition that the effect of university-environment factors on persistence is influenced by individual-level factors in the IEO model. The influence of student involvement on retention is then assessed holding a range of other individual risk and protective factors constant in order to explore which factors may be related to student retention.

Student Involvement

Student involvement is also an important factor in fostering student persistence and academic achievement (Astin, 2001; Berger & Milem, 1999; Bergen-Cico & Viscomi, 2013; Pascarella & Terenzini, 2005). Astin’s theory of student involvement postulates that “the amount of learning or development is directly proportional to the quality and quantity of involvement,” and effective educational practice is associated with its ability to induce such behavior (Pascarella & Terenzini, 2005, p. 53). While this effort is, in part, the result of personal dispositions, the institutional environment helps foster the conditions to encourage such behavioral patterns (Wolf-Wendel, Ward, & Kinzie, 2009). Institutions that foster involvement are likely to increase students’ sense of belonging and limit drop out (Berger & Milem, 1999; Kuh, Kinzie, Schuh, & Whitt, 2005; Tinto, 2017). Student involvement is operationalized in this study in alignment with Astin’s (1984) discussion of subdimensions of involvement including: place of residence, athletic involvement, and peers.
In summary, risk factors related to individual behavioral and emotional health were identified in line with the supposition that the effect of university-environment factors on persistence is influenced by individual-level factors in the IEO model. The influence of student involvement on retention is then assessed holding these risk factors constant in order to explore which factors may be related to student retention at different points in time. Our primary aim in this study is to examine the relative effect of a variety of risk and protective factors, identified under Astin’s IEO model, on drop out over time in the broader context of university life. The current analyses take advantage of a unique opportunity to examine the relationship between behavioral and emotional health as it relates to student retention. Using data from a large, longitudinal study of all incoming freshmen at a major Mid-Atlantic public university, we matched behavioral reports of substance use and mental health outcomes available on nearly 10,000 students, representing four cohorts of incoming freshmen, with a range of objective measures of university involvement obtained directly from various university divisions.

Methods

Sample

Data for these analyses come from the Spit for Science (S4S) sample, an ongoing study of college students enrolled at a large, urban university in the Mid-Atlantic region (Dick et al. 2014). The university population is racially/ethnically diverse (49% White, 17% Black/African American, 13% Asian, 8% Hispanic, 13% other), majority female and mostly between the ages of 18-24 (U.S. Department of Education, 2018). Spit for Science is a cohort sequential, longitudinal study of incoming students aimed at understanding genetic and environmental influences on health and well-being in college students. All incoming first-time freshmen age 18 or older were invited to complete questionnaires upon entry to university. Follow-up surveys
were completed each spring semester thereafter. Individuals who did not participate in the first wave of data collection had another opportunity to join the study in the spring of their freshman year; those who participated during their first year were eligible to complete follow-up assessments each spring. All Spit for Science protocols were approved by the university’s Institutional Review Board.

In total, 9,904 students across four cohorts were enrolled into the project, representing participation rates of 65%-71% across the cohorts (2011 n = 2,707; 2012 n = 2,483; 2013 n = 2,392; and 2014 n = 2,310). Only students still enrolled at the university were offered follow-up surveys each spring and all students who participated in their freshman year continued to be invited to participate in follow-up studies regardless of whether they participated in previous follow-ups (e.g., a student who failed to complete the survey in their second year would still be invited to participate in the third year follow-up). Subjects were compensated with $10 for each completed survey. The S4S project also adopts a community-engaged, Citizen Science approach to working with participants, fostering a deeper sense of involvement in the study among participants and encouraging participation (Dick, 2017). Sample sizes varied due to the fact that later cohorts have not reached certain points in their college career (e.g. fourth year follow-up surveys). Of those in the total sample, 80.3% (n = 7,959) completed the Year 1 fall survey and 76.7% (n = 7,603) completed the survey in Year 1 spring (5,673 participants in Year 1 spring were those who participated in Year 1 fall and 1,930 were new participants). Of those whom were eligible to participate in Year 2, which includes cohorts 1 through 3, 49.2% (n = 3,734) completed the survey. Approximately 37.8% (n = 1,964) of those in cohorts 1 and 2 (the only cohorts currently eligible for Year 3) completed the survey. Finally, 32.3% (n = 875) of cohort 1
completed in the Year 4 survey. See Dick et al. (2014) for a more thorough description of the sample and data collection.

Via a partnership with university leadership, survey data from participants in S4S was combined with information from several student registry databases in order to link information on student behavioral and mental health with data tracked by the university. This included information pertaining to academic outcomes, including whether or not students were still enrolled at the university, student GPA, and standardized test scores (such as the SAT or ACT), participation in student organizations, use of student services, and various other measures tracked by different university offices.

