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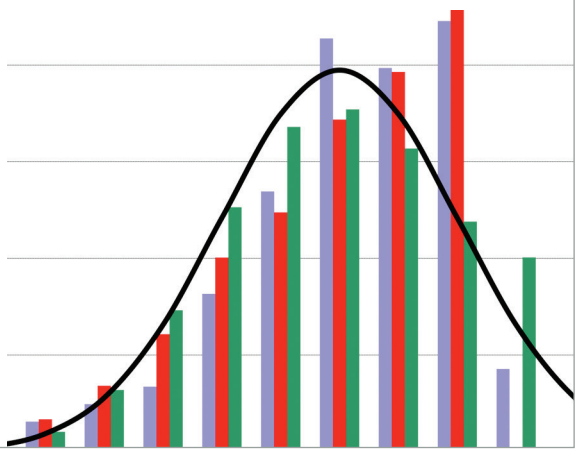

Differential Effects on Student Demographic Groups of Using ACT® College Readiness Assessment Composite Score, ACT Benchmarks, and High School Grade Point Average for Predicting Long-Term College Success through Degree Completion

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Abstract

In this study, we evaluated the differential effects on racial/ethnic, family income, and gender groups of using ACT® College Readiness Assessment Composite score and high school grade point average (HSGPA) for predicting long-term college success. Outcomes included annual progress towards a degree (based on cumulative credit-bearing hours earned), degree completion, and cumulative grade point average at 150% of normal time to degree completion (year 6 and year 3 for four- and two-year institutions, respectively). We also evaluated the utility of the individual ACT College Readiness Benchmarks for predicting college success for each demographic group.

Data for this study included over 190,000 ACT-tested students who enrolled in college as first-time entering students in fall, 2000 through 2006. Over 100 total two- and four-year institutions were represented. We used hierarchical logistic models to estimate institution-specific probabilities of college success for all students and each demographic group based on their ACT test scores and HSGPA. Accuracy and success rates for each student group were calculated at total-group optimal selection values using the distributions of ACT Composite score and HSGPA for each institution's approximate applicant pool; these rates were then summarized across institutions. Results were disaggregated by institution type.

Total-group predictions based on ACT Composite score generally overestimated the long-term college success of underrepresented minority students (by, at most, 0.11 across outcomes), lower-income students (by, at most, 0.07), and male students (by, at most, 0.13) and, to a lesser extent, underestimated the success of White students (by, at most, 0.04), higher-income students (by, at most, 0.07), and female students (by, at most, 0.10). The degree of differential prediction by gender was less pronounced for the progress to degree and degree

completion outcomes than for achieving levels of year 6/year 3 cumulative grade point average (GPA). There was minimal differential prediction by family income for achieving levels of year 6/year 3 cumulative GPA. For racial/ethnic and family income groups, there was greater over- and underprediction associated with using HSGPA than with using ACT Composite score. The opposite was true for gender. Differential prediction by student demographic groups was also observed at the ACT College Readiness Benchmark scores with the direction of the differential prediction being consistent with that observed when ACT Composite score and/or HSGPA was used.

For each student demographic group, test scores increased prediction accuracy over that for HSGPA. Typical percentages of correct classifications at total-group optimal selection values were generally higher for underrepresented minority and lower-income students than for White and higher-income students; these percentages were similar for female and male students.

Contrary to prior claims made, results from this study suggest that minority and lower-income students are not disadvantaged by using ACT Composite score or the ACT Benchmark scores to predict long-term college success. This finding held across multiple college outcomes at both two- and four-year institutions.

Acknowledgments

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Differential Effects on Student Demographic Groups of Using ACT® College Readiness Assessment Composite Score, ACT Benchmarks, and High School Grade Point Average for Predicting Long-Term College Success through Degree Completion

Introduction

To meet their admission goals while at the same time fulfilling their educational mission of maintaining equal opportunity and diversity in student enrollments, four-year postsecondary institutions often use multiple measures, including both academic and non-academic ones, in determining the likelihood that a student will be successful in college (Clinedinst, Hurley, & Hawkins, 2011). Academic measures often include grades in college preparatory courses, strength of high school curriculum, standardized test scores (ACT or SAT), and high school grade point average (HSGPA), because these measures have been found to identify accurately students who are ready for college and to predict students' eventual success in college. One outcome that is commonly used by institutions for helping them make admission decisions is first-year academic performance, as measured by first-year college grade point average (GPA). But, due to the increased pressure that institutions are currently under to improve graduation rates, institutions are also considering outcomes beyond the first year of college, including evaluating the likelihood that applicants will complete a degree within six years (Higher Education Research Institute, 2011; Saupe & Curs, 2008).

Two-year institutions are also feeling the pressure to increase graduation rates. And, even though most two-year institutions currently practice open admissions, about one-fifth of them use standardized test scores or HSGPA as part of their admission process (Breland, Maxey, Gernand, Cumming, & Trapani, 2002). Moreover, due to the reduced resources available to them some two-year institutions are having to prioritize access; restrict enrollment; eliminate lower-level, developmental courses; and identify students who are likely to graduate or transfer to a four-year institution (González, 2012). In addition, two-year institutions are being encouraged to

evaluate intermediate outcomes that measure progress towards degree completion to help determine the reasons why so many students are not completing degrees (Moore, Shulock, & Offenstein, 2009). Two-year institutions also use students' test scores and HSGPAs to counsel their applicants, including those who appear to be at risk of not succeeding in college (Habley, Valiga, McClanahan, & Burkum, 2010).

In light of the push for increased accountability in higher education and the growing concerns for open access remaining the norm at two-year institutions (González, 2012), we recently evaluated the use of ACT Composite (ACTC) score and HSGPA for identifying students who are likely to be successful in college beyond the first year for both four- and two-year institutions (Radunzel & Noble, 2012a). In this study, we found that the typical percentages of correct classifications at optimal ACTC scores for progressing towards and completing a degree were moderately high (64% to 71% at four-year institutions and 65% to 77% at two-year institutions). Across the college outcomes considered in the study, using ACTC score and HSGPA in combination resulted in greater prediction accuracy, and was more effective for identifying successful students among those expected to be successful, relative to using either pre-enrollment achievement measure separately. Other researchers (Schmitt, Keeney, Oswald, Pleskac, Billington, Sinha, & Zorzie, 2009) have also reported relatively high percentages of correct classifications when predicting bachelor's degree completion using SAT/ACT scores and HSGPA jointly (for 63% of the students). In addition, it has been shown that college success rates (including six-year bachelor's degree completion rates) are substantially greater for students with higher ACTC scores and HSGPAs than for those with lower scores or HSGPAs (Radunzel & Noble, 2012b).

In our earlier study (Radunzel & Noble, 2012a), we also investigated the usefulness of the ACT College Readiness Benchmarks in each of the subject areas for predicting long-term college success. The ACT Benchmarks are the minimum ACT test scores required for students to have a high probability of success in first-year, credit-bearing college courses–English Composition, College Algebra, social sciences courses, and Biology (Allen & Sconing, 2005), and provide an empirical definition of college readiness. The ACT Benchmarks were identified as the typical scores across both two- and four-year institutions that maximized the accuracy for predicting success (defined as earning a grade of B or higher) in the corresponding courses. Meeting the ACT Benchmarks has also been shown to be positively associated with early and long-term college success, such as enrolling and persisting in college and completing a degree (Radunzel & Noble, 2012b; ACT, 2010a). Results from Radunzel and Noble (2012a) are consistent with these other findings, and suggest that the ACT Benchmarks are effective at identifying students who are ready for college and likely to succeed beyond the first year of college.

As a reasonable extension to our earlier study (Radunzel & Noble, 2012a), in this study we examine the effects of using ACTC score, HSGPA, and the ACT Benchmarks for predicting college success among student demographic groups. When the relationships between college outcomes, test scores, and HSGPAs differ among various population student groups, using a total-group prediction equation (as would be the case in the college admissions process) may result in systematic over- or underprediction for different student groups (i.e., differential prediction).

Several studies have examined the differential effects on race/ethnicity and/or gender of using standardized test scores (including ACTC score) and HSGPA to predict first-year college

GPA, thereby helping to ensure equity in the admissions process (Sanchez, 2013; Mattern, Patterson, Shaw, Kobrin, & Barbuti, 2008; Noble, 2003; Young, 2001). Sanchez (2013) also examined the differential effects on family income groups of estimating students' chances of earning a 2.5 or higher or a 3.0 or higher first-year college GPA based on their ACTC scores and/or HSGPAs. Results from this latter study suggested that students' chances of success estimated from total-group models (all students irrespective of their demographic characteristics) were overestimated for African American, Hispanic, lower-income, and male students, and were slightly underestimated for White, higher-income, and female students. These findings held for both pre-college measures, although HSGPA models generally resulted in greater over- and underprediction of first-year success by racial/ethnic and family income groups than ACTC score models did.

In terms of prediction accuracy, ACTC score and HSGPA were somewhat more accurate predictors of first-year success for African American and Hispanic students than for White students using the 3.0 or higher first-year GPA criterion. For the 2.5 or higher GPA criterion, the percentages of correct classifications at optimal total-group selection values (values that maximized prediction accuracy for the total group of students) were more comparable across racial/ethnic groups. This latter finding also held for the family income and gender group comparisons at both GPA criterion levels. Results from the study by Sanchez (2013) are consistent with earlier studies (Mattern et al., 2008; Noble, 2003; Young, 2001), and suggest that African American, Hispanic, and lower-income students are not disadvantaged in the college admission process when ACTC score is used to predict first-year GPA.

Therefore, in this study, we extend the research by Sanchez (2013) to include college outcomes beyond the first year through degree completion. In particular, in this study we

investigate the differential effects on student demographic groups of using one of the following sets of pre-enrollment achievement measures to predict college success through degree completion:

- ACTC score,
- HSGPA,
- ACTC score and HSGPA, or
- the ACT College Readiness Benchmarks.

Using total-group and group-specific predictions based on ACTC score and/or HSGPA, as well as total-group ACTC score or HSGPA selection values that maximized prediction accuracy, we compare the probabilities of success and percentages of correct classifications across student demographic groups and predictor variables. The percentages of successful students for those at or above the ACT Benchmark scores are also compared among student groups.

Clearly, a student's likelihood of being successful in college is based on multiple factors, including both cognitive and noncognitive characteristics (Allen & Robbins, 2010). ACT does not advocate making college success predictions solely on the basis of a single measure, such as a test score, or a single selection value. The use here of one or two predictors is a mathematical simplification that can be generalized to multiple measures.

Data

Data for this study included approximately 194,000 ACT-tested students who enrolled in college as first-time entering students in fall, 2000 through 2006. Over 100 institutions were represented, including all public institutions from two state systems. Four-year institutions were required to have at least six years of follow-up data available on their students. Two-year institutions were required to have at least three years of follow-up data available on their

students. Multiple freshman cohorts of students from an institution were combined together in the analyses. Cohort years spanned from 2000 to 2003 for 61 four-year study institutions and from 2000 to 2006 for 43 two-year institutions. However, some institutions provided data for some but not all of the outcomes. As a result, the number of institutions and enrolled students with available data differed by college outcome. For additional information, see Radunzel and Noble (2012a).

To examine the differential effects on student demographic groups of using ACTC score, HSGPA, and ACT Benchmark scores to inform college admission decisions, we also included over 505,000 students who sent their ACT scores to the same 104 institutions during the same time frame but did not enroll there.[1] Nonenrolled students were identified from the 2000 to 2006 ACT records of all ACT-tested high school graduates nationally. These students requested that their ACT test scores be sent to at least one of the 104 institutions included in this study during the same time period as that for enrolled students. Nonenrolled students who sent scores to an institution, plus those who actually enrolled in an institution, comprised the "applicant pool" for that institution. The applicant pools for the institutions in this study were intended to approximate actual applicant pools.[2]

College outcomes included annual progress to degree (based on cumulative hours earned), degree completion, and cumulative GPA at 150% of normal time to degree completion (at the end of year 6 for four-year institutions and the end of year 3 for two-year institutions).

[1] Four-year institutions make admission decisions about applicants. And, although most two-year institutions have open admission policies, they are still concerned about the level of academic preparedness of their future incoming students and often work with potential applicants through activities like high school outreach and bridge programs (Barnett, Corrin, Nakanishi, Bork, Mitchell, Sepanik, … Clabaugh, 2012; Kerrigan & Slater, 2010). An example of a high school outreach program includes an early assessment/intervention program where two-year institutions offer high school juniors and seniors the opportunity to take college placement tests to evaluate their level of college readiness and then encourage them to strengthen and refresh their skills if needed.

[2] Students may send their ACT scores to any number of institutions, but actually apply to only a subset of them. Conversely, some students may apply to some institutions without submitting official ACT score reports.

Analyses were done separately by institution type, where type was determined at the time of initial enrollment. Progress to degree outcomes over time approximated bachelor's degree completion in about five years for students who started at four-year institutions and associate's degree completion in slightly over three years for students who started at two-year institutions; approximations were based on using thresholds for cumulative hours earned that increased by 24 and 18 hours, respectively, each year. For degree completion, we evaluated earning a bachelor's degree within six years of initial enrollment at a four-year institution and earning an associate's degree within three years of initial enrollment at a two-year institution. For two-year institutions from two state systems, we also evaluated associate's degree completion or transfer to an in-state four-year institution within three years of initially enrolling in college. Cumulative GPA was evaluated at the end of year 6 for four-year institutions and at the end of year 3 for two-year institutions (referred to in this report as the year 6/year 3 cumulative GPA) for enrolled students and at the time of degree completion for students who graduated with a bachelor's/associate's degree before the end of year 6/year 3. Year 6/year 3 cumulative GPA was evaluated at the following levels: 3.00 or higher and 3.50 or higher.[3]

The pre-enrollment measures used in this study included ACTC score, HSGPA, and the ACT College Readiness Benchmarks. The ACT Composite score is the rounded arithmetic average of the four subject area scores (English, Mathematics, Reading, and Science). Test scores are reported on a scale of 1 to 36. HSGPA was based on student's self-reported coursework taken in up to 23 specific courses in English, mathematics, social studies, and science and the self-reported grades earned in these courses. The ACT College Readiness Benchmarks correspond to scores of 18, 22, 21, and 24 on the ACT English, Mathematics,

[3] We are using higher criterion levels for year 6/year 3 cumulative GPA than Sanchez used in his study (2013) for first-year college GPA because the typical average value across institutions was higher for the later outcome than for the earlier one (3.1 for year 6 GPA and 2.8 for year 3 GPA vs. 2.7 for first-year GPA).

Reading, and Science tests, respectively (Allen & Sconing, 2005). Students who meet the ACT Benchmark score have approximately a 50% chance of earning a B or better and approximately a 75% chance of earning a C or better in the corresponding college course or courses (ACT, 2010b).

Differential prediction of college outcomes was evaluated by race/ethnicity, family income range, and gender. These demographic characteristics were reported by the students at the time that they registered for the ACT test. For race/ethnicity, underrepresented minority students (African American, Hispanic, and American Indian/Alaskan Native students combined) were compared to White students.[4] In this report, underrepresented minority students are referred to as minority students. Family income was categorized as less than $30,000 (Low), $30,000 to $60,000 (Mid), and more than $60,000 (High).[5] Table 1 provides the typical student demographic percentages across postsecondary institutions.

[4] The racial/ethnic minority group includes students who are generally underrepresented in postsecondary education. Results for these racial/ethnic groups were combined to have sufficient sample sizes of underrepresented minority students included in each institution's applicant pool (10 or more). At the time of data collection, Native Hawaiian/other Pacific Islander students (another racial/ethnic group often underrepresented in postsecondary education) was not a separate racial/ethnic category. Therefore, students of this race/ethnicity could not be included in the underrepresented minority group in this study. Results for other racial/ethnic groups such as Asian American students are not reported due to smaller sample sizes.

[5] The US median household income in 2003 was approximately $43,000 (US Census Bureau, 2003).

Table 1

Distributions of Student Demographic Percentages for Institutional Applicant Pools by Type of Institution

Student demographic characteristic	Two-year institutions			Four-year institutions		
	Med	Min	Max	Med	Min	Max
Race/ethnicity						
Minority	21	3	51	17	3	93
White	73	46	95	78	4	95
Family income range						
Low	39	18	54	25	14	62
Mid	43	34	55	43	28	53
High	17	11	39	29	10	50
Gender						
Female	57	32	69	56	41	79
Male	42	33	64	43	21	56

Note. Median family income and gender percentages may not sum to 100 percent due to rounding. Median racial/ethnic percentages do not sum to 100 percent due to other racial/ethnic student groups not included in racial/ethnic comparisons, (e.g., Asian American students). Med = median; Min = minimum; Max = maximum.

Method

For each student demographic group and institution, we computed mean ACTC scores and HSGPAs for enrolled students and the entire applicant pool. Mean cumulative GPAs and college success rates were also calculated by institution and student demographic group for enrolled students. Distributions of the means and rates associated with these variables were then summarized across institutions and student demographic groups using minimum, median, and maximum values.

We used hierarchical logistic models to estimate progress to degree, cumulative GPA, and degree completion rates for enrolled students from the pre-enrollment measures and student demographic characteristics (referred to in this report as group-specific regression models).[6]

[6] The hierarchical logistic regression models were estimated in HLM 6.08 (Raudenbush, Bryk, Cheong, & Congdon, 2004) using the Laplace approximation method. The pre-enrollment achievement measures were included in the models in their original units (i.e., variables were not centered in the models).

Hierarchical models account for students clustered within institutions and allow the estimated college success rates to vary across institutions. The pre-enrollment measures of ACTC score and HSGPA were evaluated individually, as well as jointly, in the models. The individual ACT subject area scores were each evaluated in separate models. The group-specific models not only included the pre-enrollment measures and the individual student demographic characteristics but also interactions between the pre-enrollment measures and student characteristics. We developed separate models by year of enrollment for each relevant outcome and by institution type (two- vs. four-year). The intercepts and the slopes of the main effects were included as random effects in all models; interaction terms were included as fixed effects.

To examine the differential effects of ACTC score or HSGPA on long-term college success by student demographic group, we used three different approaches. First, to evaluate differential prediction by student demographic group across the entire ACTC score and HSGPA scales, we compared typical probabilities of success estimated from the group-specific regression models to those estimated from the total-group regression models. The total-group regression models included the pre-enrollment achievement measures only, and did not include any of the student demographic indicator(s) (described in detail in Radunzel and Noble (2012a)). For both models, the probabilities of success were derived using the fixed effects parameter estimates from the models. When the differences in the probability estimates between the total-group and group-specific models at the same ACTC score or HSGPA are positive, then the total-group model overpredicts the probabilities of success for the specific student group. When these differences are negative, then the total-group model underpredicts success for the specific student group.

Second, we also evaluated differential prediction by student demographic group at total-group optimal selection values (values that were used to model the use of ACTC scores and HSGPA for college admissions).[7] Optimal total-group selection values correspond to a 0.50 probability of success for a given model and maximize the estimated percentages of correct selection decisions (Sawyer, 1996). Optimal selection values could be determined only for those institutions whose total-group probability curves crossed 0.50 (that is, institutions with "viable" models).[8] For the two-predictor models, multiple combinations of ACTC score and HSGPA corresponding to a probability of success of 0.50 were identified. The total-group optimal selection value(s) were used in this study for comparative purposes only (see Radunzel & Noble, 2012a).[9] In general, institutions rarely use strict selection values and often use multiple measures in making their admission decisions (Clinedinst, Hurley, & Hawkins, 2011).

For each institution with a viable total-group model, we applied the institution-specific total-group optimal selection value(s) to the corresponding group-specific probability distributions for each institution, student demographic group, and predictor (or predictor combination). We then summarized the distributions of these group-specific probabilities of success across institutions using minimum, median, and maximum values. A typical (median)

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[7] Unlike the first approach, differential prediction is compared at ACTC score and/or HSGPA values that may differ across institutions, since total-group optimal selection values for ACTC score and/or HSGPA (individually and jointly) from the total-group regression models were identified for each institution (Radunzel & Noble, 2012a).

[8] Outcomes that resulted in smaller numbers of institutions with viable total-group models included associate's degree completion and achieving higher levels of year 6/year 3 cumulative GPA when they were modeled as a function of HSGPA. The reason for this is that for many institutions, students' chances of success for these outcomes were relatively low in general and never reached 50% across the entire HSGPA scale (see Appendix B from Radunzel & Noble (2012a)).

[9] The typical ACTC or HSGPA values that maximized prediction accuracy (that is, the values associated with at least a 50% chance of being successful) were relatively high for degree completion from the same initial institution. However, the optimal selection values also varied substantially across institutions (lower selection values were generally seen for institutions with higher degree completion rates). In part, typical selection values were so high because degree completion rates from the same institution were generally low, especially for two-year institutions. Institutions are able to compensate for lower admissions standards with effective support programs and interventions. For additional discussion on these matters, see pp. 45-47 from our earlier study (Radunzel & Noble, 2012a).

group-specific probability of success below 0.50 suggests that the total-group model tends to overpredict success at the total-group optimal selection value(s) for the specific student group, and a typical probability of success above 0.50 suggests underprediction for the student group. We also used this approach to evaluate whether over- or underprediction for a particular student group is consistently observed across all institutions. In the results section, we show that these first two approaches lead to the same general differential prediction conclusions among the student demographic groups.

Third, to evaluate the differences in prediction accuracy by student demographic group, we estimated the following statistics for each predictor/predictor combination and outcome at institution-specific total-group optimal selection value(s):

1. the percentage of correct classifications (accuracy rate (AR)),
2. the percentage of successful students among those expected to be successful (success rate (SR)),
3. the increase in the percentage of correct classifications over expecting all applicants to be successful (increase in accuracy rate (ΔAR)), and
4. the percentage of students with values below the selection value(s) (100 minus this percentage gives the percentage of students in the applicant pool at or above the selection value(s)).

We calculated these statistics using the institution-specific parameter estimates from the group-specific regression models and the corresponding group distributions of ACTC scores and HSGPA for each institution's applicant pool.[10] Correct classifications include students at or above the total-group selection value(s) who would be successful and students below the value(s)

[10] For each institution the estimated group-specific conditional probabilities of success for nonenrolled students were assumed to be the same as those for enrolled students.

who would have not been successful. For a more complete description of the methodology used (including the assumptions being made) to evaluate the usefulness of pre-enrollment measures in the admissions process, see Sawyer (2010).

Distributions of these statistics were summarized across institutions and student groups using minimum, median, and maximum values. In this paper, we present results across institutions with viable models for each individual predictor/outcome combination. However, results across institutions with viable models for both predictors were similar to those reported here.

