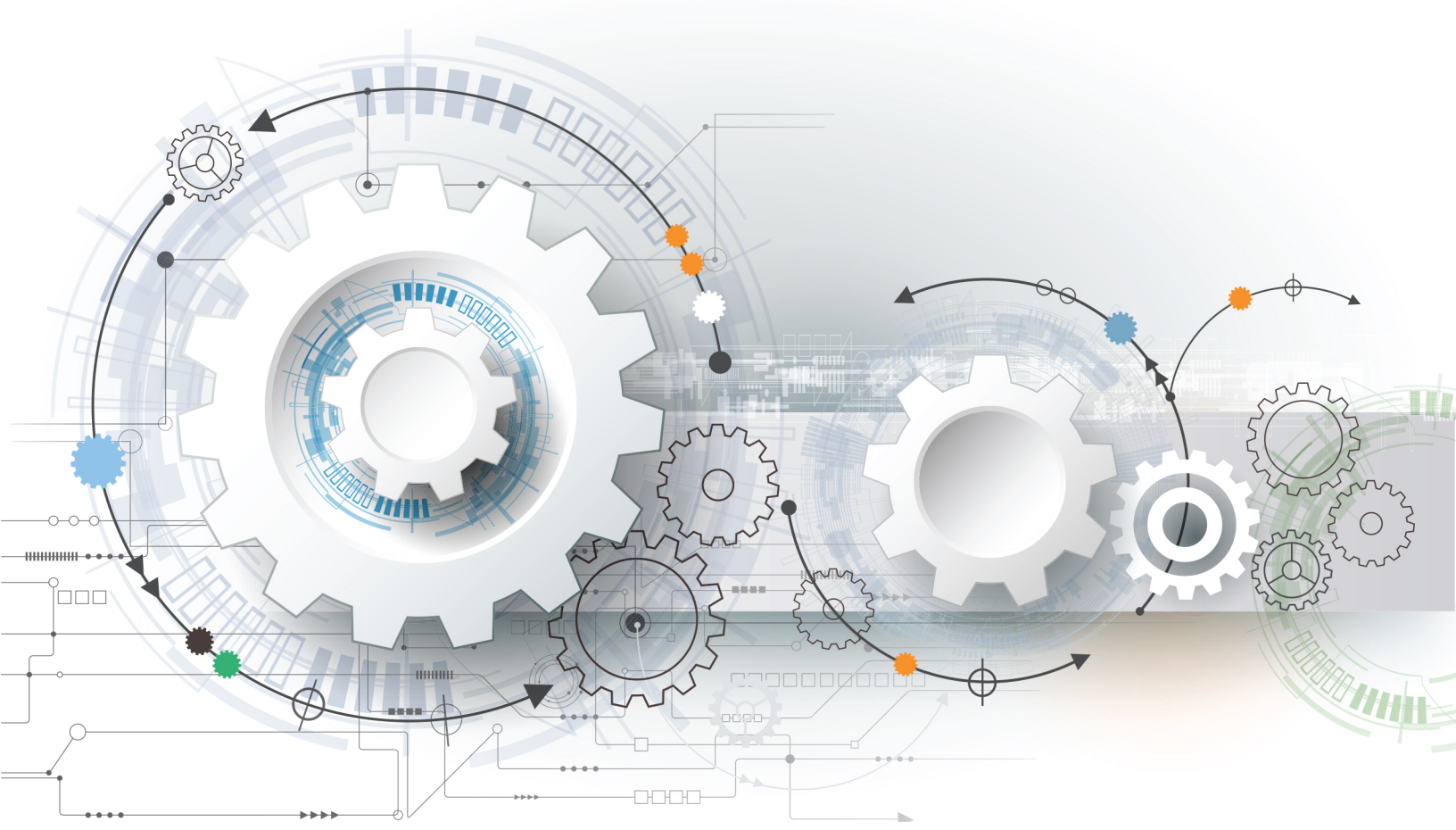
Working Paper
2018-5

They may be *First* but will They *Last*? Retention and Transfer Behavior of First-Generation Students

JUSTINE RADUNZEL, PHD



ACT.org

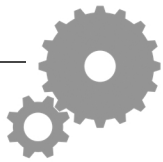
ABOUT THE AUTHOR

Justine Radunzel is a principal research scientist in Validity and Efficacy Research specializing in postsecondary outcomes research and validity evidence for the ACT test.

ACKNOWLEDGEMENTS

The author thanks Jeff Allen and Emily Neff for their input on earlier drafts.

ACT WORKING PAPER SERIES



ACT working papers document preliminary research. The papers are intended to promote discussion and feedback before formal publication. The research does not necessarily reflect the views of ACT.

R1708

Abstract

First-generation (FG) students (those whose parents have no college experience) are generally less likely than their continuing generation (CG) peers to persist in college and complete a degree, especially when compared to CG students whose parents earned at least a bachelor's degree (CG-BD). This result is often partially attributed to FG students not entering the college environment as well prepared and equipped as their CG peers; they also tend to have more financial concerns and attend college in a manner that often puts students at greater risk of not persisting and completing a degree (e.g., enrolling part-time).

Building on prior research and using student attribute data available at initial enrollment, we examined the extent to which other academic and non-academic factors explain differences in student retention, transfer, and dropout rates at year two between FG students and their CG peers. The other factors included: predicted first-year grade point average (GPA) based on students' ACT® Composite scores and high school GPA, educational goals, financial resources, gender, race/ethnicity, intentions of living on campus, number of hours planned to work while in college, full-time enrollment status, and distance between home and the initial institution attended. The last four variables were included as possible proxies of barriers to academic and social integration. Additional objectives for the study involved examining whether there were differences among parental education groups in (1) how the other student characteristics influenced student attrition and (2) the type of institution transferred to in year two.

Data for the study were available for approximately 150,000 ACT-tested first-time entering college students from the 2012, 2013, and 2014 freshman cohorts of two state higher education systems. Nearly 70 two- and four-year public institutions were included in the sample. Subsequent enrollment information was supplemented with data from the National Student

Clearinghouse. The percentage of FG students was 15% among those beginning at a four-year institution and 27% among those beginning at a two-year institution.

Study findings suggested that gaps in second-year retention rates existed among the parental education groups, primarily due to FG students being more likely to drop out in year two than CG-BD students. After statistically controlling for the other student characteristics and the institution attended, the parental education gaps in retention and dropout rates were reduced but not completely eliminated. Additionally, the effects of some of the other predictors on student attrition differed by parental education. These included: academic readiness, full-time enrollment status, gender, and race/ethnicity for both samples, and intentions of living on campus for the four-year sample. For example, while a negative association was observed between academic readiness and the likelihood of dropping out at year two for each parental education group, the strength of the relationship was weaker among FG students than it was among CG-BD students. We also found that there are parental education differences in where transfer students are going in year two. FG students were more likely than their CG-BD peers to transfer to a two-year than to a four-year institution (i.e., reverse transfer) for those beginning at a four-year institution, and less likely to transfer to a four-year than to a two-year institution (i.e., vertical transfer) for those beginning at a two-year institution.

The findings illustrate how institutions and state systems might use student information available at the time of initial enrollment, including elements from the ACT record, to learn more about their incoming FG students and how to tailor their institutional supports and services and transfer policies to help FG students achieve their educational goals. The implications of the findings for policy and practice are discussed.

They may be *First* but will They *Last*?

Retention and Transfer Behavior of First-Generation Students

First-generation (FG) students, or those whose parents have no college experience, are generally less likely to persist in college and complete a degree than their continuing-generation (CG) peers, those whose parents attended college (e.g., Ishitani, 2006; Ishitani, 2016; Redford & Hoyer, 2017). A recent study by Cataldi, Bennett, and Chen (2018) suggests that only 56% of FG students had earned a credential or were still enrolled six years after initially entering college. In comparison, this percentage was 18 percentage points lower than that for CG students who had one or more parents with at least a bachelor's degree (74%) and it was 7 percentage points lower than that for CG students whose parents had some college experience but neither parent had earned a bachelor's degree (63%). Gaps also exist in earlier outcomes such as first-to-second year persistence and attrition rates among parental education groups (ACT, 2014; Lohfink & Paulsen, 2005; Radunzel, 2017). Moreover, results from a study by Ishitani (2006) suggest that the greatest relative risk of dropping out occurs at year two for FG students when compared to CG students whose parents earned a bachelor's degree.

Given that research has consistently shown a strong positive relationship between students' pre-college academic readiness levels and their likelihood of persisting and completing a degree (ACT, 2013; Adelman, 2006; Kopp & Shaw, 2016; Schmitt, Keeney, Oswald, Pleskac, Billington, Sinha, & Zorzie, 2009), the gaps in college success rates by parental education are often partially attributed to FG students not entering the college environment as well prepared and equipped academically as their CG peers. For instance, proportionally fewer FG students take rigorous coursework in high school and earn AP/IB credits (Cataldi et al., 2018; Radunzel, 2015), while more FG students take remedial coursework in college (Chen, 2016). FG students

also tend to earn lower grades in their high school courses (Mattern & Allen, 2016; Saenz, Hurtado, Barrera, Wolf, & Yeung, 2007) and lower scores on college admissions tests (ACT, 2015; McNeish, Radunzel, & Sanchez, 2015; College Board, 2015). FG students have also been found to begin college with lower academic self-efficacy than their CG peers with comparable achievement levels (e.g., Cruce, Kinzie, Williams, Morelon, & Xingming, 2005) and to indicate that they feel less prepared for college (e.g., Bui, 2002).

In addition to entering college less academically prepared, FG students generally have more financial needs and concerns than their CG peers that can reduce their chances of persisting and succeeding in college (e.g., Attewell, Heil, & Reisel, 2011; Pratt, Harwood, Cavazos, & Ditzfeld, 2017; Wilbur & Roscigno, 2016). For instance, FG students are generally more likely to come from lower-income families (e.g., Redford & Hoyer, 2017), to be financially independent from their parents (e.g., Engle & Tinto, 2008), to lack financial aid knowledge (e.g., Lee & Mueller, 2014), and to borrow and take out larger loans (e.g., Furquim, Glasener, Oster, McCall, & DesJardins, 2017). Moreover, a higher percentage of FG students than CG students indicate that they leave school without a postsecondary credential because they cannot afford to continue attending (54% vs. 45%; Redford & Hoyer, 2017). To overcome their financial challenges, FG students often work while attending college at a higher rate and for more hours than their CG peers (Engle & Tinto, 2008). Having to work many hours, especially off campus, can limit the amount of time students have to focus on their studies and can prevent them from academically and socially integrating into the college environment (Engle, 2007; Kuh, Kinzie, Buckley, Bridges, & Hayek, 2006).

According to Tinto (1975; 1993), academic and social integration into the college environment can positively influence students' chances of returning to an institution. Besides

working fewer hours while going to college, there are other related college-attending behaviors that can help foster academic and social integration into the college environment. These include enrolling full-time, living on-campus, and being involved in student organizations and campus clubs; these college-attending behaviors are ones that FG students are generally less likely than their CG peers to do (e.g., Chen, 2005; Engle, 2007; Engle & Tinto, 2008; Lohfink & Paulsen, 2005; Wilbur & Roscigno, 2016). While research suggests that students who enroll full-time generally have higher persistence and degree completion rates than part-time students (Complete College America, 2011; Shapiro, Dundar, Wakhungu, Yuan, Nathan, & Hwang, 2016), findings on whether campus residency is associated with these outcomes have been mixed (e.g., Schudde, 2011; Lohfink & Paulsen, 2005). Yet, results from other studies suggest that campus residency helps to facilitate student engagement and a sense of belonging (e.g., Kuh, Kinzie, Schuh, Whitt, & Associates, 2010; Pascarella & Terenzini, 2005).

Current Study

Students can find themselves in academic jeopardy or encountering problems assimilating into the college environment during the first year, making it more likely that they do not return to the initial institution in the fall of their second year (e.g., Kopp & Shaw, 2016). Many institutions set up early alert or warning systems as a mechanism for identifying students most likely to struggle within the first year (e.g., Tampke, 2013). The goal of these systems is early identification so that institutional supports and services can be offered when they might be most beneficial, such as upon college arrival. With this in mind, the current study takes place within this context and illustrates how institutions might use student information available at the time of initial enrollment, including elements from the ACT record, to learn more about their

incoming FG students and gain additional insights about how they might tailor their resources and supports to better meet their unique needs.

Building on the prior research outlined above and using data available at initial enrollment related to students' academic readiness, college intentions and goals, initial enrollment attributes, and demographic characteristics, we conducted a study to answer the following research questions: 1) Do these student attributes and school characteristics help explain some of the differences in student retention, transfer, and dropout rates at year two among parental education groups? 2) Are there differences in the relevant predictors and their effects on retention and attrition by parental education? and 3) Among students who transferred at year two, are there differences in the type of institution transferred to among parental education groups?

Data

Sample

Data were available for approximately 150,000 ACT-tested students entering college for the first time in fall 2012, fall 2013, or fall 2014 at two state higher education systems. Nearly 70 two- and four-year public institutions were included in the sample. Seventy-four percent of the study sample began at a four-year institution (111,177 students from 23 four-year institutions; 38,456 students from 44 two-year institutions). From the two state systems, the ACT-tested sample represented 68% of the initial sample of students who began at a four-year institution (referred to as the four-year sample) and 33% of students who began at a two-year institution (referred to as the two-year sample).

The four-year institutions were somewhat diverse on their admissions policies (17% highly selective/selective, 48% traditional, and 35% liberal/open) and enrollment size (26% less

than 5,000; 44% 5,000 to 19,999; 30% 20,000 or higher).[1] All two-year institutions had open admissions policies, and a majority had a total enrollment of fewer than 20,000 students (75% less than 5,000; 20% 5,000 to 19,999; 5% 20,000 or higher). The two state systems provided students' first-year outcomes that included fall and spring term credit hours attempted and earned and grade point average (GPA), as well as re-enrollment status for fall of year two. Subsequent enrollment at year two was supplemented with data from the National Student Clearinghouse.

Study Outcomes

The primary outcome was whether a student returned during the fall of year two to the same institution attended in year one. The outcome was coded into the following three distinct categories to allow for the examination of two types of attrition: returned to initial institution, transferred to another institution, or dropped out (not enrolled in college). These are point-in-time definitions of "transfer" and "dropout"; it is possible that students classified as such will reenroll at some point in the future.

The secondary outcome was a binary outcome for the type of institution transferred to in year two. For the four-year sample, transferring to a two-year institution (reverse transfer; coded as 1) was compared to transferring to another four-year institution (lateral transfer; coded as 0). For the two-year sample, transferring to a four-year institution (vertical transfer; coded as 1) was compared to transferring to another two-year institution (lateral transfer; coded as 0).

[1] Total enrollment size for an institution was obtained from the Integrated Postsecondary Education Data System (IPEDS). Admission selectivity was self-reported by institutions on the ACT Institutional Data Questionnaire as defined by the typical high school class ranks of their accepted freshmen: The majority of freshmen at highly selective schools are in the top 10%, selective in the top 25%, traditional in the top 50%, and liberal in the top 75% of their high school class (ACT, 2017). Institutions with open admissions policies accept all high school graduates to the limit of capacity.

Predictors

Many of the student-level predictors were obtained from the ACT Student Profile Section (SPS) and Course and Grade Information Section (CGIS) that students complete when registering for the ACT.