All information collected outside of the scope of the parent Spit for Science project was de-identified by the S4S Registry Coordinator before reaching the data analysis team in order to maintain student confidentiality. The university’s enrollment office provided the S4S Registry Coordinator with a university identification number for all students enrolled at the university from 2011-2015 via a secure file sharing service. The S4S Registry Coordinator matched the student information to existing S4S participant ID’s, creating fake participant ID numbers for those students who were not enrolled in S4S and returned the list of student identification numbers to the enrollment office. Upon receiving this information, the enrollment office matched the university data (e.g., GPA per semester) using the university ID number. Once matching was complete, the university identification number was removed and the file containing both real and fake S4S participant ID and university data was returned to the S4S Registry Coordinator. Upon receiving this file, the registry coordinator de-identified information, dropped information on non-participants, and recirculated the data to investigators.

*Measures*
**GPA and Dropout.** Information on student retention was provided by the University’s Strategic Enrollment Management office. For each student, we received information on whether or not they were enrolled at the university during each of the semesters covered in the study period and their GPA at that time (Fall 2011 – Spring 2016). For the purposes of this study, retention is operationalized as continuous enrollment at the university. Students were considered to have dropped out if they had no recorded semester GPA for two or more consecutive semesters. Individuals who were not enrolled for a semester, but were then enrolled again at a later point were not considered to have dropped out. We focus specifically on dropout, rather than ‘stop out’, as a means to orient this work towards prevention of the known consequences of college non-completion discussed previously. The four-year graduation rate at the university is 37%, increasing to 62% by year 6, suggesting that stop out may be relatively common here (U.S. Department of Education, 2018). We did not include summer terms in developing our measure for drop out.

**Internalizing Problems.** Depression and anxiety symptoms were measured at each time point using four items from the Symptoms Checklist-90 (SCL-90) each. Questions for depression asked respondents how much discomfort they experienced in the past 30 days from: feeling blue, being worried too much, feeling no interest about things, and feeling hopeless about the future. Questions for anxiety asked respondents how much in the past 30 days they experienced discomfort from: feeling nervousness or shakiness inside, feeling suddenly scared for no reason, feeling fearful, and having spells of terror or panic. Responses ranged from 1 (none) to 5 (extreme). Items were summed to create a composite index for both depression and anxiety, each ranging from a possible score of 4 to 20. Cronbach’s alpha at each of the included time points range between 0.81 – 0.87 for SCL-90 depression and 0.83 – 0.87 for SCL-90 anxiety.
**Antisocial Behavior.** In the Year 1 Fall survey, respondents were asked to report on how often they engaged in antisocial behavior (skipping school, running away from home, stealing, using a weapon in a fight, robbing someone, starting physical fights) during high school. These are a subset of items drawn from the Semi-Structured Assessment of the Genetics of Alcoholism (SSAGA) (Bucholz et al., 1994). Responses ranged from 0 (never) to 3 (6 or more times) and were combined into a single sum score (range 0 - 18). In all subsequent surveys, antisocial behavior was assessed with three items that asked how often since the previous survey had they broken into a car, deliberately damaged property, or carried a weapon, over the past year with the same possible responses. These were again summed to create a composite score (range 0 - 9). Cronbach’s alpha at each of the included time points range between 0.36 – 0.66. Previous applications of these items as an interview report acceptable inter-rater reliability (Kappa >0.5) for all items with the exception of weapon use (Bucholz et al., 1994).

**Peer Deviance.** Respondents were asked what proportion of their friends engaged in drinking alcohol, smoking cigarettes, getting drunk, getting in trouble with police, smoking marijuana, and having problems with alcohol. During the Year 1 Fall survey, respondents reported on friends during their last year of high school. At each subsequent wave, they were asked to report on friends since the previous survey. Possible responses ranged from 0 (none) to 4 (all), resulting in a composite score of peer deviance ranging from 0 to 24. Cronbach’s alpha at each of the included time points range between 0.85-0.89.

**Substance Use.** Four items were used to assess individual's overall level of substance use. Students reported on the amount of alcohol consumed in the prior month, based on the days drinking and the typical drinks per occasion. Responses were converted to reflect the grams of ethanol consumed per month in line with methods previously reported in Dawson (2000). In
addition to alcohol consumption, alcohol-related problems using DSM-V criteria for alcohol use disorder (AUD) was also assessed. Respondents needed to indicate experiencing a symptom 3 or more times in the same 12 month period (lifetime for Year 1 Fall, past 12 months for all subsequent time points) in order for a symptom to be considered present. Those with 0 - 1 symptoms were classified as not having an AUD, while the remaining individuals were classified as having either a mild (2-3 symptoms), moderate (4-5 symptoms), or severe (6 or more symptoms) AUD, consistent with DSM-V (American Psychiatric Association, 2013). In addition to alcohol use and AUD, we included a measure of cannabis use, comparing those who had never used cannabis, those who used 1-5 times, and those who have used 6 or more times. Finally, we included a count of the number of substances an individual has used (polysubstance use), including stimulants, cocaine, and opioids. We treated the measure of polysubstance use a four-category predictor, comparing those who indicated one, two, or three of the illicit substances to those who indicated no use in the previous period. For all of the measures except alcohol consumption, the year 1 fall survey assessed lifetime use, while each subsequent survey asked about usage since the previous survey. Individuals reporting no polysubstance use were coded as 0 on the polysubstance use measure and individuals reporting no alcohol use were coded as 0 on the alcohol consumption measure.