To study the differential effects on student demographic groups of using the ACT College Readiness Benchmarks for predicting college success, we estimated group-specific probabilities of success and SRs at the Benchmark scores for each institution. Increases in SRs (denoted as ΔSRs) were also estimated to evaluate the usefulness of the predictor variables for increasing SRs over baseline success rates. For each student group, we summarized the distributions of probabilities of success, SRs, and ΔSRs across institutions using minimum, median, and maximum values. To evaluate the differential prediction of using the ACT Benchmark scores by student group, we compared typical total-group probabilities of success at the ACT Benchmark scores to corresponding group-specific probabilities of success (positive differences suggest overprediction and negative differences suggest underprediction).[11] In addition, we compared typical values of SRs and ΔSRs among student groups.

When students completed the ACT registration materials, some of them omitted responses to high school coursework and grade items, as well as to the family income range item.

[11] Since our focus was on evaluating the specific ACT Benchmark scores, we did not compare the typical probabilities of success estimated from the total-group and group-specific models (using the fixed-effects parameter estimates) across the entire scale of possible ACT subject area test scores. Such results at the ACT Benchmark scores are expected to be comparable to those reported here based on the median value across institutions.

We used multiple imputation to estimate missing values; 12% and 17% of enrolled students and 11% and 15% of nonenrolled students had missing HSGPA and family income range, respectively. Five data sets were imputed. We developed models for all five imputed data sets. No practically significant differences in parameter estimates (including standard errors) were found across the data sets. For all analyses involving HSGPA and family income range we report the results based on the initial imputed data set.

Results

Differential Effects of ACTC Score and HSGPA for Predicting Long-Term College Success

In this section, we describe the differential effects on student demographic groups of using ACTC score and HSGPA separately and jointly for predicting college success through degree completion. We first present descriptive statistics for ACTC scores, HSGPAs, and college outcomes over time disaggregated by race/ethnicity, family income, and gender. Next, we present group-specific probability distributions for the various college outcomes as functions of ACTC scores and HSGPAs, and compare these estimates to those derived from the total-group models. Following this, we present for each student demographic group the median probabilities of success, ARs, ΔARs, and SRs at the total-group optimal ACTC and HSGPA selection values to evaluate the accuracy of these pre-college measures for informing students' chances of long-term college success.

Descriptive statistics. Mean ACTC scores and HSGPAs were typically higher among enrolled students than among students in the entire applicant pool at four-year institutions, but means were comparable between enrolled students and the entire applicant pool at two-year institutions. These findings held when examined by race/ethnicity, family income range, and gender (Appendix A, Tables A-1 to A-6). For both the enrolled and applicant pool samples, White students, higher-income students, and female students typically had higher mean ACTC

scores and HSGPA values than minority students, lower-income students, and male students, respectively, at both two- and four-year institutions.

For most student demographic groups, the typical mean ACTC scores of enrolled students in this study were lower than mean ACTC scores of first-year ACT-tested college students nationally who enrolled in college in 2003 (Table A-7). This finding was observed at both two- and four-year institutions, and is consistent with our previously reported results for the total group of students (Radunzel & Noble, 2012a). For minority students and lower-income students (the two exceptions to the general finding for most groups), typical ACTC means were similar to or slightly higher than the corresponding national means. Differences in mean ACTC scores between enrolled students nationally and the sample of enrolled students for this study were larger for male students and higher-income students than for female students and middle-income students, respectively.[12]

College success rates, including degree completion rates, were typically higher for White students than for minority students, and higher for female students than for male students (Tables A-1 and A-2 for race/ethnicity and Tables A-5 and A-6 for gender). For example, the typical six-year bachelor's degree completion rate across four-year institutions was 14 percentage points higher for White students than for minority students (44% vs. 30%) and nearly 10 percentage points higher for female students than for male students (46% vs. 37%). As family income range increased, typical college success rates also increased (Tables A-3 and A-4). For example, at four-year institutions, we found that the typical six-year bachelor's degree completion rate was 14 percentage points higher for higher-income students than for lower-income students (47% vs. 33%).

[12] The result among income groups held for four-year institutions only.

The same general conclusions by student demographic group were seen at two-year institutions, albeit with a few exceptions. First, the typical three-year degree completion or transfer rate was the same for male and female students (23%; Table A-6). Second, the typical three-year associate's degree completion rate by income group was highest for middle-income students, followed by higher-income students (Table A-4). Given that the three-year degree completion or transfer rate was highest for higher-income students, a possible explanation for the degree completion result (without transfer) is that higher-income students were more likely to bypass earning an associate's degree before transferring to a four-year institution.

Probabilities of success by student demographic group. In Appendix B we provide figures of the estimated probabilities of completing a degree or achieving levels of year 6/year 3 cumulative GPA as a function of ACTC score or HSGPA by student demographic group (Figures B-1 to B-18).[13] We estimated the probabilities in the figures using the fixed effects parameter estimates from the group-specific hierarchical logistic models. Across college outcomes and student demographic group, we found that as ACTC score or HSGPA increased, the estimated probabilities of success at either a typical two- or four-year institution also increased.

Race/ethnicity. For students with ACTC scores of 27 or below, probabilities of completing a bachelor's degree by year 6 for minority students were lower than those for White students. In comparison, for students with ACTC scores of 28 or above, corresponding probabilities for minority students were comparable to or higher than those for White students (Figure B-1). We found a similar result for each of the other outcomes: however, the ACTC score associated with the change in the direction of the racial/ethnic differences (from negative to

[13] Probabilities of success are shown for degree completion and achieving levels of year 6/year 3 cumulative GPA; they are not shown for the progress to degree outcomes. In addition, probabilities of college success are shown over the range of observable ACTC scores and HSGPAs for each student demographic group.

positive) depended on the outcome (Figures B-1, B-3, and B-5). In contrast, probabilities of college success predicted from HSGPA were consistently lower for minority students than for White students (Figures B-2, B-4, and B-6). And, unlike the results for ACTC score, we found that the racial/ethnic differences increased as HSGPA increased. These findings held for all outcomes at both two- and four-year institutions.

Total-group probabilities estimated from ACTC score or HSGPA individually were generally similar to or slightly lower than the corresponding group-specific estimates for White students: The total-group model slightly underpredicted probabilities of success for White students relative to group-specific probabilities (by, at most, 0.04 across outcomes at both two- and four-year institutions; Tables C-1 and C-2 in Appendix C). We illustrate this finding for bachelor's degree completion by year 6 by ACTC score in Figure 1 and by HSGPA in Figure 2.[14]

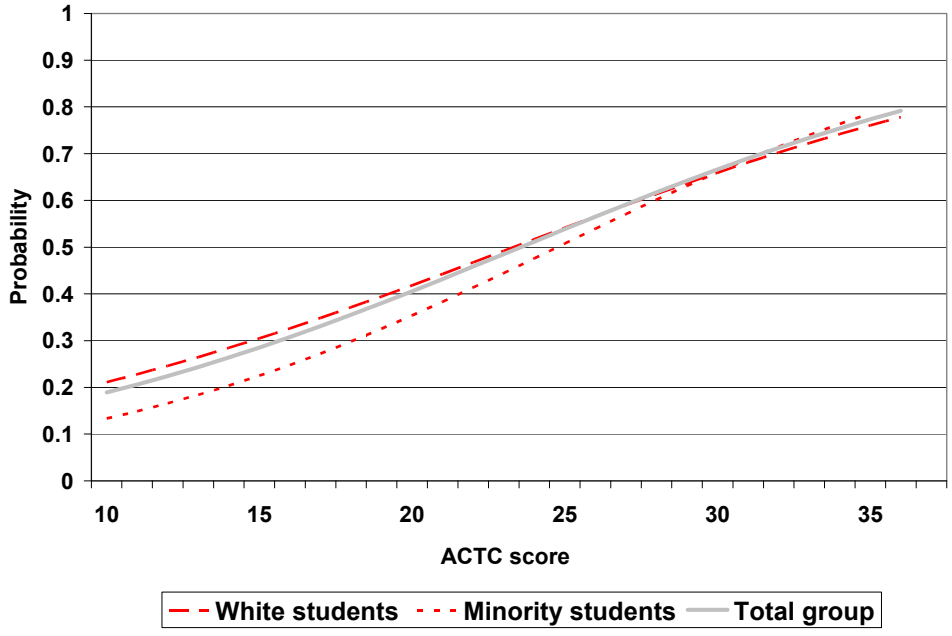

Figure 1. Estimated probabilities of six-year bachelor's degree completion by ACTC score and race/ethnicity. ACTC = ACT Composite.

[14] Probabilities estimated from the fixed effects parameter estimates from the total-group hierarchical logistic models are provided for comparison.

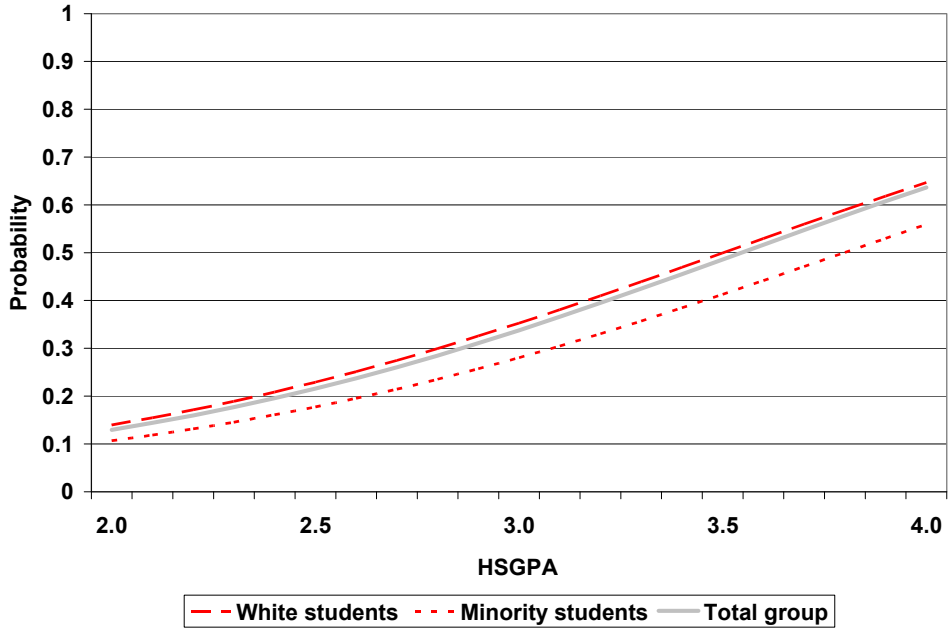

Figure 2. Estimated probabilities of six-year bachelor's degree completion by HSGPA and race/ethnicity. HSGPA = high school grade point average.

In comparison, total-group models tended to overpredict probabilities of success for minority students with ACTC scores at or below the 75th percentile for enrolled students (values of 25 and 21 at four- and two-year institutions, respectively; Figure 1 and Tables C-1 and C-2). At four-year institutions, as ACTC score increased beyond the 75th percentile, differences between total-group probabilities and those for minority students tended to decrease, suggesting little to no differential prediction of college success by race/ethnicity for students with higher ACTC scores. This finding was also observed for achieving a year 3 cumulative GPA of 3.00 or higher, or 3.50 or higher, at two-year institutions (Figure B-5). For the progress to degree and degree completion outcomes at two-year institutions, results suggested slight underprediction for the total-group model in estimating probabilities of success for minority students with higher ACTC scores (at the 99th percentile of ACTC scores of 28 or above; by, at most, 0.06; Table C-2).

Unlike the results for ACTC score, the amount of overprediction for minority students increased as HSGPA increased (Figure 2, Tables C-1 and C-2). This finding held for most outcomes at both two- and four-year institutions. We also found that for both predictors the largest differences between the total-group and group-specific probabilities for minority students generally occurred for the outcome of achieving levels of year 6/year 3 cumulative GPA.

Family income. For most of the progress to degree and degree completion outcomes, probabilities of success were greater for higher-income students than for lower-income students.[15] This result held for both ACTC score and HSGPA (Figures B-7 and B-8 for degree completion). Differences in probabilities of success between higher- and lower-income students decreased as ACTC score increased (especially at two-year institutions), but the opposite was true for HSGPA.

For both GPA levels at any given ACTC score, group-specific probabilities of achieving levels of year 6/year 3 cumulative GPA were generally comparable across family income groups (Figures B-9 and B-11). In contrast, income group differences in corresponding probabilities of success associated with HSGPA tended to increase as HSGPA increased at both two- and four-year institutions, especially for the 3.50 or higher criterion (Figures B-10 and B-12).

Total-group probabilities estimated from either ACTC score or HSGPA were generally similar to or slightly lower than those for middle-income students. We illustrate this finding for bachelor's degree completion by year 6 across the ACTC score scale in Figure 3 and across the HSGPA scale in Figure 4.

[15] The exception to this finding was for associate's degree completion by year 3 at two-year institutions. For students with higher ACTC scores (at the 99th percentile of 28 or above), the chances of completing an associate's degree by year 3 were greater for lower-income students than for higher-income students.

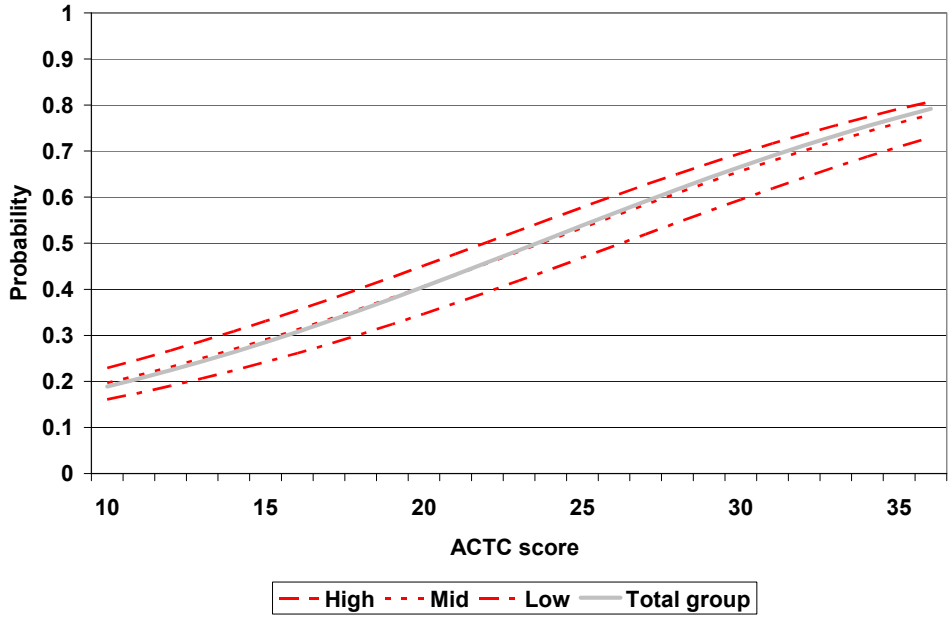

Figure 3. Estimated probabilities of six-year bachelor's degree completion by ACTC score and family income. ACTC = ACT Composite.

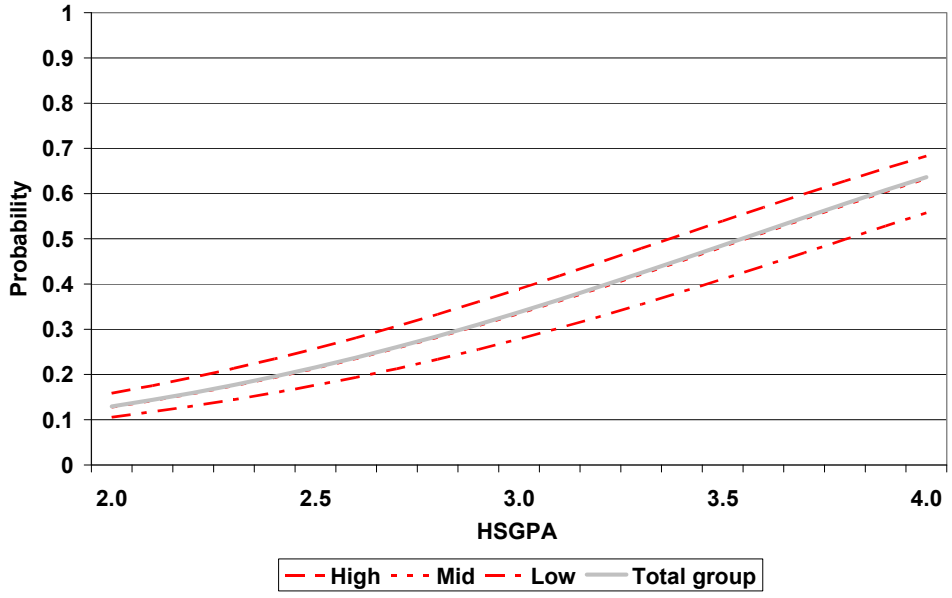

Figure 4. Estimated probabilities of six-year bachelor's degree completion by HSGPA and family income. HSGPA = high school grade point average.

For the progress to degree and degree completion outcomes, total-group models tended to slightly overpredict probabilities of success for lower-income students and underpredict those for higher-income students (Figures 3 and 4; Tables C-3 and C-4).[16] We saw these results at both types of institutions and for both predictors (by, at most, 0.07 for ACTC score and 0.08 for HSGPA). For ACTC scores beyond the 75th percentiles, the amount of overprediction and underprediction for lower- and higher-income students decreased as ACTC score increased, and approached 0 for higher-income students. In comparison, differences in probabilities resulting from the total-group and group-specific HSGPA models generally did not decrease for students with higher HSGPAs. In some cases, the opposite occurred, especially at two-year institutions (Tables C-3 and C-4).

For year 6/year 3 cumulative GPAs of 3.50 or higher, there was evidence of differential prediction for lower- and higher-income students using the total-group HSGPA model, but only for HSGPAs above 3.50 (over- and underprediction by, at most, 0.08 and 0.04, respectively; Tables C-3 and C-4). A similar result held for the 3.00 or higher criterion at four-year institutions (by, at most, 0.05 and 0.04, respectively). In contrast, there was minimal differential prediction by family income group for the 3.00 or higher criterion at two-year institutions using HSGPA. For both success levels and types of institutions, there was minimal differential prediction by family income group using the total-group ACTC score model.

Gender. For all outcomes at two- and four-year institutions, probabilities of success estimated from the ACTC group-specific models were higher for female students than for male students (Figures B-13, B-15, and B-17). This finding also held for the HSGPA group-specific models for achieving a 3.00 or higher or 3.50 or higher year 6/year 3 cumulative GPA (Figures

[16] The exception to this result was for the total-group ACTC score model that estimated probabilities for completing an associate's degree by year 3. For this outcome, there was slight overprediction for higher-income students with ACTC scores of 28 or above, and no evidence of overprediction for lower-income students.

B-16 and B-18). Gender differences in probabilities of achieving levels of year 6/year 3 cumulative GPA were generally greater when they were based on ACTC score than when they were based on HSGPA. For the progress to degree and degree completion outcomes, male and female students' chances of success based on HSGPA were comparable (generally within 4 percentage points; Figure B-14 for degree completion).

For all outcomes at both types of institutions, total-group models based on ACTC score generally overpredicted probabilities of success for male students and, to a lesser extent, underpredicted those for female students (Figure 5; Tables C-5 and C-6). Across the ACTC score scale, the maximum amount of over- and underprediction for male and female students was greater for year 6/year 3 cumulative GPA than for the progress to degree and degree completion outcomes (0.13 and 0.10 compared to 0.06 and 0.05, respectively).[17] For all outcomes at four-year institutions and for year 3 cumulative GPA at two-year institutions, the absolute differences in probabilities based on the total-group and group-specific models usually decreased as ACTC score increased for ACTC scores at or above the 75th percentile (Tables C-5 and C-6).

[17] The exception to the progress to degree and degree completion range was for associate's degree completion by year 3 where the maximum overprediction for male students was 0.10 and the maximum underprediction for female students was 0.07.

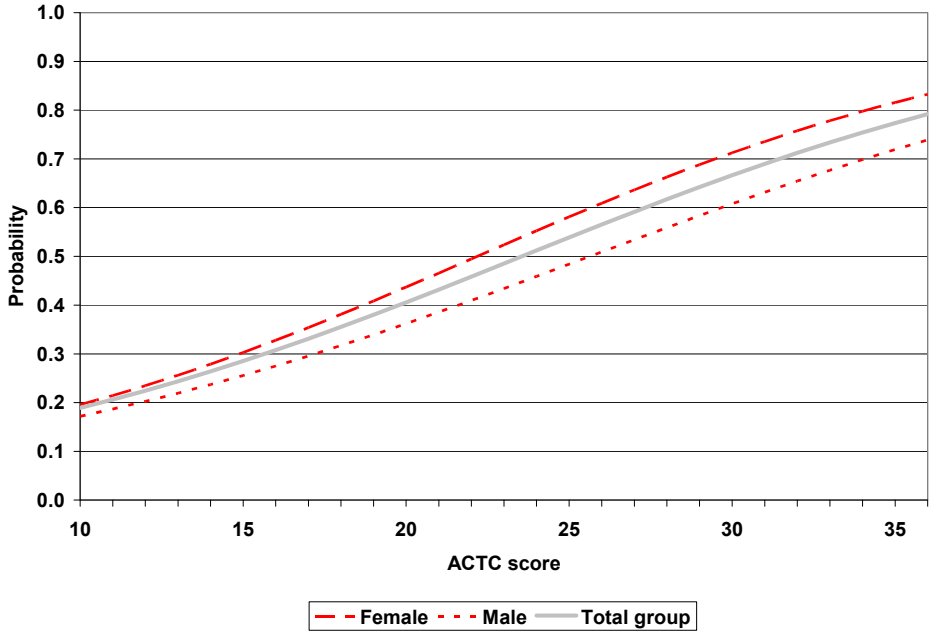

Figure 5. Estimated probabilities of six-year bachelor's degree completion by ACTC score and gender. ACTC = ACT Composite.

For the progress to degree and degree completion outcomes, total-group probabilities based on HSGPA were generally within 0.03 of the corresponding group-specific probabilities for both male and female students (Figure 6 and Tables C-5 and C-6). For cumulative GPA there was evidence of differential prediction by gender for the total-group HSGPA model (overprediction for male students by, at most, 0.09 and underprediction for female students by, at most, 0.06).[18] Moreover, as HSGPA increased the amount of overprediction for male students also increased.

[18] For cumulative GPA at two-year institutions, there was minimal underprediction of success for female students (by, at most, 0.03).

