Cooling Out Undergraduates with Health Impairments: The Freshman Experience

Jamie M. Carroll,
Doctoral Student in Sociology and Trainee at the Population Research Center, University of Texas at Austin

Chandra Muller, and
Professor of Sociology, University of Texas at Austin

Evangeleen Pattison
Doctoral Student in Sociology and Trainee at the Population Research Center, University of Texas at Austin

Jamie M. Carroll: jmcarroll@utexas.edu

Abstract

Students with health impairments represent a growing sector of the college population, but health based disparities in bachelor's degree completion persist. The classes students pass and the grades they receive during the first year of college provide signals of degree progress and academic fit that shape educational expectations, potentially subjecting students to a cooling out process (Clark 1960). Using the Beginning Postsecondary Students Longitudinal Study (BPS 04/09), we compare signals of degree progress and academic fit and changes in educational expectations between students with and without health impairments during the first year of college. We find that net of academic preparation, type of institution, enrollment intensity and first year experiences, students with mental impairments are more likely to lower their educational expectations after the first year of college, due partially to negative signals of academic fit. We find limited evidence that gaps in learning are related to the use of academic accommodations for students with health impairments. Our results suggest that students with mental impairments are disadvantaged in reaching first year benchmarks of degree progress and academic fit and are disproportionately cooled out.

Bachelor's degrees have become essential for future success in health and the labor market. More people have access to college than ever before, but bachelor's degree completion rates are not equal for all students who hope to complete a degree. College attendance has risen for students with health impairments since the passage of the Americans with Disabilities Act [ADA], which supports equal opportunities and combats discrimination, but gaps in degree completion remain.[i] "We have yet to experience the full impact of [ADA]. The dreams and ambitions of many young people with disabilities have yet to be realized" according to Lex Frieden, a disability rights advocate (Frieden, 2014). Four out of five high

[i]ADA defines a disability as "a physical or mental impairment that substantially limits one or more major life activities." Both "disability" and "health impairment" are used in the literature (Wells 2003). We use "health impairment" because it coincides with the ADA definition and the BPS questionnaire.

school students with health impairments hope to go to college, but only one third matriculate (Wagner & Blackorby, 1996; Sanford, Newman, Wagner, Cameto, Knokey, & Shaver, 2011). Of the over two million students with health impairments who do enter postsecondary institutions, only 16% receive a bachelor's degree, compared to over half of students without health impairments (Kochhar-Bryant, Bassett, & Webb, 2009). Without successful early college experiences, dreams of receiving a bachelor's degree may go unrealized. Students who pass classes and earn high grades during the first year of college are more likely to persist to the second year and graduate with a degree (Adelman, 2006; Attewell, Heil, & Reisel, 2012; Calcagno, Crosta, Bailey, & Jenkins, 2007; Martin, Wilson, Liem, & Ginns, 2013; Tinto, 1975). Student expectations of graduating are shaped by these early academic experiences (Clark, 1980; Tinto, 2012). For students with health impairments, adjusting to college life and performing at the college level may be especially challenging, with early signals tempering a sense that earning a bachelor's degree is possible.

This study investigates the early academic experiences of students with health impairments as they become accustomed to college life. Students who academically struggle during their freshman year may lower their educational expectations to reflect lower performance. Clark's concept of cooling out suggests that postsecondary institutions, particularly community colleges, use signals of degree progress and academic fit to redirect students who do not have the skills needed to obtain a bachelor's degree to lower levels of educational attainment (1960, 1980). But if, as some researchers argue, status group factors exogenous to academic achievement–such as race, gender and social class–contribute to signals of degree progress and academic fit, then postsecondary institutions unjustly cool out lower status individuals who have the ability to succeed in college (Dougherty & Kienzl, 2006; Karabel, 1972; Pascarella, Wolniak, & Pierson, 2003). Studies have found that students with mental or physical impairments in high school have higher failure rates and take lower levels of coursework than their unimpaired peers, even net of academic ability (Needham, Crosnoe, & Muller, 2004; Shifrer, Callahan, & Muller, 2013). If students with health impairments who have similar levels of high school preparation and college academic experiences as their unimpaired peers still systematically perform worse than students without health impairments during the first year of college, then institutional processes and academic demands during the transition to college may disadvantage these students.

This study approaches the disconnect between postsecondary access and bachelor's degree completion by investigating the transition through the first year of college for students with and without health impairments. Academic challenges and experiences with faculty and peers during the first year of college vary by health impairment categories (Chambers, Bolton, & Sukhai, 2013; Fuller et al., 2009; Mamiseishvili & Koch, 2011), thus we pay particular attention to gaps between students with mental and physical impairments. Four research questions guide our investigation. First, are there gaps in degree progress and academic performance between students with and without health impairments during the first year of college? Second, are these gaps explained by first year experiences? Third, are students with health impairments more likely to cool out, by lowering their educational expectations after the first year of college, than students without health impairments? Last, do signals of degree progress and academic fit mediate the relationship between health status and cooling out? Students who enter college with a health impairment are an understudied

but expanding segment of the college population, taking up about 9% of the undergraduate population (Newman et al., 2011). We investigate the challenges these students have during the first year of college that may derail them from continuing their dream to earn a bachelor's degree.

Signals Shape Educational Expectations

In an era of "college-for-all", students from diverse academic and social backgrounds aspire to earn bachelor's degrees. High educational expectations are important for success in college, but students' academic progress through and performance in first year coursework may not match their level of expectations. We use two theoretical models to frame how experiences during the first year of college shape educational expectations (Clark, 1960, 1980; Tinto, 2012). First, Tinto's model of student persistence posits that academic integration influences students' commitment to the goal of graduating and the decision to drop out (Tinto, 1975, 2012). Students are academically integrated if their academic performance and intellectual development align with their institution. Passing classes and earning good grades during the first year of college assures students that they fit academically in the college environment, enhancing their institutional commitment. However, some critics argue that Tinto's model mainly addresses 4-year schools and does not apply to individuals from disadvantaged groups who have different needs and experiences during the transition to college (Bean & Metzner, 1985; Wolniak, Mayhew, & Engberg, 2012), possibly including students with health impairments.

The second theory, Clark's concept of cooling out, claims that community colleges use signals of degree progress and academic fit to convince students who are performing poorly to lower their educational expectations (Clark, 1960, 1980). This management of ambitions in postsecondary institutions justifies inequality by making students believe their lower levels of achievement are due to personal failures, but students who come from disadvantaged backgrounds are more likely to lower their expectations than higher status students with similar abilities (Brint & Karabel, 1989; Dougherty & Kienzl, 2006; Karabel, 1972; Pascarella et al., 2003). Both of these theories underscore the role of signals of degree progress and academic fit at 2 and 4-year schools in shaping students' educational expectations. The standards of progress and performance that students are held to during the first year of college are constructed around privileged students and do not consider the diversity in academic experiences and behaviors for students from different backgrounds (Karabel, 1972; Rhoades, 2014; Tinto, 2012), including students with health impairments.

The transition to college may also differ between types of health impairments. Scholars categorize health impairments as "apparent" and "non-apparent", "visible" and "invisible" and "non-cognitive" and "cognitive" to separate the diverse experiences of mental versus physical impairments (Adams & Proctor, 2010; Frazier, Youngstom, Glutting, & Watkins, 2007; Fuller, Bradley, & Healey, 2004; Fuller et al., 2009; Mullins & Preyde, 2013; Murray, Lombardi, & Kosty, 2014; Olney & Brockelman, 2003; Wessel, Jones, Markle, & Westfall, 2009).[ii] Physical impairments are easier to document and are perceived of as more legitimate and deserving of accommodations in college classrooms (Chambers et al., 2013; Upton & Harper, 2002). Their symptoms are generally not dependent on the environment

and the types of academic accommodations they receive are more straightforward. In contrast, mental impairments are less easily detected and assessed. The symptoms may change or emerge during the transition to adulthood, making matching academic needs and accommodations more difficult (Brinckerhoff, McGuire, & Shaw, 2002; Olney & Brockelman, 2003). We examine students with mental and physical impairments as disadvantaged groups in postsecondary institutions and focus on their academic performance through four signals of degree progress and academic fit.