*Exposure to Stressful/Traumatic Interpersonal Events.* We assessed exposure to stressful life events before entering college (for the Year 1 fall survey) and in the past twelve months (for all subsequent surveys) using a checklist of 12 potentially stressful events originally designed for use in population-based adult samples (Kendler et al., 1995; Kendler, Karkowski, & Prescott, 1998). The 12 events were broken engagement, separation from a loved one or close friend, serious illness or injury, burglarized or robbed, trouble with the police, laid or fired from a job,
major financial problems, serious housing problems, serious difficulties at school, someone closed to you passed away, mother or father had a serious illness or injury, and someone else close to you had a serious illness or injury. All items were combined to create a sum score of total event exposure. Endorsement of these stressful events in our college-age sample was common, with approximately 70% of subjects endorsing at least 1 event at each time point (Year 1 Fall: 77%, Year 1 Spring: 76%, Year 2 Spring: 73%, Year 3 Spring: 71%, Year 4 Spring: 69%). Previous applications of this checklist have demonstrated that this inventory predicts patterns of tobacco use in college age samples (Cooke et al., 2016; Spindle et al., 2017). For traumatic interpersonal events, we used items adapted from the Life Events Checklist (Gray, Litz, Hsu & Lombardo, 2004). Items included whether the respondent had experienced a physical assault, sexual assault, other unwanted or uncomfortable sexual experience. These particular items from the Life Events Checklist demonstrate adequate inter-rater reliability in past work (kappa=0.80, 0.84, and 0.54, respectively) (Gray et al., 2004). As with stressful events, the first survey assessed whether these had ever occurred and all subsequent surveys assessed whether any of these had occurred since the previous survey. Items were again combined to create a sum score.

**Social Support.** We assessed social support using items adapted from the Social Support Survey of the RAND Medical Outcomes Study (Hays, Sherbourne, & Mazel, 1995). Respondents were asked how often (“none of the time,” “some of the time,” “most of the time,” “all of the time,””) they had someone available to: provide good advice during a crisis, get together with for relaxation, and to confide in or talk about your problem in the past 12 months. Items were summed so that higher scores reflected greater levels of support, ranging from 0 to 9. Cronbach alpha at each of the included time points range between 0.84 – 0.87.
Student Involvement. We included three measures of student involvement, garnered from student registry data provided by the University’s Division of Student Affairs. First, we created an indicator as to whether or not students lived on campus in university housing based on information provided by Residential Life & Housing. Second, we used data from the student organizations registry, maintained through the Division of Students Affairs and populated by students themselves, to create an indicator of the number of organizations in which the student was a member. Because relatively few students were registered to more than one organization, we collapsed this into a binary measure, indicating whether or not the student was part of a student organization. Finally, we used card reader information provided by the Student Recreation Services to assess the frequency with which students were utilizing the student recreational facilitates (including fitness center, basketball courts, and pools). Swipe in data was available for the full year in the total number of entries. We rescaled this to reflect the average number of times per week a student was utilizing these services (range 0 - 7). Use of recreational services was log transformed (plus a constant of one) to adjust for the heavy positive skew.

Demographics/Covariates. We included self-reported demographic information from the S4S survey in our analyses. Gender was treated as a dichotomous measure of male or female. Students identified the racial-ethnic category with which they most closely identified. These were collapsed into 5 categories (White, African-American, Asian, Hispanic, or Other). Parental education was measured using the average number of years of education in both parents (or one in the case when a single parent was reported) as reported by the students. Finally, we included respondents SAT composite score obtained from registry data to adjust for any role that cognitive or scholastic ability may have in student retention. SAT scores are correlated with general cognitive ability (Frey & Detterman, 2004). Additionally, domain-specific standardized tests,
such as the SAT, have been shown to predict scholastic performance in related domains and
generally function similarly across diverse groups of individuals (Coyle, T. R., 2018).

Analytic Strategy

We fit a series of logistic regressions in order to determine significant predictors of
dropout across college. Figure 1 details the timeline of survey data collection and available time
points from student registry data. Because of the staggered nature of data collection in the S4S
sample, our resulting analyses consisted of five logistic regression models. The arrows in Figure
1 delineate which of the S4S surveys was used to predict dropout in the corresponding semesters,
ensuring proper time order. In order to adjust for item non-response within each model, we used
the mice package in R to impute missing data on predictor variables (van Buuren &
Groothuis-Oudshoorn, 2011). A full description of the imputation models is available upon
request. All analyses were conducted in R, version 3.3.3 (R Core Team, 2017). All models
included gender, race-ethnicity, parental education, cohort, and SAT composite scores as
covariates. Follow-up analyses testing mediated effects of each predictor on drop out through
GPA were conducted using the Baron and Kenny method (Baron and Kenny, 1986). The full
results from these analyses are available by request from the authors.