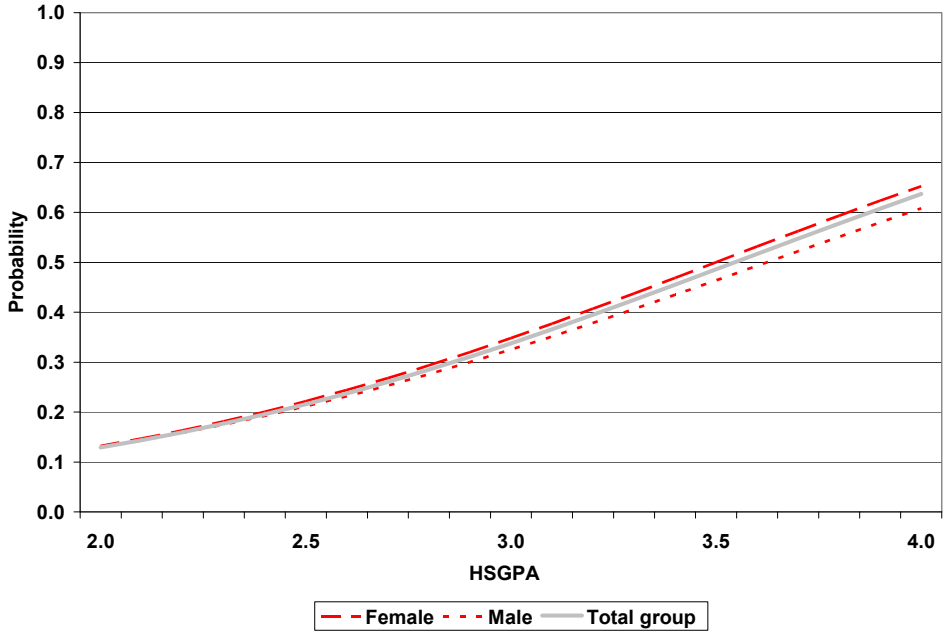

Figure 6. Estimated probabilities of six-year bachelor's degree completion by HSGPA and gender. HSGPA = high school grade point average.

Accuracy and success rates for ACTC score and HSGPA by student demographic group. In this section, we summarize median probabilities of success, ARs, ΔARs, and SRs by student demographic group across institutions with viable models based on ACTC score and/or HSGPA. These results are evaluated using the institution-specific total-group optimal selection values (where the total-group probability of success was closest to 0.50) and the group-specific probabilities of success (Appendix D, Tables D-1 to D-4 for race/ethnicity, Tables D-5 to D-8 for family income, and Tables D-9 to D-12 for gender).

In our earlier study (Radunzel & Noble, 2012a) for the total group of students, we found that median ARs, ΔARs, and SRs for the joint ACTC score and HSGPA models were generally higher than those based on the single-predictor models. A common finding in this study was that this result was seen for each student group, regardless of the outcome.

Race/ethnicity. For all three ACTC score and HSGPA model combinations, the typical probabilities of success at total-group optimal selection values generally exceeded 0.50 for White students and were less than 0.50 for minority students.[19] This finding held for most outcomes,[20] and was in general agreement with our previously reported differential prediction results by race/ethnicity.[21] In particular, we found that there was a general tendency for minority students to have lower probabilities of success than White students with the same ACTC scores/HSGPAs.[22] However, the direction and magnitude of the differences in the probabilities of success from 0.50 varied across institutions (Tables D-1 to D-4). For example, probabilities of bachelor's degree completion by year 6 at the institution-specific total-group ACTC score selection values ranged from 0.44 to 0.62 for White students and from 0.31 to 0.58 for minority students across institutions (Table D-1). In general, probabilities of success for minority students were generally lower than those for White students with the same HSGPA.[23] These differences were smaller when based on ACTC score. The total-group model that included both ACTC score and HSGPA as predictors generally resulted in the smallest amount of underprediction for White students (probabilities were closer to 0.50). For minority students, the joint model also resulted in less overprediction than the HSGPA model did.

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[19] The total-group selection values were those ACTC scores and HSGPAs that corresponded to a probability of success of 0.50 (the point where the ARs were maximized for the total group of students).

[20] For outcomes with higher total-group optimal ACTC selection values, we found that there was a tendency for slight underprediction for minority students (see results for associate's degree completion with or without transfer by year 3, Appendix D, Table D-2).

[21] Those that were based on comparing total-group and group-specific probabilities estimated using fixed-effects parameter estimates from the hierarchical logistic models.

[22] The typical amount of overprediction for minority students and underprediction for White students at total-group selection values were comparable to those estimated from the fixed-effects models at the same ACTC score or HSGPA; these estimates were not exactly the same due to differences in the approaches used to combine information across institutions.

[23] For the later progress to degree outcomes and year 6/year 3 college GPA, we found underprediction for minority students at the total-group optimal HSGPA selection values for all four-year institutions and for most two-year institutions included in this study (see minimum and maximum values in Tables D-1 to D-4).

For all three predictor models, median ARs across institutions for most of the long-term outcomes were higher for minority students than for White students.[24] Typical increases in correct classifications (ΔARs) were also substantially higher for minority students than for White students (e.g., 46% vs. 20%, respectively, for bachelor's degree completion by year 6 based on ACTC score). In contrast, typical SRs evaluated at or above the total-group optimal selection values were generally higher for White students than for minority students (e.g., 56% and 52% for bachelor's degree completion based on ACTC score). However, for all outcomes at both two- and four-year institutions, racial/ethnic differences in median SRs were smaller for the ACTC score or joint models than for the HSGPA models (e.g., 4, 5, and 10 percentage points, respectively, for bachelor's degree completion by year 6). In general, higher percentages of minority students than White students had ACTC scores and HSGPAs below the institution-specific total-group optimal selection values. Thus, substantially fewer minority students than White students had ACTC scores or HSGPAs at or above the total-group optimal values.

Family income. For the progress to degree and degree completion outcomes, the typical probabilities of success by family income group at the total-group optimal selection values were generally less than 0.50 for lower-income students (overprediction), near 0.50 for middle-income students, and above 0.50 for higher-income students (underprediction).[25] This finding generally held for all three predictor models for most, if not all institutions (Tables D-5 and D-6), but the magnitude of over- and underprediction for lower- and higher-income students varied across institutions. For example, probabilities of bachelor's degree completion by year 6 estimated from

[24] These outcomes included outcomes beyond year 2 for four-year institutions and beyond year 1 at two-year institutions.

[25] The exception to this finding was for associate's degree completion by year 3 at two-year institutions, where median probabilities of success were comparable across the three income groups.

the ACTC score and HSGPA joint model ranged from 0.40 to 0.49 across institutions for lower-income students and from 0.53 to 0.58 for higher-income students.

For two-year institutions, typical probabilities of a 3.00 or higher, or 3.50 or higher, year 3 cumulative GPA by income group at total-group optimal selection values were comparable, irrespective of the predictor used (Table D-8). For the ACTC score and joint models, this result also held at both GPA criterion levels for year 6 cumulative GPA at four-year institutions (Table D-7).[26] Across outcomes using the total-group optimal selection values, we found that HSGPA tended to overpredict success for lower-income students more than ACTC score, while the extent of underprediction for higher-income students was more similar for the two predictors.

For the later progress to degree and degree completion outcomes, median ARs across institutions were typically higher for lower-income students than for middle- and higher-income students irrespective of predictor (Tables D-5 and D-6). Correspondingly, for most of these comparisons, median ARs generally decreased as income level increased. We found a similar result for achieving a year 6/year 3 cumulative GPA of 3.50 or higher (84%, 79%, and 77% for lower-, middle-, and higher-income students at four-year institutions, Table D-7). For the earlier progress to degree outcomes and achieving a year 6/year 3 cumulative GPA of 3.00 or higher, median ARs were more comparable among the income groups. Across outcomes for all three predictor models, median ΔARs were substantially greater for lower-income students than for higher-income students, and generally greater for middle-income students than for higher-income students (Tables D-5 through D-8).

On the other hand, typical SRs for students at or above the total-group optimal selection values generally increased as income level increased (e.g., from 49% to 60% for bachelor's

[26] There was evidence of overprediction for lower-income students and underprediction for higher-income students at the total-group optimal HSGPA selection values for this outcome at four-year institutions.

degree completion and from 50% to 58% for associate's degree completion or transfer to a four-year institution based on ACTC score model).[27] For most outcomes at two-year institutions, income group differences in median SRs were generally smaller when ACTC score was used alone or jointly with HSGPA than when HSGPA was used alone (e.g., 8, 11, and 15 percentage points, respectively, for associate's degree completion or transfer to a four-year institution by year 3; Table D-6). We saw this result for both of the year 6 cumulative GPA outcomes at four-year institutions (Table D-7). For the progress to degree and degree completion outcomes at four-year institutions, income group differences in typical SRs were more comparable for all three predictor models (Table D-5). For each outcome, it was generally the case that higher percentages of lower-income students than of higher-income students had ACTC scores or HSGPAs below the institution-specific total-group optimal selection values (e.g., typical percentages of students below ACTC score selection values for bachelor's degree completion decreased from 90% to 78% as income level increased; Table D-5).

Gender. For most of the predictor models and outcomes, the typical probabilities of success at the total-group optimal selection values were generally above 0.50 for female students (underprediction) and below 0.50 for male students (overprediction).[28] Probabilities of success at the total-group optimal selection values varied across institutions (e.g., from 0.50 to 0.59 for female students and from 0.41 to 0.52 for male students using ACTC score to predict bachelor's degree completion by year 6; Table D-9). In general, using ACTC score alone tended to result in

[27] Exceptions to this finding were for completing an associate's degree by year 3 and achieving levels of year 3 cumulative GPA. The result for associate's degree completion by year 3 based on ACTC score model might be explained by higher-income students with higher ACTC scores being more likely to transfer to a four-year institution before earning an associate's degree (as evidenced by larger differences in the probabilities between the two associate's degree outcomes for higher-income students than corresponding differences for lower-income students; Figure B-7).

[28] For the progress to degree and degree completion outcomes at both types of institutions, typical probabilities of success at the total-group optimal selection values based on the HSGPA or joint models were near 0.50 for both female and male students. This result suggested minimal differential prediction by gender at the total-group optimal selection values for these outcomes and predictors.

slightly greater differential prediction by gender at the total-group optimal selection values than when HSGPA was used alone or in combination with ACTC score (Tables D-9 to D-12).[29]

For all three predictor models and most of the outcomes considered in this study, typical ARs at total-group optimal selection values were similar for female and male students.[30] Gender differences in median increases in correct classifications (ΔARs) were larger at four-year institutions than at two-year institutions, with median ΔARs consistently higher for male students than for female students. Conversely, typical SRs associated with total-group optimal selection values were consistently higher for female students than for male students (e.g., 61% and 51% for bachelor's degree completion using ACTC score). Gender differences in median SRs were smaller when HSGPA was used alone or jointly with ACTC score than when ACTC score was used alone (e.g., 5, 5, and 10 percentage points, respectively, for bachelor's degree completion by year 6). For each outcome, typical percentages of students scoring below the institution-specific total-group optimal ACTC score selection values were similar for female and male students. In contrast, for HSGPA, corresponding median percentages were higher for male students than for female students.

Differential Effects on Student Demographic Groups of Using ACT College Readiness Benchmarks for Predicting Long-Term College Success

In this section, we evaluate the differential effects of the ACT College Readiness Benchmarks for predicting college success through degree completion among student demographic groups. We first present descriptive statistics on ACT Benchmark attainment for enrolled students, as well as for the entire applicant pool disaggregated by race/ethnicity, family

[29] For year 6/year 3 cumulative GPA, there was evidence of overprediction for male students and underprediction for female students at the total-group optimal selection values for HSGPA (by, at most, 0.09 for the typical probabilities of success; Tables D-11 and D-12).

[30] The exception was for achieving a year 6/year 3 cumulative GPA of 3.50 or higher (Tables D-11 and D-12); median ARs were slightly higher for male students than for female students.

income, and gender. We then evaluate the typical probabilities of success, SRs, and ΔSRs associated with the ACT College Readiness Benchmark scores among student demographic groups.

Descriptive statistics. At four-year institutions, the typical percentages of students meeting the ACT Benchmarks were higher among enrolled students than among students in the applicant pool. In contrast, the typical Benchmark attainment percentages for students at two-year institutions were comparable for the enrolled and applicant pool samples, and were lower than those for students at four-year institutions. These findings were consistently seen when disaggregated by race/ethnicity, family income range, and gender (Appendix E, Tables E-1 to E-3).

At both two- and four-year institutions, median percentages of students meeting the ACT Benchmarks were substantially higher for White students than for minority students and for higher-income students than for lower-income students (Tables E-1 and E-2). Typical Benchmark attainment percentages were slightly higher for female students than for male students in English and reading, but were slightly lower in mathematics and science (Table E-3).

Probabilities of success and success rates for ACT College Readiness Benchmarks by student demographic group. For each student demographic group, we calculated median probabilities of success, SRs, and ΔSRs associated with ACT Benchmark scores across all institutions with available outcome data. For these analyses, we evaluated year 6/year 3 cumulative GPA for the 3.00 or higher criterion level only.[31]

A common finding that we observed across student demographic groups was that the typical probabilities of success, SRs, and ΔSRs were generally higher for the ACT Mathematics

[31] For this criterion level, the ACT Benchmark scores are more similar to the typical total-group optimal ACTC score selection values.

and Science Benchmarks than for the ACT English and Reading Benchmarks. This finding is consistent with our previously reported result for the total group of students (Radunzel & Noble, 2012a).

Race/ethnicity. The probabilities of success at the Benchmark scores for both White and minority students varied substantially across institutions. For example, probabilities of bachelor's degree completion by year 6 estimated at the ACT English Benchmark score ranged from 0.12 to 0.77 for White students and from 0.10 to 0.64 for minority students. Median probabilities of success associated with the ACT College Readiness Benchmarks were higher for White students than for minority students (Appendix F, Tables F-1 and F-2). However, racial/ethnic differences in the median probabilities of success at the Benchmark scores were smaller than those in the observed median proportions of success, where prior achievement was not considered (see Tables A-1 and A-2). For example, for bachelor's degree completion by year 6, racial/ethnic differences in probabilities ranged from 0.05 to 0.09 across Benchmark subject areas (e.g., 0.34 vs. 0.28 for the English Benchmark), compared to an observed difference in proportions (irrespective of Benchmark attainment) between White and minority students of 0.14 (0.44 vs. 0.30). This result generally held across outcomes at both two- and four-year institutions.

For White students, median probabilities of success at the Benchmark scores were similar to those for the total group of students (generally differed by only 0.01 to 0.02).[32] For minority students, probabilities of college success at the Benchmarks were typically lower than those for

[32] For achieving a year 6 cumulative GPA of 3.00 or higher, the typical group-specific probabilities of success at the ACT English and Reading Benchmark for White students were greater than those estimated from the total-group model by 0.04 (that is, the total-group model slightly underpredicted the success of White students for this outcome; Table F-1).

the total group of students.[33] Thus, the total-group models tended to overpredict college success for minority students scoring at the Benchmarks. It was generally the case that there was less overprediction associated with the ACT Mathematics Benchmark than for the other Benchmarks.[34] For example, for bachelor's degree completion by year 6, differences between the typical probability estimates for the total group and those for minority students were 0.07, 0.04, 0.07, and 0.05 at the ACT English, Mathematics, Reading, and Science Benchmarks, respectively.

Typical SRs associated with the ACT Benchmark scores were slightly higher for White students than for minority students. This finding held for all outcomes at both two- and four-year institutions and for each of the four Benchmarks (Tables F-1 and F-2). For example, for bachelor's degree completion by year 6, the median SR associated with the ACT Mathematics Benchmark was 53% for White students, compared to 48% for minority students. Racial/ethnic differences in median SRs were generally smaller for the ACT Mathematics Benchmark than for the other Benchmarks (e.g., 10, 5, 9, and 7 percentage points for the English, Mathematics, Reading, and Science Benchmarks, respectively, for bachelor's degree completion by year 6).[35] In contrast, ΔSRs associated with the Benchmark scores were typically higher for minority students than for White students.

Family income. Median probabilities of success associated with the ACT Benchmarks were greater for higher-income students than for middle- and lower-income students; lower-income students tended to have the lowest estimated probabilities of success (Appendix F,

[33] Group-specific probabilities of success for minority students were typically lower than total-group probabilities at the Benchmark scores by 0.02 to 0.09 for four-year institutions and by 0.02 to 0.07 for two-year institutions. The one exception to this result was for achieving a year 6 cumulative GPA of 3.00 or higher at four-year institutions, where the total-group model typically overpredicted success for minority students by 0.11 to 0.16.

[34] Differences in the amount of overprediction for minority students between Benchmarks were relatively small (ranged from 0.02 to 0.07 for four-year institutions and from 0.01 to 0.04 for two-year institutions).

[35] Exceptions to this finding were for the two degree completion outcomes at two-year institutions where racial/ethnic differences in median SRs were more comparable across the Benchmarks (Table F-2).

Tables F-3 and F-4).[36] However, differences in median probabilities of success across income groups at the Benchmark scores were somewhat smaller than differences in the observed median proportions of success reported previously (Tables A-3 and A-4), when prior achievement was not taken into accounted (by, at most, 0.08). This finding held for most outcomes at both types of institutions.

Median probabilities of success for middle-income students at the Benchmark scores were similar to corresponding median total-group probabilities (higher by, at most, 0.03). Probabilities at the Benchmarks for lower-income students were typically lower than the corresponding total-group probabilities (by 0.02 to 0.09 at four-year institutions and by 0.01 to 0.06 at two-year institutions).[37] Conversely, typical probabilities for higher-income students were greater than the corresponding median total-group probabilities (by 0.01 to 0.06 at four-year institutions and by 0.03 to 0.07 at two-year institutions).[38] These results taken together suggest that across the outcomes, total-group models for predicting students' chances of college success at the ACT Benchmark scores tended to slightly overpredict probabilities of success for lower-income students and underpredict success for higher-income students.

Typical SRs associated with the ACT Benchmark scores generally increased as family income range increased (e.g., from 38% to 50% for bachelor's degree completion by year 6 using the ACT English Benchmark). This finding held for most outcomes at two- and four-year

[36] Exceptions to this finding were for completing an associate's degree by year 3 and achieving a year 3 cumulative GPA of 3.00 or higher. For these outcomes, median probabilities of success were comparable across the family income groups (Table F-4).

[37] The one exception to this finding was for achieving a year 3 cumulative GPA of 3.00 or higher at two-year institutions. For this outcome, group-specific probabilities for lower-income students were similar to the total-group probabilities (Table F-4).

[38] Exceptions to this finding were for completing an associate's degree by year 3 and achieving a year 3 cumulative GPA of 3.00 or higher. For these outcomes, group-specific probabilities at the Benchmark scores for higher-income students were more similar to the corresponding total-group probabilities (Table F-4).

institutions and across all four Benchmarks (Tables F-3 and F-4).[39] Income differences in median SRs were generally smaller for the ACT Mathematics Benchmark than for the other Benchmarks (e.g., 12, 9, 13, and 11 percentage points for the English, Mathematics, Reading, and Science Benchmarks, respectively, for bachelor's degree completion by year 6). Typical ΔSRs associated with the Benchmark scores were higher for lower-income students than for higher-income students.[40]

Gender. Median probabilities of success associated with the ACT Benchmarks were generally higher for female students than for male students (Appendix F, Tables F-5 and F-6). Gender differences in median probabilities of success were slightly larger for the ACT Mathematics and Science Benchmarks than for the English and Reading Benchmarks.

For the progress to degree and degree completion outcomes, median probabilities of success at the Benchmark scores were slightly higher than those for the total group of students for female students (underprediction), and lower for male students (overprediction) (generally only by 0.01 to 0.08). For each of the outcome and Benchmark combinations, the underprediction for female students generally corresponded to a somewhat similar degree of overprediction for male students. For achieving a year 6/year 3 cumulative GPA of 3.00 or higher, there tended to be more differential prediction by gender associated with the Benchmark scores than was seen for the other outcomes (absolute differences in median probabilities ranged from 0.04 to 0.14 for this outcome). In addition, the degree of overprediction for male students was larger than the degree of underprediction for female students. These findings were in general

[39] Exceptions to this finding included completing an associate's degree by year 3 and achieving a year 3 cumulative GPA of 3.00 or higher. For these outcomes, median SRs were more comparable across the three family income groups (Table F-4).

[40] Differences in typical ΔSRs between lower- and higher-income students were generally larger for the ACT Mathematics and Science Benchmarks than for the English and Reading Benchmarks.

agreement with the ones noted earlier for the probabilities of success evaluated at the total-group optimal ACTC score selection values.

Typical SRs associated with the ACT Benchmark scores were higher for female students than for male students. This finding held for all outcomes at two- and four-year institutions and across all four Benchmarks (Tables F-5 and F-6). Gender differences in median SRs were slightly larger for the ACT Mathematics and Science Benchmarks than for the English and Reading Benchmarks (e.g., 12 vs. 7 to 8 percentage points, respectively, for bachelor's degree completion by year 6). In addition, typical ΔSRs associated with the ACT Benchmarks were slightly higher for female students than for male students in mathematics and science,[41] and were similar for female and male students in English and reading.

Discussion

In this study, we evaluated the differential effects on racial/ethnic, family income, and gender groups of using ACTC scores and HSGPAs for identifying possible applicants who are likely to progress towards and complete a degree. This study is unique in that it is the first study to evaluate differential prediction and differences in prediction accuracy by student groups for multiple measures of college success beyond the first year at both two- and four-year institutions. For the most part, results from this study are in general agreement with those from prior studies that examined first-year college grades or GPA as the outcome (Sanchez, 2013; Mattern et al., 2008; Noble, 2003; Young, 2001; results previously summarized in the Introduction section).

In this study, we used multiple approaches to examine the differential effects among student demographic groups, including: (1) comparing the total-group and group-specific probabilities of success across the entire ACTC score and HSGPA scales (using the fixed effects

[41] The exception to this finding was for achieving a year 6 cumulative GPA of 3.00 or higher. For this outcome, median ΔSRs associated with the Benchmarks were similar between male and female students (Table F-5).

parameter estimates for the models), (2) evaluating how much the typical and individual institutional group-specific probabilities of success at the total-group optimal selection values differed from 0.50, and (3) comparing the prediction accuracy at the total-group optimal selection values among the student groups. The first two approaches that examined differential prediction among student groups led to the same general conclusions across institutions for each student demographic group (discussed in detail below). The latter two approaches demonstrated that the degree of over- and underprediction, as well as the percentages of correction classifications, at the total-group optimal selection values varied across institutions (see minimum and maximum values in Appendices D and F). The third approach revealed a common finding that was seen across student demographic groups, namely that using both ACTC score and HSGPA jointly improved prediction accuracy and success rates for most of the outcomes over those based on HSGPA alone.

Below, we summarize the general findings for each student demographic group, point out the results from our study that differ from prior research, and discuss some possible explanations for the results.