Demographic characteristics. Students indicated the highest level of education attained by their mother/guardian 1 and father/guardian 2 according to the following options: (1) less than high school; (2) high school graduate/GED; (3) business/technical school or certificate program; (4) some college, no degree or certificate; (5) associate's degree (two years); (6) bachelor's degree (four years); (7) one or two years of graduate study (MA, MBA, etc.); or (8) doctorate or professional degree (PhD, MD, JD, etc.). Parents' educational level was categorized into three groups: neither parent attended a higher education institution (labeled *first-generation or FG*; options (1) to (2)), at least one parent had some college experience but neither completed a bachelor's degree (labeled *continuing generation – some college or CG-SC*; options (3) to (5)), or at least one parent earned a bachelor's degree (labeled *continuing generation – bachelor's degree or higher or CG-BD*; options (6) to (8)). The definition of first-generation college students in this study is consistent with that used in recent National Center for Education Statistics (NCES) studies (Cataldi et al., 2018; Redford & Hoyer, 2017). In comparison, the *Higher Education Act* defines FG students as those whose parent or guardian have not completed a bachelor's degree (Higher Education Act of 1965, 1998 Higher Education Act Amendments, 1998), that is, the CG-SC group is combined with the FG group. For this reason, CG-BD students are used as the referent group for parental education comparisons.

The other demographic characteristics included: gender, race/ethnicity, annual family income, and median household income associated with student's residential zip code. Race/ethnicity was categorized as African American, Asian, Hispanic, Other, White, and

missing. The Other category was comprised of racial/ethnic groups with smaller sample sizes that included: American Indian, Native Hawaiian/Pacific Islander, and Multiracial.

For annual family income, students were asked to estimate the approximate total combined annual income of their parents by selecting one of nine possible range options beginning with less than $24,000 and ending with more than $150,000. These options were classified into the following three categories: less than $36,000 (low), $36,000 to $80,000 (medium), and more than $80,000 (high). Another measure of socioeconomic status that was considered in this study included the median household income associated with student's residential zip code. The median household income by zip code was based on 2006 to 2010 data from the American Community Survey and classified into the following three categories: $43,315 or less, $43,316 to $61,580, and more than $61,580.[2]

Academic readiness. Institutions often develop admissions models to estimate first-year grade point average (FYGPA) from students' standardized test scores, high school coursework and grades, class rank, and other information (Clinedinst & Koranteng, 2018; Rigol, 2003) and use these predicted values as a single variable or index that encompasses students' precollege readiness levels. Examples of institutions using this index or predicted GPA values to help identify students who may benefit from institutional supports and services or may be at-risk of leaving the institution have been noted in the literature (Beaudoin & Kumar, 2012; Bogard, Helbig, Huff, & James, 2011; D'Amico & Dika, 2013; Rudick, Kellen, Sugarman, Lindstrom, & Johnson, 2015).

[2] Data for median household income by zip code was obtained from the following site: http://www.psc.isr.umich.edu/dis/census/Features/tract2zip/ provided by the Michigan Population Studies Center. The zip code of the high school attended was used in cases where a student's residential zip code was missing.

Along these same lines, the academic readiness measure that was used in this study was a student's institution-specific predicted FYGPA estimated from students' ACT Composite scores and high school GPA. The ACT Composite score is the rounded average of the four subject area scores in English, mathematics, reading, and science that was obtained from a student's latest testing record prior to enrolling in college. High school GPA (HSGPA) was based on students' self-reports of their coursework taken in up to 23 specific courses in English, mathematics, social studies, and science, and the grades earned in those courses. Prior studies have shown that students report high school coursework and grades accurately relative to information provided in their official high school transcripts (Sanchez & Buddin, 2016; Shaw & Mattern, 2009).

Typically, institutions develop their admissions models on data from earlier cohorts and then apply the model to estimate predicted FYGPA for potential incoming students. In this study, we use students' actual FYGPAs that were provided by the state systems to estimate their predicted FYGPAs to illustrate how this information may be used to identify early on those who may be a risk of leaving their initial institution in year two. More details about how FYGPA was estimated are discussed in the method section.

College intentions and educational goals. Students provided information about their intentions of living on campus (categorized as yes or no) and the number of hours they planned to work per week during their first year of college (options included none, 1 to 10, 11 to 20, 21 to 30, and more than 30 hours).[3] Students were also asked about the highest level of education that they expected to complete, which was categorized as: associate's degree or vocational/technical

[3] Living on campus included options of living in residential halls, a fraternity or sorority, or married student housing. Options classified as not living on campus included living in an off-campus room or apartment or own home or in parents' or relative's home.

program (labeled as associate's degree or below), bachelor's degree, beyond a bachelor's degree, or other.

Enrollment characteristics. The initial enrollment characteristics included enrollment status (full- vs. part-time) and distance from home. A student was considered to be a full-time student if they attempted 12 or more credit hours during their first fall term. The distance between a student's home address and college address was calculated using a SAS function that returns the geodetic distance in miles between two zip code locations.[4] Due to the heavily right-skewed distribution of the distance values, it was categorized as: 0 to 24 miles, 25 to 89 miles, and 90 or more miles from home. Distance from home was included as a possible predictor given that attending a college farther from home has been shown to be negatively related to social integration and college adjustment (e.g., Brooks & DuBois, 1995; Tognoli, 2003) and positively related to the likelihood of transferring to another institution that is generally closer to home (e.g., Mattern, Wyatt, & Shaw, 2013; Radunzel, 2017).

Method

Multiple Imputation

Some students did not respond to all ACT SPS and CGIS items that were included as predictors in this study. The missing rate was 10% or below for most predictors for the four-year sample; the rate ranged from <1% for median household income based on the students' residential zip code to 10% for parents' education level. The one exception to this was annual family income that had a missing rate of 18% for the four-year sample. For the two-year sample,

[4] Distance was calculated based on a student's residential zip code obtained from their ACT record and the postsecondary institution's zip code obtained from IPEDS using the ZIPCITYDISTANCE function in SAS. The centroid of each zip code is used in the distance calculations. Students attending a college that had the same zip code as their home address had a distance value of 0.

the missing rate was as low as <1% for median household income and as high as 16% for annual family income. The missing rate for parents' education level for the two-year sample was 14%.

Multiple imputation was used to estimate missing values for student characteristics (Rubin, 1987; Schafer & Graham, 2002). Five data sets were imputed using the SAS MI procedure (SAS Institute Inc., 2011). The MI procedure replaces missing values of variables with plausible values based on non-missing data. Models were developed for all five imputed data sets. The reported models were based on the average parameter estimates across the five imputed data sets that were calculated using the SAS MIANALYZE procedure.

Given that parental education was the primary demographic variable of interest and it was imputed for 10% and 14% of the students in the two samples, we conducted follow-up analyses on the sample that excluded those who did not provide their parents' education levels. The same general conclusions emerged as those reported here based on the imputed data sets. Additionally, instead of imputing or removing the 3% to 4% of students missing race/ethnicity, they were grouped as a separate racial/ethnic category labeled as missing. This was done because race/ethnicity was not of primary focus in this study. From sensitivity analyses where we excluded students that did not provide race/ethnicity, we found that the estimates and significance levels for the individual predictors and interactions were similar to those reported here.

Academic Readiness Index

Hierarchical linear regression was used to estimate an institution-specific predicted FYGPA for a student from their ACT Composite score and HSGPA. The outcome in these models was students' actual FYGPA. The model included the two predictors as well as their interaction term. The intercept and the slopes for ACT Composite score and HSGPA were

allowed to vary across institutions in order to develop institution-specific predictions. Estimates of the fixed effects from the prediction models and the variance estimates for the random effects averaged across the five imputed data sets are shown in Tables A1 and A2 in Appendix A. The predicted FYGPAs at a typical institution as a function of the two predictors are shown in Figures A1 and A2 in Appendix A. As illustrated in the figures, students with higher HSGPAs and ACT Composite scores had higher predicted FYGPAs. The typical correlation between predicted and actual FYGPA was .50 for the four-year sample; the values ranged from .34 to .61 across institutions. For the two-year sample, the median correlation was .35 with individual values ranging from .26 to .48 across institutions. These correlations are consistent with those reported in other studies (D'Amico & Dika, 2013; Sawyer, 2010).

Analytic Techniques

Due to the nested structure of the data (i.e., students clustered within institutions), hierarchical regression models were developed to predict retention from the student characteristics. A hierarchical multinomial regression model was used for the three-category retention outcome, where those who returned to their initial institution in year two was used as the base category.[5] For the binary transfer type outcomes, a hierarchical logistic regression model was used. Hierarchical models provide two general types of estimates: (1) fixed effects, which estimate the value of the parameter at a typical institution, and (2) variance estimates, which describe the variability of the parameter estimates across institutions. In these models, intercepts were allowed to vary randomly across institutions. Institutional characteristics were also included in the models, as retention rates have been shown to vary by institution size and selectivity (Kopp & Shaw, 2016; Lohfink & Paulsen, 2005; Marsh, 2014).

[5] THE GLIMMIX procedure for generalized mixed models, available in SAS 9.2, with the Laplace estimation method and generalized logit link was used to fit the models.

The primary independent variable was parental education. In the analyses, we compare the outcomes of FG students and CG-SC students to CG-BD students. To answer the first research question, models were developed that included the student-level predictors, as well as institution-level predictors for each outcome. The institution-level predictors included admissions selectivity (for four-year sample only) and size of the institution. To answer the second question, models were developed that included statistically significant interaction terms with parental education to determine whether the effects of the predictors differed by parental education group.

For each variable, the odds ratio (OR) was reported as a means to compare the strength of the predictor-outcome relationships among student characteristics. Two ORs of attrition compared to the base category were estimated in the primary analyses: the OR of dropping out vs. returning to the initial institution and the OR of transferring to another institution vs. returning to the initial institution. The OR represents the odds of experiencing the outcome (e.g., dropping out compared to returning) for a certain subgroup of students (e.g., FG students), compared to the odds of experiencing the outcome for another subgroup of students (e.g., CG-BD students; the latter group is often referred to as the referent group).[6]

In comparison to members of the referent group, an OR greater than 1.0 indicates that members of the subgroup of interest are generally more likely to experience the outcome of interest, whereas an OR less than 1.0 indicates that they are less likely to do so. An OR estimated from a single-predictor model is labeled as an *unadjusted OR*. An OR estimated from a multiple-

[6] For a multinomial outcome, the odds of experiencing a particular outcome (e.g., dropping out) is the ratio of the probability of experiencing the outcome (e.g., dropping out) to the probability of experiencing the base outcome (e.g., returning to the initial institution). For a binary outcome, the odds of experience a particular outcome (e.g., transferring from a four-year institution to a two-year institution) is the ratio of the probability of experience the outcome (e.g., transferring to a two-year institution) to the probability of not experiencing the outcome (e.g., transferring from a four-year institution to another four-year institution).

predictor model is labeled as an *adjusted OR* because the OR reflects the effect of taking into account other student characteristics. For each student characteristic that interacted with parental education on retention and attrition, adjusted ORs for the predictor were calculated within each parental education group. A significance level of 0.01 was used in this study.

Results

Description of Study Samples by Parental Education

The four-year sample was comprised of 15% FG students, 33% CG-SC students, and 52% CG-BD students. In comparison, the percentages were 27%, 43%, and 30%, respectively for the two-year sample.[7] Descriptive statistics on student demographics, college intentions, enrollment characteristics, and institution characteristics by parental education for the four-year and two-year sample are provided in Tables B1 and B2 in Appendix B.

Briefly, for both samples, FG students and CG-SC students tended to be more likely than their peers to be female, Hispanic or African American, from a less affluent neighborhood, from a family with a lower annual income, and to have plans of working more hours during their first year of college. Compared to CG-BD students, FG students and CG-SC students were less likely to have intentions of living on campus, to attend a larger institution, and to enroll full-time in college during their first year. For the four-year sample, a greater percentage of FG students and CG-SC students attended a college that was closer to home. For the two-year sample, this percentage was more comparable across the parental education groups. Additionally, predicted FYGPAs, actual FYGPAs, ACT Composite scores, and HSGPAs tended to be the lowest on average for FG students and the highest for CG-BD students (Table B3). Moreover, for the four-

[7] These same percentages were seen across all five imputed data sets. In comparison, an NCES study by Redford and Hoyer (2018) reported the following parental education distribution among postsecondary enrollees: 24% FG, 34% CG-SC, and 42% CG-BD, irrespective of type of institution initially attended.

year sample, fewer FG students and CG-SC students were enrolled at a selective or highly selective institution (Table B1).

In terms of the study outcomes, the lowest typical retention rate was seen for FG students, and the highest rate was seen for CG-BD students (Figure 1). Larger gaps in retention rates were seen in the four-year sample than in the two-year sample. For the four-year sample, these gaps existed because FG students and CG-SC students were more likely than CG-BD students to drop out (OR = 2.77 and 2.06, respectively; Table C1) or to transfer to another institution (OR = 1.30 and 1.27) as compared to returning to their initial institution in year two. For the two-year sample, FG and CG-SC students were more likely than CG-BD students to drop out (OR = 1.41 and 1.28, respectively; Table C1), but they were less likely to transfer to another institution in year two (OR = 0.56 and 0.73).

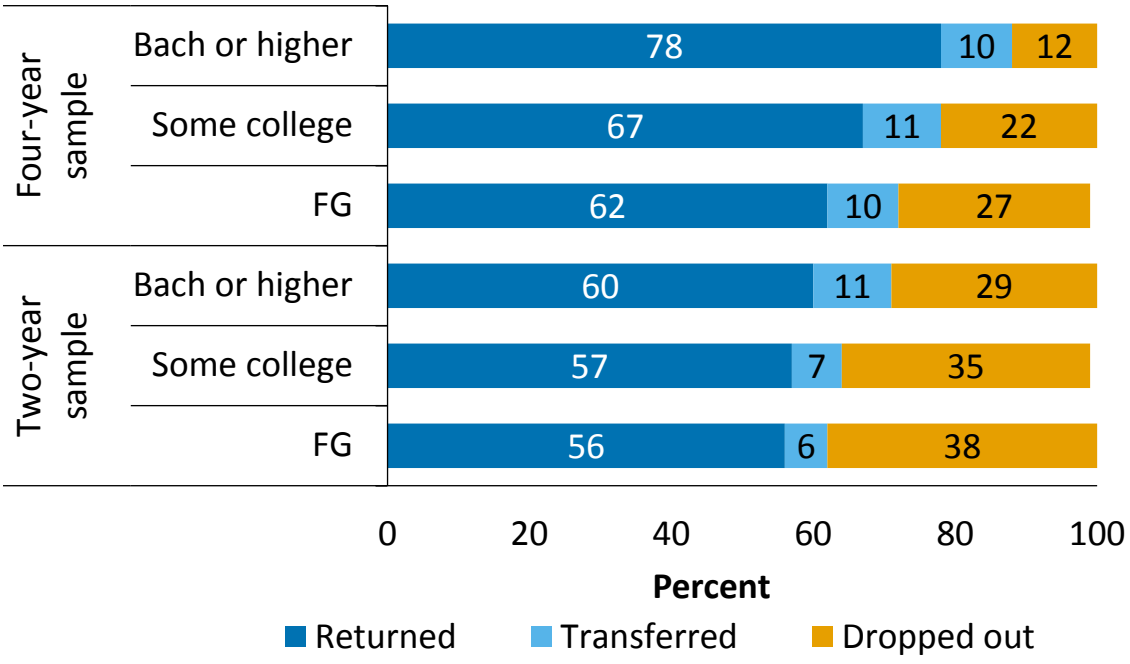


Figure 1. Modeled retention and attrition rates by parental education and sample, accounting for institution attended[8]

[8] Based on the average estimates computed across the five imputed data sets that are provided in Table C1 in Appendix C.