Results

Table 1 includes all descriptive statistics for the Spit for Science sample across each time
point. Demographics of the sample are reflective of the student population from which the
sample was drawn. In order to understand patterns of sample attrition, we ran a series of
multinomial logistic regressions to examine whether there were demographic differences in
patterns of dropout and survey participation. Overall, females and those with higher SAT scores
were more likely to be among participants who did not drop out and continued to participate in
the survey, across each wave. Some differences in participation across racial-ethnic categories
and parental education emerged at certain points, but results were not consistent across time.
Overall, these analyses suggested the analytic sample did not vary in any systematic manner
across demographic categories among those in relation to dropout or non-participation (full
results available upon request).

Before moving on to the multivariate analyses, we first ran a series of bivariate
correlations between risk/protective factors at each wave and dropping out at any point in the
future. These correlations are presented in the forest plot in Figure 2. We used either polychoric
(in the case when the risk/protective factors was ordinal) or polyserial (in the case when the
risk/protective factor was continuous) correlations to determine relationships with dropout.
Rather than focus on individual correlations, we note two important patterns here. First, almost
all of the risk or protective factors are associated with dropout in the expected direction to
varying degrees. Second, most of the effect sizes are small to modest. We also see that by the
fifth time point (Year 4 spring) none of the risk or protective factors remain significantly
associated.

**Dropout After the First Semester**

Table 2 includes the estimates for each of the risk/protective factors in the multivariate,
logistic regression models. In addition to each of the variables presented, all models also
included gender, race, parental education, age, cohort, and SAT scores as covariates. In terms of
risk, those who reported greater levels of depressive symptoms (OR = 1.09, p < .001), antisocial
behaviors during high school (OR = 1.09, p < .01), or stressful events before entering college (OR
= 1.10, p <.01) had significantly greater odds of dropping out after the first semester. Additionally, those who reported cannabis use 6 or more times in their lives were 31% more likely to dropout compared to non-users, though this was only marginally significant (OR = 1.31, p <.10). Those who were part of a student organization were 58% less likely to leave the university compared to those not in a student organization (OR = 0.42, p <.001). Surprisingly, those who reported greater levels of anxiety (OR = 0.94, p <.05) or using one of the illicit substances in the polysubstance count prior to college (OR = 0.60, p <.05) were less likely to drop out.

Dropout after the Second or Third Semester

The prevalence of dropout during the Year 1 Spring to Year 2 Fall (13%) was the highest during any point in the study. Depressive symptoms (OR = 1.06, p <.001), recent antisocial behaviors (OR = 1.06, p <.05), and recent stressful events (OR = 1.12, p <.001) were again associated with greater odds of dropping out. Those who used cannabis 6 or more times (OR = 1.22, p < .10) and those who reported using two other illicit substances (OR = 1.37, p < .10) were also at greater risk of dropping out, though these associations were only marginally significant. For protective factors, those who reported more social support, (OR = 0.95, p <.01) and those living on campus (OR = 0.69, p <.001) were less likely to dropout. Involvement in a student organization was again associated with lower odds of dropping out (OR = 0.76, p <.05), though its effect was less pronounced compared to the first semester, with those in a student organization having 24% lower odds of dropping out compared to those not in an organization. Finally, greater anxiety was again associated with lower odds of dropping out (OR = 0.95, p <.001).
Dropout after the Fourth or Fifth Semester

We see a slight change in the pattern of significant estimates for the model predicting dropout during the Year 2 Spring through Year 3 Fall semesters. While stressful events (OR = 1.14, p < .001) and antisocial behaviors (OR = 1.11, p < .10) were again associated with greater odds of dropout, we see that the effect of polysubstance use (for those indicating using two illicit substances) is greatly increased (OR = 1.97, p < .05) and these users are at almost twice the risk of dropping out compared to non-users. Social support (OR = 0.94, p < .10) and participation in student organizations (OR = 0.69, p < .10) were marginally associated with reduced risk of dropout during this period.

Dropout after the Sixth or Seventh Semester

A similar pattern of results emerged in the model for Year 3 Spring to Year 4 Fall. Stressful events (OR = 1.28, p < .001) were again associated with greater dropout, with stronger effects than previous models. Antisocial behaviors were no longer associated with dropout, though depressive symptoms were significant again during this time period (OR = 1.12, p < .01). While polysubstance use was no longer associated with dropout, those who indicated cannabis use 6 or more times in the previous year were at a significantly higher risk of dropout (OR = 2.26, p < .05). None of the protective factors were associated with dropout at even a marginal level in this model.