Race/Ethnicity

Results from this study suggest that racial/ethnic minority students are not *disadvantaged* when ACT test scores are used to help inform college admissions decisions and to identify those students who are likely to be successful in college beyond the first year. This statement is supported by the results showing that ACTC score was somewhat of a more accurate predictor of long-term college success for racial/ethnic minority students than for White students.[42] In

[42] Depending on the outcome, accuracy rates at total-group optimal selection values were 2 to 14 percentage points higher for underrepresented minority students than for White students. Differences in accuracy rates among racial/ethnic groups were larger for the later college outcomes and for achieving higher levels of year 6/year 3 cumulative GPA.

addition, for all the outcomes examined in this study, increases in the percentages of correct classifications associated with using these measures over not using them (i.e., selecting all students) were substantially greater for minority students than for White students. These findings were also seen when HSGPA was used as the predictor.

We also found that total-group models based on either ACTC score, HSGPA, or both ACTC score and HSGPA generally overestimated minority students' chances of success.[43] Overprediction of long-term college success for minority students was more pronounced when HSGPA was used, rather than ACTC score. Furthermore, the degree of overprediction for minority students generally increased as HSGPA increased, and decreased as ACTC score increased. Overprediction for minority students was also observed at the ACT Benchmark scores. Little to no underprediction was found for White students using any of the pre-college measures.

Other first-year college outcome studies (Sanchez, 2013; Mattern et al., 2008; Noble, 2003; Zwick & Sklar, 2005) evaluated differences among individual racial/ethnic minority groups. These studies found greater overprediction for African American students than for Hispanic or White students, a finding also reported in a comprehensive review of earlier studies (Young, 2001). Sanchez (2013) also found slightly greater prediction accuracy for African American students than for Hispanic or White students for first-year GPAs of 3.00 or higher. Unfortunately in this study, due to smaller numbers of minority students, we were unable to examine results for long-term college success by the individual racial/ethnic minority groups.

A consistent finding across studies is that the overprediction of college success for racial/ethnic minority students tends to be more severe when HSGPA is used alone, compared to

[43] Total-group predictions based on ACTC score were generally found to overestimate underrepresented minority students' likelihood of long-term college success by, at most, 0.11, and to underestimate White students' likelihood of success by, at most, 0.04 across outcomes.

using test scores alone or jointly with HSGPA. This finding might be explained by racial/ethnic differences in academic preparation and/or educational opportunities (e.g., attending underresourced, understaffed schools and not having access to sufficiently rigorous high school coursework (ACT, 2010b)). These differences in academic preparation are generally reflected in standardized test scores (ACT, 2005), but may not be in HSGPA. For example, because of large disparities between high schools in their grading practices and the rigor of their courses, a high-ranking or high GPA student from one school could differ substantially from a high-ranking or high GPA student from another institution in his/her preparedness for college-level work. HSGPA can also be affected by grade inflation (Woodruff & Ziomek, 2004).

Across the outcomes considered in this study, the typical degree of overprediction for minority students associated with using standardized test scores or HSGPA alone generally fell within the wide range of reported values from earlier studies (where first-year GPA was the outcome). In this study, there was greater overprediction for minority students at four-year institutions for achieving levels of year 6 cumulative GPA than there was for the progress to degree and degree completion outcomes. At two-year institutions the degree of overprediction for racial/ethnic minority students was more comparable across the outcomes, and was similar to that seen at four-year institutions for the progress to degree outcomes. None of the other studies that we reviewed reported results by institution type: they either included four-year institutions only in their sample or combined results for two- and four-year institutions.

As previously suggested in the literature (Zwick & Sklar, 2005; Young, 2001), differential prediction of college success for racial/ethnic groups might be due to racial/ethnic differences in other factors (cultural, societal, or institutional) that influence students' likelihood of success in college. For example, students in the minority on a campus with little diversity in

the study body composition may experience more feelings of anxiety, be less socially engaged in college, and have a more difficult time making the transition from high school to college (Carter, 2006). And, as a result, they may perform below expectations based on their pre-college achievement. Research has also shown that minority students tend to be less knowledgeable about the steps that are needed to prepare for higher education, such as knowing how to finance a college education or plan for educational and career goals (Tym, McMillion, Barone, & Webster, 2004), thereby putting them at somewhat of a disadvantage for succeeding in college.

Smaller percentages of minority than White students in the applicant pool were at or above the total-group optimal selection values or ACT Benchmark scores. Minority students are typically not as academically prepared for college (as evidenced by lower average ACTC scores and HSGPAs, and being less likely to meet the ACT College Readiness Benchmarks (ACT, 2012)). However, racial/ethnic differences in chances of long-term college success and in percentages of successful students at the ACT Benchmark scores were smaller than racial/ethnic differences in the observed college success rates (irrespective of Benchmark attainment). In addition, racial/ethnic differences in chances of college success and in percentages of successful students (from among those expected to be successful) were smaller when examined by ACTC score than by HSGPA. These findings agree with results from two earlier studies (Radunzel & Noble, 2012b; ACT, 2010b) that showed that college readiness helps reduce racial/ethnic gaps in college success rates. For example, one of the studies (Radunzel & Noble, 2012b) found that differences in six-year bachelor's degree completion rates between African American or Hispanic students and White students were reduced by more than 50% among those who had met all four ACT College Readiness Benchmarks.

Family income

Results from this study suggest that lower-income students are not *disadvantaged* when ACT test scores are used to help inform college admissions decisions and identify those students who are likely to be successful in college beyond the first year. This statement is supported by the result that prediction accuracy using ACTC score total-group optimal selection values for lower-income students was greater than or equivalent to that for higher-income students.[44] In addition, for all the outcomes examined in this study, increases in the percentages of correct classifications associated with using pre-college academic measures over not using them were greater for lower-income students than for higher-income students. These findings were also seen when HSGPA was used as the predictor.

In this study, we also found that total-group models based on either ACTC score, HSGPA, or both predictors slightly overpredicted the chances of lower-income students progressing towards and completing a degree.[45] For these same outcomes, students' chances were slightly underpredicted for higher-income students; there was little to no differential prediction for middle-income students. For the year 6/year 3 cumulative GPA outcomes, there was little to no differential prediction among family income groups based on ACTC score. This finding did not hold for HSGPA. In fact, the degrees of over- and underprediction for lower- and higher-income students across outcomes were slightly greater for HSGPA than for ACTC score.[46] In addition, there was a tendency for over- and underprediction for lower- and higher-

[44] Depending on the outcome, accuracy rates at total-group optimal selection values were 0 to 10 percentage points higher for lower-income students than for higher-income students. Differences in accuracy rates among income groups were larger for the later college outcomes and for achieving higher levels of year 6/year 3 cumulative GPA.

[45] Total-group predictions based on ACTC score were generally found to overestimate lower-income students' likelihood of long-term college success by, at most, 0.07, and to underestimate higher-income students' likelihood of success by, at most, 0.07 across outcomes.

[46] This finding might be explained by differences between income groups in academic preparation and/or educational opportunities (a reason previously suggested for why there is a larger degree of differential prediction by race/ethnicity associated with HSGPA than with ACTC score).

income students to increase as HSGPA increased, and decrease or remain the same as ACTC score increased. Total-group models at the ACT Benchmark scores also slightly overpredicted students' chances of progressing towards and completing a degree for lower-income students and underpredicted them for higher-income students.

Sanchez (2013), the only other published study that evaluated differential prediction for family income groups, found similar prediction accuracy results for first-year GPA to those reported here for long-term outcomes. One difference in the ACTC score results between these two studies was that there was evidence of differential prediction among family income groups for first-year GPA (Sanchez study) but not for year 6/year 3 cumulative GPA in this study. However, GPA results for this study were based on a more homogenous sample than the Sanchez study, and were disaggregated by institution type. In particular, this study was based on students who were still enrolled six (three) years later *or* had completed a bachelor's (associate's) degree prior to the end of year 6 (year 3): that is, those students who were persisting and/or succeeding in college through year 6 (year 3).

Differential prediction in college success by family income might be due to income group differences in other factors that influence students' chances of success in college. These might include those previously discussed for race/ethnicity (cultural, societal, or institutional). But, lower-income students are also more likely than their peers to be first-generation students and to have non-academic obligations; they are also more likely to have work and/or family responsibilities that can influence their study habits and chances of long-term college success (Hurtado, Laird, & Perorazio, 2010; Engle & Tinto, 2008).

In contrast to that seen for race/ethnicity, income group differences in students' chances of progressing towards and completing a degree were slightly but not dramatically reduced when

pre-college achievement was taken into account. Another study (Radunzel & Noble, 2012b) also found that reductions in family income gaps in retention and degree completion rates were generally smaller than those found for racial/ethnic groups when the number of ACT Benchmarks met was taken into account. These findings highlight the different types of obstacles lower-income students face compared to other student groups, even among those who are academically prepared for college. It has been suggested in the literature that these obstacles can be overcome with financial assistance and effective institutional support programs (Hurtado, Laird, & Perorazio, 2010).

Gender

Results from this study suggest that ACT test scores are useful in helping inform college admissions decisions and identifying those male and female students who are likely to be successful in college beyond the first year. Percentages of correct classifications were comparable for male and female students for almost all outcomes examined. In addition, increases in prediction accuracy associated with using the pre-college academic measures (compared to not using them) were relatively large for both gender groups, especially for the later outcomes and for achieving a year 6/year 3 cumulative GPA of 3.50 or higher.

Consistent with results previously reported on the ACT and SAT test scores (Sanchez, 2013; Mattern et al., 2008; Young, 2001) using first-year college GPA as the outcome, we found that year 6/year 3 cumulative GPA was underpredicted for female students and overpredicted for male students.[47] There was slightly greater under- and overprediction by gender associated with ACTC score than with HSGPA. In comparison, the degree of differential prediction by gender was less pronounced for the progress to degree and degree completion outcomes than for the

[47] Total-group predictions based on ACTC score were generally found to overestimate male students' likelihood of long-term college success by, at most, 0.13, and to underestimate female students' likelihood of success by, at most, 0.10.

cumulative GPA outcomes. ACT Benchmark scores also slightly underpredicted longer-term college outcomes for female students and overpredicted them for male students.

As previously suggested in the literature (Mattern et al., 2008; Young, 2001), a plausible explanation for female students doing better and male students doing worse than predicted, given the same ACT test score might be due to differences in noncognitive characteristics between the two gender groups. Prior research (Robbins, Allen, Casillas, Peterson, & Le, 2006; Allen, Robbins, Casillas, & Oh, 2008) has shown that academic behaviors provide additional information that increases accuracy in identifying students who are at risk of poor grades in college and for dropping out, beyond measures of academic achievement. It has also been shown that female students score slightly higher on scales of noncognitive skills in the areas of academic discipline, commitment to college, and study skills (Le, Casillas, Robbins, & Langley, 2005). Other research has suggested that female students are also more likely than male students to seek out and use support services at postsecondary institutions (Angrist, Lang, & Oreopoulos, 2009), which can help improve students' study skills and chances of success in college.

A study by Allen & Robbins (2010) found that even after controlling for first-year academic performance, motivation (as measured by the Academic Discipline scale from ENGAGE® measured at onset of college), and interest-major congruence, male students were less likely than female students to complete a bachelor's degree in a timely manner. This finding supports the hypothesis that there are gender differences in other characteristics associated with a student's likelihood of progressing towards and completing a degree. Later measures of motivation would better capture the level of motivational skills that emerge in response to the student's college environment.

A reasonable explanation as to why the differential prediction by gender seems to be less severe for HSGPA than for ACT test scores is that HSGPA likely measures aspects of both the cognitive and noncognitive components of college success. For example, HSGPA is not only affected by level of content mastery, but is also affected by a student's personal behaviors, such as whether the student is prudent about taking good notes, putting forth effort and participating in class, completing homework assignments, and preparing well for course exams. ACT test scores, on the other hand, measure only the cognitive components. This interpretation is supported by results from a prior study (Allen et al., 2008) that found that students' level of academic self-discipline was statistically related to HSGPA, but was not related to ACTC score.

Conclusions

Some researchers have suggested that standardized test scores like the ACT test are not useful and not predictive of long-term college success, especially for underrepresented minority and lower-income students (Soares, 2012). Other researchers have reported that SAT/ACT test scores add little information to predicting long-term college success, including degree completion, after statistically controlling for HSGPA (Bowen, Chingos, & McPherson, 2009). However, results from this study and from our earlier study (Radunzel & Noble, 2012a) do not support this view.

Regardless of student demographic group, ACTC score prediction accuracy for progress to degree and degree completion is moderately high (62% to 73% at four-year institutions and 62% to 86% at two-year institutions). For most of the outcomes and student demographic groups examined, using both ACTC score and HSGPA improves prediction accuracy and identification of successful students among those expected to be successful. Moreover, overprediction of long-term college success for underrepresented minority and lower-income students was more severe

when HSGPA was used alone, compared to when ACTC score was used alone or in combination with HSGPA in the prediction models. In particular, differences in students' chances of college success among racial/ethnic and family income groups were smaller when examined by ACTC score than by HSGPA. These findings taken together provide further evidence of the incremental benefit of using both ACTC score and HSGPA for predicting college success beyond the first year. Using multiple measures is consistent with ACT's recommended usage for college success predictions. In addition, the ACT Benchmark scores were found to be useful for predicting long-term college success for all students, irrespective of student demographic characteristics, providing further validity evidence for using them as measures of college readiness.

Other studies (Robbins, et al., 2006; Lotkowski, Robbins, & Noeth, 2004) have shown that students who are academically prepared for college, academically self-disciplined, socially engaged, and committed to college are more likely than those who are not to persist to degree completion. These findings together with the results from this study also suggest that there is a need to ensure that *all* students are offered guidance and have the opportunity to connect their educational aspirations to solid academic preparation and behaviors in high school, thereby better preparing and equipping them to succeed in college or career. Given the findings from this study for pre-enrollment achievement measures, future research should examine whether the effects of noncognitive student characteristics on early and long-term college success differ among student demographic groups after accounting for pre-college academic achievement.

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Appendix A

Tables A-1 to A-7

Table A-1

Distributions of Mean ACTC Scores, HSGPAs, College Success Rates, and College GPAs across Four-Year Institutions by Applicant/Enrollment Status and Race/Ethnicity

Enrollment status	Predictor variable	Race/ ethnicity	Number of students		Mean	
			Med	Min/Max	Med	Min/Max
Applicant pool	ACTC	White	4,278	126/33,446	21.2	19.0/23.6
		Minority	969	19/7,441	17.8	15.9/20.1
	HSGPA	White	4,278	126/33,446	3.25	3.00/3.56
		Minority	969	19/7,441	2.96	2.70/3.34
Enrolled students	ACTC	White	901	16/8,064	22.0	16.6/26.2
		Minority	187	9/1,413	19.0	15.8/22.7
	HSGPA	White	901	16/8,064	3.35	2.97/3.75
		Minority	187	9/1,413	3.09	2.74/3.68
	Progress year 1	White	1,086	38/8,064	72	40/90
		Minority	206	9/1,413	55	12/85
	Progress year 2	White	1,082	38/8,064	56	25/84
		Minority	206	9/1,413	40	10/78
	Progress year 3	White	1,058	37/8,064	48	21/80
		Minority	206	9/1,413	34	8/76
	Progress year 4	White	1,054	38/8,064	46	21/80
		Minority	206	9/1,413	31	8/74
	Bachelor's degree	White	901	16/8,064	44	17/80
		Minority	187	9/1,413	30	0/70
	Year 6 cum GPA[a]	White	463	7/5,258	3.17	2.83/3.53
		Minority	78	1/847	2.87	2.28/3.28

Note. Med = Median; Min = Minimum; Max = Maximum; ACTC = ACT Composite; HSGPA = high school grade point average. Underrepresented minority students include African American, American Indian, and Hispanic students. Because some institutions provided data for some but not all of the college outcomes, the descriptive statistics in the table are based on 61 four-year institutions for ACTC score, HSGPA, and bachelor's degree completion by year 6, 50 institutions for the progress to degree outcomes, and 57 institutions for year 6 cumulative GPA.

[a] Student's cumulative GPAs at degree completion were included in year 6 GPA analyses for students who graduated with a bachelor's degree before the end of year 6.

Table A-2

Distributions of Mean ACTC Scores, HSGPAs, College Success Rates, and College GPAs across Two-Year Institutions by Applicant/Enrollment Status and Race/Ethnicity

Enrollment status	Predictor variable	Race/ ethnicity	Number of students		Mean	
			Med	Min/Max	Med	Min/Max
Applicant pool	ACTC	White	1,648	87/11,747	18.7	17.7/20.7
		Minority	458	12/3,396	16.9	15.2/19.1
	HSGPA	White	1,648	87/11,747	3.07	2.87/3.25
		Minority	458	12/3,396	2.85	2.62/3.12
Enrolled students	ACTC	White	788	68/6,901	18.8	17.6/20.9
		Minority	225	9/1,842	16.8	15.2/19.2
	HSGPA	White	788	68/6,901	3.05	2.85/3.31
		Minority	225	9/1,842	2.87	2.61/3.24
	Progress year 1	White	740	55/6,413	54	19/78
		Minority	210	7/1,647	38	10/75
	Progress year 2	White	740	68/6,448	42	9/63
		Minority	210	9/1,667	30	10/56
	Progress year 3	White	739	68/6,387	36	5/57
		Minority	209	9/1,674	24	0/49
	Associate's degree	White	788	68/6,901	15	5/37
		Minority	225	9/1,842	8	0/29
	Associate's degree plus transfer	White	913	113/6,901	24	7/44
		Minority	257	12/1,842	15	4/37
	Year 3 cum GPA[a]	White	317	17/3,466	2.86	2.64/3.16
		Minority	60	1/842	2.58	1.53/3.28

Note. Med = Median; Min = Minimum; Max = Maximum; ACTC = ACT Composite; HSGPA = high school grade point average. Underrepresented minority students include African American, American Indian, and Hispanic students. Because some institutions provided data for some but not all of the college outcomes, the descriptive statistics in the table are based on 43 two-year institutions for ACTC score, HSGPA, and associate's degree completion by year 3, 42 institutions for the progress to degree outcomes and year 3 cumulative GPA, and 40 institutions for associate's degree or transfer to a four-year institution by year 3.

[a] Student's cumulative GPAs at degree completion were included in year 3 GPA analyses for students who graduated with an associate's degree before the end of year 3.

Table A-3

Distributions of Mean ACTC Scores, HSGPAs, College Success Rates, and College GPAs across Four-Year Institutions by Applicant/Enrollment Status and Family Income

Enrollment status	Predictor variable	Family income	Number of students		Mean	
			Med	Min/Max	Med	Min/Max
Applicant pool	ACTC	Low	1,786	53/9,573	19.2	15.9/21.7
		Mid	2,760	74/17,237	20.6	16.6/22.9
		High	1,725	32/20,132	21.3	17.5/23.9
	HSGPA	Low	1,786	53/9,573	3.11	2.79/3.38
		Mid	2,760	74/17,237	3.22	2.83/3.49
		High	1,725	32/20,132	3.27	2.84/3.56
Enrolled students	ACTC	Low	375	18/1,488	20.4	15.6/23.6
		Mid	492	23/3,425	21.6	16.4/24.8
		High	421	9/5,108	22.1	16.7/26.2
	HSGPA	Low	375	18/1,488	3.24	2.78/3.74
		Mid	492	23/3,425	3.34	2.81/3.72
		High	421	9/5,108	3.34	2.82/3.73
	Progress year 1	Low	402	18/1,447	61	18/94
		Mid	650	23/3,425	68	27/88
		High	421	9/5,108	72	39/92
	Progress year 2	Low	402	18/1,449	45	15/78
		Mid	645	23/3,425	56	18/81
		High	421	9/5,108	60	27/89
	Progress year 3	Low	402	17/1,410	38	10/74
		Mid	633	23/3,425	49	18/78
		High	420	9/5,108	53	25/82
	Progress year 4	Low	402	18/1,400	37	10/73
		Mid	634	23/3,425	46	18/78
		High	420	8/5,108	50	26/82
	Bachelor's degree	Low	375	18/1,488	33	10/76
		Mid	492	23/3,425	43	17/78
		High	421	9/5,108	47	24/82

Table A-3 (cont.)

Enrollment status	Predictor variable	Family income	Number of students		Mean	
			Med	Min/Max	Med	Min/Max
Enrolled students	Year 6 cum GPA[a]	Low	148	5/907	3.04	2.74/3.47
		Mid	272	13/2,161	3.13	2.76/3.49
		High	209	6/3,475	3.18	2.92/3.42

Note. Med = Median; Min = Minimum; Max = Maximum; ACTC = ACT Composite; HSGPA = high school grade point average. Low is for lower-income students (annual family income < $30,000), Mid is for middle-income students (annual family income between $30,000 and $60,000), and High is for higher-income students (annual family income > $60,000). Because some institutions provided data for some but not all of the college outcomes, the descriptive statistics in the table are based on 61 four-year institutions for ACTC score, HSGPA, and bachelor's degree completion by year 6, 50 institutions for the progress to degree outcomes, and 57 institutions for year 6 cumulative GPA.

[a] Student's cumulative GPAs at degree completion were included in year 6 GPA analyses for students who graduated with a bachelor's degree before the end of year 6.

Table A-4

Distributions of Mean ACTC Scores, HSGPAs, College Success Rates, and College GPAs across Two-Year Institutions by Applicant/Enrollment Status and Family Income

Enrollment status	Predictor variable	Family income	Number of students		Mean	
			Med	Min/Max	Med	Min/Max
Applicant pool	ACTC	Low	862	22/4,902	17.6	16.0/19.8
		Mid	937	51/7,061	18.5	17.2/20.4
		High	355	47/4,509	19.1	17.7/20.6
	HSGPA	Low	862	22/4,902	2.98	2.74/3.15
		Mid	937	51/7,061	3.07	2.84/3.25
		High	355	47/4,509	3.09	2.86/3.31
Enrolled students	ACTC	Low	403	18/2,654	17.7	16.1/20.5
		Mid	353	39/4,154	18.4	17.1/20.6
		High	138	26/2,743	18.9	17.4/20.9
	HSGPA	Low	403	18/2,654	2.97	2.72/3.19
		Mid	353	39/4,154	3.06	2.82/3.30
		High	138	26/2,743	3.07	2.85/3.32
	Progress year 1	Low	383	15/2,399	45	22/74
		Mid	351	31/3,841	53	16/79
		High	145	23/2,564	59	14/82
	Progress year 2	Low	383	18/2,430	34	9/56
		Mid	351	39/3,869	42	9/63
		High	145	23/2,567	47	6/67
	Progress year 3	Low	383	18/2,410	28	5/49
		Mid	351	39/3,860	36	5/57
		High	142	23/2,538	41	0/62
	Associate's degree	Low	403	18/2,654	12	4/30
		Mid	353	39/4,154	17	4/37
		High	138	26/2,743	15	2/39
	Associate's degree plus transfer	Low	426	46/2,654	17	6/36
		Mid	456	85/4,154	26	7/44
		High	178	26/2,743	30	9/48

Table A-4 (cont.)