Given that more than 80% of students from each parental education group indicated that they had educational aspirations of obtaining at least a bachelor's degree, we examined where students who transferred to another institution were going. For the four-year sample, among those who transferred in year two, the odds of reverse transferring to a two-year institution for FG students and CG-SC students was 1.90 and 1.44 times that of CG-BD students (Table C2), after statistically controlling for the initial institution attended. As illustrated in Figure 2, this translated to 16 and 9 percentage point differences in reverse transfer rates when comparing FG and CG-SC students to CG-BD students, respectively. For the two-year sample, FG students and CG-SC students were less likely than CG-BD students to vertically transfer to a four-year institution (OR = 0.46 and 0.62, respectively; Table C1 and Figure 2).

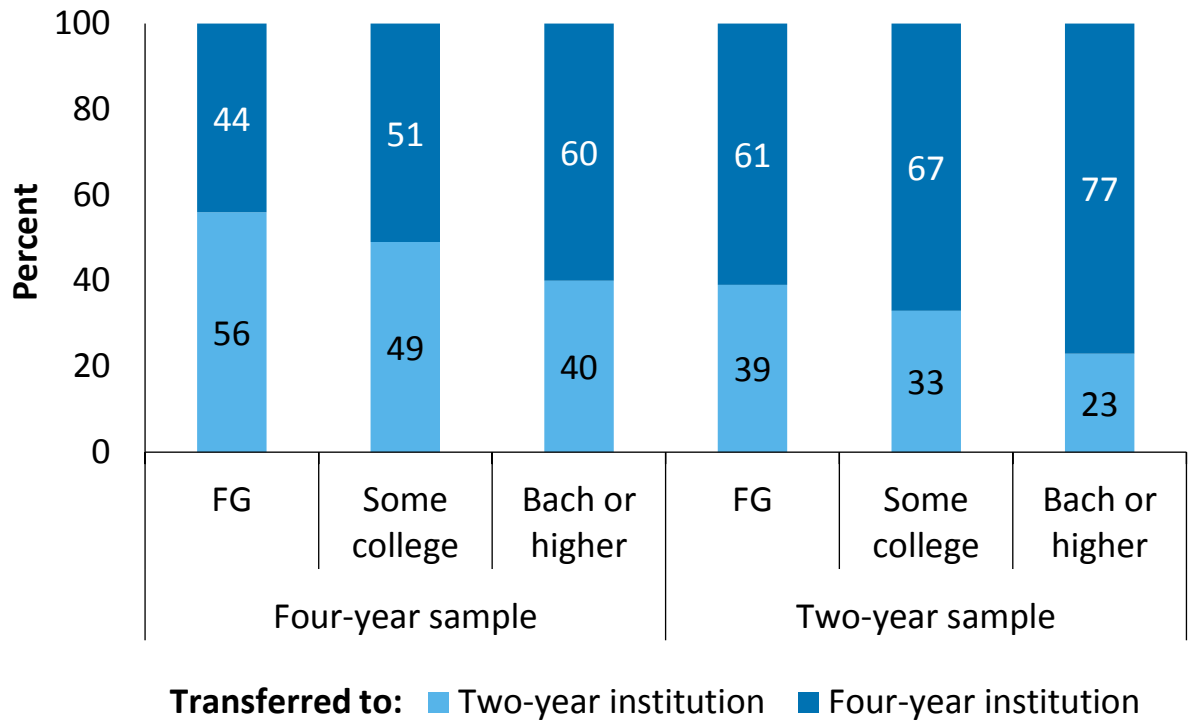


Figure 2. Type of transfer by parental education and sample, accounting for institution attended[9]

[9] Based on the average estimates computed across the five imputed data sets that are provided in Table C2 in Appendix C.

Multiple-Predictor Models of Retention

The results of the multiple-predictor model are presented in Table 1 for the four-year sample and Table 2 for the two-year sample. Variability estimates for the random intercepts are provided in the footnotes to the tables. For both samples, all of the student-level characteristics included in the models were found to be significantly related to student attrition. The institution-level characteristics were not significant predictors of either type of attrition for the four-year sample, but institution size was significantly related to attrition due to student transfer for the two-year sample. The results for the two-year sample indicated that students attending smaller institutions were less likely than those attending larger institutions to transfer to another institution as compared to returning to their initial institution (adjusted OR = 0.53 to 0.56; Table 2).

For model fit, the McFadden's pseudo R^2 (McFadden, 1974) for the multiple-predictor model that accounted for institution attended and the student-level predictors was 10.8% for the four-year sample and 5.2% for the two-year sample. These pseudo R^2 estimates are consistent with those reported in other studies on first-to-second year retention (D'Amico & Dika, 2013; Kopp & Shaw, 2016; Radunzel, 2017) and indicate that the incoming student information and institution characteristics predict retention and attrition to some degree. Pseudo R^2 values for binary or multinomial outcomes are typically smaller in magnitude than R^2 values for continuous outcomes.

Before focusing on the results by parental education, the associations between the other student-level characteristics and the two types of attrition are briefly discussed. For the most part, these relationships were in the same direction as previously suggested in the literature (e.g., Radunzel, 2017). For the four-year sample, the following characteristics were found to be associated with a reduced risk of dropping out as compared to returning to their initial institution

in year two: being predicted to earn a higher FYGPA (adjusted OR = 0.49 associated with a one standardized unit increase in predicted FYGPA), being female (adjusted OR = 0.77), being Hispanic or Asian (adjusted OR = 0.81 and 0.40, respectively compared to White), coming from a more affluent neighborhood (adjusted OR = 0.86 and 0.68, compared to < $43,316), planning to work fewer hours while in college (adjusted OR = 0.43 to 0.87, compared to more than 30 hours), intending to live on campus (adjusted OR = 0.88), having educational goals of a bachelor's degree or higher (adjusted OR = 0.72 to 0.73, compared to associate's degree or below), enrolling full-time (adjusted OR = 0.54), and being from a family with a higher annual income (adjusted OR = 0.84 and 0.67, compared to < $30,000).

The characteristics associated with a reduced risk of transferring to another institution as compared to returning to the initial institution in year two included: being predicted to earn a higher FYGPA (adjusted OR = 0.65), being male (adjusted OR = 0.90), being Asian (adjusted OR = 0.67 compared to White), not intending to live on campus (adjusted OR = 0.86), attending an institution closer to home (adjusted OR = 0.52 and 0.91, compared to 90 or more miles from home), and enrolling full-time (adjusted OR = 0.76).

Table 1. Multiple-Predictor Results for First-to-Second Year Retention for Four-Year Sample[1]

		Dropped out vs. returned				Transferred vs. returned			
Variable	Category	Estimate	SE	OR	*p*-value	Estimate	SE	OR	*p*-value
Intercept		-0.276	0.116		.017	-2.345	0.198		<.001
Parental education	FG	0.367	0.028	1.443	<.001	0.086	0.035	1.089	.014
	Some college	0.297	0.022	1.346	<.001	0.120	0.025	1.128	<.001
Gender	Female	-0.266	0.018	0.767	<.001	0.110	0.021	1.117	<.001
Race/ethnicity	African American	-0.075	0.029	0.928	.011	-0.063	0.036	0.939	.078
	Hispanic	-0.216	0.047	0.806	<.001	-0.099	0.055	0.906	.072
	Asian	-0.912	0.097	0.402	<.001	-0.401	0.097	0.670	<.001
	Other race	0.344	0.043	1.411	<.001	0.114	0.054	1.121	.034
	Missing	0.215	0.048	1.240	<.001	-0.364	0.068	0.695	<.001
Median household income	< $43,316	0.382	0.029	1.465	<.001	-0.066	0.032	0.936	.036
	$43,316 to $61,580	0.232	0.026	1.261	<.001	-0.022	0.027	0.978	.417
Hours planned to work per week	None	-0.835	0.059	0.434	<.001	-0.242	0.083	0.785	.004
	1 to 10	-0.711	0.057	0.491	<.001	-0.174	0.082	0.840	.035
	11 to 20	-0.439	0.053	0.645	<.001	-0.089	0.078	0.915	.257
	21 to 30	-0.139	0.054	0.870	.010	0.012	0.083	1.012	.882
Intend to live on campus	Yes	-0.131	0.021	0.878	<.001	0.152	0.028	1.164	<.001
Distance from home	25 to 89 miles	0.032	0.023	1.032	.162	0.546	0.029	1.726	<.001
	90 or more miles	-0.288	0.027	0.750	<.001	0.645	0.030	1.906	<.001
Educational plans	Beyond bachelor's	-0.325	0.053	0.723	<.001	0.144	0.080	1.155	.072
	Bachelor's degree	-0.312	0.052	0.732	<.001	0.130	0.078	1.139	.097
	Other	-0.163	0.096	0.850	.089	0.067	0.148	1.070	.649
Enroll status	Full-time	-0.610	0.031	0.543	<.001	-0.281	0.043	0.755	<.001
Predicted FYGPA[2]		-0.708	0.012	0.492	<.001	-0.436	0.013	0.646	<.001
Annual family income	$36,000 to $80,000	-0.178	0.025	0.837	<.001	0.016	0.034	1.016	.646
	> $80,000	-0.409	0.028	0.665	<.001	-0.038	0.035	0.962	.280
Admission selectivity	Selective	-0.029	0.088	0.971	.741	-0.168	0.179	0.845	.347
	Traditional	0.077	0.063	1.080	.219	0.067	0.125	1.069	.591
Institution size	< 5,000	0.043	0.082	1.044	.604	0.004	0.164	1.004	.980
	5,000 to 19,999	-0.094	0.064	0.910	.141	-0.007	0.131	0.993	.958

[1] Estimates shown are the averages computed across the five imputed data sets. The variability estimates (and SE) for the random intercepts were 0.011 (0.004) for dropped out vs. returned and 0.052 (0.017) for transferred vs. returned. Both estimates were significantly different from zero; $p = .004$ and .002, respectively.
[2] Predictor was standardized to have a mean of 0 and a standard deviation of 1.

For the most part, the same characteristics as those identified for the four-year sample were found to be associated with a decreased risk of dropping out in year two for the two-year

sample. The one exception was for intending to live on campus where the relation was in the opposite direction. For this predictor, the odds of dropping out for two-year students who had intentions of living on campus was 1.18 times that of those without such intentions.

For attrition due to transfer, there were both similarities and differences in the results between the two- and four-year samples. For the similarities, attending an institution closer to home (adjusted OR = 0.46 and 0.69, compared to 90 or more miles), enrolling full-time (adjusted OR = 0.87), and not intending to live on campus (adjusted OR = 0.63) were each associated with a decreased risk of transferring as compared to returning in year two for the two-year sample. In contrast to the four-year sample results, being predicted to earn a higher FYGPA (adjusted OR = 1.15), being African American (adjusted OR = 1.41 compared to White), having educational plans of earning a bachelor's degree or higher (adjusted OR = 1.55 and 1.85 compared to associate's degree or below), and being from a family with a higher annual income (adjusted OR = 1.21 compared to lower income family) were associated with an increased chance of transferring to another institution as compared to returning to the initial institution in year two.

First Question. After statistically controlling for institution attended and other student and institution characteristics, the gaps in retention and dropout rates were reduced, but they were not completely eliminated. For the four-year sample, the adjusted odds of dropping out for FG students and CG-SC students was 1.44 and 1.35 times that of CG-BD students, as compared to returning to the same institution in year two. The corresponding adjusted odds of transferring to another institution were 1.09 and 1.13, respectively. For the two-year sample, FG and CG-SC students continued to be more likely than CG-BD students to drop out (adjusted OR = 1.13 and 1.12, respectively; Table 2), while at the same time they were less likely to transfer to another institution in year two (adjusted OR = 0.71 and 0.83).

Table 2. Multiple-Predictor Results for First-to-Second Year Retention for Two-Year Sample[1]

		Dropped out vs. returned				Transferred vs. returned			
Variable	Category	Estimate	SE	OR	*p*-value	Estimate	SE	OR	*p*-value
Intercept		-0.060	0.124		.628	-2.102	0.271		<.001
Parental education	FG	0.120	0.034	1.127	<.001	-0.349	0.060	0.705	<.001
	Some college	0.112	0.030	1.119	<.001	-0.192	0.048	0.825	<.001
Gender	Female	-0.206	0.024	0.814	<.001	-0.017	0.040	0.983	.669
Race/ethnicity	African American	0.092	0.037	1.096	.013	0.342	0.063	1.408	<.001
	Hispanic	-0.350	0.049	0.705	<.001	-0.166	0.091	0.847	.068
	Asian	-0.680	0.123	0.507	.001	-0.229	0.190	0.795	.229
	Other race	0.222	0.057	1.248	.001	-0.018	0.107	0.982	.868
	Missing	0.174	0.060	1.190	.004	-0.161	0.108	0.851	.135
Median household income	< $43,316	0.283	0.042	1.327	<.001	-0.236	0.066	0.790	<.001
	$43,316 to $61,580	0.199	0.039	1.220	<.001	-0.073	0.057	0.929	.199
Hours planned to work per week	None	-0.524	0.066	0.592	<.001	0.208	0.127	1.232	.102
	1 to 10	-0.535	0.057	0.585	<.001	0.192	0.121	1.211	.113
	11 to 20	-0.385	0.053	0.681	<.001	0.123	0.115	1.131	.283
	21 to 30	-0.149	0.056	0.862	.008	0.040	0.119	1.041	.739
Intend to live on campus	Yes	0.165	0.025	1.179	<.001	0.463	0.042	1.589	<.001
Distance from home	25 to 89 miles	0.072	0.032	1.075	.024	0.411	0.053	1.509	<.001
	90 or more miles	-0.045	0.060	0.956	.453	0.782	0.088	2.187	<.001
Educational plans	Beyond bachelor's	-0.033	0.044	0.968	.455	0.614	0.103	1.849	<.001
	Bachelor's degree	-0.106	0.038	0.900	.006	0.440	0.096	1.553	<.001
	Other	-0.029	0.085	0.971	.733	-0.135	0.217	0.873	.533
Enroll status	Full-time	-0.442	0.025	0.643	<.001	-0.136	0.043	0.873	.002
Predicted FYGPA[2]		-0.304	0.014	0.738	<.001	0.142	0.022	1.152	<.001
Annual family income	$36,000 to $80,000	-0.161	0.031	0.851	<.001	0.024	0.051	1.024	.643
	> $80,000	-0.277	0.038	0.758	<.001	0.193	0.059	1.212	.001
Institution size	< 5,000	0.148	0.106	1.160	.162	-0.581	0.227	0.559	.010
	5,000 to 19,999	-0.018	0.112	0.982	.872	-0.636	0.241	0.530	.008

[1] Estimates shown are the averages computed across the five imputed data sets. The variability estimates (and SE) for the random intercepts were 0.018 (0.006) for dropped out vs. returned and 0.090 (0.025) for transferred vs. returned. Both estimates were significantly different from zero; $p = .004$ and <.001, respectively.

[2] Predictor was standardized to have a mean of 0 and a standard deviation of 1.

The reductions in the gaps in attrition rates by parental education are further illustrated in the example shown in Figure 3, where the other predictors in the model are set to the sample means. For this example, the gaps in the dropout rates are 4 percentage points between FG and

CG-BD students for each sample. In comparison, the unadjusted gaps were 15 percentage points for the four-year sample and 9 percentage points for the two-year sample.