Benchmarks of degree progress and academic performance during the first year of college shape the probability of degree attainment and students' beliefs in their abilities. The measures of degree progress we consider, college-level math completion and credit accumulation, are signals of academic integration that institutions use to manage student ambitions of degree attainment. Taking and passing a college-level math course during the first year of college boosts overall persistence towards a degree and is essential for degree progress in science, technology, engineering and math (STEM) fields (Adelman, 1998; Herzog, 2005). Academic momentum, indicated by earning 20 credits during the first year of college, predicts persistence and degree attainment more strongly than race, gender, school selectivity and high school preparation (Adelman, 2006; Attewell et al., 2012). Course failure and grade point average (GPA) signal to students how well they academically fit in postsecondary classrooms. For students who have struggled in the past, failing a course can trigger thoughts of self-doubt and alter self-efficacy (Attewell et al., 2012; Tinto, 2012; Zajacova, Lynch, & Espenshade, 2005). Students who earn a GPA in the top quartile of their cohort have a higher chance of earning a degree than students with lower GPAs (Adelman, 2006). These signals of degree progress and academic fit shape the likelihood of receiving a degree for students, and impact a student's own educational expectations.

Passing these benchmarks and earning good grades during the first year of college may be particularly challenging for students with health impairments. Students with health impairments have worse academic performance in high school than students without health impairments (Fletcher, 2010; Merrell, 2001; Needham, Crosnoe, & Muller, 2004). A growing body of literature suggests that this trend continues in college. Although some evidence suggests that students with health impairments simply take longer to complete programs than students without health impairments (Wessel et al., 2009), other research finds that students with health impairments have worse academic performance than students without health impairments. A study of a single university found that students with Attention Deficit Disorder (ADD) are more likely to be put on academic probation (earning a GPA below a 2.0) than students without ADD (Frazier et al., 2007). Another study found that students with learning disabilities have more D and P (passing a pass/fail class) grades than students without learning disabilities (Vogel & Adelman, 1992). Students with health impairments may face attitudinal barriers from college advisors, professors, family or friends because of perceived inability to tackle challenging coursework, which could diminish their sense of self-efficacy and restrict their access to college-level coursework, especially in math and science (Hedrick, Dizén, Collins, Evans, & Grayson, 2010; Zajacova

---

[ii]Physical impairments include sensory, orthopedic and other health impairments. Mental impairments include depression, emotional disturbance, Attention Deficit Disorder (ADD) and learning disabilities.

et al., 2005). Students with health impairments may also have difficulty adjusting to college instructional strategies. For example, students with a learning disability or ADD can have difficulty processing information and concentrating (Brinckerhoff et al., 2002). This evidence suggests that students with health impairments may be disadvantaged in completing first year college classes, but it remains unclear how signals of degree progress and academic fit differ according to health impairment status.

The Role of Social Integration and Enrollment Characteristics

Students with health impairments face social, physical and emotional barriers to successful interactions with non-impaired adults and peers in college, limiting their access to support outside the classroom. Social integration developed through meeting with faculty and advisors or attending social events during the first few months of college influences learning and builds confidence in students (Tinto, 2012; Wolniak et al., 2012). But students with health impairments indicate that they feel demeaned and degraded by faculty and peers without impairments (Barnard-Brak, Lechtenberger & Lan, 2010) and believe the system is designed for "normal" people (Mullins & Preyde, 2013). They feel trapped between their desire to fit in with the "normal" students and labels that make them more visible (Fuller et al., 2009). Social integration is important for students who struggle academically during the first year of college, but there are barriers for students with health impairments.

Postsecondary schools provide academic support to fill in gaps in achievement for students with health impairments, but there are institutional barriers to these interactions. Unlike in high school where special education teachers direct all accommodations for and assessments of students, college students are in charge of verifying their health impairment status with disability services offices and managing their accommodations within each class (NJCLD, 2007). This shift in policy requires more individual responsibility and adds steps to the process of disclosure, which could explain why of the students who receive special education services in high school, only 1 to 3% receive accommodations in college and less than half disclose their health impairment status to faculty or administration (Barnard-Brak, Lechtenberger & Lan, 2010; Sanford et al., 2011). Many studies of students with health impairments in college draw samples from students who are registered with disability services offices, leaving out any students who choose not to disclosure their status. We use self-reports of health impairment status and therefore include all students who identify as having an impairment, whether disclosed or not.

The disclosure process and experiences interacting with faculty and staff may be different for students with mental and physical impairments. Students with physical impairments are more likely to receive accommodations (Chambers et al., 2013; Fuller et al., 2004) and report being better adjusted to the college environment than students with mental impairments (Adams & Proctor, 2010; Fuller et al., 2009; Murray et al., 2014). Students with invisible impairments, such as depression, ADD or a learning disability, can pass as "normal" and avoid some discrimination from faculty and peers, but passing as normal does not eliminate the symptoms of impairments and validating invisible impairments is challenging (Johnson, 2006; Mullins & Preyde, 2013). The visible nature of most physical impairments may make the transition to college easier, taking weight off the disclosure

process. Consequently, we predict that students with mental impairments have a harder time transitioning during the first year of college than students with physical impairments and are more likely to receive negative signals of degree progress and academic fit. Students with physical impairments who make it to college may also be more resilient to negative perceptions of their impairment. The students diagnosed with mental impairments who enroll in college generally come from more privileged backgrounds and may be less prepared to face failure. Additionally, stereotypes associated with mental impairments may impact students' perceptions of their own abilities. Thus, we predict that students with mental impairments will be more susceptible to the signals of degree progress and academic fit and lower their educational expectations.

Certain characteristics of college life separate the experience of students with health impairments from students without health impairments. Evidence suggests that students with health impairments who enter higher education typically are older, are more likely to live at home, have lower educational expectations, are more likely to enroll in 2-year than 4-year schools, have lower rates of acceptance into selective universities and enroll in fewer classes than students without health impairments (Fairweather & Shaver, 1990; Janus, 2009; Luna, 2009; Sanford et al., 2011; Wells, 2003; Vogel & Adelman 1992). We address these issues by, first, controlling on living arrangements and age. Second, we only include individuals who enter postsecondary schools with the expectation of receiving at least a bachelor's degree. Third, we assess the school type, whether it is a 2 or 4-year school, and the school selectivity. Fourth, we include controls for enrollment status. We expect that differences in enrollment characteristics will not explain the academic performance gap between students with and without health impairments.

During the first year of college students are held up to benchmarks of degree progress and academic fit that may disadvantage students with health impairments. We estimate gaps in academic outcomes during the transition to college and educational expectations two years after college entry between students with and without health impairments, controlling on high school preparation, enrollment characteristics and first year experiences. Our aim is to understand if students with mental and physical impairments are more likely to have negative signals of degree progress and academic fit during the first year of college and if they are disproportionately subjected to the cooling out process.

Methods

This study used data from the first and second waves of the most recent cohort of the Beginning Postsecondary Students Longitudinal Study (BPS) from 2004 to 2009 and linked transcript data from the Postsecondary Education Transcript Study (PETS). The sample is nationally representative of students who entered any postsecondary institution in the U.S. and Puerto Rico for the first time during the 2003 to 2004 school year. The first wave includes about 18,000 students, 17,000 of whom were matched with transcript data collected in 2009.