Enrollment status	Predictor variable	Family income	Number of students		Mean	
			Med	Min/Max	Med	Min/Max
Enrolled students	Year 3 cum GPA[a]	Low	126	7/1,155	2.79	2.40/3.12
		Mid	159	14/2,076	2.84	2.65/3.13
		High	72	4/1,498	2.85	2.47/3.19

Note. Med = Median; Min = Minimum; Max = Maximum; ACTC = ACT Composite; HSGPA = high school grade point average. Low is for lower-income students (annual family income < $30,000), Mid is for middle income students (annual family income between $30,000 and $60,000), and High is for higher-income students (annual family income > $60,000). Because some institutions provided data for some but not all of the college outcomes, the descriptive statistics in the table are based on 43 two-year institutions for ACTC score, HSGPA, and associate's degree completion by year 3, 42 institutions for the progress to degree outcomes and year 3 cumulative GPA, and 40 institutions for associate's degree or transfer to a four-year institution by year 3.

[a] Student's cumulative GPAs at degree completion were included in year 3 GPA analyses for students who graduated with an associate's degree before the end of year 3.

Table A-5

Distributions of Mean ACTC Scores, HSGPAs, College Success Rates, and College GPAs across Four-Year Institutions by Applicant/Enrollment Status and Gender

Enrollment status	Predictor variable	Gender	Number of students		Mean	
			Med	Min/Max	Med	Min/Max
Applicant pool	ACTC	Female	3,788	91/21,590	20.4	16.6/22.9
		Male	2,447	68/19,922	20.3	15.9/23.3
	HSGPA	Female	3,788	91/21,590	3.29	2.91/3.56
		Male	2,447	68/19,922	3.11	2.67/3.43
Enrolled students	ACTC	Female	742	26/5,439	21.7	16.6/25.0
		Male	574	24/4,299	21.4	15.4/25.8
	HSGPA	Female	742	26/5,439	3.40	2.96/3.76
		Male	574	24/4,299	3.21	2.63/3.70
	Progress year 1	Female	878	26/5,439	72	29/91
		Male	661	24/4,299	64	26/86
	Progress year 2	Female	877	26/5,439	59	23/85
		Male	662	24/4,299	50	18/80
	Progress year 3	Female	872	25/5,439	51	19/83
		Male	645	24/4,299	42	16/76
	Progress year 4	Female	868	25/5,439	48	18/83
		Male	644	24/4,299	40	17/75
	Bachelor's degree	Female	742	26/5,439	46	17/81
		Male	574	24/4,299	37	14/77
	Year 6 cum GPA[a]	Female	394	14/3,484	3.22	2.84/3.68
		Male	245	10/2,744	3.00	2.64/3.18

Note. Med = Median; Min = Minimum; Max = Maximum; ACTC = ACT Composite; HSGPA = high school grade point average. Because some institutions provided data for some but not all of the college outcomes, the descriptive statistics in the table are based on 61 four-year institutions for ACTC score, HSGPA, and bachelor's degree completion by year 6, 50 institutions for the progress to degree outcomes, and 57 institutions for year 6 cumulative GPA.

[a] Student's cumulative GPAs at degree completion were included in year 6 GPA analyses for students who graduated with a bachelor's degree before the end of year 6.

Table A-6

Distributions of Mean ACTC Scores, HSGPAs, College Success Rates, and College GPAs across Two-Year Institutions by Applicant/Enrollment Status and Gender

Enrollment status	Predictor variable	Gender	Number of students		Mean	
			Med	Min/Max	Med	Min/Max
Applicant pool	ACTC	Female	1,274	72/9,661	18.4	16.7/20.3
		Male	837	44/6,679	18.3	16.7/20.0
	HSGPA	Female	1,274	72/9,661	3.12	2.86/3.29
		Male	837	44/6,679	2.93	2.69/3.09
Enrolled students	ACTC	Female	519	62/5,550	18.4	16.8/20.7
		Male	406	29/3,882	18.2	16.8/20.3
	HSGPA	Female	519	62/5,550	3.11	2.83/3.33
		Male	406	29/3,882	2.92	2.70/3.13
	Progress year 1	Female	512	47/5,167	52	20/76
		Male	367	28/3,531	48	15/78
	Progress year 2	Female	512	62/5,184	40	11/60
		Male	368	29/3,578	38	5/63
	Progress year 3	Female	511	62/5,134	35	5/54
		Male	366	29/3,568	30	2/57
	Associate's degree	Female	519	62/5,550	15	5/33
		Male	406	29/3,882	12	3/40
	Associate's degree or transfer	Female	619	72/5,550	23	11/42
		Male	473	85/3,882	23	4/43
	Year 3 cum GPA[a]	Female	201	18/2,776	2.89	2.55/3.29
		Male	146	6/1,898	2.73	2.39/3.46

Note. Med = Median; Min = Minimum; Max = Maximum; ACTC = ACT Composite; HSGPA = high school grade point average. Because some institutions provided data for some but not all of the college outcomes, the descriptive statistics in the table are based on 43 two-year institutions for ACTC score, HSGPA, and associate's degree completion by year 3, 42 institutions for the progress to degree outcomes and year 3 cumulative GPA, and 40 institutions for associate's degree or transfer to a four-year institution by year 3.

[a] Student's cumulative GPAs at degree completion were included in year 3 GPA analyses for students who graduated with an associate's degree before the end of year 3.

Table A-7

Comparison of Mean ACTC Scores between Study Sample and ACT-Tested National Sample of Enrolled Students by Student Demographic Group and Institution Type

Student demographic group	Two-year institutions		Four-year institutions	
	Study sample	National sample	Study sample	National sample
Race/ethnicity				
White	18.8	19.4	22.0	23.3
Minority	16.8	16.2	19.0	19.1
Family income range				
Low	17.7	17.6	20.4	20.2
Mid	18.4	19.1	21.6	22.2
High	18.9	19.6	22.1	23.6
Gender				
Female	18.4	18.6	21.7	22.4
Male	18.2	18.9	21.4	22.9

Note. Results for the study sample are the typical mean ACTC scores across 61 four-year and 43 two-year institutions (see median values from Tables A-1 to A-6). Results for the national sample are average scores for 2003 ACT-tested high school graduates who enrolled in college in fall 2003 (includes over 581,000 and 191,000 students who initially enrolled in a four- and two-year institution, respectively), using enrollment data from the National Student Clearinghouse. Underrepresented minority students include African American, American Indian, and Hispanic students. Low is for lower-income students (annual family income < $30,000), Mid is for middle-income students (annual family income between $30,000 and $60,000), and High is for higher-income students (annual family income > $60,000).

Appendix B

Figures B-1 to B-18

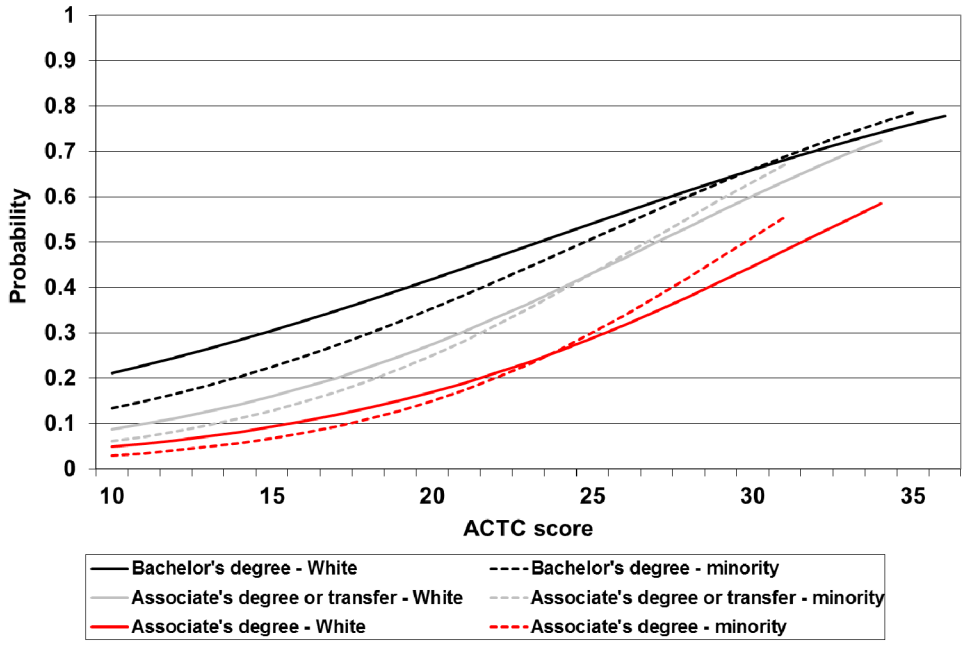

Figure B-1. Estimated probabilities of degree completion by ACTC score and race/ethnicity. ACTC = ACT Composite. Bachelor's degree completion by year 6 at four-year institutions and associate's degree completion by year 3 at two-year institutions.

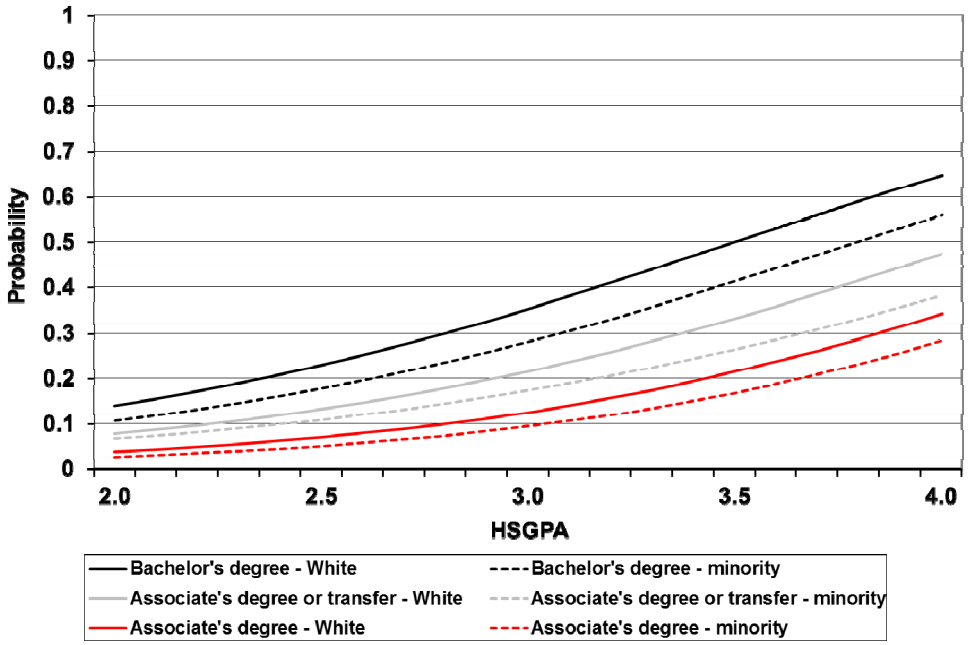

Figure B-2. Estimated probabilities of degree completion by HSGPA and race/ethnicity. HSGPA = high school grade point average. Bachelor's degree completion by year 6 at four-year institutions and associate's degree completion by year 3 at two-year institutions.

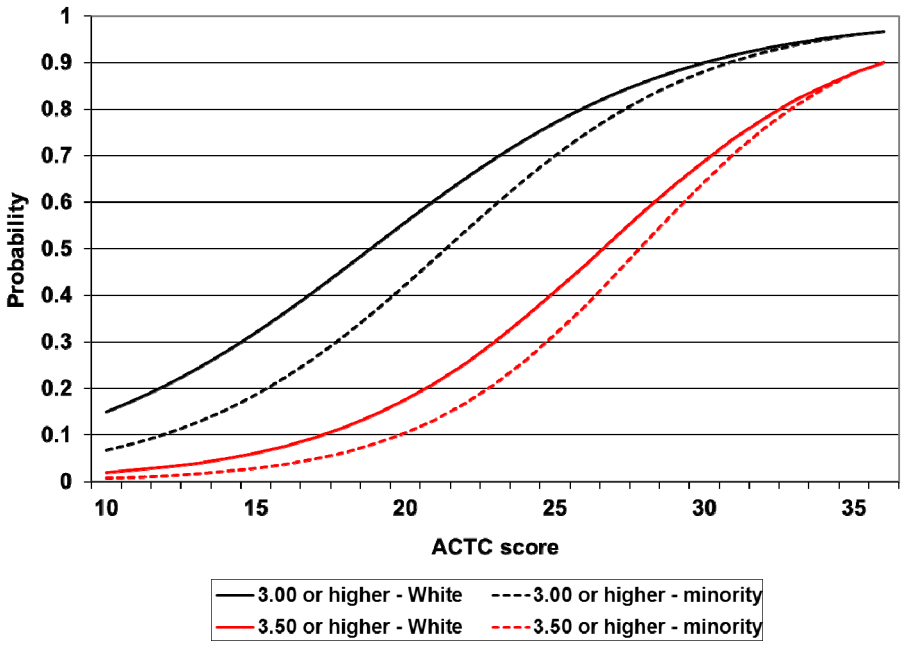

Figure B-3. Estimated probabilities of achieving levels of year 6 cumulative GPA by ACTC score and race/ethnicity for four-year institutions. ACTC = ACT Composite.

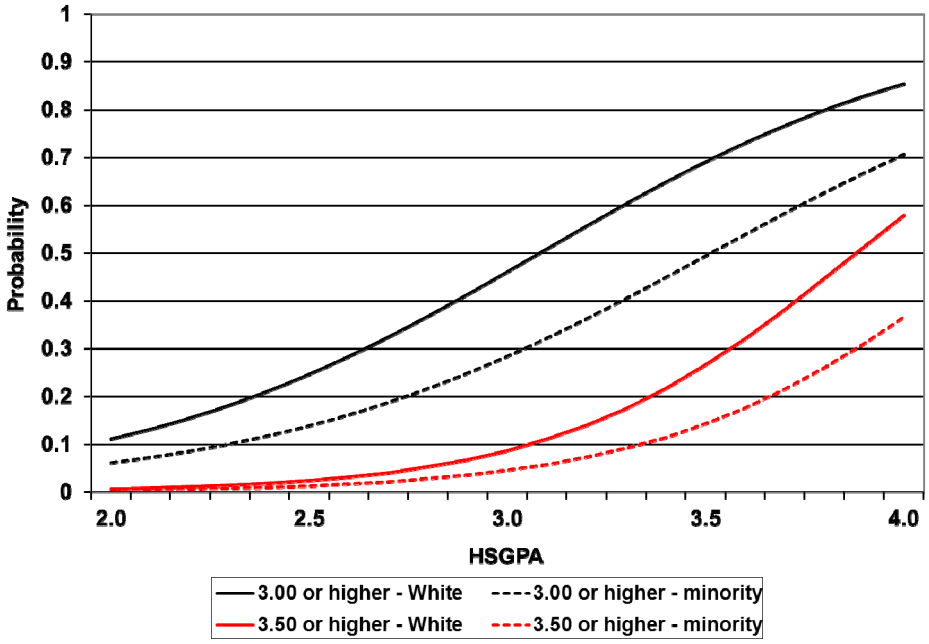

Figure B-4. Estimated probabilities of achieving levels of year 6 cumulative GPA by HSGPA and race/ethnicity for four-year institutions. HSGPA = high school grade point average.

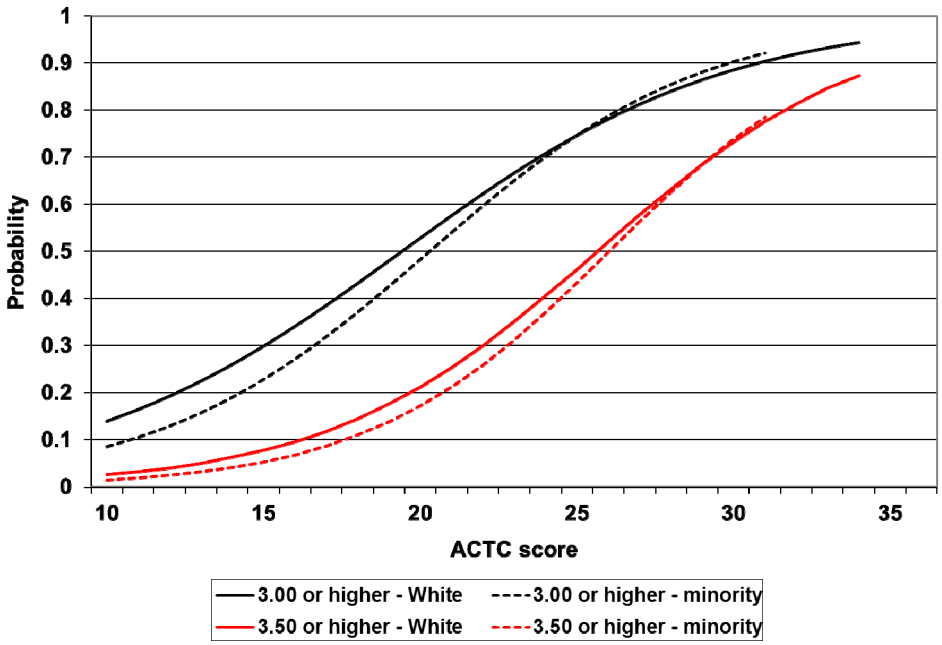

Figure B-5. Estimated probabilities of achieving levels of year 3 cumulative GPA by ACTC score and race/ethnicity for two-year institutions. ACTC = ACT Composite.

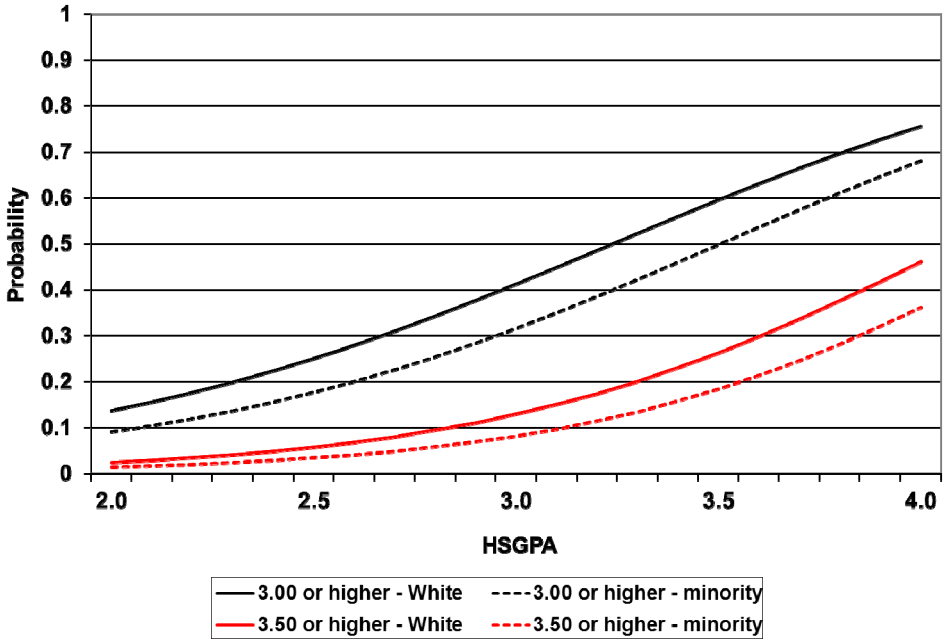

Figure B-6. Estimated probabilities of achieving levels of year 3 cumulative GPA by HSGPA and race/ethnicity for two-year institutions. HSGPA = high school grade point average.

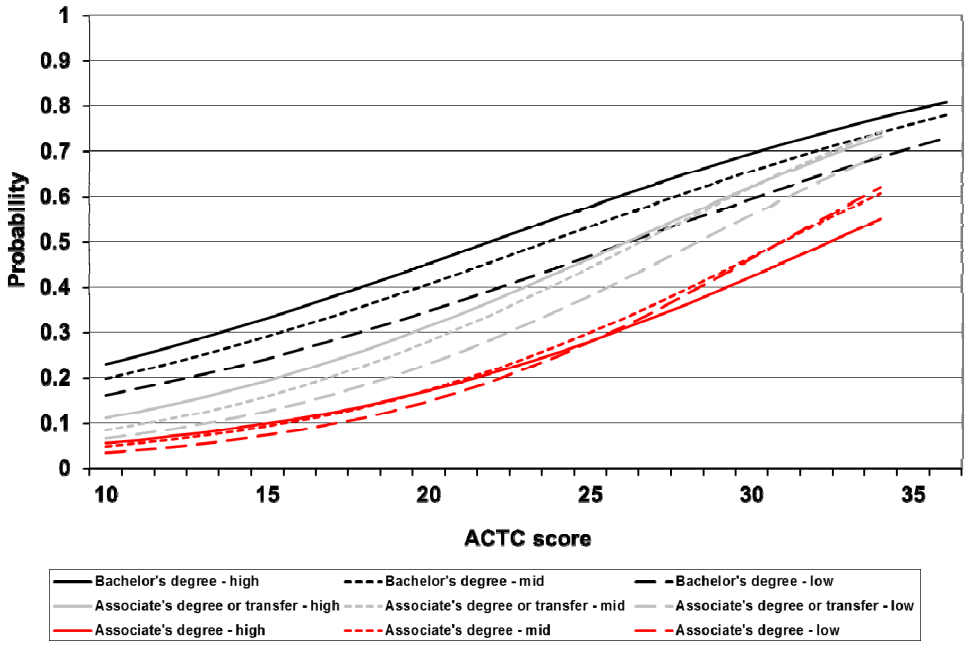

Figure B-7. Estimated probabilities of degree completion by ACTC score and family income. ACTC = ACT Composite. Bachelor's degree completion by year 6 at four-year institutions and associate's degree completion by year 3 at two-year institutions.