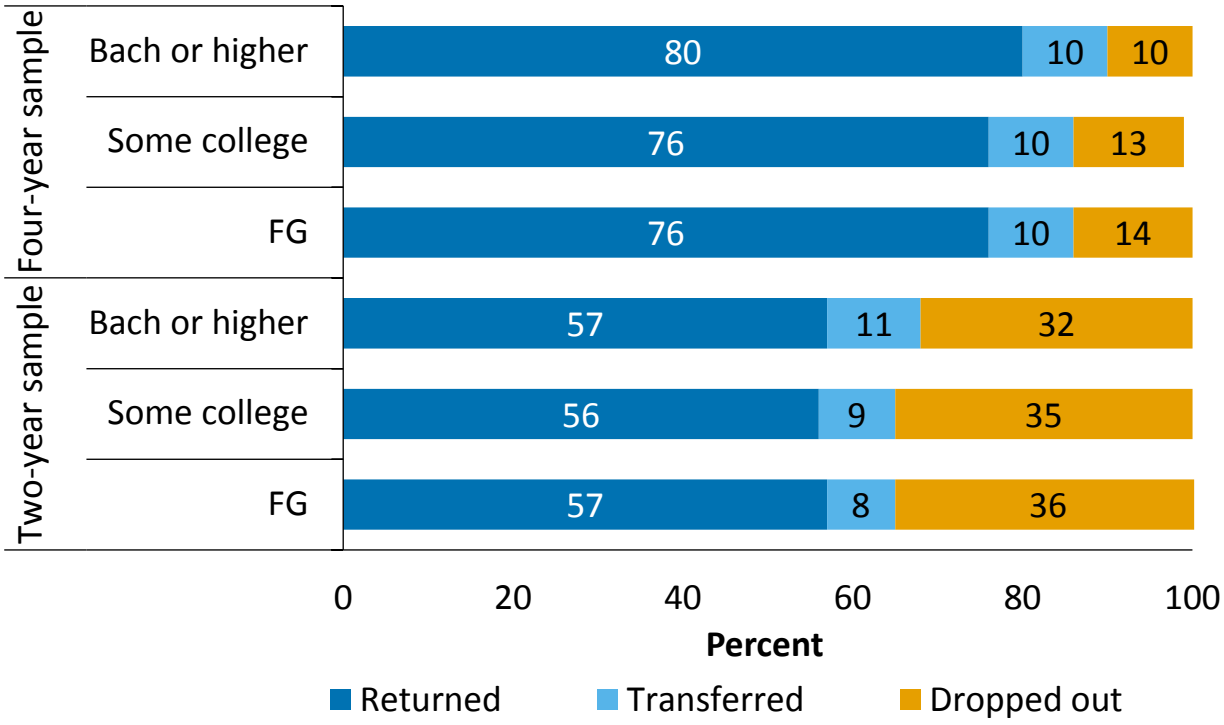


Figure 3. Modeled retention and attrition rates by parental education and sample holding all other predictors constant at sample means[10]

Second question. To determine whether there are differences in the effects of the other predictors on student attrition by parental education, the interactions between the other predictors and parental education were examined. For the four-year sample, the following predictors interacted with parental education on student attrition: predicted FYGPA ($p < .001$), gender ($p < .001$), race/ethnicity ($p < .001$), enrollment status ($p < .01$), and intentions to live on campus ($p < .01$). For the two-year sample, the following predictors interacted with parental education on student attrition: predicted FYGPA ($p < .01$), gender ($p < .01$), race/ethnicity ($p < .01$), and

[10] Based on the average estimates computed across the five imputed data sets that are provided in Tables 1 and 2.

enrollment status (p = .011). Tables 3 and 4 compare the parameter estimates and adjusted ORs by parental education for the predictors that significantly interacted with parental education on student attrition for the four-year and two-year samples, respectively. The effects for the other predictors included in the models did not differ by parental education and would be the same as or similar to those shown in Tables 1 and 2. We note that none of the financial-related variables (neighborhood median household income, annual family income, or number of hours planned to work during the first year) interacted with parental education on student attrition.

From Table 3 for the four-year sample, the results suggest that the following student characteristics had less of an effect on dropping out (as compared to returning) among FG and CG-SC students than they did among CG-BD students: entering college better prepared academically as measured by a higher predicted FYGPA, being female, enrolling fulltime, and intending to live-on campus.[11] Intentions of living on campus was not significantly associated with dropout for FG students.

[11] This is indicated by the parameter estimates associated with the predictor being closer to 0 and the adjusted OR being closer to 1 for FG and CG-SC students than they are for CG-BD students.

Table 3. Effects of the Student Attrition Predictors that Differed by Parental Education for Four-Year Sample

	FG			Some college			Bachelor or higher		
Variable	Estimate	SE	Adj-OR	Estimate	SE	Adj-OR	Estimate	SE	Adj-OR
Dropped out vs. returned									
Predicted FYGPA[1]	-0.615***	0.024	0.541	-0.650***	0.018	0.522	-0.809	0.018	0.445
Gender – female	-0.151***	0.040	0.860	-0.245*	0.029	0.783	-0.348	0.032	0.706
Race/ethnicity									
African American	-0.100	0.055	0.905†	-0.042	0.042	0.959†	-0.102	0.050	0.903†
Asian	-1.285***	0.187	0.277	-0.942	0.225	0.390	-0.588	0.150	0.556
Hispanic	-0.579***	0.080	0.561	-0.125*	0.081	0.883†	0.127	0.085	1.135†
Other	0.345	0.090	1.412	0.393	0.066	1.481	0.241	0.081	1.272
Missing	-0.344***	0.150	0.709†	0.330	0.080	1.391	0.308	0.078	1.361
Full-time status	-0.499*	0.058	0.607	-0.632	0.053	0.532	-0.711	0.063	0.491
Plans to live on campus	-0.049*	0.041	0.953†	-0.125	0.032	0.883	-0.179	0.035	0.836
Transferred vs. returned									
Predicted FYGPA[1]	-0.324***	0.034	0.724	-0.391***	0.022	0.677	-0.497	0.018	0.608
Gender – female	0.174	0.056	1.190	0.166*	0.037	1.180	0.061	0.030	1.063†
Race/ethnicity									
African American	0.102	0.079	1.108†	-0.136	0.054	0.873†	-0.077	0.056	0.926†
Asian	-0.644	0.201	0.525	-0.607	0.233	0.545	-0.210	0.131	0.810†
Hispanic	-0.296*	0.114	0.744	-0.057	0.099	0.945†	0.007	0.088	1.007†
Other	0.041	0.138	1.042†	0.036	0.087	1.037†	0.197	0.080	1.218†
Missing	-0.550	0.215	0.577	-0.416	0.127	0.660	-0.293	0.096	0.746
Full-time status	-0.042**	0.091	0.959†	-0.338	0.070	0.713	-0.416	0.074	0.659
Plans to live on campus	0.238*	0.065	1.269	0.214*	0.043	1.239	0.053	0.044	1.054†

Note. *p*-value comparing whether parameter estimate for FG students and those whose parents have some college experience is different from the estimate for students whose parents earned a bachelor's degree or higher. * $p < .05$; ** $p < .01$; *** $p < .001$

† indicates that the 99% confidence interval for adjusted OR includes 1; that is, the associated parameter estimate is not significantly different from zero.

[1] Predictor was standardized to have a mean of 0 and a standard deviation of 1.

Table 4. Effects of the Student Attrition Predictors that Differed by Parental Education for Two-Year Sample

	FG			Some college			Bachelor or higher		
Variable	Estimate	SE	Adj-OR	Estimate	SE	Adj-OR	Estimate	SE	Adj-OR
Dropped out vs. returned									
Predicted FYGPA[1]	-0.307	0.027	0.736	-0.310	0.020	0.733	-0.298	0.025	0.743
Gender – female	-0.081**	0.046	0.922†	-0.235	0.035	0.791	-0.298	0.047	0.743
Race/ethnicity									
African American	0.101	0.067	1.107†	0.147*	0.053	1.158	-0.024	0.073	0.977†
Asian	-0.862	0.189	0.423	-0.506	0.226	0.603†	-0.584	0.245	0.558†
Hispanic	-0.563**	0.071	0.570	-0.138	0.084	0.871†	-0.120	0.118	0.887†
Other	0.105	0.111	1.111†	0.311	0.086	1.365	0.185	0.119	1.203†
Missing	0.043	0.140	1.044†	0.255	0.097	1.290	0.152	0.122	1.164†
Full-time status	-0.369**	0.051	0.691	-0.417*	0.041	0.659	-0.555	0.048	0.574
Transferred vs. returned									
Predicted FYGPA[1]	0.037***	0.049	1.038†	0.090**	0.033	1.094	0.228	0.032	1.257
Gender – female	0.019	0.092	1.019†	-0.071	0.062	0.932†	0.005	0.063	1.005†
Race/ethnicity									
African American	0.456	0.125	1.578	0.364	0.089	1.439	0.189	0.110	1.208†
Asian	-0.452	0.377	0.636†	-0.381	0.495	0.683†	-0.009	0.295	0.991†
Hispanic	-0.451*	0.172	0.637	-0.143	0.157	0.867†	0.180	0.160	1.198†
Other	-0.194	0.268	0.824†	0.138	0.172	1.147†	-0.108	0.183	0.898†
Missing	-0.194	0.305	0.824†	-0.084	0.175	0.919†	-0.223	0.163	0.800†
Full-time status	-0.056	0.097	0.946†	-0.055	0.074	0.946†	-0.257	0.072	0.774

Note. *p*-value comparing whether parameter estimate for FG students and those whose parents have some college experience is different from the estimate for students whose parents earned a bachelor's degree or higher. * $p < .05$; ** $p < .01$; *** $p < .001$

† indicates that the 99% confidence interval for adjusted OR includes 1; that is, the associated parameter estimate is not significantly different from zero.

[1] Predictor was standardized to have a mean of 0 and a standard deviation of 1.

In terms of attrition due to transfer, the effects of entering college better prepared academically and enrolling full time on this type of attrition were smaller for FG and CG-SC students than for CG-BD students, while the effects of being female and planning to live on campus were larger. Additionally, gender, race/ethnicity, and intentions of living on campus were not significant predictors of transfer at year two for CG-BD students, while full-time enrollment was not a significant predictor of transfer for FG students. For race/ethnicity, Asian students were less likely than White students to drop out and to transfer to another institution, with a more pronounced effect among FG and CG-SC students than among CG-BD students (e.g., adjusted OR = 0.28 and 0.53 for FG and 0.56 and 0.81 for CG-BD, respectively). Hispanic students were less likely than Whites students to drop out and to transfer to another institution (adjusted OR = 0.56 and 0.74) among FG students but not among CG-SC and CG-BD students (e.g., adjusted OR = 1.14 and 1.01 for CG-BD).

To further illustrate the interaction with students' incoming readiness levels, Figure 4 provides retention and attrition rates by parental education and predicted FYGPA for the four-year sample, holding all other predictors constant at their sample means. For this example, we see that for all three parental education groups that as a students' predicted FYGPA increases, their chances of returning to the initial institution increase while their chances of dropping out and their chances of transferring decrease. Another observation from this example is that the gaps in retention rates were slightly larger among students predicted to earn higher FYGPAs based on their ACT Composite score and HSGPA and slightly smaller among those entering less academically prepared as indicated by a predicted FYGPA below 2.00. That is, there appears to be larger gaps in retention rates between FG and CG-BD students and between CG-SC and CG-BD students among those who are entering college better prepared academically.

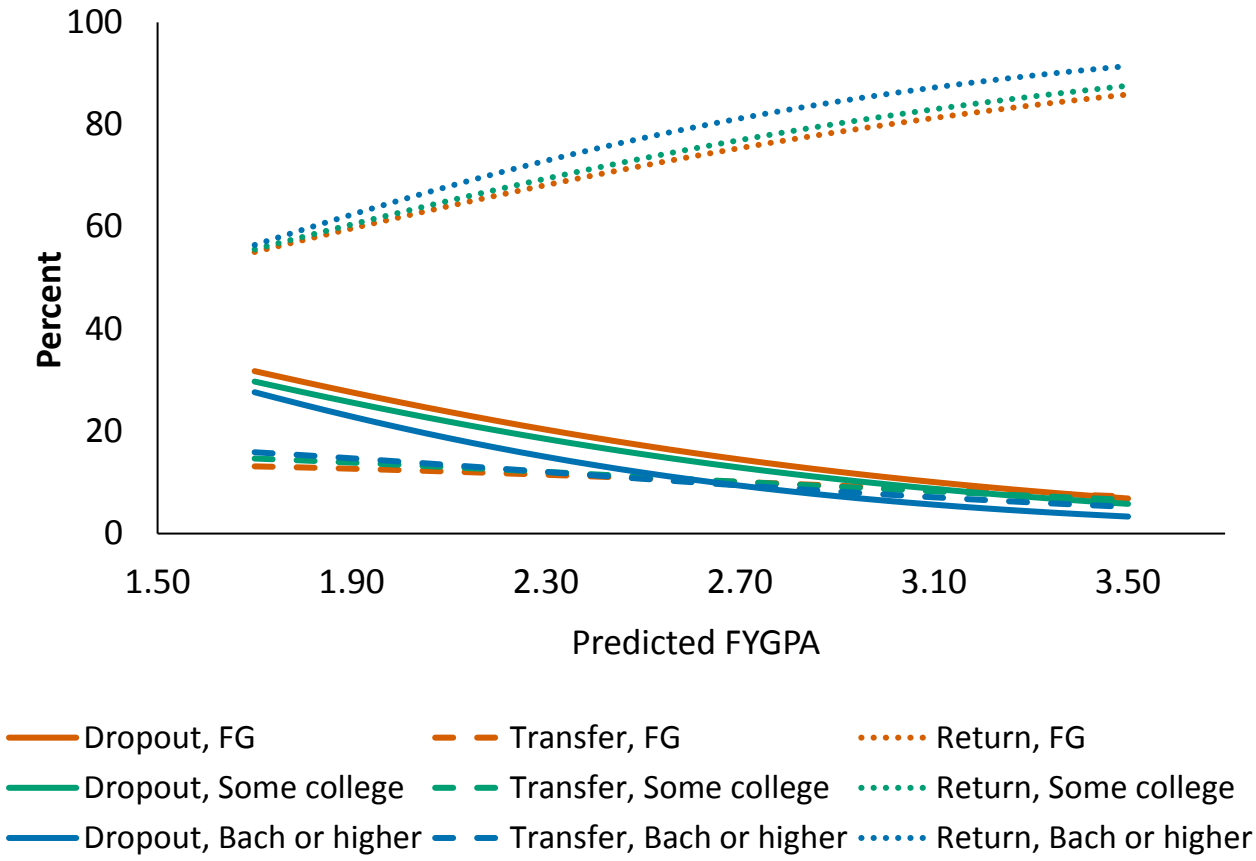


Figure 4. Retention and attrition rates by parental education and predicted FYGPA for the four-year sample holding all other predictors constant at sample means

Figure 5 provides retention and attrition rates by parental education and enrollment status for the four-year sample, holding all other predictors constant at their sample means. According to this example, there is a slightly larger difference in retention rates between full- and part-time students among CG-BD students than there is among FG students. This difference is primarily due to full-time students being less likely than part-time students to transfer at year two among CG-BD students (adjusted OR = 0.66) but not among FG students (adjusted OR = 0.96).