We restricted the sample to students who first enrolled at 2 or 4-year postsecondary institutions with the expectation of receiving at least a bachelor's degree, excluding those

who first enrolled in certificate programs (N=2070) or had educational expectations less than a bachelor's degree during the first year of college (N=880).[iii] BPS only asked students 23 years and below to report on their high school preparation, so we excluded anyone 24 or older from the sample (N=2380). Additionally, students who were not enrolled in any postsecondary classes during the 2003 to 2004 school year were dropped from the analytic sample (N=570). All analyses used the appropriate panel weight to make inferences about the general population of first-time beginning college students.

Health Impairment

In the spring 2004 survey, students self-reported whether they had a limiting condition lasting at least six months. We categorized students with physical impairments as those with any non-cognitive impairment, including sensory, orthopedic or health impairment, and students with mental impairments as those with any cognitive impairment, including learning disability, ADD, depression or an emotional disturbance. Because students were not asked to report on multiple impairments, our analysis focuses on the main condition that limits students.

First Year Signals of Degree Progress and Academic Fit

We constructed transcript-based indicators for signals of degree progress and academic fit to assess how well students transition through the first year of postsecondary study. College-level math completion includes introductory and advanced math coursework, but excludes pre-college and remedial classes. The reference category for math course completion includes individuals who did not attempt a college-level math course and those who attempted unsuccessfully (i.e. failed, withdrew or received an incomplete).[iv] To measure earning at least 20 credits, we used the total number of credits earned before entering the second year of college. In ancillary analyses we also predicted the total number of credits earned and earning at least 10 credits during the first year of college and found similar disparities by health impairment status. Course failure indicates that a student failed at least one course during the first year of college, whether it was for credit or not. We constructed GPA at the end of the first year by averaging course grades that are weighted by the number of credits earned in each course.

Educational Expectations

We used the educational expectations reported during the spring of 2004 and spring of 2006 to assess if students lowered their educational expectations. Since the first point in data collection for BPS is during the freshman year of college (Fall 2003 – Spring 2004), we do not have student educational expectations before entering college. The expectations of students during the second semester of the freshman year may have already been lowered by their experiences during the first semester.[v] Thus, using the freshmen year educational

---

[iii]N's are rounded to the nearest 10 as per National Center for Educational Statistics (NCES) guidelines.
[iv]In additional analyses, we used a categorical indicator of college math: not attempting, attempting and not completing and attempting and completing. Students with mental impairments are more likely to attempt and not complete than students without health impairments, but they are not significantly different than students with physical impairments in either attempting and not completing or attempting and completing. Due to the small sample sizes in the multinomial regression and for ease of interpretation, we included those who attempted and did not complete in the reference category.

expectations as a baseline gives us conservative estimates of how much students' educational expectations have changed since entering college.

Students who have "cooled out" their expectations are those who expected at least a bachelor's degree in 2004, but expected lower than a bachelor's degree in the second wave of data collection in 2006. This includes individuals who lowered their expectations to an associate's degree, certificate or no degree, but excludes individuals who lowered their expectations from a professional or graduate degree to a bachelor's degree.[vi]

First Year Experiences

Level of coursework, number of credits attempted, social integration and use of academic services are the four measures of first year experiences we considered in our analyses. Using the College Course Map (CCM), we generated variables for math and writing coursework attempted, with not taking math or writing as the omitted reference category. We split the math courses into precollege (including remedial), introductory college-level and advanced and the writing courses into introductory (including remedial) and advanced (Adelman, 1998). We also constructed a variable indicating if a student took a remedial course in any subject during the first year of college and a measure of the total number of credits attempted during the first year.

We measured social integration through self-reports of how frequently (never, sometimes, often) students talk with faculty outside of class, have informal meetings with faculty, meet with an academic advisor and participate in study groups, fine arts activities, school clubs and sports. Using these items, we transformed each into a standardized variable with a mean of zero and standard deviation of one and averaged them to construct a scale of social integration (alpha=0.732).

Students who reported health impairments were also asked if they used eight different academic services during their first year of college: adaptive equipment and technology, alternative exam formats, course substitution or waivers, readers or classroom note-takers, registration assistance, sign language or oral interpreters, tutors to assist with homework, and other services. This question suggests that students reported their health impairment status to the office of student disability services, which granted them access to certain academic accommodations. Because of the wide range of possible accommodations used by different students at different schools, our measure only takes into account if the student used at least one academic service during the first year of college or not. The most used services reported by students are alternative exam formats and tutors to assist with homework, followed by registration assistance and readers or note-takers.

---

[v]A subsample of students who took the ACT (N=5140) reported their educational expectations on the exam date. We estimated if their educational expectations changed before the BPS 2004 questionnaire administration. Only about 2% of these students lowered their educational expectations and the proportion of students who lowered their expectations was not significantly different between students with and without health impairments.

[vi]We do not exclude students who dropped out from our analyses, thus some of the students who "cooled out" are also no longer enrolled in school. In ancillary analyses, we predicted enrolling during the second year of college and, although the signals of degree progress and academic fit are highly predictive of second year enrollment, health impairment status is not, most likely due to small sample sizes (only about 90 students with mental and 60 students with physical impairments drop out).

School Type

We classified the first school a student enrolled in according to the level of selectivity and school type. We relied on measures pre-constructed in BPS to indicate if a student attended a 2-year school or broad access (open admissions or minimally selective) 4-year school, with attending a moderately or very selective 4-year school as the omitted reference category. Results are robust to separating moderately and selective 4-year schools.

Controls

We include student background, academic preparation and enrollment characteristics as controls in all of our models. Background variables include gender, age, race and parents' education, indicating if at least one parent received a bachelor's degree. High school preparation measures include highest math course taken, high school curriculum, type of high school certification, SAT scores, precollege credits earned and high school GPA. Students self-reported the math courses they took in high school and we used this information to construct an indicator for whether a student took courses in Algebra 2 or above. BPS indicates if a student's high school curriculum qualifies them for the Academic Competitiveness Grant (ACG), which requires students to have taken three years of math, four years of English, three years of science, three years of social studies and one year of a foreign language. We refer to this as a "full high school curriculum". We created an indicator of receiving a GED or certificate, with a high school diploma as the reference. The SAT scores reported in BPS are from the College Board, when available, or self-reported and student ACT scores are converted to SAT values. We also included a measure of receiving at least one college credit for courses taken in high school, reported as any Advanced Placement or International Baccalaureate credits on postsecondary transcripts. Students report if their high school GPA falls within seven different grade ranges. We recoded the categories to their midpoints to construct a continuous indicator of high school GPA.[vii] Enrollment characteristics include enrollment intensity and living situations. We measure enrollment intensity as the number of months a student was enrolled full-time during their first year of college. A variable indicating that a student resided off campus for any of first year period is also included, and the reference is living on campus.