Dropout after the Eighth Semester

Finally, when we look at the last model for Year 4 Spring, we see none of the risk or protective factors are associated with dropout at this point. Only those who met the criteria for a severe AUD were at greater risk, and though its effect was large, it was only marginally
significant (OR = 8.15, p < .10). Additionally, participation in recreational services measure was omitted from the Year 4 Spring model due to issues with model convergence.

Mediation effects via GPA

Effects that were fully mediated by GPA include: anxiety, antisocial behavior, and stressful events on first semester drop out; antisocial behavior, and organization participation on second or third semester drop out; and polysubstance use on fourth or fifth semester drop out. Effects that were partially mediated by GPA include: depression and organization participation on first semester drop out; depression, anxiety, stressful events, and living on-campus on second or third semester drop out; stressful events on fourth or fifth semester drop out; and depression, cannabis use, stressful events on fifth or sixth semester drop out. Effects that were not mediated by GPA include: polysubstance use on first semester drop out and social support on second or third year drop out.

Discussion

Student retention is influenced by a variety of social, cognitive, behavioral, and interpersonal factors. In the current analysis, we have attempted to expand on our understanding of the influences that contribute to retention using a large sample of college students followed longitudinally with surveys about behavioral and emotional health across the course of their college career. To our knowledge, this is the largest and most comprehensive study of the role of behavioral and emotional health factors, combined with student involvement data, in predicting dropout from university among prospective cohorts of students followed longitudinally. Largely, our results are consistent with previous studies examining students’ behavioral and emotional health, student involvement, and retention (Duncan, 2000; French & Conrad, 2001; Breslau,
We found evidence of predictors with consistent effects across the college years, as well as evidence that some predictors vary in importance across time points. Overall, there were three consistent predictors of student retention: depressive symptoms, exposure to stressful life events, and antisocial behaviors. Substance use (including alcohol) did not predict dropout during the early portion of a student’s college career. However, as students moved into their second year and beyond, the effect of substance use became more pronounced. Those using multiple illicit substances, those frequently using cannabis, and those with a severe AUD were at heightened risk of dropping out. Overall, these results highlight the importance of non-academic factors in impacting student retention, especially as all models adjusted for cognitive ability (in the form of SAT scores) upon entering college.

Interestingly, we found that risk factors impact dropout across time in college, while protective factors were more important during the early years. Involvement in student organizations, living on campus, and greater social support were all associated with lower odds of dropping out. However, these associations were only significant during the first one to three semesters. In line with Berger and Milem’s (1999) theory, these organizations and network environments may foster student involvement during a critical transitional period further integrating these students to the institution, resulting in decreased odds of dropping out. Administrators may consider greater efforts to incorporate newer students into various student activities in order to maximize any influences involvement may have on reducing dropout. Additionally, some of the variables assumed to be risk factors (anxiety and illicit substance use) were actually protective early in students college career. Previous work suggests that sub-clinical
levels of anxiety may enhance performance on various tasks (Hardy, Beattie, & Woodman, 2007; Jones, 1995; Keeley, Zayac, & Correia, 2008). In terms of illicit substance use, further analysis of substances endorsed at this point revealed approximately 82% of the 1 substance category indicated using stimulants, rather than cocaine or opioids. This could include substances such as Adderall or Ritalin, which may reflect the use of these drugs by students in non-medically prescribed ways to help improve focus.

Our findings should be interpreted within the context of the following limitations. First, the data that is collected at the university site of this study does not distinguish between transfer and drop out. As such, our measure of dropout does not differentiate between transferring to another school and leaving college permanently. It is possible that some of the students we classified as having dropped out went on to other schools to complete their college degree. Given that the transfer out rate at the current university (those who leave the university for another institution within 150% of the expected time it takes to complete a degree) is roughly 22% (U.S. Department of Education, 2018), it is possible that some of those who transferred were misclassified as dropping out. This would have the effect of underestimating the impact of behavioral and emotional health challenges, making our estimates conservative. Second, our measure of stressful life events was not developed specifically for college students and, accordingly, may not comprehensively index the stressors that college students are likely to encounter, e.g., stressful roommate relationships. Third, our binary measure of self-report gender does not account for diversity in gender identity and our measure of self-report race/ethnicity allows identification with either a single group, ‘more than one race’, or “unknown”. The groups “more than one race”, “unknown”, “American Indian/Native Alaskan”, and “Native Hawaiian/Other Pacific Islander” were collapsed into a single “Other” group for analysis due to
small sample size within these groups. Fourth, it is important to note that for student organization data, the students themselves were responsible for registering via the online university portal. Therefore, it is possible that we did not capture some students who were involved with organizations but chose not to register. Additionally, our measure does not capture the degree of involvement with any given organization. Fifth, our measure of recreational sports services utilization assessed number of visits to recreational facilities in the past year. Finer-grained measures of engagement with university recreational services, such as participation in specific programming or utilization over shorter periods of time, may demonstrate a different pattern of results. Future studies should also aim to collect data about indicators of student involvement beyond student organization participation and living in residence halls, as some students may not live in residence halls or have the time to engage with student clubs. Sixth, our measure of antisocial behavior was derived from a structured interview that is not specific to college populations. Future work may consider identifying antisocial behaviors that are more tailored to college populations using nationally representative data. Finally, while we identified many significant associations, the effect sizes of risk and protective factors were relatively small. Most of the odds-ratios ranged from 1.06-1.97, which correspond to Cohen’s d between 0.03-0.37 (in the small effect range). Individuals responsible for the creation and implementation of retention programs would do well to focus on multiple risk factors, as focus on any single risk factor is unlikely to have a substantive effect on retention.