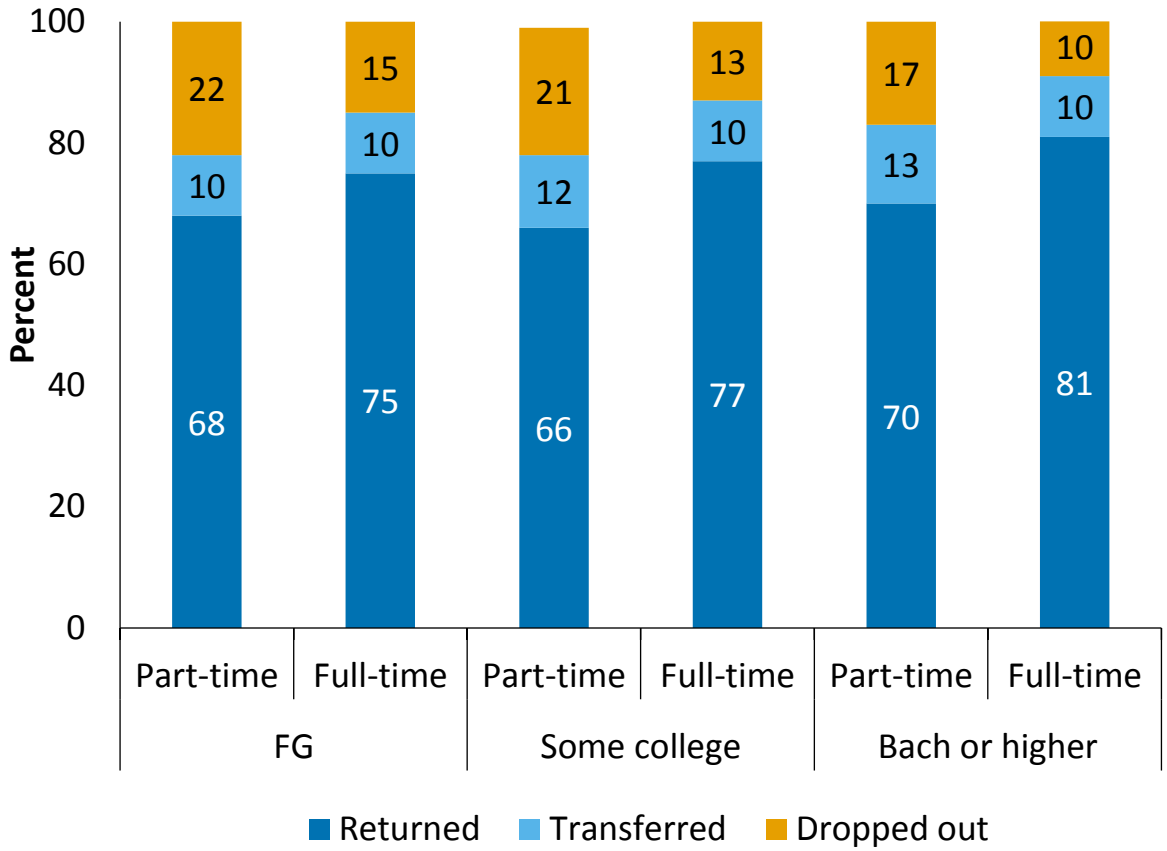


Figure 5. Retention and attrition rates by parental education and first-year enrollment status for the four-year sample holding all other predictors constant at sample means

From Table 4, the results for the two-year sample suggest that being female and enrolling full time had smaller effects on dropping out (as compared to returning) among FG and CG-SC students than they did among CG-BD students (e.g., adjusted OR for full-time status = 0.69 for FG and 0.57 for CG-BD).[12] For attrition due to transfer, entering college better prepared academically and enrolling full time had slightly smaller effects on this type of attrition for FG and CG-SC students than for CG-BD students (e.g., adjusted OR for full-time = 0.95 for FG and 0.77 for CG-BD). Among FG students, Hispanic students were significantly less likely than

[12] This is indicated by the parameter estimates associated with the predictor being closer to 0 and the adjusted OR being closer to 1 for FG and CG-SC students than they are for CG-BD students.

White students to drop out and to transfer to another institution (adjusted OR = 0.57 and 0.64). This was not seen among CG-SC and CG-BD students (e.g., adjusted OR = 0.89 and 1.20 for CG-BD).

Figure 6 provides retention and attrition rates by parental education and predicted FYGPA for the two-year sample, holding all other predictors constant at their sample means. For this example, as a students' predicted FYGPA increases, their chances of returning to the initial institution and transferring to another institution increase while their chances of dropping out decrease. This finding held for all three parental education groups. Another observation seen in this example is that there were larger differences in the transfer rates between CG-BD students and FG students and CG-BD students and CG-SC students among those entering better prepared academically with higher predicted FYGPAs (e.g., adjusted OR = 1.04, 1.09, and 1.26 for FG, CG-SC and CG-BD students). Some students beginning at a two-year institution may go on and transfer to a four-year institution to work towards earning a bachelor's degree. CG-BD students may be doing this more often than FG and CG-SC students given their higher transfer rates among those entering better prepared academically.

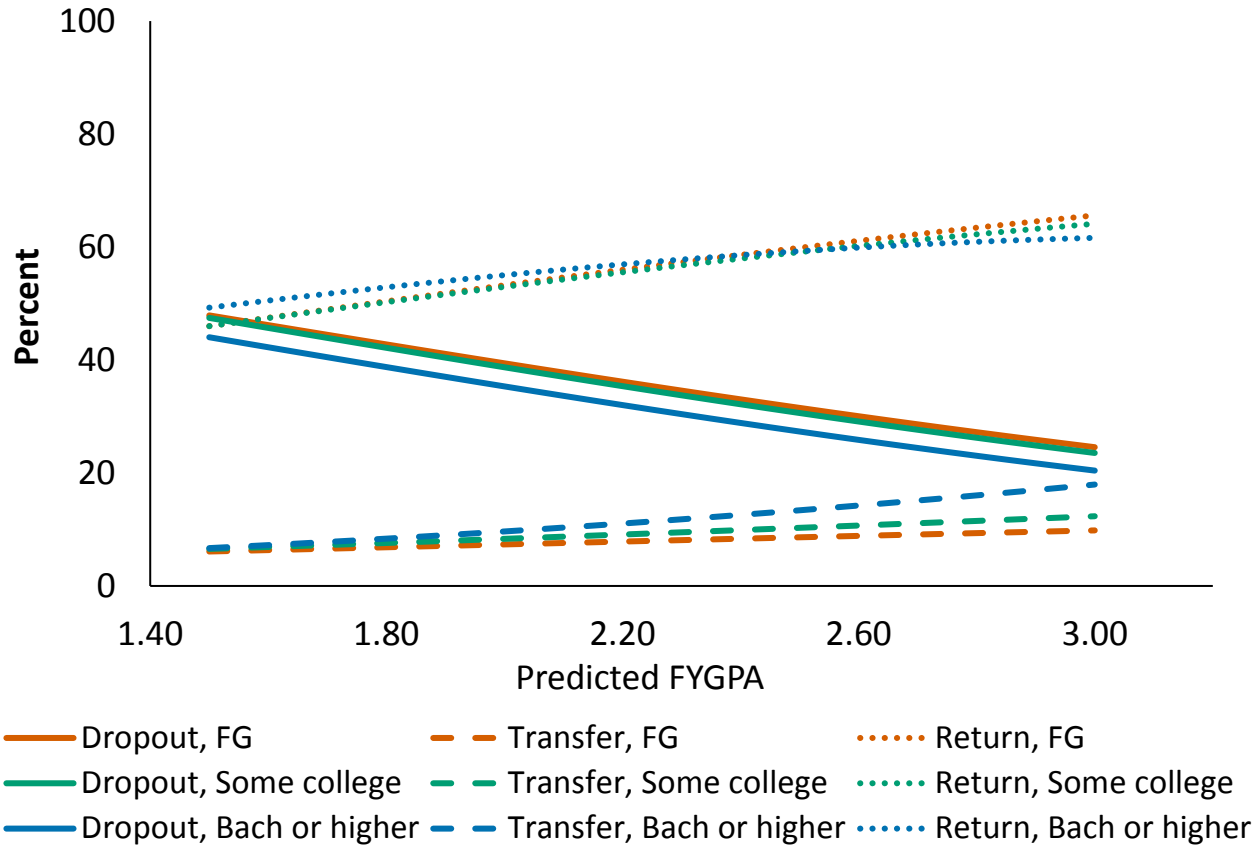


Figure 6. Retention and attrition rates by parental education and predicted FYGPA for the two-year sample holding all other predictors constant at sample means

Multiple-Predictor Models of Transfer Type

The results of the multiple-predictor model for transfer type are presented in Table 5. Variability estimates for the random intercepts are provided in the footnote to the table. For both samples, all of the student- and institution-level characteristics from the retention models were included in the transfer type models regardless of their statistical significance. McFadden's R^2 for the multiple-predictor model that accounted for institution attended and the student-level predictors was 9.5% for the four-year sample and 15.6% for the two-year sample. These R^2 estimates are consistent with those reported in another study on transfer type (Radunzel, 2017).

Third question. For the four-year sample, FG and CG-SC students were significantly more likely than CG-BD students to reverse transfer to a two-year institution, even after statistically controlling for other institution and student characteristics related to academic readiness levels, college intentions, enrollment attributes, and demographic factors (adjusted OR = 1.39 and 1.19, respectively; Figure 7). In terms of the relationships between transfer type and the other predictors included in the model, significantly greater chances of reverse transferring as compared to transferring to another four-year institution were found for the following characteristics: being predicted to earn a lower FYGPA (adjusted OR = 1.63 associated with a one standardized unit decrease), being male (adjusted OR = 1.14), being African American (adjusted OR = 1.25 compared to White), planning to work more hours while in college (e.g., adjusted OR = 2.28 for more than 30 hours versus 0 hours), and attending an institution closer to home (e.g., adjusted OR = 2.03 for less than 25 miles versus 90 or more miles).

After statistically controlling for other institution and student characteristics, the vertical transfer rates for FG and CG-SC students were estimated to be lower than that of CG-BD students in the two-year sample (adjusted OR = 0.73 and 0.80, respectively; see also Figure 6). These differences, however, were not statistically significant at the .01 level. Other student characteristics that were found to be significantly associated with greater chances of transferring vertically included the following: entering college better prepared academically (adjusted OR = 1.54 associated with every one standardized unit increase in predicted FYGPA), coming from a more affluent neighborhood (e.g., adjusted OR = 1.49 for > $61,580 versus < $43,316), planning to work fewer hours (e.g., adjusted OR = 2.16 for none versus 30 or more hours), attending a college closer to home (e.g., adjusted OR = 2.32 less than 25 miles versus 90 or more miles), and

Table 5. Multiple-Predictor Results for Transfer Type by Sample[1]

		Four-year sample				Two-year sample			
		Transfer to 2-year institution (vs. to another 4-year institution)				Transfer to 4-year institution (vs. to another 2-year institution)			
Variable	Category	Estimate	SE	Adj-OR	*p*-value	Estimate	SE	Adj-OR	*p*-value
Intercept		0.863	0.414		.038	-0.305	0.524		.560
Parental education	FG	0.332	0.069	1.394	<.001	-0.311	0.135	0.733	.023
	Some college	0.177	0.054	1.194	.002	-0.228	0.109	0.796	.039
Gender	Female	-0.130	0.042	0.878	.002	-0.221	0.088	0.802	.012
Race/ethnicity	African American	0.224	0.069	1.251	.001	-0.071	0.134	0.932	.596
	Hispanic	0.248	0.109	1.282	.023	-0.069	0.198	0.933	.728
	Asian	-0.269	0.202	0.764	.183	0.140	0.435	1.150	.748
	Other race	0.122	0.105	1.130	.243	-0.053	0.238	0.948	.822
	Missing	0.181	0.138	1.198	.191	-0.038	0.240	0.963	.875
Median household income	< $43,316	0.018	0.061	1.018	.772	-0.399	0.146	0.671	.006
	$43,316 to $61,580	-0.112	0.054	0.894	.038	-0.236	0.129	0.790	.068
Hours planned to work per week	None	-0.826	0.168	0.438	<.001	0.770	0.291	2.160	.009
	1 to 10	-0.690	0.166	0.502	<.001	0.799	0.264	2.222	.003
	11 to 20	-0.460	0.159	0.632	.004	0.785	0.263	2.193	.003
	21 to 30	-0.299	0.166	0.742	.072	0.629	0.269	1.876	.020
Intend to live on campus	Yes	-0.128	0.053	0.880	.016	0.155	0.091	1.168	.089
Distance from home	25 to 89 miles	-0.455	0.057	0.634	<.001	-0.737	0.110	0.478	<.001
	90 or more miles	-0.710	0.060	0.492	<.001	-0.842	0.169	0.431	<.001
Educational plans	Beyond bachelor's	-0.443	0.200	0.642	.033	0.687	0.205	1.988	.001
	Bachelor's degree	-0.448	0.191	0.639	.024	0.403	0.190	1.497	.034
	Other	-0.562	0.283	0.570	.048	0.427	0.487	1.532	.381
Enroll status	Full-time	-0.018	0.083	0.982	.824	0.101	0.093	1.106	.279
Predicted FYGPA[2]		-0.486	0.029	0.615	<.001	0.429	0.049	1.536	<.001
Annual family income	$36,000 to $80,000	-0.035	0.063	0.965	.576	0.073	0.109	1.076	.502
	> $80,000	-0.132	0.067	0.876	.051	0.246	0.134	1.279	.067
Admission selectivity	Selective	0.142	0.343	1.153	.679				
	Traditional	0.560	0.240	1.750	.020				
Institution size	< 5,000	0.136	0.315	1.146	.666	0.383	0.419	1.466	.362
	5,000 to 19,999	-0.055	0.252	0.947	.828	0.793	0.445	2.210	.075

[1] Estimates shown are the averages combined across the five imputed data sets. The variability estimates (and SE) for the random intercepts were 0.189 (0.064) for the four-year sample and 0.298 (0.087) for the two-year sample. Both estimates were significantly different from zero; $p = .003$ and <.001, respectively.

[2] Predictor was standardized to have a mean of 0 and a standard deviation of 1.

having greater educational aspirations (e.g., adjusted OR = 1.99 for beyond bachelor's versus associate's degree or below).