Analysis Plan

We begin with bivariate analyses to asses baseline differences between students with and without health impairments in signals of degree progress and academic fit and changes in educational expectations. Next, we conduct multivariate analyses, which proceed in two parts. First, we focus on the signals of degree progress and academic fit. We use logistic regression to predict math completion, earning 20 credits and course failure. We report results as average marginal effects (AME), which indicate the percent change in predicted probability of successfully completing the outcome of interest for students with mental or physical impairments compared to students without impairments. AMEs applied to

---

[vii]There are 1,480 students missing SAT scores and 800 students missing high school GPA in BPS. For these students, we imputed missing scores using multiple imputation with important indicators of academic ability, including race, gender, parents' education, GPA, school type, high school certification, highest math course taken in high school, type of high school and type of high school curriculum. We perform additional analyses using listwise deletion and mean substitution and the findings are consistent.

nonlinear models allow us to compare coefficients between health impairment status groups across models, while taking all of our controls into account. To predict first year GPA, we use Ordinary Least Squares (OLS) regression and report results as coefficients, which condition on all other variables in the model. We nest the models, first estimating effects of background, preparation and enrollment characteristics, and then add first year experiences. Throughout this first analysis our aim is to assess if students with mental or physical health impairments are more likely to receive negative signals of degree progress and academic fit than their unimpaired peers during the first year of college and to examine if first year experiences explain any disadvantages by health status.

The last part of our analysis focuses on cooling out educational expectations. We use logistic regression, reporting AME, to predict expecting lower than a bachelor's degree two years after college entry. We nest our models, first estimating effects of the models included above. Then we include our signals of degree progress and academic fit. This final step assesses if students with mental or physical impairments are more likely to lower their educational expectations during college than students without impairments and if the first year signals of degree progress and academic fit mediate the relationship between health status and cooling out.

One of the main challenges in this study is trying to account for prior differences between students with and without health impairments. Students with mental and physical impairments may have different outcomes during the first year of college due to unmeasured characteristics or background academic behaviors instead of any institutional processes (Rosenbaum & Rubin, 1985). In ancillary analyses, we accounted for this possibility using propensity score matching techniques. To isolate the effects of having a health impairment, we calculated the propensity of reporting a health impairment using all variables we have prior to college entry that are theoretically related to health impairments, including high school experiences, dependency status, age, race, gender, parents' education, an indicator of delayed enrollment status and delaying enrollment due to a health problem. Using kernel, nearest neighbor and stratification matching techniques, we then predicted each of our outcome variables with the propensity to report any health impairment, a mental health impairment or a physical health impairment (Frisco, Muller and Frank, 2007). The results from these analyses indicate that students with health impairments have significantly different outcomes during the first year of college than students without health impairments, even when matching students according to their pre-enrollment experiences. For ease of interpretation and to fulfill our second goal of this paper, to understand institutional processes of cooling out, we do not include these propensity models in our final results, but these findings are available upon request.

All of our multivariate models include the Inverse Mills Ratio (IMR) to provide robust estimates accounting for our sample selection. We estimated the IMR, or hazard rate of not being included in the sample of students expecting at least a bachelor's degree, first by using a probit model to calculate the likelihood of being included in the sample with the pre-enrollment characteristics included in our models. Then, we predicted the propensity score for each individual to be included in the sample and used this score to calculate the IMR (Berk, 1983).

Results

The weighted descriptive statistics presented in Table 1 depict differences between students with mental and physical impairments and those without health impairments. As shown in the first rows of the table, students with health impairments are more likely to have negative signals of degree progress and academic fit than students without health impairments, but there are differences between health impairment categories. The average rate of completing college-level math is not significantly different between students with mental or physical impairments, but students with mental impairments on average earn lower GPAs than students with physical impairments. Additionally, only students with mental impairments earn fewer than 20 credits and fail at least one course more than students without health impairments, on average. Students with physical impairments have similar rates as students without health impairments. As indicated in the next few rows in the table, educational expectations for students with and without health impairments do not differ during the freshman year of college, but this pattern changes two years later. Students with health impairments are less likely to expect a graduate or professional degree and more likely to expect less than a bachelor's degree two years after initial college enrollment than students without health impairments, but there are no differences between students with mental and physical impairments.

Students with health impairments have significantly lower high school preparation than students without health impairments, which may explain part of the gap in first year performance and educational expectations. First year college students with health impairments on average took lower levels of math in high school and take lower levels of math in college. Despite worse academic outcomes for college students with mental impairments, a higher proportion of these students come from privileged backgrounds than students without health impairments. They are more likely to attend selective, 4-year schools and on average earn higher SAT scores than students with physical impairments. Although students with mental impairments have similar ability as students without health impairments, as indicated by SAT scores, they have worse high school academic performance, as indicated by high school GPA. These descriptive statistics suggest that students with health impairments, especially mental impairments, are more likely to experience negative signals of degree progress and academic fit and to lower their educational expectations than students without health impairments, but it remains unclear how these factors are related.

One of the first year experiences, using academic accommodations, may explain some of the differences we observe above. Students with mental impairments use academic accommodations at significantly higher rates than students with physical impairments. Although the literature notes that students with physical impairments are more likely to receive accommodations, the types of accommodations included in the BPS survey are mainly academic and may ignore the different kinds of nonacademic accommodations students with physical impairments require. Additionally, the students with mental impairments in this sample are significantly more privileged than the students with physical impairments, granting them more resources to fulfill the requirements of disability services offices. The following analyses will explore whether academic accommodations, as well as

other first year experiences, explain the gaps in performance and expectations for students with health impairments.

Signals of Degree Progress

Table 2 displays the AME from logistic regression models predicting completing a college-level math course (panel a) and earning at least 20 credits (panel b) by the end of the first year of college. Our results suggest that students with mental impairments have a more difficult time adjusting to college than students without health impairments, but first year experiences explain the gap in college-level math completion. In Table 2, panel a, students with a mental impairment are 8.1 percentage points less likely to complete a college-level math class during their first year of college than students without health impairments. Students with physical impairments are 5 percentage points less likely to complete college-level math, but this difference is only marginally significant.

The first year experiences in model 2 explain the gap in college-level math completion between students with and without health impairments. Specifically, using academic accommodations and enrolling in remedial courses are significantly related to college-level math completion, but in ancillary analyses it is the use of academic accommodations that lowers the gap in college-level math between students with and without health impairments. We estimated the predicted probabilities of students with mental, physical or no health impairments who are otherwise typical, privileged college students–18 years-old, white, female students who reside on campus, attend nine months full time, did not take remedial courses, took Algebra 2 in high school, earned precollege credit in high school, took a full high school curriculum and have parents with a bachelor's degree. The predicted probability of completing college-level math for a privileged student in a nonselective (2-year or broad access 4-year) school without a health impairment is .44. The predicted probability for the same student with a physical impairment is .41 and with a mental impairment is .34. Accounting for first year experiences in model 2 closes this gap by about .05. Overall, these findings suggest that the gap in college-level math completion between students with and without health impairments may be related to whether or not students use academic accommodations during their first year of college.

The analysis in Table 2, panel b, provides support for our hypothesis that students with mental impairments have a more difficult time adjusting to college than students with physical impairments. As shown in model 2, students with mental impairments are 5.7 percentage points less likely than students without health impairments, and are significantly less likely than students with physical impairments, to earn 20 credits during their first year of college. No gap exists for students with physical impairments. Our estimates suggest that this benchmark is common among privileged college students at nonselective schools, who have a .95 predicted probability of earning at least 20 credits. But students with mental impairments are less likely to receive this positive signal of degree progress, and first year experiences do not explain any of this gap.

Signals of Academic Fit

Our next four models in Table 3 predict signals of academic fit. As with signals of degree progress, students with health impairments have a harder time adjusting to college coursework, but there are differences between students with mental and physical impairments. Table 3, panel a, displays the results of logistic regression models predicting failing at least one course during the first year of college. Students with mental impairments are 10.2 percentage points more likely to fail a course than students without health impairments and their likelihood of failure is significantly higher than students with physical impairments. Students with physical impairments, on the other hand, have a similar likelihood of course failure as students without health impairments. The predicted probability of failing at least one course during the first year for a privileged student at a nonselective school is .18, but a similar student with a mental impairment has a probability of .27.