Using a longitudinal sample of college students, we have added to the current literature on student retention by examining the ways in which non-academic factors protect against and increase risk for dropout across the course of college. Students with more depressive symptoms, those experiencing frequent stressful events, and those with greater levels of substance use (in
many forms) are at increased risk of exiting college before finishing their degree across the majority of their college years. In the early years of college, those things that increase student involvement and participation, such as living on campus, being involved in a student organization, decrease risk of dropping out. Future research should continue to compare the relative impact of these risk and factors over time for us to better understand the impact of these different experiences on student retention. Additionally, development of a stressful events questionnaire that is tailored to the typical age and context of college may be warranted for future examinations of these associations. In conclusion, student retention is influenced by social, cognitive, behavioral, and interpersonal factors. The relative importance of these factors varies over time, such that involvement with extracurricular university activities and facilities is particularly influential in students’ early years of college. Given that student involvement is most influential in the early years of college, efforts to encourage involvement among newer students may represent a means to maximize the influence of student involvement on reducing dropout among these students. Additionally, programs and services that address emotional and behavioral health problems throughout the duration of college will serve to limit any impact these problems have on student retention. These analyses reinforce the notion that administrators and policy makers take a more holistic view of the student experience in order to promote improved educational outcomes.
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http://monitoringthefuture.org/pubs.html#monographs

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1163-1184.