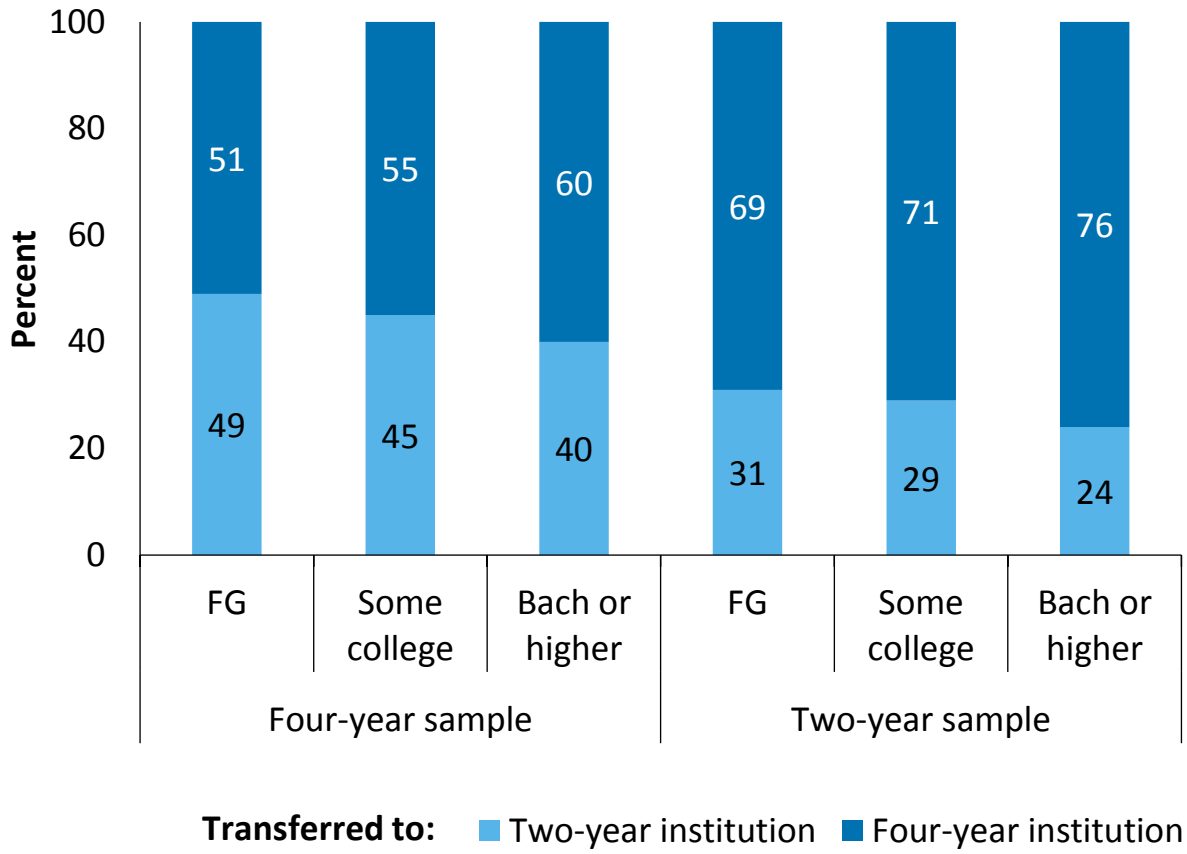


Figure 7. Type of transfer by parental education and sample holding all other predictors constant at sample means

In subsequent analyses, we examined whether the other predictors interacted with parental education on transfer type. None of the interaction terms were found to be statistically significant at the .01 level (results not shown). This finding suggests that the effects of the other predictors on transfer type did not differ by parental education.

Discussion

This study examined retention and attrition at year two in relation to student information available at the time of college enrollment for FG students and their CG peers. The student

attributes included pre-college academic readiness levels, financial resources, demographic characteristics, and other variables thought to serve as proxies for barriers to academic and social integration at the initial institution attended. Student characteristics were examined in relation to two types of attrition−dropping out of college and transferring to another institution−in comparison to returning in year two. The results suggest that even though the student characteristics (including pre-college academic readiness levels) help to reduce the gaps in first-to-second year retention, there are differences in how these attributes influence student attrition across the parental education groups. From this perspective, the study findings support the need for institutional programs—such as early high school outreach programs, summer bridge programs, academic supports and enrichment programs, mentoring and intrusive advising programs, and skills learning support programs—designed to help FG and CG-SC students succeed and persist in college. Moreover, additional research is needed to better understand the unique needs of students coming from these two groups.

First Question

The study findings showed that, compared to their CG-BD peers, FG students and CG-SC students tended to be at greater risk of dropping out of college at year two even after statistically controlling for their incoming academic achievement levels, educational goals, financial resources, intentions of living on campus, number of hours planned to work, and enrollment characteristics related to full-time status and distance from home. This finding held at both two- and four-year institutions. In terms of attrition due to transfer, FG and CG-SC students were somewhat more likely than CG-BD students to transfer to another institution as compared to returning in year two among those beginning at a four-year institution, whereas they were less likely to do so among those beginning at a two-year institution. A comparison between the

unadjusted and adjusted analyses highlight that these other student characteristics helped to explain but did not completely eliminate the gaps in retention and attrition rates among parental education groups (compare Table C1 to Tables 1 and 2). These findings are consistent with those reported by others on persistence (Kopp & Shaw, 2016; Ishitani, 2016; Radunzel, 2017) and degree completion (Wilbur & Roscigno, 2016).

Second Question

Another finding of the study was that the effects of some but not all of the predictors related to student attrition differed across the parental education groups. These included: academic readiness, enrollment status, gender, and race/ethnicity for both the two- and four-year samples, and intentions of living on campus for the four-year sample.

Academic readiness. The measure of academic readiness used in this study was students' predicted FYGPA based on their ACT Composite score and HSGPA, an index that institutions might develop for use in their admissions process and have available for use in their early alert warning systems (e.g., D'Amico & Dika, 2013; Rudick et al., 2015). For the four-year sample, academic readiness was negatively related to dropout and transfer for all three parental education groups, suggesting that students who entered better prepared academically were more likely to be retained than those entering less academically prepared. However, the strength of the association between academic readiness and the two types of attrition was significantly smaller for FG and CG-SC students than for CG-BD students.

For the two-year sample, academic readiness was negatively related to dropout in a similar manner across all three parental education groups. In contrast, academic readiness was positively related to transfer for the two CG groups only, with a significantly smaller effect for CG-SC students than for CG-BD students. Considering that about one-third of students

beginning at a two-year institution eventually go on to transfer to a four-year institution (Jenkins & Fink, 2016) and that this typically occurs more frequently among those who are enrolling in college better prepared (e.g., Porchea, Allen, Robbins, & Phelps, 2010; Radunzel, 2017), it raises concerns that a similar pattern did not emerge for FG students beginning at two-year institutions.

The academic readiness findings in this study could be due to differences in other factors among the parental education groups that were not available in this study. For example, given that FG students often lack early exposure to and knowledge about the college environment (Engle, 2007; Radunzel, 2015) and the guidance at home that can help contribute to student success in college (Saenz et al., 2007; Westbrook & Scott, 2012), FG students can often experience a greater cultural shift upon matriculating to college (D'Amico & Dika, 2013). More specifically, FG students often have a more difficult time making the transition and mastering the role of the college student that can lead to them having poorer outcomes than their CG peers even after prior achievement levels are taken into account (Collier & Morgan, 2008).

Another possible explanation might be related to students' academic self-efficacy or other social and emotional learning (SEL) skills. Academic self-efficacy, academic discipline, and other SEL skills have been found to be positively related to college grades and retention even after controlling for academic achievement and socioeconomic status (e.g., Robbins, Allen, Casillas, Peterson, & Le, 2006; Robbins, Lauver, Le, Davis, Langley, & Carlstrom, 2004), including among FG students (e.g., Majer, 2009). Other research suggests that FG students begin college with lower academic self-efficacy than their CG peers with comparable achievement levels (e.g., Cruce et al., 2005) and are more apt to indicate that they feel less prepared for college (Bui, 2002). Moreover, institutions often offer learning support programs that are aimed at helping FG students in multiple ways to overcome their unique obstacles; these programs

often include courses that are designed to help FG students develop SEL skills (e.g., Wibrowski, Matthews, & Kitsantas, 2017). Based on the current study findings, future research should investigate the role that SEL skills play in helping to explain the academic readiness findings from this study.

Enrollment status. For both samples, the negative effects of full-time enrollment on both types of attrition were the largest among CG-BD students and the smallest among FG students; full-time enrollment was not a significant predictor of attrition due to transfer for FG students. Given that full-time students generally spend more time on campus, they are more likely than part-time students to get involved in campus activities and clubs, interact with faculty, connect with peers, and take advantage of support services that can lead to greater academic engagement and social integration into the campus environment (Center for Community College Student Engagement, 2017). Unfortunately, some research suggests that FG students tend to be less likely than their CG peers to get involved in these types of activities (e.g., Wilbur & Roscigno, 2016), which may help to explain why full-time enrollment had a smaller effect on attrition for FG students. Other researchers have suggested that FG students may not get involved in these activities due to other unique distractions such as having other family obligations and responsibilities (Engle & Tinto, 2008) or struggling with cultural differences between home and college life (D'Amico & Dika, 2013). Yet, other research suggests that FG students may actually benefit more from participating in academic-related activities such as interacting with faculty (Lohfink & Paulsen, 2005).

Based on the current study findings and those from the literature, institutions and their personnel may need to be more intrusive in assisting and advising FG students on topics related to enrollment status and activity involvement, including helping them to overcome any unique

challenges they may be experiencing that may be limiting their opportunities for involvement. In fact, authors of a recent study (Center for Community College Student Engagement, 2017) encourage institutions to work with part-time students (many of whom are FG students) on determining ways that might allow them to enroll full time for at least part of their college careers instead of enrolling part time every semester; this way they may have greater opportunity to participate in campus activities and engage in interactions with faculty and peers. Their recommendation comes from their study findings that show that although those with mixed enrollment (i.e., part-time during some semesters and full-time during others) at community colleges have lower persistence and completion outcomes than those who continuously enroll full time, they do have better outcomes than those who always enroll part time. This finding is further corroborated by NSC results reported in Shapiro et al. (2016), a result observed for students at both two- and four-year institutions.

Intentions of living on campus. For the four-year sample, having intentions of living on campus was found to be negatively related to dropout as compared to returning in year two and positively related to transferring to another institution, a finding consistent with that reported in another study (Radunzel, 2017). Analyses by parental education revealed that the negative association with dropout was seen among CG students only, while the positive association with transfer was seen among FG and CG-SC students only. For the two-year sample, having intentions of living on campus was found to be positively related to transfer and to a lesser extent dropout; these relationships did not depend on parental education. The two-year sample finding of being more likely to transfer to another institution likely ties in with the fact that on-campus housing is offered at only about one-fourth of two-year institutions (American Association of Community Colleges, 2016).

In contrast to the current study, a study by Lohfink and Paulsen (2005) using a combined sample of students beginning at two- and four-year institutions found that living on campus was not significantly related to first-to-second year retention for FG students nor for CG students. Their study focused on an older cohort of students who began college in 1995-1996 and utilized a dichotomized outcome for retention. Future research should explore this relationship further using students' actual campus residency status on a more recent cohort of students. Furthermore, in light of the reality that FG students are generally less likely than their CG peers to enroll full-time and live on campus, institutions need to come up with strategies and solutions that create ways for these students to have similar enriching campus experiences and interactions that may be more readily available to those enrolled full-time and living on campus. These strategies should also include engaging and encouraging faculty and successful FG upper-classmen to mentor FG students (Engle, Bermeo, & O'Brien, 2006; Institute for Higher Education Policy, 2012).

Demographic characteristics. We found that parental education interacted with gender and race/ethnicity on student attrition for both samples. For gender, there were smaller differences in dropout rates as compared to returning in year two between female and male students among FG students. For race/ethnicity, we found that Asian and Hispanic students were less likely than White students to drop out and transfer at year two and that this finding was more pronounced among FG students than among CG students for both samples. Other studies have also found that Asian students have lower attrition rates than White students (Ishitani, 2016; Kopp & Shaw, 2016; Radunzel, 2017), and that once academic readiness measures are statistically controlled for in the models, that Hispanic students have similar or lower attrition rates at year two than White students (e.g., Ishitani, 2016; Radunzel, 2017).

In light of the statistic that nearly one-half of Hispanic students entering college are FG (Skomsvold, 2015) and the Hispanic FG findings in this study, we agree with other researchers (Reyes & Nora, 2012) that further research is warranted on the Hispanic FG population.[13] It could be that compared to the White FG students in this study, Hispanic FG students utilized institutional supports and services to a greater extent, leading to a better persistence outcome. We are unable to validate this possible explanation as we did not have data on resource utilization.

None of our somewhat limited financial-related variables – annual income, neighborhood median household income, or number of hours planned to work − interacted with parental education on student attrition, meaning that their effects were similar across the parental education groups. In contrast, Lohfink and Paulsen (2005) found that some of their financial-related variables positively influenced students' likelihood of returning in the second year for FG students but not for CG students. These included: total annual income and the grant aid received – though the effect of annual income was smaller than that of grant aid as well as that of total work-study aid. Another recent study (Latino, Stegmann, Radunzel, Way, Sanchez, & Casillas, 2018) based on data from a single institution of Hispanic students found that receiving need-based financial aid was positively associated with first-to-second year retention among FG students but not among CG-BD students. It may have been the case that if we had information about the financial aid received that we would have seen differences by parental education. Considering the changes that have occurred in federal and state aid over the past decade (Mitchell, Leachman, & Masterson, 2016) since the Lohfink and Paulsen study (2005), this is another area that should be explored in greater detail.

[13] In comparison, fewer than one-third of White students in college are FG according to Skomsvold (2015).

Third Question

While a majority of FG students indicated they had educational aspirations of obtaining a bachelor's degree or higher, they were more likely than their CG-BD peers to reverse transfer among those beginning at a four-year institution (adjusted OR = 1.39) and less likely to vertically transfer among those beginning at a two-year institution (adjusted OR = 0.73), even after statistically controlling for the other student characteristics included in this study. This finding also held to a lesser degree for CG-SC students (adjusted OR = 1.19 for four-year sample and 0.80 for two-year sample) and is consistent with those reported in other studies (Goldrick-Rab & Pfeffer, 2009; Radunzel, 2017). Considering that reverse transfer is generally associated with lower rates of bachelor's degree completion than lateral transfer (Hossler, Shapiro, Dundar, Chen, Zerquera, Ziskin, & Torres, 2012; Radunzel, 2012), these findings suggest that the bachelor's degree aspirations for many FG students may go unfulfilled. As such, they support the need for transfer strategies and policies that help and do not hinder upward mobility for FG students. Transfer strategies might include strengthening partnerships between two- and four-year institutions, developing new articulation agreements, and implementing guidance programs to help FG students successfully navigate the transfer process.

Limitations

The data for the study came from two state systems; as such, it was not a nationally representative sample. Moreover, the ACT-tested sample only represented one-third of the total population of students beginning at two-year institutions in these two states. Therefore, some of the findings may be specific to these states and may not generalize. Despite this limitation, the study illustrates how institutions and state systems might conduct local studies of this nature to learn more about their FG students and how they compare to their CG peers.

Another limitation of the study is the lack of additional variables and information that might have helped to explain some of the findings (e.g., financial aid received, SEL measures, and resource utilization). Future studies should incorporate some of these additional measures to better understand their role and whether they help to explain some of the findings that were based on incoming student information.

Summary

FG and CG-SC students comprise a substantial portion of the undergraduate population (33% FG and 28% CG-SC; Skomsvold, 2015), and compared to their CG-BD peers tend to fare worse in college. They also tend to be more likely to borrow and take out larger loans (Furquim et al., 2017), which can result in them accumulating debt without receiving the benefit of completing a degree. For these reasons, it is imperative for institutions, states, and policymakers to identify solutions and strategies that not only help students from these backgrounds enroll in college, but that also help them to persist to degree completion.

An initial step might include conducting local studies using incoming student information such as that illustrated here. Besides early identification of those students who may be at-risk of leaving the institution, information from such local studies can (1) provide insights on gaps in outcomes among parental education groups, (2) help to identify unique barriers to success for FG and CG-SC students, and (3) inform retention and transfer strategies and policies intended to help these students achieve their educational goals, including earning a bachelor's degree. The incoming student information can then be augmented with additional data and metrics from the first year and beyond to further shape institutional strategies to better serve FG students.

References

ACT. (2013). *Readiness matters: The impact of college readiness on college persistence and degree completion.* Iowa City, IA: ACT.

ACT. (2014). *A profile of 2012 ACT-tested high school graduates: College choice report: Part 3: Persistence and transfer.* Iowa City, IA: ACT.