Results from predicting course performance measured by GPA again suggest that students with mental impairments receive negative signals of academic fit. The OLS regression of first year GPA in Table 3, panel b, shows that, on average, students with mental impairments receive a GPA that is .32 lower than students without health impairments, net of background characteristics, academic preparation and postsecondary enrollment characteristics. The addition of first year experiences in model 2 only explains about .05 of this gap and the change in coefficients is not statistically significant. Students with physical impairments, on average, receive a first year GPA that is not significantly different from students without health impairments, but is significantly higher than students with mental impairments once we control on background, preparation and enrollment characteristics. The average GPA for a privileged student at a nonselective school without a health impairment is 2.75, which is equivalent to about a B average. The average GPA of this same student with a mental impairment is about 2.47, which is about a C+. Students with mental impairments receive both negative signals of academic fit we consider at higher rates than students without health impairments and students with physical impairments.

Cooling Out

The last step of our analysis in Table 4 presents results from logistic regression models predicting whether students lowered their degree expectations to below a bachelor's degree two years after enrollment, additionally examining the role of signals of degree progress and academic fit in the process. Our findings suggest that students with mental impairments are more likely to be cooled out than students without health impairments, but this association is partially explained by first year experiences and signals of degree progress and academic fit. Controlling on background, preparation and enrollment characteristics in model 1, students with mental impairments are 6.3 percentage points more likely to lower their degree expectations two years after enrollment than students without health impairments. In contrast, students with physical impairments have the same likelihood of cooling out as students without health impairments. The inclusion of first year experiences in model 2 explains less than 2 percentage points of this association. Signals of degree progress in model 3 explain little of the gap in cooling out, but signals of academic fit in model 4 render the AME for students with mental impairments nonsignificant. Students who earn 20 credits

are less likely to lower their expectations, but course failure and GPA explain this estimated effect in model 4.

Using the signals of degree progress (completing college level math and earning 20 credits) and academic fit (failing a class and earning the average GPA for a student with a mental impairment in Table 1), we estimated the predicted probability of cooling out for students with and without health impairments. The predicted probability of a privileged college student at a nonselective school without an impairment cooling out is .05 if the student experiences negative signals of degree progress and academic fit. The same student with the same signals and a mental impairment has a .07 predicted probability of cooling out. Although this gap is relatively small, it suggests that of the two million students with health impairments enrolled in postsecondary institutions each year, 40,000 otherwise qualified students with a mental impairment may be cooled out.

Discussion

Students with health impairments have gained more access to college since the passage of ADA, yet their rates of degree completion still lag behind students without health impairments. Students with health impairments may face more challenges adjusting to the postsecondary environment than students without health impairments. Academic integration during the transition to college shapes students' educational expectations, potentially cooling out students who receive signals that they do not academically fit in an institution. Postsecondary institutions manage the degree aspirations of students through signals of degree progress and academic fit to deal with the disconnect between student academic capacity and the level of ability needed to complete a bachelor's degree. But some research suggest that factors exogenous to academic ability contribute to students receiving negative signals of degree progress and academic fit (Dougherty & Kienzl, 2006; Karabel, 1972; Pascarella et al., 2003). We investigated if students with health impairments represent a disadvantaged group within the postsecondary community, systematically performing worse during the first year of college and being subjected to the cooling out process.

We find that students with mental impairments are more likely to receive negative signals of degree progress and academic fit and lower their educational expectations than students without health impairments, controlling on high school preparation, background, enrollment characteristics and first year experiences. Using academic services explains the gap in college-level math completion between students with mental impairments and students without impairments, but these students still have lower rates of credit accumulation, higher rates of course failure and lower GPAs than both students without impairments and students with physical impairments. These negative signals of degree progress and academic fit partially explain the higher likelihood of cooling out for students with mental impairments. These findings are robust to a host of controls and analyses using propensity score matching techniques. Below we discuss three major themes and policy suggestions that emerge from our study.

First, academic coursework during the first year of college disadvantages students with mental impairments. Students who do not build credits and receive high GPAs during the

first year of college are more likely to drop out and less likely to eventually earn a bachelor's degree (Adelman, 2006; Tinto, 1975). Although we cannot be sure exactly what causes achievement gaps, we do suggest two possible institutional processes that could provide more support for these students. Building academic and social relationships during the first year of college is crucial to support academic performance, but students with health impairments have to manage their identity in a new environment. Qualitative studies address the perception of discrimination by students with health impairments, who claim that stigmas related to their impairments and lack of understanding of faculty members get in the way of their academic success (Barnard-Brak, Lechtenberger & Lan, 2010; Fuller et al., 2009). We attempted to address the different experiences students with health impairments face with social interactions, but our measure of social integration only takes frequency of interactions into account, and not quality. Faculty members and teaching assistants at postsecondary institutions are provided with limited information about students with health impairments and may not know the best way to approach these interactions. Although some disability services offices at postsecondary institutions may provide training opportunities, there are no training or certification guidelines at the national-level. If faculty members are trained on the best ways to approach interactions with students with health impairments, then perhaps these social interactions would provide more of a boost for student achievement.

But if students with health impairments do not disclose their health impairment status, then faculty and staff may not be able to apply their support in the best way. During the first year of college, many students choose not to disclose their impairment status in an attempt to fit in with "normal" students, but being perceived of as "normal" does not erase symptoms of health impairments (Johnson, 2006; Mullins & Preyde, 2013). In BPS, students self-reported whether or not they used academic services, but there is no information about the availability of these services. We do find limited evidence that the use of academic services explains gaps in college-level math achievement, but other studies may find that the use of academic accommodations supports positive student outcomes when taking the local institutional policies into consideration. The process of disclosing an impairment may be more or less daunting in different postsecondary environments. Each postsecondary institution has their own policies for these processes, making it difficult for students to be prepared to disclose their impairment early in their college career. K-12 institutions have procedures in place for evaluating health impairments and assigning accommodations, but these are not aligned with similar processes at postsecondary institutions. Colleges should recognize that mental impairments can impede students' progress and should be addressed early in students' college careers. Although colleges cannot require students to disclose their impairment status, they can support an environment where students feel comfortable and able to receive the academic services they need to perform their best during the transition to college.

A second theme our findings support is the strong possibility that students with mental impairments face a process of cooling out. Our results suggest that institutions shape educational expectations of students through signals of degree progress and academic fit. Colleges require students to take stepping-stone classes during the first year of college that serve as gatekeepers for higher-level coursework. Introductory math and science professors even claim to purposefully demand more out of students in these classes to weed out those

without the ability to proceed in STEM (Eagan & Jager, 2008). Institutions need to consider the diverse abilities and experiences of students with health impairments when defining the level of achievement necessary to complete first year coursework. Although academic accommodations are supposed to fill in any gaps in learning for students with health impairments, professors should still be aware of not only their content requirements, but also content delivery. BPS provides rich postsecondary transcript data on grades and courses, but we cannot address particular classroom processes that could contribute to the signals of degree progress and academic fit or cooling out (Tinto, 1997; Deil-Amen, 2011). Some instructional strategies, including Universal Design for Instruction (UDI), may assist to close the gap between students with and without health impairments (McGuire & Scott, 2006). Postsecondary institutions should be aware of the diverse needs of students when constructing standards of degree progress and academic fit to reduce the likelihood of students cooling out.