Research, 4(1), 27-41. doi:10.1080/08917779108248762


<table>
<thead>
<tr>
<th></th>
<th>Mean(SD) / N(%)</th>
<th>Mean(SD) / N(%)</th>
<th>Mean(SD) / N(%)</th>
<th>Mean(SD) / N(%)</th>
<th>Mean(SD) / N(%)</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Year 1 Fall</td>
<td>Year 1 Spring</td>
<td>Year 2 Spring</td>
<td>Year 3 Spring</td>
<td>Year 4 Spring</td>
<td></td>
</tr>
<tr>
<td>Dropout*</td>
<td>321 (4%)</td>
<td>983 (13%)</td>
<td>247 (7%)</td>
<td>77 (4%)</td>
<td>23 (3%)</td>
<td></td>
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<tr>
<td>Female</td>
<td>4,900 (62%)</td>
<td>4,761 (63%)</td>
<td>2,447 (66%)</td>
<td>1,308 (67%)</td>
<td>571 (66%)</td>
<td></td>
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<tr>
<td>Parental Education</td>
<td>15.06 (2.03)</td>
<td>15.06 (2.03)</td>
<td>15.07 (2.03)</td>
<td>15.1 (2.04)</td>
<td>15.05 (2.12)</td>
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<tr>
<td>Non-Hispanic White</td>
<td>4,025 (51%)</td>
<td>3,573 (48%)</td>
<td>1,692 (46%)</td>
<td>873 (45%)</td>
<td>397 (46%)</td>
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</tr>
<tr>
<td>Black</td>
<td>1,459 (19%)</td>
<td>1,539 (21%)</td>
<td>786 (21%)</td>
<td>423 (22%)</td>
<td>194 (23%)</td>
<td></td>
</tr>
<tr>
<td>Asian</td>
<td>1,281 (16%)</td>
<td>1,300 (17%)</td>
<td>710 (19%)</td>
<td>393 (20%)</td>
<td>157 (18%)</td>
<td></td>
</tr>
<tr>
<td>Hispanic</td>
<td>480 (6%)</td>
<td>459 (6%)</td>
<td>213 (6%)</td>
<td>100 (5%)</td>
<td>55 (6%)</td>
<td></td>
</tr>
<tr>
<td>Other race</td>
<td>605 (8%)</td>
<td>610 (8%)</td>
<td>275 (7%)</td>
<td>275 (7%)</td>
<td>59 (7%)</td>
<td></td>
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<tr>
<td>Depression</td>
<td>8.74 (3.70)</td>
<td>9.76 (3.92)</td>
<td>9.50 (4.02)</td>
<td>9.34 (4.00)</td>
<td>9.31 (4.03)</td>
<td>4 - 20</td>
</tr>
<tr>
<td>Anxiety</td>
<td>6.79 (3.13)</td>
<td>6.90 (3.26)</td>
<td>6.52 (3.05)</td>
<td>6.58 (3.09)</td>
<td>6.64 (3.23)</td>
<td>4 - 20</td>
</tr>
<tr>
<td>Antisocial Behavior</td>
<td>2.14 (2.27)</td>
<td>0.49 (1.16)</td>
<td>0.45 (1.05)</td>
<td>0.44 (1.05)</td>
<td>0.39 (0.97)</td>
<td>0 - 24</td>
</tr>
<tr>
<td>Peer deviance</td>
<td>8.44 (5.17)</td>
<td>9.06 (5.15)</td>
<td>8.73 (4.94)</td>
<td>8.31 (4.70)</td>
<td>8.29 (4.62)</td>
<td>0 - 9</td>
</tr>
<tr>
<td>AUD: Mild</td>
<td>741 (10%)</td>
<td>701 (12%)</td>
<td>533 (16%)</td>
<td>293 (16%)</td>
<td>141 (17%)</td>
<td></td>
</tr>
<tr>
<td>AUD: Moderate</td>
<td>200 (3%)</td>
<td>187 (3%)</td>
<td>149 (4%)</td>
<td>80 (4%)</td>
<td>46 (5%)</td>
<td></td>
</tr>
<tr>
<td>AUD: Severe</td>
<td>92 (1%)</td>
<td>97 (2%)</td>
<td>76 (2%)</td>
<td>40 (2%)</td>
<td>24 (3%)</td>
<td></td>
</tr>
<tr>
<td>Alcohol consumption</td>
<td>170.66 (416.56)</td>
<td>218.81 (487.60)</td>
<td>227.41 (473.02)</td>
<td>260.30 (497.13)</td>
<td>298.66 (514.35)</td>
<td>0 – 5108.8</td>
</tr>
<tr>
<td>(grams of ethanol/month)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Cannabis use: 1-5 times</td>
<td>955 (13%)</td>
<td>1,323 (19%)</td>
<td>493 (14%)</td>
<td>284 (15%)</td>
<td>117 (14%)</td>
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</tr>
<tr>
<td>Cannabis use: 6+ times</td>
<td>2,390 (31%)</td>
<td>1,577 (23%)</td>
<td>1,040 (29%)</td>
<td>506 (27%)</td>
<td>198 (24%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>T1</td>
<td>T2</td>
<td>T3</td>
<td>T4</td>
<td>T5</td>
<td></td>
</tr>
<tr>
<td>--------------------------------</td>
<td>----------</td>
<td>----------</td>
<td>----------</td>
<td>----------</td>
<td>----------</td>
<td></td>
</tr>
<tr>
<td>Polysubstance use: 1</td>
<td>691 (9%)</td>
<td>806 (11%)</td>
<td>426 (11%)</td>
<td>245 (13%)</td>
<td>64 (8%)</td>
<td></td>
</tr>
<tr>
<td>Polysubstance use: 2</td>
<td>261 (3%)</td>
<td>244 (3%)</td>
<td>154 (4%)</td>
<td>86 (5%)</td>
<td>30 (4%)</td>
<td></td>
</tr>
<tr>
<td>Polysubstance use: 3</td>
<td>126 (2%)</td>
<td>101 (1%)</td>
<td>57 (2%)</td>
<td>42 (2%)</td>
<td>6 (1%)</td>
<td></td>
</tr>
<tr>
<td>Stressful events</td>
<td>1.95 (1.72)</td>
<td>1.91 (1.78)</td>
<td>1.89 (1.82)</td>
<td>1.74 (1.72)</td>
<td>1.76 (1.84)</td>
<td>0 - 12</td>
</tr>
<tr>
<td>Interpersonal trauma</td>
<td>0.54 (0.82)</td>
<td>0.33 (0.66)</td>
<td>0.26 (0.59)</td>
<td>0.20 (0.52)</td>
<td>0.22 (0.51)</td>
<td>0 - 3</td>
</tr>
<tr>
<td>Social support</td>
<td>6.52 (2.25)</td>
<td>5.85 (2.30)</td>
<td>6.20 (2.30)</td>
<td>6.16 (2.30)</td>
<td>6.26 (2.34)</td>
<td>0 - 9</td>
</tr>
<tr>
<td>Living on campus</td>
<td>7051 (89%)</td>
<td>6601 (87%)</td>
<td>1494 (40%)</td>
<td>554 (28%)</td>
<td>159 (18%)</td>
<td></td>
</tr>
<tr>
<td>Student organization membership</td>
<td>1126 (14%)</td>
<td>1045 (14%)</td>
<td>543 (15%)</td>
<td>320 (16%)</td>
<td>119 (14%)</td>
<td></td>
</tr>
<tr>
<td>Use of student recreation services</td>
<td>0.04 (0.14)</td>
<td>0.03 (0.12)</td>
<td>0.08 (0.26)</td>
<td>0.07 (0.23)</td>
<td>0.05 (0.18)</td>
<td>0 - 7</td>
</tr>
<tr>
<td>N</td>
<td>7,959</td>
<td>7,603</td>
<td>3,734</td>
<td>1,964</td>
<td>875</td>
<td></td>
</tr>
</tbody>
</table>