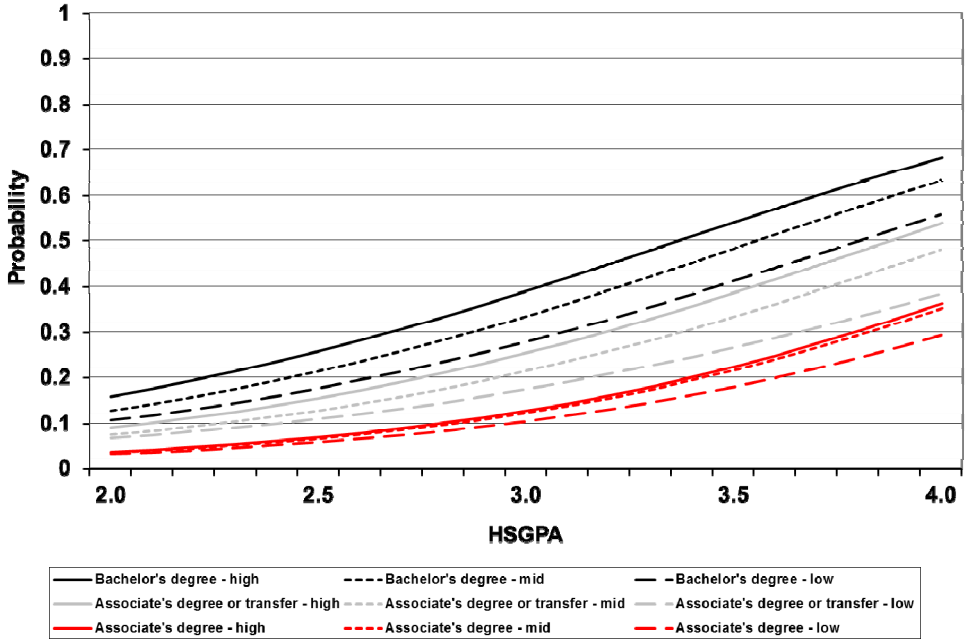

Figure B-8. Estimated probabilities of degree completion by HSGPA and family income. HSGPA = high school grade point average. Bachelor's degree completion by year 6 at four-year institutions and associate's degree completion by year 3 at two-year institutions.

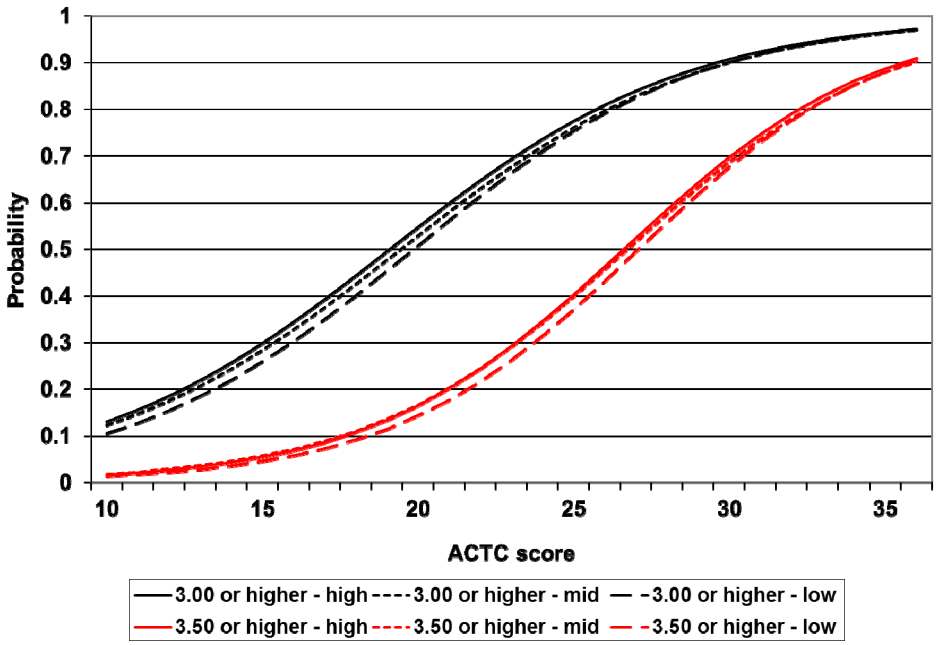

Figure B-9. Estimated probabilities of achieving levels of year 6 cumulative GPA by ACTC score and family income for four-year institutions. ACTC = ACT Composite.

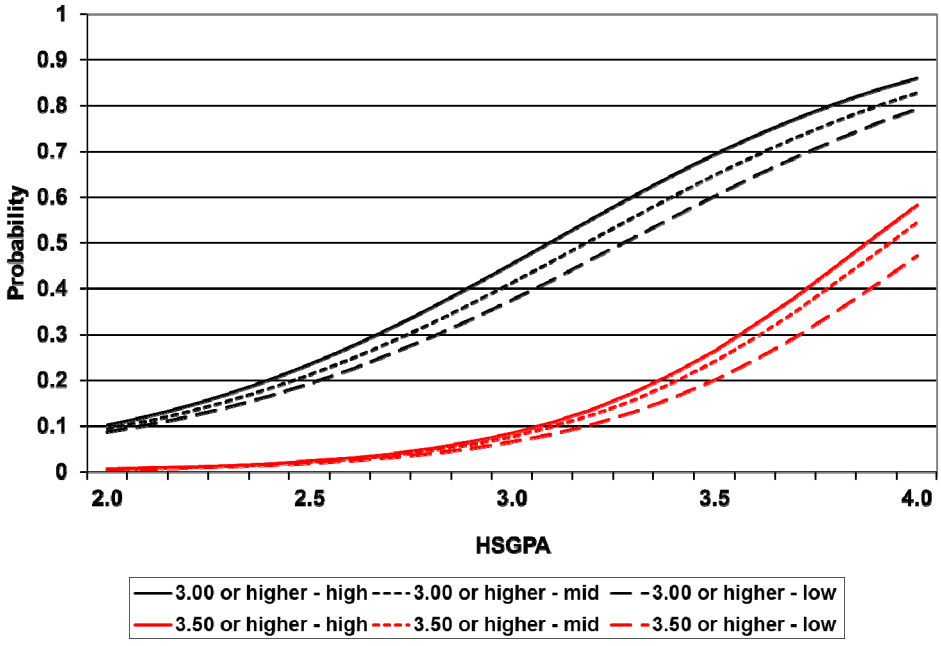

Figure B-10. Estimated probabilities of achieving levels of year 6 cumulative GPA by HSGPA and family income for four-year institutions. HSGPA = high school grade point average.

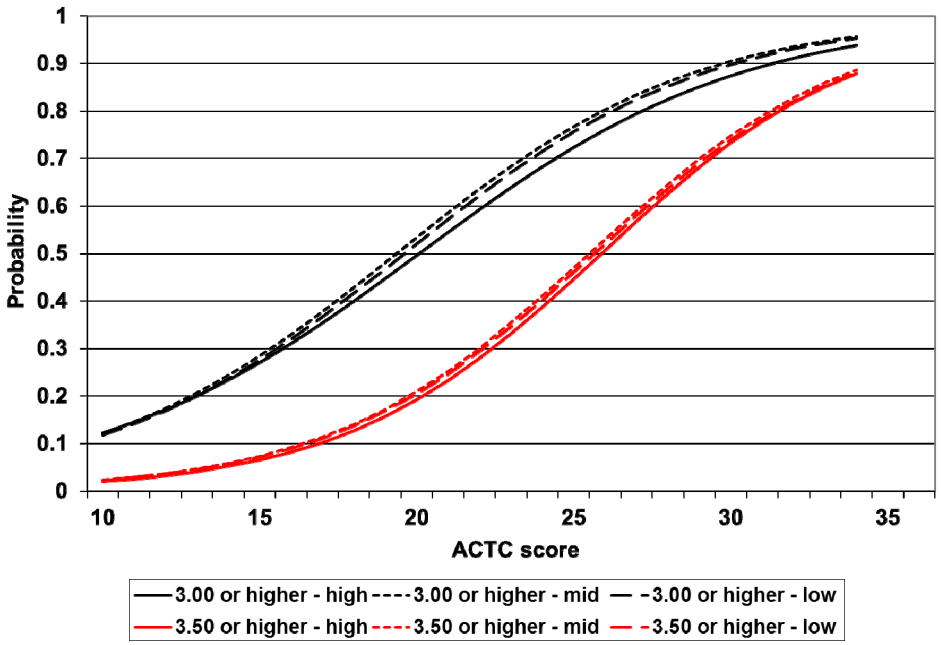

Figure B-11. Estimated probabilities of achieving levels of year 3 cumulative GPA by ACTC score and family income for two-year institutions. ACTC = ACT Composite.

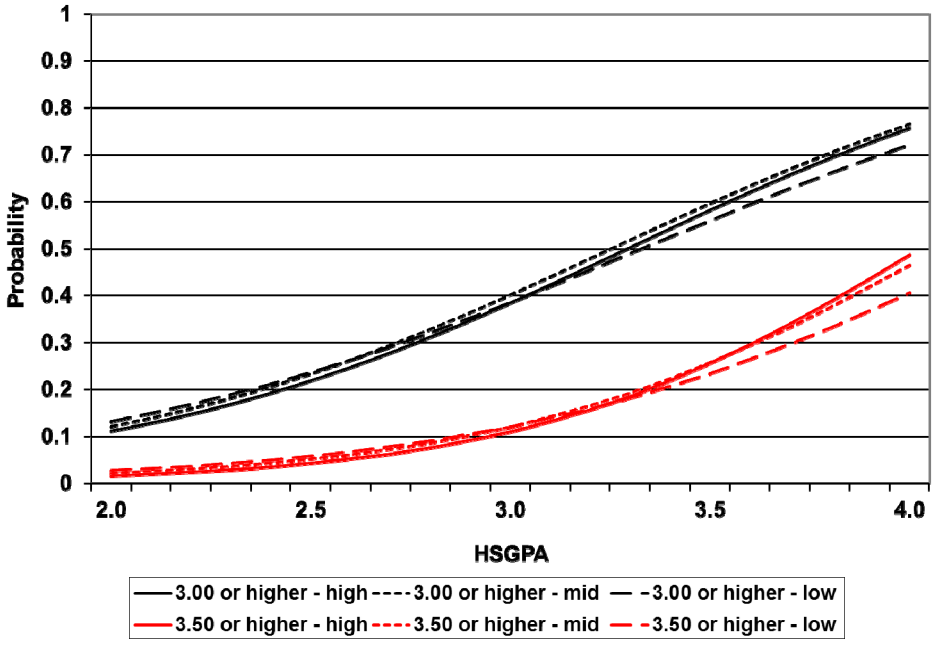

Figure B-12. Estimated probabilities of achieving levels of year 3 cumulative GPA by HSGPA and family income for two-year institutions. HSGPA = high school grade point average.

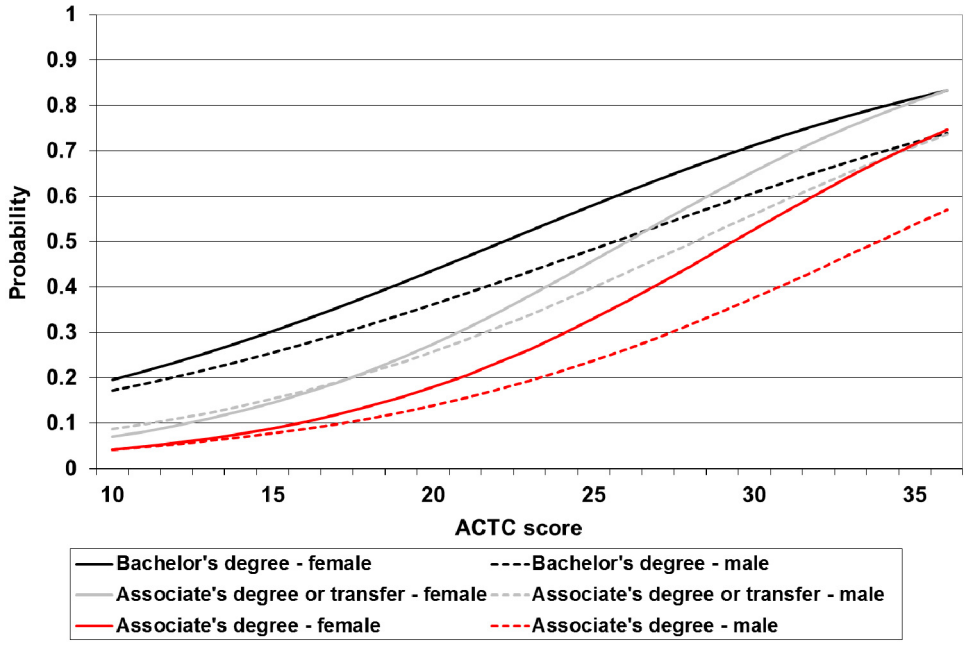

Figure B-13. Estimated probabilities of degree completion by ACTC score and gender. ACTC = ACT Composite. Bachelor's degree completion by year 6 at four-year institutions and associate's degree completion by year 3 at two-year institutions.

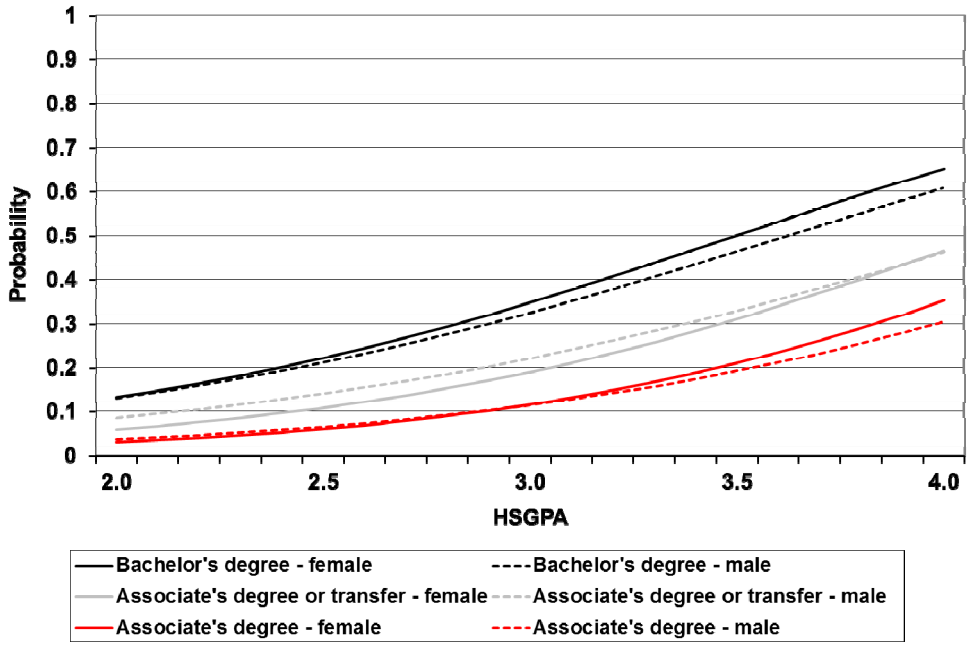

Figure B-14. Estimated probabilities of degree completion by HSGPA and gender. HSGPA = high school grade point average. Bachelor's degree completion by year 6 at four-year institutions and associate's degree completion by year 3 at two-year institutions.

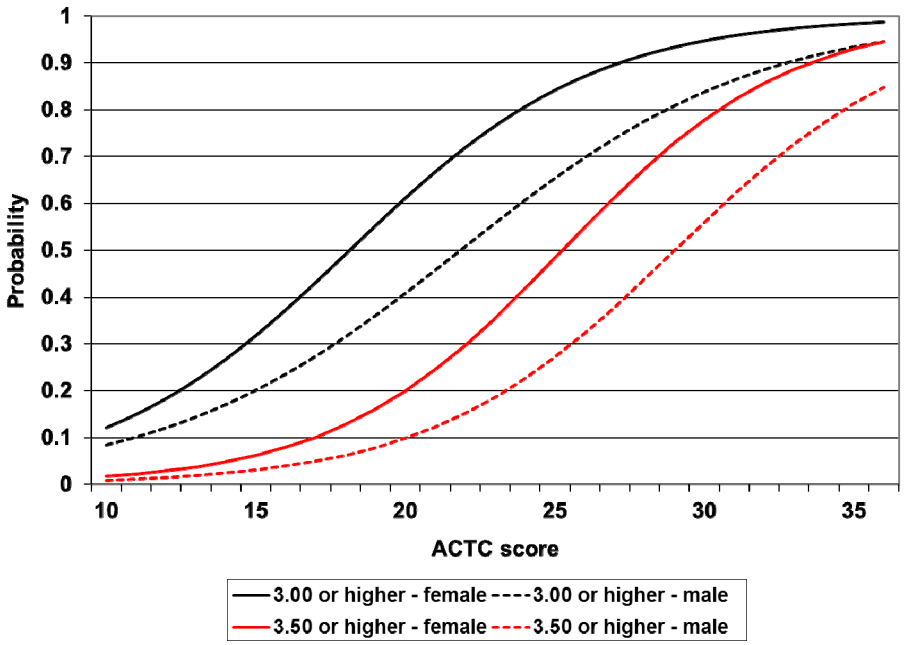

Figure B-15. Estimated probabilities of achieving levels of year 6 cumulative GPA by ACTC score and gender for four-year institutions. ACTC = ACT Composite.

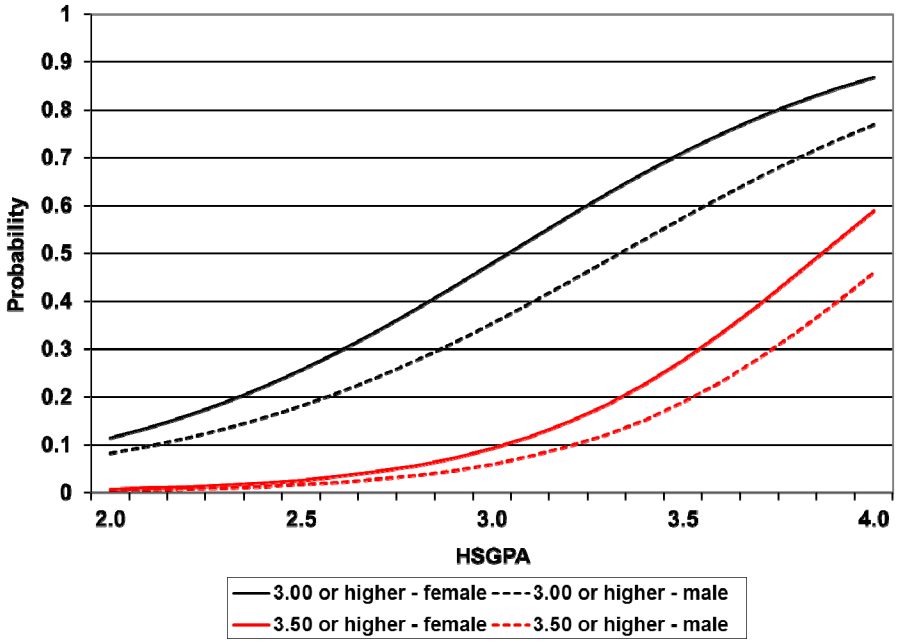

Figure B-16. Estimated probabilities of achieving levels of year 6 cumulative GPA by HSGPA and gender for four-year institutions. HSGPA = high school grade point average.

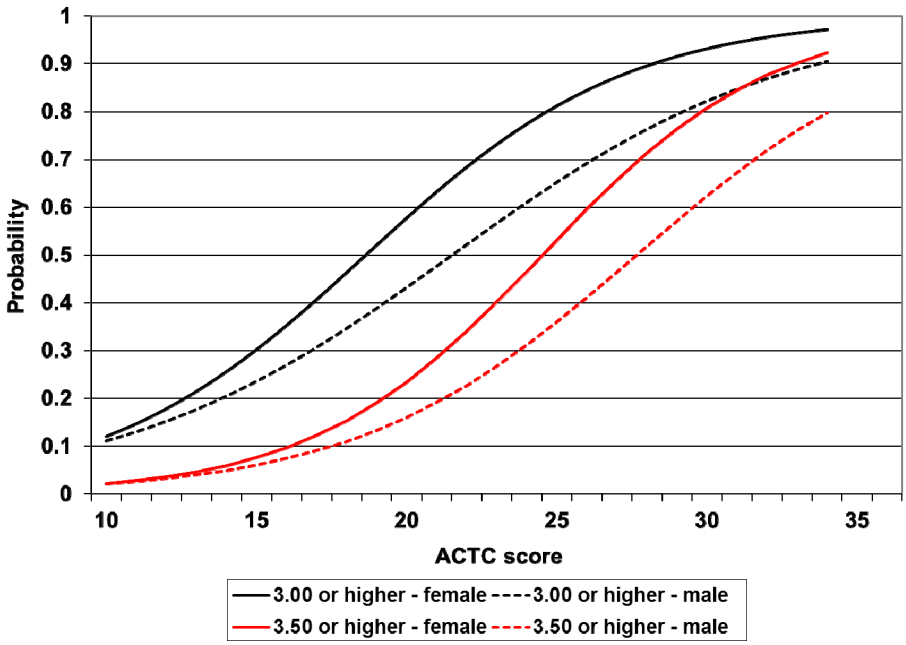

Figure B-17. Estimated probabilities of achieving levels of year 3 cumulative GPA by ACTC score and gender for two-year institutions. ACTC = ACT Composite.

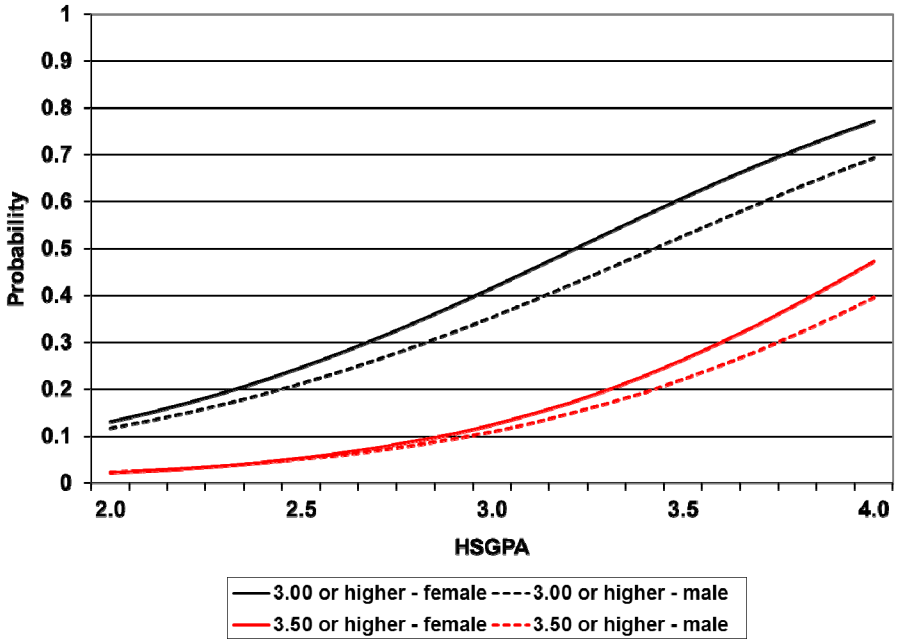

Figure B-18. Estimated probabilities of achieving levels of year 3 cumulative GPA by HSGPA and gender for two-year institutions. HSGPA = high school grade point average.