A final theme for discussion is the exclusion of students with health impairments from college-level math, one important step in the pathway towards a STEM degree. While we find that college-level math completion has no relationship with cooling out of degree expectations, it may be related to students cooling out in other ways, such as through selecting majors. College-level math is an important indicator of general degree progress, but this barrier may be one of many that restrict access to high status STEM occupations for students with health impairments. Although 10% of people in the labor force report health impairments, only 2% of people in STEM occupations report health impairments (Moon, Todd, Morton, & Ivey, 2012). There is evidence that this is not due to differential interests, but differential access; students with health impairments are just as likely as students without health impairments to declare a STEM major upon college entry (Moon et al., 2012). The use of academic accommodations and taking remedial courses during the first year of college explain the negative association between mental impairment and college-level math completion, suggesting that these institutional processes may play a role in placing students with health impairments on pathways away from STEM majors. If institutions are serious about wanting to increase the diversity of individuals who end up in STEM occupations, they should understand how the transition to college and stepping-stone math and science classes may redirect qualified students from graduating with a STEM degree.

Our analysis is limited by the data and methods available to us. BPS only includes self-reported data on high school preparation, impairment status, social integration and academic accommodations. We control on SAT scores and high school GPA to account for differences in academic ability upon college entry, but these may be weak measures. Additionally, we cannot claim causality in our analyses. It is possible that there are unmeasured attributes of students that are correlated with their health impairment and with postsecondary progress and achievement. Although we try to account for this possibility through our controls and through propensity score matching techniques, we cannot be sure if having a health impairment is the factor causing students to perform worse during their first year of college. Despite these limitations, our findings suggest the existence of broad and important trends across 2 and 4-year schools that disadvantage students with health impairments.

Receiving a college degree has become even more essential for future success in work and health, but students with health impairments are less likely to obtain this credential. Access to college is not enough. Postsecondary institutions need to be aware of how their academic requirements might discriminate against students from different status groups, including students with health impairments. Just having the support available is not enough. Students, faculty and staff need to be educated on how to communicate with students with health impairments about the availability and importance of academic and social supports. Opportunities within college to fulfill aspirations of graduating with a degree and finding gainful employment are the main tenets of ADA, which, as Frieden (2014) underscored, have yet to be fully realized.

Acknowledgments

References

Adams KS, Proctor BE. Adaptation to College for Students With and Without Disabilities: Group Differences and Predictors. Journal of Postsecondary Education and Disability. 2010; 22(3):166–184.

Adelman, C. Women and men of the engineering path: a model for analyses of undergraduate careers. Washington, DC: U.S. Dept. of Education: National Institute for Science Education; 1998.

Adelman, C. The Toolbox Revisited: Paths to Degree Completion From High School Through College. Washington, D.C: U.S. Department of Education; 2006.

Attewell P, Heil S, Reisel L. What is Academic Momentum? And Does it Matter? Educational Evaluation Policy Analysis. 2012; 34(1):27–44.

Bahr PR. *Cooling Out* in the Community College: What is the Effect of Academic Advising on Students' Chances of Success? Research in Higher Education. 2008; 49:704–732.

Barnard-Brak L, Lechtenberger D, Lan WY. Accomodation Strategies of College Students with Disabilities. The Qualitative Report. 2010; 15(2):411–429.

Bean JP, Metzner BS. A Conceptual Model of Nontraditional Undergraduate Student Attrition. Review of Educational Research. 1985; 55(4):485–540.

Berk R. An Introduction to Sample Selection Bias in Sociological Data. American Sociological Review. 1983; 48(3):386–398.

Brinckerhoff, LC.; McGuire, JM.; Shaw, SF. Postsecondary Education and Transition for Students with Learning Disabilities. 2. Austin, TX: Pro-Ed, Inc; 2002.

Brint, S.; Karabel, J. The Diverted Dream: Community Colleges and the Promise of Educational Opportunity in America, 1900–1985. New York: Oxford University Press, Inc; 1989.

Calcagno JC, Crosta P, Bailey T, Jenkins D. Stepping Stones to a Degree: The impact of enrollment pathways and milestones on community college student outcomes. Research in Higher Education. 2007; 48(7):775–801.

Chambers T, Bolton M, Sukhai MA. Financial Barriers for Students with Non-apparent Disabilities within Canadian Postsecondary Education. Journal of Postsecondary Education and Disability. 2013; 26(1):53–66.

Clark BR. The "Cooling-Out" Function in Higher Education. American Journal of Sociology. 1960; 65(6):569–576.

Clark BR. The "Cooling Out" Function Revisited. New Directions for Community Colleges. 1980; 32(8):15–31.

Deil-Amen R. Socio-Academic Integrative Moments: Rethinking Academic and Social Integration Among Two-Year College Students in Career-Related Programs. The Journal of Higher Education. 2011; 82(1):54–91.

The National Joint Committee on Learning Disabilities (NJCLD). The Documentation Disconnect for Students with Learning Disabilities: Improving Access to Postsecondary Disability Services: A Report from the National Joint Committee on Learning Disabilities. Learning Disability Quarterly. 2007; 30(4):265–274.

Dougherty KJ, Kienzl GS. It's Not Enough to Get Through the Open Door: Inequalities by Social Background in Transfer from Community Colleges to Four-Year Colleges. Teachers College Record. 2006; 108(3):452–487.

Eagan MK, Jaeger AJ. Closing the Gate: Part-Time Faculty Instruction in Gatekeeper Courses and First-Year Persistence. New Directions for Teaching and Learning. 2008; 115:39–53.

Fairweather JS, Shaver DM. A Troubled Future?: Participation in Postsecondary Education by Youth with Disabilities. Journal of Higher Education. 1990; 61(3):332–348.

Fletcher JM. Adolescent depression and educational attainment: results using sibling fixed effects. Health Economics. 2010; 19(7):855–871. [PubMed: 19582699]

Frazier TW, Youngstrom EA, Glutting JJ, Watkins MW. ADHD and Achievement: Meta-Analysis of the Child, Adolescent, and Adult Literatures and a Concomitant Study With College Students. Journal of Learning Disabilities. 2007; 40(1):49–65. [PubMed: 17274547]

Frieden, L. Social Justice in the 21st Century: Empowering Minds, Changing Hearts and Inspiring Service. Talk presented at the LBJ Presidential Library Civil Rights Summit; Austin, TX. 2014.

Frisco ML, Muller C, Frank K. Parents' Union Dissolution and Adolescents' School Performance: Comparing Methodological Approaches. Journal of Marriage and Family. 2007; 69(3):721–741. [PubMed: 20300482]

Fuller M, Bradley A, Healey M. Incorporating disabled students within an inclusive higher education environment. Disability & Society. 2004; 19(5):455–468.

Fuller, M.; Georgeson, J.; Healey, M.; Hurst, A.; Kelly, K.; Riddell, S.; Roberts, H.; Weedon, E. Improving Disabled Students' Learning: Experiences and Outcomes. Abingdon, Oxon Routledge: 2009.

Upton TD, Harper DC. Multidimentional Disability Attitudes and Equitable Evaluation of Educational Accommodations by College Students Without Disabilities. Journal of Postsecondary Education and Disability. 2002; 15(2):115–130.

Hedrick B, Dizén M, Collins K, Evans J, Grayson T. Perceptions of College Students With and Without Disabilities and Effects of STEM and non-STEM Enrollment on Student Engagement and Institutional Involvement. Journal of Postsecondary Education and Disability. 2010; 23(2):129–136.

Herzog S. Measuring Determinants of Student Return vs. Dropout/Stopout vs. Transfer: A First-to-Second Year Analysis of New Freshmen. Research in Higher Education. 2005; 46(8):883–928.

Janus AL. Disability and the Transition to Adulthood. Social Forces. 2009; 88(1):99–120.

Johnson, AL. VISTAS Online. American Counseling Association; 2006. Students with Disabilities in Postsecondary Education: Barriers to Success and Implications for Professionals.

Karabel J. Community Colleges and Social Stratification. Harvard Education Review. 1972; 42(November):521–562.