ACT. (2015). *The condition of college & career readiness 2015: First-generation students.* Iowa City, IA: ACT.

ACT. (2017). *National collegiate retention and persistence-to-degree rates*. Iowa City, IA: ACT.

Adelman, C. (2006). *The toolbox revisited: Paths to degree completion from high school through college.* Washington, DC: U.S. Department of Education.

American Association of Community Colleges. (2016). *Data points: On-campus housing.* Washington, DC: AACC. Retrieved from https://www.aacc.nche.edu/wp-content/uploads/2017/09/DataPoints_No23.pdf.

Attewell, P., Heil, S., & Reisel, L. (2011). Competing explanations of undergraduate noncompletion. *American Educational Research Journal*, *48*(3), 536–559.

Beaudoin, B., & Kumar, P. (2012). *Using data to identify at-risk students and develop retention strategies.* University Leadership Council Custom Research Brief. Washington, DC: Education Advisory Board.

Bogard, M., Helbig, T., Huff, G., & James, C. (2011). *A comparison of empirical models for predicting student retention*. White paper. Bowling Green, KY: Office of Institutional Research, Western Kentucky University. Retrieved from http://www4.wku.edu/instres/documents/comparison_of_empirical_models.pdf

Brooks, J. H., II, & DuBois, D. L. (1995). Individual and environmental predictors of adjustment during the first year of college. *Journal of College Student Development, 36*(4), 347–360.

Bui, K. V. T. (2002). First-generation college students at a four-year university: Background characteristics, reasons for pursuing higher education, and first-year experiences. *College Student Journal*, *36*(1), 3–11.

Cataldi, E. F., Bennett, C. T., & Chen, X. (2018). *First-generation students: College access, persistence, and postbachelor's outcomes.* (NCES 2018-421). U.S. Department of Education. Washington, DC: National Center for Education Statistics.

Center for Community College Student Engagement. (2017). *Even one semester: Full-time enrollment and student success.* Austin, TX: The University of Texas at Austin,

College of Education, Department of Educational Administration, Program in Higher Education Leadership.

Chen, X. (2005). *First-generation students in postsecondary education: A look at their college transcripts* (NCES 2005–171). U.S. Department of Education. Washington, DC: National Center for Education Statistics.

Chen, X. (2016). *Remedial coursetaking at U.S. public 2- and 4-year institutions: Scope, experiences, and outcomes* (NCES 2016-405). U.S. Department of Education. Washington, DC: National Center for Education Statistics.

Clinedinst, M., & Koranteng, A. (2018). *2017 state of college admission*. Alexandria, VA: National Association for College Admissions Counseling.

College Board. (2015). *2015 college-bound seniors total group profile report.* New York, NY: The College Board. Retrieved from https://secure-media.collegeboard.org/digitalServices/pdf/sat/total-group-2015.pdf

Collier, P. J., & Morgan, D. L. (2008). "Is that paper really due today?": Differences in first-generation and traditional college students' understandings of faculty expectations. *Higher Education, 55*(4), 425–446.

Complete College America. (2011). *Time is the enemy*. Washington, DC: Complete College America.

Cruce, T. M., Kinzie, J. L., Williams, J. M., Morelon, C. L., & Xingming, Y. (2005). *The relationship between first-generation status and academic self-efficacy among entering college students*. Paper presented at the 30th Annual Meeting of the Association for the Study of Higher Education (ASHE), Philadelphia, PA, November 17-19, 2005. Paper retrieved from http://nsse.indiana.edu/pdf/conference_presentations/2005/First-Generation%20Academic%20Self-Efficacy%20-%20ASHE.pdf.

D'Amico, M. M., & Dika, S. L. (2013). Using data known at the time of admission to predict first-generation college student success. *Journal of College Student Retention: Research, Theory & Practice, 15*(2), 173–192.

Engle, J. (2007). Postsecondary access and success for first-generation college students. *American Academic, 3*(1), 25–48.

Engle, J., Bermeo, A., & O'Brien, C. (2006). *Straight from the source: What works for first-generation students.* Washington, DC: The Pell Institution for the Study of Opportunity in Higher Education.

Engle, J., & Tinto, V. (2008). *Moving beyond access: College success for low-income, first-generation students.* Washington, DC: The Pell Institute.

Furquim, F., Glasener, K. M., Oster, M., McCall, B. P., & DesJardins, S. L. (2017). Navigating the financial aid process: Borrowing outcomes among first-generation and non-first-generation students. *ANNALS of the American Academy of Political and Social Science, 671*(1), 69–91.

Goldrick-Rab, S., & Pfeffer, F. T. (2009). Beyond access: Explaining socioeconomic differences in college transfer. *Sociology of Education, 82*(2), 101–125.

Higher Education Act of 1965, 1998 Higher Education Act Amendments, Subpart 2—Federal Early Outreach and Student Services Programs, CHAPTER 1—FEDERAL TRIO PROGRAMS SEC. 402A, 20 U.S.C. 1070a–11 (1998).

Hossler, D., Shapiro, D., Dundar, A., Chen, J., Zerquera, D., Ziskin, M., & Torres, V. (2012). *Reverse transfer: A national view of student mobility from four-year to two-year institutions* (Signature Report No. 3). Herndon, VA: National Student Clearinghouse Research Center.

Institute for Higher Education Policy. (2012). *Supporting first-generation college students through classroom-based practices.* Washington, DC: Institute for Higher Education Policy.

Ishitani, T. T. (2006). Studying attrition and degree completion behavior among first-generation college students in the United States. *Journal of Higher Education, 77*(5), 861–885.

Ishitani, T. T. (2016). Time-varying effects of academic and social integration on student persistence for first and second years in college: National data approach. *Journal of College Student Retention: Research, Theory & Practice, 18*(3), 263–286.

Jenkins, D., & Fink, J. (2016). *Tracking transfer: New measures of institutional and state effectiveness in helping community college students attain bachelor's degrees.* New York, NY: Community College Research Center.

Kopp, J. P., & Shaw, E. J. (2016). How final is leaving college while in academic jeopardy? Examining the utility of differentiating college leavers by academic standing. *Journal of College Student Retention: Research, Theory, & Practice, 18*(1), 2–30.

Kuh, G. D., Kinzie, J., Buckley, J. A., Bridges, B. K., & Hayek, J. C. (2006). *What matters to student success: A review of the literature* (Report commissioned for the National Symposium on Postsecondary Student Success: Spearheading a Dialog on Student Success). Washington, DC: National Postsecondary Education Cooperative.

Kuh, G. D., Kinzie, J., Schuh, J. H., & Whitt, E. J., & Associates (2010). *Student success in college: Creating conditions that matter*. San Francisco, CA: John Wiley & Sons.

Latino, C. A., Stegmann, G., Radunzel, J., Way, J. D., Sanchez, E., & Casillas, A. (2018). Reducing gaps in first-year outcomes between Hispanic first-generation college students and their peers: The role of accelerated learning and financial aid. *Journal of*

College Student Retention: Research, Theory & Practice. DOI: 10.1177/1521025118768055

Lee, J., & Mueller, J. A. (2014). Student loan debt literacy: A comparison of first-generation and continuing-generation college students. *Journal of College Student Development, 55*(7), 714–719.

Lohfink, M. M., & Paulsen, M. B. (2005). Comparing the determinants of persistence for first-generation and continuing-generation students. *Journal of College Student Development, 46*(4), 409–428.

Majer, J. M. (2009). Self-efficacy and academic success among ethnically diverse first-generation community college students. *Journal of Diversity in Higher Education, 2*(4), 243–250.

Marsh, G. (2014). Institutional characteristics and student retention in public 4-year colleges and universities. *Journal of College Student Retention: Research, Theory, & Practice*. *16*(1), 127–151.

Mattern, K., & Allen, J. (2016). *More information, more informed decisions: Why test-optional policies do NOT benefit institutions or students.* Iowa City, IA: ACT.

Mattern, K. D., Wyatt, J. N., & Shaw, E. J. (2013). College distance from home: Implications for student transfer behavior. *Journal of the First-Year Experience & Students in Transition, 25*(1), 77–92.

McFadden, D. (1974). Conditional logit analysis of qualitative choice behavior. In P. Zarembka (Ed.), *Frontiers in Econometrics* (pp. 105–142). New York, NY: Academic Press.

McNeish, D. M., Radunzel, J., & Sanchez, E. (2015). *A multidimensional perspective of college readiness: Relating student and school characteristics to performance on the ACT.* Iowa City, IA: ACT.

Mitchell, M., Leachman, M., & Masterson, K. (2016). *Funding down, tuition up: State cuts to higher education threaten quality and affordability at public colleges.* Washington, DC: Center on Budget and Policy Priorities.

Pascarella, E. T., & Terenzini, P. T. (2005). *How college affects students, volume 2: A third decade of research.* San Francisco, CA: Jossey-Bass.

Porchea, S. F., Allen, J., Robbins, S., & Phelps, R. P. (2010). Predictors of long-term enrollment and degree outcomes for community college students: Integrating academic, psychosocial, socio-demographic, and situational factors. *The Journal of Higher Education, 81*(6), 750–778.

Pratt, I. S., Harwood, H. B., Cavazos, J. T., & Ditzfeld, C. P. (2017). Should I stay or should I go? Retention in first-generation college students. *Journal of College Student Retention: Research, Theory, & Practice*. *36,* 1–14. doi:10.1177/1521025117690868

Radunzel, J. (2012). *Where are 2003 high school graduates seven years later?* Iowa City, IA: ACT. Retrieved from http://www.act.org/content/dam/act/unsecured/documents/WhereDidHighSchoolGraduatesGo.pdf

Radunzel, J. (2015). *Informing educational planning and advising for students from at-risk demographic groups: Results from a survey of high school seniors who took the ACT.* Iowa City, IA: ACT.

Radunzel, J. (2017). *Using incoming student information to identify students at-risk of not returning to their initial institution in year two.* Iowa City, IA: ACT.

Redford, J., & Hoyer, K. M. (2017). *First-generation and continuing-generation college students: A comparison of high school and postsecondary experiences* (NCES 2018-009). U.S. Department of Education. Washington, DC: National Center for Education Statistics.

Reyes, N. A. S., & Nora, A. (2012). *Lost among the data: A review of Latino first generation college students*. San Antonio, TX: Hispanic Association of Colleges and Universities.

Rigol, G. W. (2003). *Admissions decision making models: How U.S. institutions of higher education select undergraduate students*. New York, NY: The College Board.

Robbins, S. B., Lauver, K., Le, H., Davis, D., Langley, R., & Carlstrom, A. (2004). Do psychosocial and study skill factors predict college outcomes? A meta-analysis. *Psychological Bulletin*, *130*(2), 261–288.

Robbins, S. B., Allen, J., Casillas, A., Peterson, C. H., & Le, H. (2006). Unraveling the differential effects of motivational and skills, social, and self-management measures from traditional predictors of college outcomes. *Journal of Educational Psychology*, *98*(3), 598–616.

Rubin, D. B. (1987). *Multiple imputation for nonresponse in surveys.* New York, NY: Wiley.

Rudick, C., Kellen, V., Sugarman, R., Lindstrom, A., & Johnson, A. (2015, January 1). *Student success regression analysis summary draft v3*. Retrieved from http://www.uky.edu/iraa/research-briefs.

Saenz, V. B., Hurtado, S., Barrera, D., Wolf, D., & Yeung, F. (2007). *First in my family: A profile of first-generation college students at four-year institutions since 1971*. Los Angeles, CA: Higher Education Research Institute, UCLA.

Sanchez, E., & Buddin, R. (2016). *How accurate are self-reported high school courses, course grades, and grade point average?* Iowa City, IA: ACT.

SAS Institute Inc. (2011). SAS/QC® 9.3 User's Guide [Computer software]. Cary, NC: SAS Institute Inc.

Sawyer, R. (2010). *Usefulness of high school average and ACT scores in making college admission decisions*. Iowa City, IA: ACT.

Schafer, J. L., & Graham, J. W. (2002). Missing data: Our view of the state of the art. *Psychological Methods, 7*(2), 147–177.

Schudde, L. T. (2011). The causal effect of campus residency on college student retention. *The Review of Higher Education, 34*(4), 581–610.

Schmitt, N., Keeney, J, Oswald, F. L., Pleskac, T. J., Billington, A. Q., Sinha, R., & Zorzie, M. (2009). Prediction of 4-year college student performance using cognitive and noncognitive predictors and the impact on demographic status of admitted students. *Journal of Applied Psychology*, 94(6), 1479-1497.

Shapiro, D., Dundar, A., Wakhungu, P. K., Yuan, X., Nathan, A. & Hwang, Y. (2016, November). *Completing college: A national view of student attainment rates – Fall 2010 cohort* (Signature Report No. 12). Herndon, VA: National Student Clearinghouse Research Center.

Shaw, E. J., & Mattern, K. D. (2009). *Examining the accuracy of self-reported high school grade point average.* (College Board Research Report 2009-5). New York, NY: The College Board.

Skomsvold, P. (2015). *Web tables—Profile of undergraduate students: 2011–12* (NCES 2015-167). U.S. Department of Education. Washington, DC: National Center for Education Statistics.

Tampke, D. R. (2013). Developing, implementing, and assessing an early alert system. *Journal of College Student Retention: Research, Theory, and Practice, 14*(4), 523–532.

Tinto, V. (1975). Dropout from higher education: A theoretical synthesis of recent research. *Review of Educational Research, 45*(1), 89–125.

Tinto, V. (1993). *Leaving college: Rethinking the cause and cures of student attrition* (2nd ed.). Chicago, IL: The University of Chicago Press.

Tognoli, J. (2003). Leaving home: Homesickness, place attachment, and transition among residential college students. *Journal of College Student Psychotherapy, 18*(1), 35–48.

Westbrook, S. B., & Scott, J. A. (2012). The influence of parents on the persistence decisions of first-generation college students. *Focus on Colleges, Universities, and Schools, 6*(1), 1–9.

Wibrowski, C. R., Matthews, W. K., & Kitsantas, A. (2017). The role of a skills learning support program on first-generation college students' self-regulation, motivation, and academic achievement: A longitudinal study. *Journal of College Student Retention: Research, Theory, and Practice, 19*(3), 317–332.

Wilbur, T. G., & Roscigno, V. J. (2016). First-generation disadvantage and college enrollment/completion. *Socius: Sociological Research for a Dynamic World, 2*, 1–11.

Appendix A

Table A1. Estimates of FYGPA Models by Sample[1]

Variable	Estimate	SE	Min	Max	*p*-value
Four-year sample					
Intercept	2.645	0.028	2.644	2.645	<.001
HSGPA	0.383	0.011	0.382	0.385	<.001
ACT Composite	0.262	0.018	0.261	0.263	<.001
HSGPA*ACT Composite	0.050	0.003	0.049	0.051	<.001
Two-year sample					
Intercept	2.285	0.030	2.284	2.287	<.001
HSGPA	0.345	0.007	0.343	0.346	<.001
ACT Composite	0.131	0.013	0.130	0.132	<.001
HSGPA*ACT Composite	0.072	0.006	0.069	0.073	<.001

[1] Estimates shown are the averages combined across the five imputed data sets. HSGPA and ACT Composite score were standardized to have a mean of 0 and standard deviation of 1.