Appendix C

Tables C-1 to C-6

Table C-1

Differences in Probabilities of Success between Total-Group and Group-Specific Models based on ACTC Score or HSGPA for Four-Year Institutions

Outcome variable	Race/ ethnicity	ACTC score			HSGPA		
		< 19	19–25	> 25	<3.00	3.00–3.80	> 3.80
Bachelor's degree	White	-0.02	-0.01 to 0.00	0.00 to 0.01	-0.02 to -0.01	-0.02 to -0.01	-0.01
	Minority	0.06	0.03 to 0.06	-0.01 to 0.03	0.02 to 0.05	0.06 to 0.08	0.08
Progress year 1	White	-0.03 to -0.02	-0.02 to 0.00	0.00	-0.03 to -0.02	-0.02	-0.01
	Minority	0.06 to 0.08	0.01 to 0.05	-0.01 to 0.00	0.03 to 0.08	0.08 to 0.09	0.07 to 0.08
Progress year 2	White	-0.02	-0.01 to 0.00	0.00 to 0.01	-0.02 to -0.01	-0.02	-0.01
	Minority	0.05 to 0.06	0.01 to 0.05	-0.01 to 0.01	0.02 to 0.06	0.07 to 0.08	0.08
Progress year 3	White	-0.02 to -0.01	-0.01 to 0.00	0.00 to 0.01	-0.01	-0.02 to -0.01	-0.01
	Minority	0.05 to 0.06	0.02 to 0.05	-0.02 to 0.01	0.02 to 0.06	0.06 to 0.09	0.09
Progress year 4	White	-0.02	-0.01 to 0.00	0.00 to 0.01	-0.01	-0.02 to -0.01	-0.01
	Minority	0.05 to 0.06	0.03 to 0.06	-0.02 to 0.02	0.02 to 0.06	0.06 to 0.09	0.09
Year 6 cum GPA 3.00 or higher	White	-0.04 to -0.03	-0.03 to 0.00	0.00 to 0.01	-0.04 to -0.02	-0.04 to -0.03	-0.02
	Minority	0.05 to 0.11	0.07 to 0.11	0.00 to 0.06	0.03 to 0.13	0.14 to 0.16	0.13 to 0.14
Year 6 cum GPA 3.50 or higher	White	-0.01 to 0.00	-0.02 to -0.01	-0.01 to 0.01	-0.01 to 0.00	-0.03 to -0.01	-0.03
	Minority	0.01 to 0.04	0.05 to 0.08	0.00 to 0.08	0.00 to 0.03	0.03 to 0.16	0.17 to 0.18

Note. Negative differences indicate underprediction and positive differences indicate overprediction. The probabilities of success were estimated using the fixed effects parameter estimates from the hierarchical logistic models. The difference between the two models was whether a race/ethnicity indicator was included in the model (included in the group-specific model, but not in the total-group model). The cutoffs used in the table for ACTC score and HSGPA are the 25th and 75th percentiles for the total group of enrolled students at four-year study institutions. There were 61, 50, and 57 institutions with available outcomes data for bachelor's degree completion by year 6, the progress to degree outcomes, and year 6 cumulative GPA, respectively. Students' cumulative GPAs at degree completion were included in year 6 GPA analyses for students who graduated with a bachelor's degree before the end of year 6. Underrepresented minority students include African American, American Indian, and Hispanic students.

Table C-2

Differences in Probabilities of Success between Total-Group and Group-Specific Models based on ACTC Score or HSGPA for Two-Year Institutions

Outcome variable	Race/ ethnicity	ACTC score			HSGPA		
		< 16	16–21	> 21	<2.60	2.60–3.50	> 3.50
Associate's degree	White	-0.01	-0.01 to 0.00	0.00 to 0.02	-0.01 to 0.00	-0.01	-0.01
	Minority	0.01 to 0.02	0.01 to 0.02	-0.06 to 0.01	0.01	0.01 to 0.04	0.04 to 0.05
Associate's degree or transfer	White	-0.01	-0.01	-0.01 to 0.01	-0.01	-0.01	-0.01
	Minority	0.02	0.02	-0.03 to 0.01	0.01 to 0.02	0.02 to 0.06	0.06 to 0.08
Progress year 1	White	-0.03	-0.03 to -0.01	0.00 to 0.01	-0.03	-0.03	-0.02
	Minority	0.05 to 0.06	0.01 to 0.06	-0.02 to 0.00	0.05 to 0.07	0.08 to 0.10	0.09 to 0.10
Progress year 2	White	-0.02	-0.02 to -0.01	-0.01 to 0.01	-0.02	-0.02	-0.02
	Minority	0.04 to 0.05	0.01 to 0.04	-0.03 to 0.01	0.03 to 0.04	0.05 to 0.08	0.08
Progress year 3	White	-0.02	-0.02 to -0.01	-0.01 to 0.01	-0.02 to -0.01	-0.02	-0.02 to -0.01
	Minority	0.04	0.01 to 0.04	-0.04 to 0.01	0.02 to 0.03	0.04 to 0.07	0.07
Year 3 cum GPA 3.00 or higher	White	-0.02	-0.02 to -0.01	0.00 to 0.01	-0.02 to -0.01	-0.02	-0.01
	Minority	0.04 to 0.05	0.03 to 0.05	-0.01 to 0.02	0.03 to 0.05	0.06 to 0.08	0.07 to 0.08
Year 3 cum GPA 3.50 or higher	White	-0.01 to 0.00	-0.01	-0.01 to 0.01	-0.01 to 0.00	-0.01	-0.01
	Minority	0.01 to 0.02	0.02 to 0.04	0.00 to 0.04	0.01 to 0.02	0.02 to 0.07	0.07 to 0.09

Note. Negative differences indicate underprediction and positive differences indicate overprediction. The probabilities of success were estimated using the fixed effects parameter estimates from the hierarchical logistic models. The difference between the two models was whether a race/ethnicity indicator was included in the model (included in the group-specific model, but not in the total-group model). The cutoffs used in the table for ACTC score and HSGPA are the 25th and 75th percentiles for the total group of enrolled students at two-year study institutions. There were 43, 42, 42, and 40 institutions with available outcomes data for associate's degree completion by year 3, the progress to degree outcomes, year 3 cumulative GPA, and associate's degree or transfer to a four-year institution by year 3, respectively. Students' cumulative GPAs at degree completion were included in year 3 GPA analyses for students who graduated with an associate's degree before the end of year 3. Underrepresented minority students include African American, American Indian, and Hispanic students.

Table C-3

Differences in Probabilities of Success between Total-Group and Group-Specific Models based on ACTC Score or HSGPA for Four-Year Institutions

Outcome variable	Family income	ACTC score			HSGPA		
		< 19	19–25	> 25	<3.00	3.00–3.80	> 3.80
Bachelor's degree	Low	0.03 to 0.05	0.06 to 0.07	0.06 to 0.07	0.02 to 0.06	0.06 to 0.08	0.08
	High	-0.05 to -0.04	-0.05 to -0.04	-0.04 to -0.02	-0.05 to -0.03	-0.05	-0.05
Progress year 1	Low	0.02 to 0.05	0.05 to 0.06	0.02 to 0.05	0.02 to 0.07	0.07 to 0.08	0.06 to 0.07
	High	-0.04 to -0.03	-0.04 to -0.03	-0.02 to 0.00	-0.06 to -0.03	-0.06 to -0.04	-0.04 to -0.03
Progress year 2	Low	0.02 to 0.05	0.06 to 0.07	0.04 to 0.07	0.02 to 0.06	0.07 to 0.08	0.08
	High	-0.05 to -0.04	-0.05 to -0.04	-0.03 to -0.01	-0.06 to -0.03	-0.06 to -0.05	-0.05 to -0.04
Progress year 3	Low	0.02 to 0.05	0.06 to 0.07	0.05 to 0.07	0.02 to 0.06	0.06 to 0.08	0.08
	High	-0.04 to -0.03	-0.04	-0.04 to -0.01	-0.05 to -0.02	-0.06 to -0.05	-0.05
Progress year 4	Low	0.02 to 0.05	0.06 to 0.07	0.06 to 0.07	0.02 to 0.06	0.06 to 0.08	0.08
	High	-0.04 to -0.03	-0.04	-0.04 to -0.02	-0.05 to -0.02	-0.06 to -0.05	-0.05
Year 6 cum GPA 3.00 or higher	Low	0.01 to 0.02	0.01 to 0.02	0.00 to 0.01	0.01 to 0.04	0.05 to 0.06	0.04 to 0.05
	High	-0.02 to -0.01	-0.02 to -0.01	-0.01 to 0.00	-0.03 to -0.01	-0.04 to -0.03	-0.03
Year 6 cum GPA 3.50 or higher	Low	0.00 to 0.01	0.02 to 0.03	0.00 to 0.02	0.00 to 0.01	0.02 to 0.07	0.07 to 0.08
	High	0.00	-0.01 to 0.00	-0.01 to 0.00	0.00	-0.03 to 0.01	-0.04 to -0.03

Note. Negative differences indicate underprediction and positive differences indicate overprediction. The probabilities of success were estimated using the fixed effects parameter estimates from the hierarchical logistic models. The difference between the two models was whether an income indicator was included in the model (included in the group-specific model, but not in the total-group model). The cutoffs used in the table for ACTC score and HSGPA are the 25th and 75th percentiles for the total group of enrolled students at four-year study institutions. There were 61, 50, and 57 institutions with available outcomes data for bachelor's degree completion by year 6, the progress to degree outcomes, and year 6 cumulative GPA, respectively. Students' cumulative GPAs at degree completion were included in year 6 GPA analyses for students who graduated with a bachelor's degree before the end of year 6. Low is for lower-income students (annual family income < $30,000) and High is for higher-income students (annual family income > $60,000). Differences for middle-income students were generally near 0, and therefore are not included in this table.

Table C-4

Differences in Probabilities of Success between Total-Group and Group-Specific Models based on ACTC Score or HSGPA for Two-Year Institutions

Outcome variable	Family income	ACTC score			HSGPA		
		< 16	16–21	> 21	<2.60	2.60–3.50	> 3.50
Associate's degree	Low	0.01	0.01 to 0.02	-0.01 to 0.01	0.00 to 0.01	0.01 to 0.03	0.03 to 0.04
	High	-0.01	-0.01	0.00 to 0.06	-0.01 to 0.00	-0.02 to -0.01	-0.03 to -0.02
Associate's degree or transfer	Low	0.01 to 0.02	0.03 to 0.04	0.04 to 0.05	0.01 to 0.02	0.02 to 0.05	0.06 to 0.08
	High	-0.04 to -0.03	-0.05 to -0.04	-0.04 to 0.00	-0.03 to -0.02	-0.07 to -0.03	-0.08 to -0.07
Progress year 1	Low	0.03 to 0.04	0.04 to 0.05	0.00 to 0.04	0.03 to 0.04	0.05 to 0.06	0.06
	High	-0.07 to -0.06	-0.07 to -0.04	-0.03 to 0.00	-0.07 to -0.05	-0.08 to -0.07	-0.07 to -0.05
Progress year 2	Low	0.02 to 0.04	0.04 to 0.05	0.02 to 0.05	0.02 to 0.03	0.04 to 0.06	0.06 to 0.07
	High	-0.06	-0.06 to -0.05	-0.04 to 0.00	-0.05 to -0.03	-0.08 to -0.05	-0.08 to -0.07
Progress year 3	Low	0.02 to 0.03	0.03 to 0.04	0.02 to 0.04	0.01 to 0.03	0.03 to 0.06	0.06
	High	-0.06 to -0.05	-0.06 to -0.04	-0.04 to 0.01	-0.05 to -0.03	-0.07 to -0.05	-0.07 to -0.06
Year 3 cum GPA 3.00 or higher	Low	0.00	0.00	0.00	-0.01 to 0.00	0.00 to 0.02	0.02 to 0.03
	High	0.00 to 0.01	0.01 to 0.03	0.01 to 0.03	0.01	0.00 to 0.01	-0.01 to 0.00
Year 3 cum GPA 3.50 or higher	Low	0.00	0.00	0.00	-0.01	-0.01 to 0.02	0.02 to 0.05
	High	0.00 to 0.01	0.01	0.00 to 0.02	0.01	-0.01 to 0.01	-0.04 to -0.01

Note. Negative differences indicate underprediction and positive differences indicate overprediction. The probabilities of success were estimated using the fixed effects parameter estimates from the hierarchical logistic models. The difference between the two models was whether an income indicator was included in the model (included in the group-specific model, but not in the total-group model). The cutoffs used in the table for ACTC score and HSGPA are the 25th and 75th percentiles for the total group of enrolled students at two-year study institutions. There were 43, 42, 42, and 40 institutions with available outcomes data for associate's degree completion by year 3, the progress to degree outcomes, year 3 cumulative GPA, and associate's degree or transfer to a four-year institution by year 3, respectively. Students' cumulative GPAs at degree completion were included in year 3 GPA analyses for students who graduated with an associate's degree before the end of year 3. Low is for lower-income students (annual family income < $30,000) and High is for higher-income students (annual family income > $60,000). Differences for middle-income students were generally near 0, and therefore are not included in this table.

Table C-5

Differences in Probabilities of Success between Total-Group and Group-Specific Models based on ACTC Score or HSGPA for Four-Year Institutions

		ACTC score			HSGPA		
Outcome variable	Gender	< 19	19–25	> 25	<3.00	3.00–3.80	> 3.80
Bachelor's degree	Female	-0.03 to -0.01	-0.04 to -0.03	-0.05 to -0.04	-0.01 to 0.00	-0.02 to -0.01	-0.02
	Male	0.02 to 0.04	0.04 to 0.06	0.05 to 0.06	0.00 to 0.01	0.01 to 0.03	0.03
Progress year 1	Female	-0.04 to 0.00	-0.04	-0.04 to -0.01	-0.02 to 0.00	-0.02 to -0.01	-0.01
	Male	0.02 to 0.06	0.05 to 0.06	0.02 to 0.05	0.00 to 0.02	0.02 to 0.03	0.02
Progress year 2	Female	-0.04 to -0.01	-0.05 to -0.04	-0.04 to -0.02	-0.02 to 0.00	-0.02 to -0.01	-0.01
	Male	0.02 to 0.05	0.05 to 0.06	0.03 to 0.06	0.00 to 0.02	0.02	0.02
Progress year 3	Female	-0.03 to -0.01	-0.05 to -0.04	-0.05 to -0.03	-0.01	-0.02 to -0.01	-0.02 to -0.01
	Male	0.02 to 0.05	0.05 to 0.06	0.04 to 0.06	0.00 to 0.01	0.02 to 0.03	0.02 to 0.03
Progress year 4	Female	-0.03 to -0.01	-0.05 to -0.03	-0.05 to -0.03	-0.01	-0.01	-0.01
	Male	0.02 to 0.04	0.05 to 0.06	0.04 to 0.06	0.00 to 0.01	0.02	0.02
Year 6 cum GPA 3.00 or higher	Female	-0.07 to 0.00	-0.09 to -0.08	-0.07 to -0.02	-0.06 to -0.01	-0.06 to -0.04	-0.04 to -0.03
	Male	0.04 to 0.11	0.11 to 0.13	0.03 to 0.10	0.01 to 0.06	0.07 to 0.08	0.07
Year 6 cum GPA 3.50 or higher	Female	-0.02 to 0.00	-0.09 to -0.03	-0.10 to -0.04	-0.01 to 0.00	-0.04 to -0.02	-0.04
	Male	0.01 to 0.04	0.05 to 0.13	0.06 to 0.13	0.00 to 0.01	0.02 to 0.08	0.09

Note. Negative differences indicate underprediction and positive differences indicate overprediction. The probabilities of success were estimated using the fixed effects parameter estimates from the hierarchical logistic models. The difference between the two models was whether a gender indicator was included in the model (included in the group-specific model, but not in the total-group model). The cutoffs used in the table for ACTC score and HSGPA are the 25th and 75th percentiles for the total group of enrolled students at four-year study institutions. There were 61, 50, and 57 institutions with available outcomes data for bachelor's degree completion by year 6, the progress to degree outcomes, and year 6 cumulative GPA, respectively. Students' cumulative GPAs at degree completion were included in year 6 GPA analyses for students who graduated with a bachelor's degree before the end of year 6.

Table C-6

Differences in Probabilities of Success between Total-Group and Group-Specific Models based on ACTC Score or HSGPA for Two-Year Institutions

		ACTC score			HSGPA		
Outcome variable	Gender	< 16	16–21	> 21	<2.60	2.60–3.50	> 3.50
Associate's degree	Female	0.00	-0.02 to 0.00	-0.07 to -0.02	0.00	0.00	-0.02 to -0.01
	Male	0.00 to 0.01	0.01 to 0.03	0.03 to 0.10	0.00	0.00 to 0.01	0.02 to 0.03
Associate's degree or transfer	Female	0.01	-0.01 to 0.00	-0.05 to -0.01	0.01 to 0.02	0.01 to 0.02	-0.01 to 0.01
	Male	0.00 to 0.01	0.00 to 0.01	0.02 to 0.06	-0.02 to -0.01	-0.02 to -0.01	-0.01 to 0.00
Progress year 1	Female	0.01 to 0.02	-0.03 to 0.00	-0.03 to -0.01	0.03	0.00 to 0.03	-0.02 to 0.00
	Male	-0.02 to 0.00	0.00 to 0.03	0.02 to 0.04	-0.03	-0.02 to 0.00	0.00 to 0.01
Progress year 2	Female	0.00 to 0.01	-0.03 to 0.00	-0.04 to -0.03	0.02	0.00 to 0.02	-0.02 to -0.01
	Male	-0.01 to 0.01	0.01 to 0.04	0.04 to 0.05	-0.02	-0.01 to 0.01	0.01 to 0.02
Progress year 3	Female	0.00 to 0.01	-0.02 to 0.00	-0.04 to -0.03	0.01	0.00 to 0.01	-0.01 to 0.00
	Male	0.00 to 0.01	0.01 to 0.04	0.04 to 0.06	-0.01	-0.01 to 0.01	0.01 to 0.02
Year 3 cum GPA 3.00 or higher	Female	-0.02 to 0.00	-0.06 to -0.03	-0.06 to -0.02	-0.01	-0.03 to -0.02	-0.03 to -0.02
	Male	0.01 to 0.04	0.05 to 0.09	0.05 to 0.10	0.01 to 0.02	0.02 to 0.05	0.05 to 0.06
Year 3 cum GPA 3.50 or higher	Female	0.00	-0.04 to -0.01	-0.08 to -0.04	0.00	-0.01 to 0.00	-0.02 to -0.01
	Male	0.00 to 0.01	0.02 to 0.06	0.07 to 0.12	0.00	0.00 to 0.03	0.03 to 0.06

Note. Negative differences indicate underprediction and positive differences indicate overprediction. The probabilities of success were estimated using the fixed effects parameter estimates from the hierarchical logistic models. The difference between the two models was whether a gender indicator was included in the model (included in the group-specific model, but not in the total-group model). The cutoffs used in the table for ACTC score and HSGPA are the 25th and 75th percentiles for the total group of enrolled students at two-year study institutions. There were 43, 42, 42, and 40 institutions with available outcomes data for associate's degree completion by year 3, the progress to degree outcomes, year 3 cumulative GPA, and associate's degree or transfer to a four-year institution by year 3, respectively. Students' cumulative GPAs at degree completion were included in year 3 GPA analyses for students who graduated with an associate's degree before the end of year 3.

Appendix D

Tables D-1 to D-12

Table D-1

Results for Bachelor's Degree Completion and Progress to Degree at Four-Year Institutions based on ACTC Score and HSGPA Models by Race/Ethnicity at Total-Group Optimal Selection Values (SV)

Predictor variable (median SV)	Race/ ethnicity	*K*	Group-specific probability of success		Accuracy rate (AR)		Increase in AR (ΔAR)		Success rate (SR)		Observed percentage below	
			Med	Min/Max	Med	Min/Max	Med	Min/Max	Med	Min/Max	Med	Min/Max
Bachelor's degree completion by year 6												
ACTC	White	58	0.51	0.44/0.62	63	53/82	20	-1/65	56	50/77	77	0/100
(25)	Minority	58	0.48	0.31/0.58	73	48/90	46	0/80	52	36/64	95	0/100
HSGPA	White	56	0.51	0.48/0.58	65	58/77	21	0/51	59	52/77	65	2/95
(3.57)	Minority	56	0.43	0.26/0.50	69	55/87	40	2/75	49	29/64	81	5/99
ACTC &	White	61	0.51	0.44/0.55	65	58/83	24	0/66	59	51/77	67	2/99
HSGPA[a]	Minority	61	0.45	0.33/0.54	73	57/89	46	3/79	54	39/63	85	9/100
Progress to degree year 1												
ACTC	White	44	0.54	0.50/0.62	70	62/87	2	0/33	72	62/87	17	0/75
(18)	Minority	44	0.45	0.36/0.55	68	55/87	16	0/73	62	48/78	46	0/95
HSGPA	White	48	0.52	0.46/0.68	73	64/88	5	0/34	75	65/88	23	0/82
(2.80)	Minority	48	0.43	0.26/0.53	68	61/84	13	0/71	60	33/80	39	0/89
ACTC &	White	48	0.51	0.47/0.55	74	67/85	5	0/37	75	67/86	22	0/68
HSGPA[a]	Minority	48	0.45	0.36/0.63	71	62/88	18	0/74	65	49/79	48	0/92
Progress to degree year 2												
ACTC	White	49	0.52	0.50/0.56	65	58/80	9	0/46	64	59/80	44	0/88
(20)	Minority	49	0.47	0.32/0.56	67	52/88	32	0/77	58	41/71	74	0/99
HSGPA	White	50	0.51	0.48/0.62	69	62/80	13	0/45	67	57/80	42	1/93
(3.13)	Minority	50	0.43	0.26/0.49	67	57/87	29	1/76	56	33/72	65	2/96
ACTC &	White	50	0.51	0.49/0.53	70	62/78	14	1/47	68	61/79	44	3/82
HSGPA[a]	Minority	50	0.46	0.35/0.51	69	57/89	34	3/77	59	46/70	69	14/97

Table D-1 (cont.)