Kochhar-Bryant, C.; Bassett, DS.; Webb, KW. Transition to Postsecondary Education for Students With Disabilities. Thousand Oaks, CA: Corwin Press; 2009.

Luna C. "But how can those students make it here?": Examining the institutional discourse about what it means to be "LD" at an Ivy League University. International Journal of Inclusive Education. 2009; 13(2):157–178.

Mamiseishvili K, Koch LC. First-to-Second-Year Persistence of Students With Disabilities in Postsecondary Instititions in the United States. Rehabilitation Counseling Bulletin. 2011; 54(2):93–105.

Martin AJ, Wilson R, Liem GAD, Ginns P. Academic Momentum at University/College: Exploring Roles of Prior Learning, Life Experiences, and Ongoing Performance in Academic Achievement Across Time. The Journal of Higher Education. 2013; 84(5):640–674.

McGuire JM, Scott SS. Universal Design for Instruction: Extending the Universal Design Paradigm to College Instruction. Journal of Postsecondary Education and Disability. 2006; 19(2)

Merrell C, Tymms PB. Inattention, hyperactivity and impulsiveness: Their impact on academic achievement and progress. British Journal of Educational Psychology. 2001; 71:43–56. [PubMed: 11307708]

Moon, NW.; Todd, RL.; Morton, DL.; Ivey, E. Accommodating Students with Disabilities in Science, Technology, Engineering, and Mathematics (STEM): Findings from Research and Practice for Middle Grades through University Education. Atlanta, Georgia: Center for Assistive Technology and Environmental Access College of Architecture Georgia Institute of Technology; 2012.

Mullins L, Preyde M. The lived experience of students with an invisible disability at a Canadian university. Disability & Society. 2013; 28(2):147–160.

Murray C, Lombardi A, Kosty D. Profiling Adjustment Among Postsecondary Students With Disabilities: A Person-Centered Approach. Journal of Diversity in Higher Education. 2014; 7(1): 31–44.

Needham BL, Crosnoe R, Muller C. Academic Failure in Secondary School: The Inter-Related Role of Health Problems and Educational Context. Social Problems. 2004; 51(4):269–586.

Newman, L.; Wagner, M.; Knokey, A-M.; Marder, C.; Nagle, K.; Shaver, D.; Wei, X. A Report From the National Longitudinal Transition Study-2 (NLTS2). Menlo Park, CA: SRI International; 2011. The Post-High School Outcomes of Young Adults With Disabilities up to 8 Years After High School.

Olney MF, Brockelman KF. Out of the Disability Closet: Strategic use of perception management by select university students with disabilities. Disability & Society. 2003; 18(1):35–50.

Pascarella ET, Wolniak GC, Pierson CT. Influences on Community College Students' Educational Plans. Research in Higher Education. 2003; 44(3):301–314.

Rhoades G. The Higher Education We Choose, Collectively: Reembodying and Repoliticizing Choice. The Journal of Higher Education. 2014; 85(6):917–930.

Rosenbaum PR, Rubin DB. Constructing a Control Group Using Multivariate Matched Sampling Methods That Incorporate the Propensity Score. The American Statistician. 1985; 39(1):33–38.

Sanford, C.; Newman, L.; Wagner, M.; Cameto, R.; Knokey, A-M.; Shaver, D. The Post-High School Outcomes of Young Adults With Disabilities up to 6 Years After High School Key Findings From the National Longitudinal Transition Study-2 (NLTS2). Menlo Park, CA: SRI International; 2011.

Shifrer D, Callahan RM, Muller C. Equity or Marginalization?: The High School Course-Taking of Students Labeled With a Learning Disability. American Educational Research Journal. 2013; 50(4):656–682. [PubMed: 24982511]

Tinto V. Dropout from Higher Education: A Theoretical Synthesis of Recent Research. Review of Educational Research. 1975; 45(1):89–125.

Tinto V. Classrooms as Communities: Exploring the Educational Character of Student Persistence. The Journal of Higher Education. 1997; 68(6):599–623.

Tinto, V. Completing College: Rethinking Institutional Action. Chicago: University of Chicago Press; 2012.

Vogel SA, Adelman PB. The Success of College Students with Learning Disabilities: Factors Relating to Educational Attainment. Journal of Learning Disabilities. 1992:25.

Wagner M, Blackorby J. Transition from High School to Work or College: How Special Education Students Fare. The Future of Children. 1996; 6(1):103–120. [PubMed: 8689255]

Wells T, Sandefur G, Hogan D. What Happens after the High School Years among Young Persons with Disabilities? Social Forces. 2003; 82(2):803–832.

Wessel RD, Jones JA, Markle L, Westfall C. Retention and Graduation of Students with Disabilities: Facilitating Student Success. Journal of Postsecondary Education and Disability. 2009; 21(3):116–125.

Wolniak GC, Mayhew MJ, Engberg ME. Learning's Weak Link to Persistence. The Journal of Higher Education. 2012; 83(6):795–823.

Zajacova A, Lynch SM, Espenshade TJ. Self-Efficacy, Stress, and Academic Success in College. Research in Higher Education. 2005; 46(6):677–706.

Table 1

Descriptive statistics with proportions or means and standard deviations by health impairment status (weighted)

Health Impairment Status	Total	None	Physical	Mental
Signals of Degree Progress and Academic Fit				
Completed college-level math	.43	.44	[N].33	[N].31
Earned 20 credits	.65	.66	.61	[N].54
Failed at least one class	.29	.29	.33	[N].40
Grade Point Average (GPA)	2.34 (.02)	2.38 (.02)	[N]2.17 (.09)	[N,P]1.98 (.06)
Educational Expectations				
Freshman Year (2004)				
Bachelor's Degree	.34	.34	.28	.35
Graduate/Professional Degree	.66	.66	.72	.65
Two Years Later (2006)				
Less than a Bachelor's Degree	.12	.11	[N].18	[N].19
Bachelor's Degree	.32	.32	.35	.35
Graduate/Professional Degree	.56	.57	[N].48	[N].46
Background				
Male	.46	.46	0.44	0.47
Female	.54	.54	0.56	0.53
Race				
White	.65	.64	.63	[N,P].77
Black	.11	.12	.11	[N,P].05
Hispanic	.13	.13	.14	[N].09
Asian	.06	.06	.05	[N,P].01
Parents earned at least a Bachelor's Degree	.47	.47	.43	[N,P].55
Age	18.67 (.02)	18.66 (.02)	[N]18.79 (.08)	[P]18.69 (.06)
High School Preparation				
SAT Score	981 (3.88)	983 (3.95)	[N]944 (11.66)	[P]982 (9.52)
Took Algebra 2 or above	.87	.88	[N].80	[N].79
At least one precollege credit	.09	.09	[N].06	[N].06
Full high school curriculum	.61	.61	[N].50	[N].53
High School GPA	3.13 (.01)	3.15 (.01)	[N]3.02 (.03)	[N,P]2.97 (.04)
Received a GED/Certificate	.04	.03	[N].12	[N].09
Enrollment Characteristics				
School Type				
4-yr Moderate/Very Selective	.47	.47	[N].34	[P].44
4-yr Open/Minimally Selective	.12	.13	.14	.09
2-yr	.41	.40	[N].52	.47

Health Impairment Status	Total	None	Physical	Mental
Months enrolled full time	7.75 (.08)	7.82 (.08)	N7.48 (.30)	N7.05 (.35)
Housing off campus [ref. on campus]	.62	.62	N.68	.67
First Year Experiences				
Social Integration Scale	.03 (.02)	.04 (.02)	−.12 (.07)	.03 (.08)
Used at least one accommodation	.03	0	N.20	N,P.37
Took at least one remedial course	.04	.04	.05	.04
Math Courses Attempted				
No Math Courses	.29	.28	.35	.32
Precollege Math	.23	.22	.26	.28
Intro Math	.33	.33	.30	.32
Advanced Math	.15	.16	N.09	N.09
Writing Courses Attempted				
No Writing Courses	.46	.45	.51	P.41
Intro Writing	.49	.49	.45	.52
Advanced Writing	.05	.05	.05	.06
Number of Credits Attempted	29.80 (.29)	29.98 (.28)	29.42 (1.20)	N27.30 (1.09)
N	11820	10790	420	550

Note:

N compared to no impairment (p<.05),

P physical impairment (p<.05). Excludes individuals categorized with a health impairment as "other" (N=60).