*Dropout at that time point. Percentage based on number of S4S participants at each time point. SD = Standard Deviation.
Table 2: Multivariate Logistic Regression Models for Dropout

<table>
<thead>
<tr>
<th></th>
<th>Year 1 Fall</th>
<th>Year 1 Spring / Year 2 Fall</th>
<th>Year 2 Spring / Year 3 Fall</th>
<th>Year 3 Spring / Year 4 Fall</th>
<th>Year 4 Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR</td>
<td>Se</td>
<td>OR</td>
<td>se</td>
<td>OR</td>
</tr>
<tr>
<td>Depressive Symptoms</td>
<td>1.09</td>
<td>0.02</td>
<td>***</td>
<td>1.06</td>
<td>0.01</td>
</tr>
<tr>
<td>Anxiety Symptoms</td>
<td>0.94</td>
<td>0.02</td>
<td>*</td>
<td>0.96</td>
<td>0.01</td>
</tr>
<tr>
<td>Antisocial Behaviors</td>
<td>1.09</td>
<td>0.03</td>
<td>***</td>
<td>1.06</td>
<td>0.03</td>
</tr>
<tr>
<td>Peer Deviance</td>
<td>1.02</td>
<td>0.01</td>
<td>0.99</td>
<td>0.01</td>
<td>1.01</td>
</tr>
<tr>
<td>AUD: Mild</td>
<td>0.72</td>
<td>0.22</td>
<td>0.91</td>
<td>0.13</td>
<td>1.12</td>
</tr>
<tr>
<td>AUD: Moderate</td>
<td>0.60</td>
<td>0.36</td>
<td>0.90</td>
<td>0.21</td>
<td>1.03</td>
</tr>
<tr>
<td>AUD: Severe</td>
<td>0.40</td>
<td>0.57</td>
<td>1.12</td>
<td>0.25</td>
<td>1.12</td>
</tr>
<tr>
<td>Alcohol Use</td>
<td>1.00</td>
<td>0.00</td>
<td>1.00</td>
<td>0.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Cannabis Use (1-5 times)</td>
<td>1.16</td>
<td>0.19</td>
<td>1.09</td>
<td>0.10</td>
<td>1.19</td>
</tr>
<tr>
<td>Cannabis Use (6+ times)</td>
<td>1.31</td>
<td>0.16</td>
<td>†</td>
<td>1.22</td>
<td>0.11</td>
</tr>
<tr>
<td>Polysubstance Use: 1</td>
<td>0.60</td>
<td>0.24</td>
<td>*</td>
<td>1.08</td>
<td>0.12</td>
</tr>
<tr>
<td>Polysubstance Use: 2</td>
<td>1.04</td>
<td>0.27</td>
<td>1.37</td>
<td>0.18</td>
<td>†</td>
</tr>
<tr>
<td>Polysubstance Use: 3</td>
<td>1.27</td>
<td>0.36</td>
<td>1.20</td>
<td>0.28</td>
<td>0.83</td>
</tr>
<tr>
<td>Stressful Events</td>
<td>1.10</td>
<td>0.03</td>
<td>**</td>
<td>1.12</td>
<td>0.02</td>
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<tr>
<td>Traumatic Events</td>
<td>1.08</td>
<td>0.07</td>
<td>1.07</td>
<td>0.05</td>
<td>1.00</td>
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<tr>
<td>Social Support</td>
<td>0.99</td>
<td>0.03</td>
<td>0.95</td>
<td>0.02</td>
<td>**</td>
</tr>
<tr>
<td>Live on Campus</td>
<td>0.74</td>
<td>0.17</td>
<td>†</td>
<td>0.69</td>
<td>0.10</td>
</tr>
<tr>
<td>Student Organization Participation</td>
<td>0.42</td>
<td>0.25</td>
<td>***</td>
<td>0.76</td>
<td>0.12</td>
</tr>
<tr>
<td>Use of student recreation services</td>
<td>0.55</td>
<td>0.75</td>
<td>0.44</td>
<td>0.49</td>
<td>†</td>
</tr>
</tbody>
</table>

N 7,959 7,603 3,734 1,964 875

All models include gender, race-ethnicity, age, parental education, cohort, and SAT scores as covariates. Omitted categories for categorical predictors include males, whites, those who do not meet criteria for an AUD, those who have not used cannabis in the previous period, and those who have not used any other illicit drugs in the previous period.

*** p < .001; ** p < .01; * p < .05; † p < .10
Figure  SEQ Figure \* ARABIC 1: Data Points across the S4S Sample
Figure  SEQ Figure \* ARABIC 2: Correlations with Ever Dropping Out across Time

Figure displays correlation estimates between various risk/protective factors and dropping out at that time point and any point forward. Squares represent point estimates and bars reference 95% confidence intervals.