Table A2. Variance Estimates of Random Effects from FYGPA Models by Sample[1]

Variable[2]	Estimate	SE	Min	Max	*p*-value
Four-year sample					
Intercept	0.017	0.006	0.017	0.018	.002
HSGPA	0.003	0.001	0.002	0.003	.006
ACT Composite	0.007	0.002	0.007	0.007	.004
Two-year sample					
Intercept	0.0361	0.0083	0.0360	0.0362	<.001
HSGPA	0.0003	0.0004	0.0001	0.0004	.474
ACT Composite	0.0044	0.0015	0.0042	0.0045	.003

[1] Estimates shown are the averages combined across the five imputed data sets. HSGPA and ACT Composite score were standardized to have a mean of 0 and standard deviation of 1.
[2] For both the two- and four-year sample, the interaction term did not randomly vary across institutions; therefore, the interaction term was included in the model as a fixed effect only.

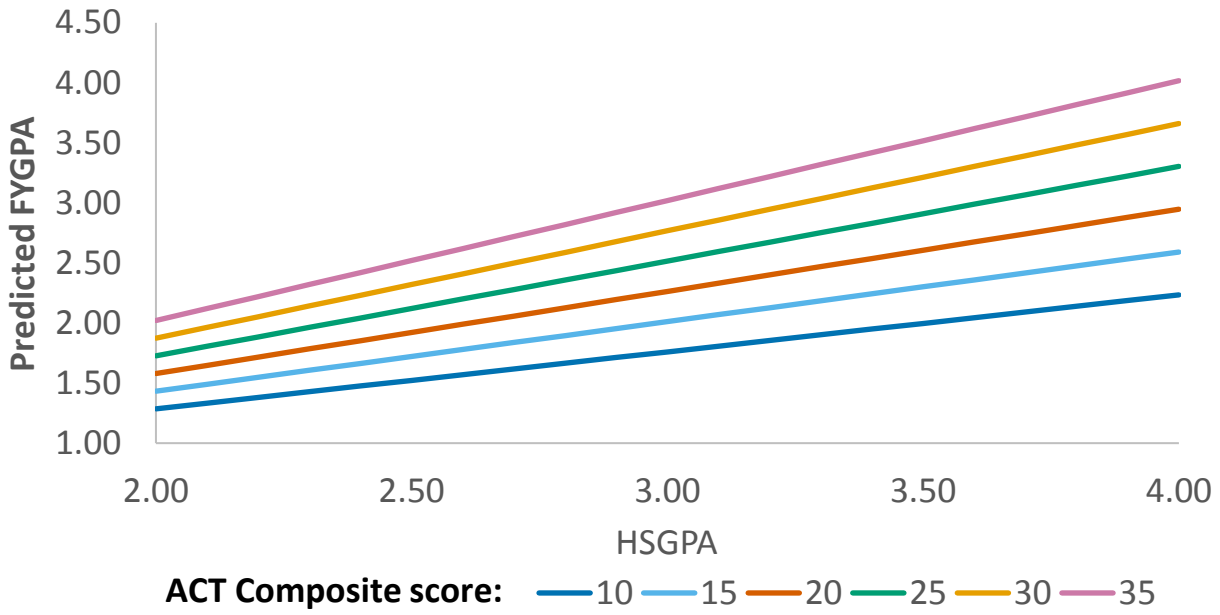


Figure A1. Predicted FYGPAs at a typical institution as a function of ACT Composite score and HSGPA for the four-year sample

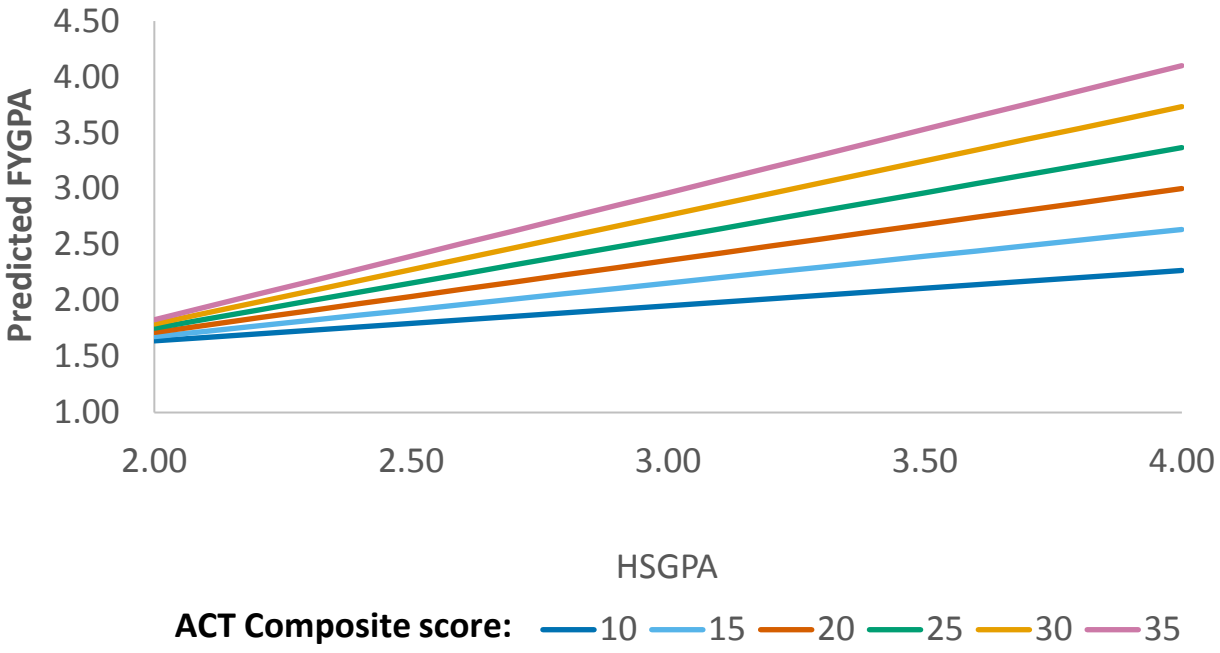


Figure A2. Predicted FYGPAs at a typical institution as a function of ACT Composite score and HSGPA for the two-year sample

Appendix B

Table B1. Description of Student Characteristics by Parental Education for Four-Year Sample

	FG		Some college		Bachelor or higher	
Student characteristic	*n*	Percent	*n*	Percent	*n*	Percent
Gender						
Female	9,391	57.2	20,332	55.5	28,922	49.8
Male	7,029	42.8	16,296	44.5	29,207	50.2
Race/ethnicity						
African American	3,130	19.1	5,582	15.2	4,686	8.1
Asian	499	3.0	406	1.1	1,102	1.9
Hispanic	1,312	8.0	1,320	3.6	1,661	2.9
Other	742	4.5	1,654	4.5	1,864	3.2
Missing	430	2.6	1,312	3.6	2,055	3.5
White	10,307	62.8	26,354	72.0	46,761	80.4
Residential median household income*						
Less than $43,316	8,034	48.9	14,251	38.9	13,387	23.0
$43,316 to $61,580	6,411	39.0	15,393	42.0	21,454	36.9
More than $61,580	1,975	12.0	6,984	19.1	23,288	40.1
Annual family income						
Less than $36,000	8,486	51.7	11,241	30.7	5,841	10.0
$36,000 to $80,000	6,162	37.5	16,147	44.1	17,675	30.4
More than $80,000	1,772	10.8	9,240	25.2	34,613	59.5
Hours planned to work per week						
None	1,560	9.5	4,902	13.4	13,615	23.4
1 to 10	2,955	18.0	7,857	21.5	17,643	30.4
11 to 20	7,559	46.0	17,208	47.0	21,758	37.4
21 to 30	3,508	21.4	5,744	15.7	4,496	7.7
31 or more	838	5.1	917	2.5	617	1.1
Intend to live on campus						
No	6,797	41.4	12,268	33.5	11,140	19.2
Yes	9,623	58.6	24,360	66.5	46,989	80.8
Degree plans						
Associate's or below	837	5.1	1,196	3.3	549	0.9
Bachelor's degree	10,513	64.0	22,021	60.1	28,769	49.5
Beyond bachelor's	4,755	29.0	13,071	35.7	28,526	49.1
Other	315	1.9	340	0.9	285	0.5
Distance from home						
Less than 25 miles	6,790	41.4	13,802	37.7	19,376	33.3
25 to 89 miles	6,145	37.4	13,202	36.0	15,930	27.4
90 or more miles	3,485	21.2	9,624	26.3	22,823	39.3

Student characteristic	FG		Some college		Bachelor or higher	
	n	Percent	*n*	Percent	*n*	Percent
Full-time enrollment						
No	2,200	13.4	3,226	8.8	2,313	4.0
Yes	14,220	86.6	33,402	91.2	55,816	96.0
Selectivity of institution attended						
Selective	3,859	23.5	9,795	26.7	22,422	38.6
Traditional	8,931	54.4	19,977	54.5	29,214	50.3
Open/Liberal	3,630	22.1	6,856	18.7	6,493	11.2
Size of institution						
Less than 5,000	2,205	13.4	3,747	10.2	3,028	5.2
5,000 to 19,999	6,834	41.6	14,590	39.8	18,979	32.6
20,000 or below	7,381	45.0	18,291	49.9	36,122	62.1

Note. Descriptive statistics based on first imputed data set. Similar statistics were seen for the other four imputed data sets.

* Median household income is based on students' residential zip code.

Table B2. Description of Student Characteristics by Parental Education for Two-Year Sample

	FG		Some college		Bachelor or higher	
Student characteristic	*n*	Percent	*n*	Percent	*n*	Percent
Gender						
Female	6,236	60.5	9,247	55.6	5,400	46.9
Male	4,071	39.5	7,379	44.4	6,123	53.1
Race/ethnicity						
African American	1,906	18.5	2,686	16.2	1,327	11.5
Asian	177	1.7	127	0.8	125	1.1
Hispanic	1,342	13.0	767	4.6	472	4.1
Other	411	4.0	687	4.1	436	3.8
Missing	276	2.7	666	4.0	495	4.3
White	6,195	60.1	11,693	70.3	8,668	75.2
Residential median household income*						
Less than $43,316	5,549	53.8	7,637	45.9	3,944	34.2
$43,316 to $61,580	3,791	36.8	6,707	40.3	4,674	40.6
More than $61,580	967	9.4	2,282	13.7	2,905	25.2
Annual family income						
Less than $36,000	6,018	58.4	6,270	37.7	2,165	18.8
$36,000 to $80,000	3,453	33.5	7,396	44.5	4,599	39.9
More than $80,000	836	8.1	2,960	17.8	4,759	41.3
Hours planned to work per week						
None	620	6.0	1,305	7.8	1,242	10.8
1 to 10	1,641	15.9	2,973	17.9	2,597	22.5
11 to 20	4,534	44.0	7,988	48.0	5,524	47.9
21 to 30	2,759	26.8	3,565	21.4	1,787	15.5
31 or more	753	7.3	795	4.8	373	3.2
Intend to live on campus						
No	6,501	63.1	9,655	58.1	6,038	52.4
Yes	3,806	36.9	6,971	41.9	5,485	47.6
Degree plans						
Associate's or below	1,494	14.5	1,932	11.6	746	6.5
Bachelor's degree	6,576	63.8	10,863	65.3	7,470	64.8
Beyond bachelor's	1,910	18.5	3,547	21.3	3,160	27.4
Other	327	3.2	284	1.7	147	1.3
Distance from home						
Less than 25 miles	7,493	72.7	12,398	74.6	8,904	77.3
25 to 89 miles	2,140	20.8	3,195	19.2	1,841	16.0
90 or more miles	674	6.5	1,033	6.2	778	6.8

Student characteristic	FG		Some college		Bachelor or higher	
	n	Percent	*n*	Percent	*n*	Percent
Full-time enrollment						
No	4,578	44.4	6,135	36.9	3,668	31.8
Yes	5,729	55.6	10,491	63.1	7,855	68.2
Size of institution						
Less than 5,000	5,145	49.9	7,734	46.5	4,376	38.0
5,000 to 19,999	3,799	36.9	6,378	38.4	4,616	40.1
20,000 or below	1,363	13.2	2,514	15.1	2,531	22.0

Note. Descriptive statistics based on first imputed data set. Similar statistics were seen for the other four imputed data sets.

* Median household income is based on students' residential zip code.

Table B3. Average Predicted FYGPA, ACT Composite Score, and HSGPA by Parental Education and Sample

	Mean (SD)		
Student characteristic	FG	Some college	Bachelor or higher
Four-year sample			
ACT Composite score	20.34 (4.18)	21.55 (4.30)	23.76 (4.48)
HSGPA	3.19 (0.55)	3.27 (0.54)	3.44 (0.49)
Predicted FYGPA	2.42 (0.55)	2.54 (0.55)	2.77 (0.53)
Actual FYGPA	2.31 (1.11)	2.48 (1.07)	2.84 (0.93)
Two-year sample			
ACT Composite score	17.95 (3.49)	18.72 (3.70)	19.55 (3.89)
HSGPA	2.90 (0.57)	2.96 (0.57)	3.02 (0.57)
Predicted FYGPA	2.17 (0.44)	2.22 (0.45)	2.26 (0.46)
Actual FYGPA	2.15 (1.21)	2.19 (1.20)	2.33 (1.18)

Note. Means and standard deviations based on first imputed data set. Similar statistics were seen for the other four imputed data sets.

Appendix C

Table C1. Results for First-to-Second Year Retention by Parental Education and Sample

	Dropped out vs. returned				Transferred vs. returned			
	Estimate	SE	Odds ratio	p-value	Estimate	SE	Odds ratio	p-value
Four-year sample								
Intercept[1]	-1.843	0.086		<.001	-2.079	0.070		<.001
Parental Educ.								
FG	1.020	0.024	2.774	<.001	0.263	0.032	1.301	<.001
Some college	0.721	0.021	2.057	<.001	0.242	0.024	1.274	<.001
Bach or higher								
Two-year sample								
Intercept[2]	-0.725	0.035		<.001	-1.730	0.062		<.001
Parental Educ.								
FG	0.345	0.031	1.412	<.001	-0.581	0.055	0.559	<.001
Some college	0.248	0.029	1.281	<.001	-0.318	0.045	0.728	<.001
Bach or higher								

Note. Estimates shown are the averages combined across the five imputed data sets.

[1] For the four-year sample, the variability estimates (and SE) for the random intercepts were 0.164 (0.049) for dropped out vs. returned and 0.105 (0.032) for transferred vs. returned. Both estimates were significantly different from zero; p = <.001 and .001, respectively.

[2] For the two-year sample, the variability estimates (and SE) for the random intercepts were 0.027 (0.008) for dropped out vs. returned and 0.111 (0.028) for transferred vs. returned. Both estimates were significantly different from zero; both $p < .001$.

Table C2. Results for Transfer Type[1] by Parental Education and Sample

Variable	Estimate	SE	Odds ratio	p-value
Four-year sample				
Intercept[2]	-0.390	0.103		.001
Parental Educ.				
FG	0.642	0.061	1.901	<.001
Some college	0.361	0.047	1.435	<.001
Bach or higher				
Two-year sample				
Intercept[2]	1.202	0.128		<.001
Parental Educ.				
FG	-0.774	0.117	0.461	<.001
Some college	-0.478	0.098	0.620	<.001
Bach or higher				

Note. Estimates shown are the averages combined across the five imputed data sets.

[1] For the four-year sample, the transfer type outcome examined transferring to a two-year institution in relation to transferring to another four-year institution. For the two-year sample, the transfer type outcome evaluated transferring to a four-year institution in relation to transferring to another two-year institution.

[2] The variability estimates (and SE) for the random intercepts were 0.214 (0.069) for the four-year sample and 0.423 (0.114) for the two-year sample. Both estimates were significantly different from zero; $p = .002$ and <.001, respectively.