Table 2

Logistic regression models predicting completing college-level math and earning 20 credits by the end of the first year of college

	a		b	
	Completed College-Level Math		**Earned 20 Credits**	
Health Impairment Status [ref. none]	(1)	(2)	(1)	(2)
Physical	−.050[+]	−.032	.017	.018
Mental	−.081[**]	−.045	−.053[**P]	−.057[*P]
Background				
Gender [ref. female]	.032[**]	.031[**]	−.035[**]	−.035[***]
Race [ref. white]				
Black	.033[+]	.032[+]	−.064[***]	−.073[***]
Hispanic	.002	.003	−.033[*]	−.035[*]
Parent Bachelor's [ref. below]	.001	.002	.027[*]	.024[*]
High School Preparation				
SAT Score (divided by 100)	.029[***]	.027[***]	.026[***]	.026[***]
Algebra 2 or above [ref. below]	.045[*]	.046[*]	.007	.006
Full HS Curriculum	.017	.018	.012	.012
High School GPA	.081[***]	.079[***]	.061[***]	.060[***]
Precollege Credit [ref. none]	−.018	−.016	.132[***]	.127[***]
Received a GED/Certificate	−.045	−.043	−.130[***]	−.128[***]
School Type [ref. selective 4-yr]				
4-yr Open/Minimally Selective	−.039[*]	−.034[+]	−.030[+]	−.023
2-yr	−.094[**]	−.089[**]	−.031	−.021
First Year Experiences				
Social Integration		−.004		.031[***]
Used at least one accommodation		−.097[*]		−.000
Took at least one remedial course		−.136[***]		−.021
Adj R^2	.130	.133	.338	.342
BIC	2834193	2824902	2010499	1998035
Log-Likelihood	−1472000	−1468000	−1061000	−1054000

Note: All models include controls for age, enrollment status, living arrangements and "other" disability.

[P] denotes where the coefficient is significantly different (p<.05) from students with physical impairments. Includes IMR as a covariate and transcript panel weight. N=11820.

[+] p<.10,

[*] p<.05,

[**] p<.01,

***
p<.001

Table 3

Logistic regression models predicting failing at least one course and OLS regression models predicting GPA during the first year of college

	a		b	
	Course Failure		**GPA**	
	(1)	**(2)**	**(1)**	**(2)**
Health Impairment Status [ref. none]				
Physical	−.004	−.003	−.074	−.056
Mental	.107 ***P	.102 **P	−.322 ***P	−.277 ***P
Background				
Gender [ref. female]	.079 ***	.079 ***	−.217 ***	−.202 ***
Race [ref. white]				
Black	.055 **	.056 **	−.270 ***	−.221 ***
Hispanic	.022	.022	−.152 **	−.103 **
Parent Bachelor's [ref. below]	−.040 **	−.036 **	.092 **	.093 ***
High School Preparation				
SAT Score (divided by 100)	−.042 ***	−.037 ***	.110 ***	.094 ***
Algebra 2 or above [ref. below]	−.019	−.017	.038	.046
Full HS Curriculum	−.001	−.001	−.005	−.010
High School GPA	−.082 ***	−.077 ***	.277 ***	.253 ***
Precollege Credit [ref. none]	−.072 **	−.063 **	.168 ***	.162 ***
Received a GED/Certificate	.066 *	.065 *	−.270 **	−.219 **
School Type [ref. selective 4-yr]				
4-yr Open/Minimally Selective	.038 *	.038 *	.093 *	.072 +
2-yr	−.020	−.035	.108 +	.056
First Year Experiences				
Social Integration		−.017 **		.038 **
Used at least 1 accommodation		.002		−.077
Took at least 1 remedial course		−.045		−.158 **
Math Courses Attempted [ref. none]				
Precollege		.106 ***		−.313 ***
Intro		.016		−.044
Advanced		.003		−.077 *
Writing Courses Attempted [ref. none]				
Intro		.010		−.023
Advanced		−.004		.040
Credits Attempted		−.001 *		.015 ***
Adj R^2	.081	.091	.197	.254

	a		b	
	Course Failure		**GPA**	
	(1)	**(2)**	**(1)**	**(2)**
BIC	2648471	2621036	−78786	−79575
Log-Likelihood	−1380000	−1366000	−15936	−15499

Note: All models include controls for age, enrollment status, living arrangements and "other" disability.

P denotes where the coefficient is significantly different (p<.05) from students with physical impairments. Includes IMR as a covariate and transcript panel weight. N=11820.

+ p<.10,

* p<.05,

** p<.01,

*** p<.001

Table 4

Logistic regression models predicting "cooling out" educational expectations

	(1)	(2)	(3)	(4)
Health Impairment [ref. none]				
Physical	.012	.004	.005	.004
Mental	.063*	.047*	.045+	.037
Background				
Gender [ref. female]	.010	.008	.007	.002
Race [ref. white]				
Black	−.042**	−.045**	−.046***	−.051***
Hispanic	−.061***	−.064***	−.065***	−.065***
Parent Bachelor's [ref. below]	−.065***	−.062***	−.060***	−.056***
High School Preparation				
SAT Score (divided by 100)	−.016***	−.015***	−.014***	−.011***
Algebra 2 or above [ref. below]	−.008	−.008	−.008	−.007
Full HS Curriculum	−.006	−.005	−.005	−.006
High School GPA	−.026**	−.024**	−.021*	−.016+
Precollege Credit [ref. none]	−.085**	−.076**	−.072**	−.065*
Received a GED/Certificate	−.004	−.010	−.013	−.019
Enrollment [ref. selective 4-yr]				
4-yr Open/Minimally Selective	.052***	.050***	.048***	.051***
2-yr	.126***	.130***	.125***	.128***
First Year Experiences				
Social Integration		−.017**	−.016**	−.016**
Used at least 1 accommodation		.030	.029	.027
Took at least 1 remedial course		−.007	−.006	−.007
Math Courses Attempted [ref. none]				
Precollege		.001	−.001	−.009
Intro		.009	.032+	.003
Advanced		−.013	.011	−.018
Writing Courses Attempted [ref. none]				
Intro		−.008	−.008	−.010
Advanced		−.033+	−.029	−.030+
Credits Attempted		−.002***	−.001*	−.001**
First Year Outcomes				
Competed College-level Math [ref. no completion]			−.025	.009
Earned 20 Credits [ref. earned < 20]			−.047***	−.006
Course Failure [ref. no failure]				.028**
GPA				−.028***

	(1)	(2)	(3)	(4)
Adj R^2	.125	.138	.143	.159
BIC	1468092	1445131	1436896	1407227
Log-Likelihood	−789375	−777852	−773725	−758881

Note: All models include controls for age, enrollment status, living arrangements and "other" disability. Includes IMR as a covariate and transcript panel weight. N=11820.

[+] p<.10,

[*] p<.05,

[**] p<.01,

[***] p<.001