Predictor variable (median SV)	Race/ ethnicity	*K*	Group-specific probability of success		Accuracy rate (AR)		Increase in AR (ΔAR)		Success rate (SR)		Observed percentage below	
			Med	Min/Max	Med	Min/Max	Med	Min/Max	Med	Min/Max	Med	Min/Max
Progress to degree year 3												
ACTC	White	50	0.52	0.48/0.56	63	56/78	15	0/55	60	55/78	63	0/95
(22)	Minority	50	0.46	0.31/0.57	70	51/90	39	0/81	55	38/68	89	0/100
HSGPA	White	50	0.51	0.49/0.59	67	60/77	19	0/54	63	54/77	53	1/94
(3.39)	Minority	50	0.43	0.25/0.48	69	55/90	38	1/80	52	30/70	76	4/99
ACTC &	White	50	0.51	0.48/0.54	68	60/79	20	1/56	64	58/76	55	4/90
HSGPA[a]	Minority	50	0.45	0.33/0.51	72	56/91	41	4/81	56	43/68	80	16/98
Progress to degree year 4												
ACTC	White	48	0.52	0.48/0.57	64	55/79	19	-1/57	59	54/74	68	0/97
(24)	Minority	48	0.47	0.31/0.60	73	47/90	45	0/80	55	37/67	92	0/100
HSGPA	White	49	0.51	0.47/0.57	66	59/78	22	0/56	62	53/77	56	3/94
(3.46)	Minority	49	0.43	0.24/0.50	71	54/89	42	1/80	51	27/68	78	6/97
ACTC &	White	50	0.51	0.47/0.55	67	59/79	22	1/58	62	55/76	60	5/92
HSGPA[a]	Minority	50	0.45	0.31/0.54	73	55/90	46	4/80	55	40/67	85	16/99

Note. All statistics presented in the table are evaluated at the institution-specific total-group optimal selection values that were associated with the maximum ARs. Total-group optimal selection values (SV) varied substantially across institutions (see Radunzel & Noble, 2012a); median SVs are shown in table. *K* = number of institutions with viable total-group models. There were 61 and 50 institutions with available outcomes data for bachelor's degree completion and progress to degree analyses, respectively. Med = Median; Min = Minimum; Max = Maximum; ACTC = ACT Composite; HSGPA = high school grade point average. Underrepresented minority students include African American, American Indian, and Hispanic students.

[a]Multiple combinations of ACTC score and HSGPA corresponded to a probability of 0.50 for the total-group joint models.

Table D-2

Results for Associate's Degree Completion and Progress to Degree at Two-Year Institutions based on ACTC Score and HSGPA Models by Race/Ethnicity at Total-Group Optimal Selection Values (SV)

Predictor variable (median SV)	Race/ ethnicity	*K*	Group-specific probability of success		Accuracy rate (AR)		Increase in AR (ΔAR)		Success rate (SR)		Observed percentage below	
			Med	Min/Max	Med	Min/Max	Med	Min/Max	Med	Min/Max	Med	Min/Max
Associate's degree completion by year 3												
ACTC	White	25	0.50	0.48/0.52	81	64/92	61	28/84	53	49/60	99	90/100
(29)	Minority	25	0.55	0.52/0.60	86	71/96	72	41/92	50	26/65	100	94/100
HSGPA	White	5	0.51	0.50/0.51	70	67/73	39	31/45	53	51/55	90	81/94
(3.92)	Minority	5	0.49	0.47/0.50	75	72/79	50	42/59	50	49/53	95	85/96
ACTC &	White	25	0.49	0.45/0.51	81	63/92	61	26/83	52	48/57	99	80/100
HSGPA[a]	Minority	25	0.47	0.25/0.55	87	73/97	75	44/93	49	24/58	100	86/100
Associate's degree completion or transfer to a four-year institution by year 3												
ACTC	White	38	0.51	0.48/0.53	76	61/87	51	19/73	55	48/60	98	72/100
(27)	Minority	38	0.52	0.49/0.55	85	66/92	69	30/85	54	34/67	100	82/100
HSGPA	White	14	0.51	0.49/0.53	68	61/74	33	20/47	55	51/61	84	61/96
(3.75)	Minority	14	0.45	0.39/0.50	74	65/86	48	29/71	49	39/56	91	70/100
ACTC &	White	38	0.50	0.49/0.52	76	61/87	51	21/73	54	50/62	96	62/100
HSGPA[a]	Minority	38	0.47	0.34/0.51	84	66/92	68	31/85	52	33/63	100	73/100
Progress to degree year 1												
ACTC	White	41	0.54	0.50/0.61	65	57/77	11	0/54	66	54/74	48	0/99
(19)	Minority	41	0.48	0.39/0.61	69	58/86	31	0/71	60	51/70	69	0/97
HSGPA	White	41	0.52	0.48/0.60	65	58/78	10	0/34	66	60/78	44	1/85
(3.03)	Minority	41	0.43	0.28/0.51	65	59/84	27	0/71	53	34/76	56	3/95
ACTC &	White	42	0.51	0.43/0.57	67	61/78	12	0/52	68	56/78	45	0/99
HSGPA[a]	Minority	42	0.47	0.36/0.55	70	60/88	31	0/77	61	45/75	66	2/100

Table D-2 (cont.)

Predictor variable (median SV)	Race/ ethnicity	*K*	Group-specific probability of success		Accuracy rate (AR)		Increase in AR (ΔAR)		Success rate (SR)		Observed percentage below	
			Med	Min/Max	Med	Min/Max	Med	Min/Max	Med	Min/Max	Med	Min/Max
Progress to degree year 2												
ACTC	White	41	0.52	0.49/0.57	63	59/73	20	0/47	60	52/67	72	14/96
(21)	Minority	41	0.50	0.44/0.59	71	57/86	41	6/71	58	51/66	92	25/100
HSGPA	White	41	0.51	0.50/0.57	65	59/74	22	1/47	61	55/69	67	18/95
(3.38)	Minority	41	0.43	0.32/0.52	70	55/85	40	6/69	50	25/66	82	26/100
ACTC &	White	41	0.51	0.49/0.56	66	62/74	23	1/48	62	55/69	67	19/94
HSGPA[a]	Minority	41	0.47	0.38/0.55	71	57/85	41	7/70	55	49/68	85	31/99
Progress to degree year 3												
ACTC	White	41	0.51	0.49/0.56	66	57/77	30	1/54	57	53/63	86	32/100
(23)	Minority	41	0.51	0.44/0.60	76	59/88	52	12/75	57	47/64	97	44/100
HSGPA	White	36	0.51	0.49/0.54	66	58/73	30	3/45	57	53/66	79	36/98
(3.62)	Minority	36	0.43	0.32/0.52	73	57/87	45	14/74	49	32/62	89	44/100
ACTC &	White	41	0.51	0.49/0.54	68	59/77	32	3/55	59	53/67	81	37/98
HSGPA[a]	Minority	41	0.48	0.39/0.53	75	59/87	50	16/74	55	48/64	93	48/100

Note. All statistics presented in the table are evaluated at the institution-specific total-group optimal selection values that were associated with the maximum ARs. Total-group optimal selection values (SV) varied substantially across institutions (see Radunzel & Noble, 2012a); median SVs are shown in table. *K* = number of institutions with viable total-group models. There were 43 and 42 institutions with available outcomes data for associate's degree completion and progress to degree analyses, respectively. There were 40 institutions with data available for associate's degree or transfer to a four-year institution by year 3. Med = Median; Min = Minimum; Max = Maximum; ACTC = ACT Composite; HSGPA = high school grade point average. Underrepresented minority students include African American, American Indian, and Hispanic students.

[a]Multiple combinations of ACTC score and HSGPA corresponded to a probability of 0.50 for the total-group joint models.

Table D-3

Results for Achieving Levels of Year 6 College Cumulative GPA at Four-Year Institutions based on ACTC Score and HSGPA Models by Race/Ethnicity at Total-Group Optimal Selection Values (SV)

Predictor variable (median SV)	Race/ ethnicity	*K*	Group-specific probability of success		Accuracy rate (AR)		Increase in AR (ΔAR)		Success rate (SR)		Observed percentage below	
			Med	Min/Max	Med	Min/Max	Med	Min/Max	Med	Min/Max	Med	Min/Max
3.00 or higher												
ACTC	White	57	0.55	0.52/0.62	66	62/73	7	0/24	70	62/76	36	16/76
(20)	Minority	57	0.41	0.35/0.54	70	61/79	37	7/58	54	48/64	65	35/91
HSGPA	White	57	0.53	0.50/0.73	71	63/76	13	-4/33	73	62/85	39	18/68
(3.17)	Minority	57	0.34	0.27/0.50	70	59/79	37	9/58	51	39/63	59	34/84
ACTC &	White	57	0.53	0.50/0.66	71	67/76	15	-1/35	73	64/82	42	15/71
HSGPA[a]	Minority	57	0.38	0.33/0.50	75	63/83	45	11/66	57	47/65	71	42/88
3.50 or higher												
ACTC	White	57	0.53	0.50/0.61	77	59/87	52	12/74	61	56/70	91	76/98
(27)	Minority	57	0.45	0.39/0.55	91	71/96	82	40/91	52	37/66	98	89/100
HSGPA	White	40	0.52	0.50/0.69	78	55/83	51	-1/65	58	53/73	84	61/96
(3.86)	Minority	40	0.32	0.23/0.45	90	71/94	81	42/89	36	25/49	95	74/99
ACTC &	White	57	0.51	0.49/0.62	80	59/89	58	8/77	63	56/70	88	65/98
HSGPA[a]	Minority	57	0.40	0.31/0.49	93	72/97	85	42/93	50	33/70	97	84/100

Note. All statistics presented in the table are evaluated at the institution-specific optimal total-group selection values that were associated with the maximum ARs. Total-group optimal selection values (SV) varied substantially across institutions (see Radunzel & Noble, 2012a); median SVs are shown in table. *K* = number of institutions with viable total-group models. Students' cumulative GPAs at degree completion were included in year 6 GPA analyses for students who graduated with a bachelor's degree before the end of year 6. There were 57 institutions with data available for the year 6 college GPA analyses. Med = Median; Min = Minimum; Max = Maximum; ACTC = ACT Composite; HSGPA = high school grade point average. Underrepresented minority students include African American, American Indian, and Hispanic students.

[a]Multiple combinations of ACTC score and HSGPA corresponded to a probability of 0.50 for the total-group joint models.

Table D-4

Results for Achieving Levels of Year 3 College Cumulative GPA at Two-Year Institutions based on ACTC Score and HSGPA Models by Race/Ethnicity at Total-Group Optimal Selection Values (SV)

Predictor variable (median SV)	Race/ ethnicity	*K*	Group-specific probability of success		Accuracy rate (AR)		Increase in AR (ΔAR)		Success rate (SR)		Observed percentage below	
			Med	Min/Max	Med	Min/Max	Med	Min/Max	Med	Min/Max	Med	Min/Max
3.00 or higher												
ACTC	White	42	0.53	0.49/0.59	64	60/68	17	2/30	62	56/73	62	27/88
(20)	Minority	42	0.48	0.43/0.54	71	61/80	40	17/61	58	51/67	82	48/98
HSGPA	White	42	0.52	0.49/0.55	67	63/70	22	3/35	63	59/72	63	31/80
(3.30)	Minority	42	0.41	0.33/0.49	72	59/81	42	18/62	54	39/64	74	39/91
ACTC &	White	42	0.51	0.49/0.54	68	63/71	24	4/36	65	60/74	61	31/79
HSGPA[a]	Minority	42	0.46	0.39/0.50	75	62/81	44	19/61	59	48/71	78	46/92
3.50 or higher												
ACTC	White	42	0.52	0.45/0.56	81	70/87	62	37/74	59	50/65	97	84/100
(26)	Minority	42	0.50	0.44/0.56	90	80/94	81	61/88	55	34/76	99	89/100
HSGPA	White	5	0.52	0.51/0.53	77	72/80	53	42/60	53	52/56	93	85/96
(3.98)	Minority	5	0.39	0.39/0.42	87	81/89	74	65/78	42	39/45	97	89/98
ACTC &	White	42	0.50	0.45/0.54	83	72/88	65	40/77	58	49/65	95	84/99
HSGPA[a]	Minority	42	0.44	0.28/0.51	91	81/95	81	60/90	54	27/66	99	86/100

Note. All statistics presented in the table are evaluated at the institution-specific total-group optimal selection values that were associated with the maximum ARs. Total-group optimal selection values (SV) varied substantially across institutions (see Radunzel & Noble, 2012a); median SVs are shown in table. *K* = number of institutions with viable total-group models. Students' cumulative GPAs at degree completion were included in year 3 GPA analyses for students who graduated with an associate's degree before the end of year 3. There were 42 institutions with data available for the year 3 college GPA analyses. Med = Median; Min = Minimum; Max = Maximum; ACTC = ACT Composite; HSGPA = high school grade point average. Underrepresented minority students include African American, American Indian, and Hispanic students.

[a]Multiple combinations of ACTC score and HSGPA corresponded to a probability of 0.50 for the total-group joint models.

Table D-5

Results for Bachelor's Degree Completion and Progress to Degree at Four-Year Institutions based on ACTC Score and HSGPA Models by Family Income at Total-Group Optimal Selection Values (SV)

Predictor variable (median SV)	Family income	*K*	Group-specific probability of success		Accuracy rate (AR)		Increase in AR (ΔAR)		Success rate (SR)		Observed percentage below	
			Med	Min/Max	Med	Min/Max	Med	Min/Max	Med	Min/Max	Med	Min/Max
Bachelor's degree completion by year 6												
ACTC	Low	58	0.44	0.39/0.49	69	52/90	39	0/79	49	42/65	90	0/100
(25)	Mid	58	0.50	0.47/0.53	63	55/82	23	0/65	56	49/71	82	0/100
	High	58	0.55	0.53/0.57	62	52/77	14	0/55	60	54/77	78	0/99
HSGPA	Low	56	0.43	0.38/0.47	68	57/85	35	1/70	51	42/71	73	4/97
(3.57)	Mid	56	0.49	0.46/0.53	65	59/77	21	0/55	58	51/76	66	3/96
	High	56	0.55	0.53/0.59	64	57/79	14	0/41	63	56/80	62	2/95
ACTC &	Low	61	0.43	0.40/0.49	70	58/89	39	1/78	52	43/71	77	3/100
HSGPA[a]	Mid	61	0.49	0.47/0.52	66	59/83	26	0/65	58	51/75	68	3/99
	High	61	0.55	0.53/0.58	65	57/79	18	0/56	64	56/79	63	2/99
Progress to degree year 1												
ACTC	Low	44	0.47	0.42/0.52	68	57/83	9	0/63	62	52/76	34	0/93
(18)	Mid	44	0.53	0.50/0.59	70	62/83	3	0/52	71	62/83	20	0/84
	High	44	0.56	0.52/0.64	72	62/88	1	0/40	75	66/88	14	0/76
HSGPA	Low	48	0.44	0.36/0.53	70	61/80	10	0/59	63	47/78	31	0/90
(2.80)	Mid	48	0.49	0.47/0.55	73	66/84	6	0/47	73	63/84	24	0/88
	High	48	0.55	0.51/0.63	74	67/88	3	0/34	78	69/88	21	0/83
ACTC &	Low	48	0.45	0.40/0.67	71	62/83	11	0/64	66	56/81	35	0/91
HSGPA[a]	Mid	48	0.50	0.48/0.55	74	67/84	7	0/55	74	66/84	26	0/84
	High	48	0.54	0.51/0.59	76	69/87	4	0/41	79	70/87	21	0/73

Table D-5 (cont.)

Predictor variable (median SV)	Family income	*K*	Group-specific probability of success		Accuracy rate (AR)		Increase in AR (ΔAR)		Success rate (SR)		Observed percentage below	
			Med	Min/Max	Med	Min/Max	Med	Min/Max	Med	Min/Max	Med	Min/Max
Progress to degree year 2												
ACTC	Low	49	0.46	0.40/0.51	64	54/85	21	0/70	55	49/71	57	0/97
(20)	Mid	49	0.51	0.49/0.57	64	57/82	9	0/63	63	57/76	50	0/92
	High	49	0.56	0.53/0.61	67	59/82	4	0/50	68	62/82	39	0/86
HSGPA	Low	50	0.43	0.36/0.49	66	58/83	24	1/67	57	43/71	50	2/96
(3.13)	Mid	50	0.49	0.47/0.54	69	60/79	14	0/57	65	57/77	44	2/96
	High	50	0.55	0.53/0.60	69	63/82	8	0/46	70	62/82	40	1/92
ACTC &	Low	50	0.44	0.40/0.49	67	59/86	25	1/71	58	51/68	54	10/96
HSGPA[a]	Mid	50	0.50	0.48/0.53	69	61/83	17	1/65	66	60/74	47	5/91
	High	50	0.55	0.52/0.58	70	63/80	9	0/50	71	65/81	41	3/83
Progress to degree year 3												
ACTC	Low	50	0.45	0.40/0.51	67	55/89	31	0/79	53	45/68	76	0/99
(22)	Mid	50	0.51	0.48/0.55	63	54/82	15	0/63	61	53/75	64	0/96
	High	50	0.55	0.52/0.60	64	56/80	9	0/51	65	58/80	60	0/94
HSGPA	Low	50	0.43	0.37/0.48	67	57/88	31	1/76	54	40/68	64	4/98
(3.39)	Mid	50	0.50	0.47/0.54	66	59/80	20	0/60	61	52/74	55	3/97
	High	50	0.55	0.53/0.60	67	60/78	13	0/49	67	60/79	52	1/95
ACTC &	Low	50	0.44	0.40/0.47	68	57/88	34	3/77	55	49/66	68	11/97
HSGPA[a]	Mid	50	0.50	0.48/0.52	68	59/83	21	1/65	62	57/73	58	7/93
	High	50	0.55	0.53/0.57	68	60/78	14	0/51	68	62/78	53	4/89

Table D-5 (cont.)

Predictor variable (median SV)	Family income	*K*	Group-specific probability of success		Accuracy rate (AR)		Increase in AR (ΔAR)		Success rate (SR)		Observed percentage below	
			Med	Min/Max	Med	Min/Max	Med	Min/Max	Med	Min/Max	Med	Min/Max
Progress to degree year 4												
ACTC (24)	Low	48	0.44	0.39/0.50	68	52/89	35	0/79	51	42/66	79	0/99
	Mid	48	0.51	0.48/0.55	63	54/81	22	0/62	58	52/71	70	0/98
	High	48	0.55	0.53/0.60	62	55/77	14	0/50	64	57/77	65	0/97
HSGPA (3.46)	Low	49	0.43	0.37/0.46	68	57/85	33	1/72	53	41/66	68	6/97
	Mid	49	0.50	0.47/0.52	67	58/79	22	1/58	60	52/74	60	4/97
	High	49	0.55	0.53/0.60	66	60/78	15	0/47	66	57/79	57	2/95
ACTC & HSGPA[a]	Low	50	0.44	0.40/0.47	69	57/89	35	2/77	54	46/65	73	9/98
	Mid	50	0.50	0.47/0.52	67	59/82	24	1/63	60	54/73	62	6/94
	High	50	0.55	0.53/0.57	67	60/77	17	0/50	66	60/78	58	4/92

Note. All statistics presented in the table are evaluated at the institution-specific total-group optimal selection values that were associated with the maximum ARs. Total-group optimal selection values (SV) varied substantially across institutions (see Radunzel & Noble, 2012a); median SVs are shown in table. *K* = number of institutions with viable total-group models. There were 61 and 50 institutions with available outcomes data for bachelor's degree completion and progress to degree analyses, respectively. Med = Median; Min = Minimum; Max = Maximum; ACTC = ACT Composite; HSGPA = high school grade point average. Low is for lower-income students (annual family income < $30,000), Mid is for middle-income students (annual family income between $30,000 and $60,000), and High is for higher-income students (annual family income > $60,000).

[a]Multiple combinations of ACTC score and HSGPA corresponded to a probability of 0.50 for the total-group joint models.

Table D-6

Results for Associates's Degree Completion and Progress to Degree at Two-Year Institutions based on ACTC Score and HSGPA Models by Family Income at Total-Group Optimal Selection Values (SV)

Predictor variable (median SV)	Family income	*K*	Group-specific probability of success		Accuracy rate (AR)		Increase in AR (ΔAR)		Success rate (SR)		Observed percentage below	
			Med	Min/Max	Med	Min/Max	Med	Min/Max	Med	Min/Max	Med	Min/Max
Associate's degree completion by year 3												
ACTC	Low	25	0.49	0.47/0.54	84	71/94	68	42/89	52	35/58	100	94/100
(29)	Mid	25	0.51	0.50/0.55	80	63/92	60	26/84	56	51/64	99	91/100
	High	25	0.47	0.46/0.52	79	62/92	57	23/83	49	32/57	99	88/100
HSGPA	Low	5	0.45	0.44/0.45	75	72/78	51	44/57	47	44/48	93	85/96
(3.92)	Mid	5	0.53	0.52/0.53	70	67/72	38	30/44	54	53/57	89	82/93
	High	5	0.52	0.52/0.53	69	67/72	36	30/43	54	53/57	88	80/94
ACTC &	Low	25	0.46	0.39/0.52	84	71/95	69	42/89	50	38/59	100	86/100
HSGPA[a]	Mid	25	0.51	0.44/0.53	80	63/92	60	26/84	55	50/59	99	81/100
	High	25	0.49	0.35/0.52	79	62/91	57	23/82	51	34/58	98	76/100
Associate's degree completion or transfer to a four-year institution by year 3												
ACTC	Low	38	0.46	0.43/0.49	81	67/92	63	34/84	50	38/57	99	81/100
(27)	Mid	38	0.53	0.49/0.56	75	61/88	50	18/76	57	47/63	98	73/100
	High	38	0.54	0.50/0.57	71	58/84	41	12/69	58	44/64	97	69/100
HSGPA	Low	14	0.43	0.42/0.44	73	66/79	47	33/58	46	43/52	89	68/96
(3.75)	Mid	14	0.52	0.51/0.54	68	62/73	34	21/46	56	53/63	85	62/99
	High	14	0.57	0.55/0.59	65	58/69	26	13/37	61	59/66	83	60/95
ACTC &	Low	38	0.44	0.37/0.46	81	67/92	62	34/83	48	37/55	98	70/100
HSGPA[a]	Mid	38	0.52	0.47/0.53	76	62/88	51	22/76	56	46/65	96	63/100
	High	38	0.55	0.48/0.58	70	59/85	39	14/70	59	50/68	94	60/100

Table D-6 (cont.)

Predictor variable (median SV)	Family income	*K*	Group-specific probability of success		Accuracy rate (AR)		Increase in AR (ΔAR)		Success rate (SR)		Observed percentage below	
			Med	Min/Max	Med	Min/Max	Med	Min/Max	Med	Min/Max	Med	Min/Max
Progress to degree year 1												
ACTC	Low	41	0.47	0.44/0.52	66	57/82	25	0/63	60	50/67	61	0/99
(19)	Mid	41	0.54	0.49/0.59	65	57/79	11	0/58	67	44/74	50	0/100
	High	41	0.57	0.50/0.63	65	58/78	6	-1/57	70	50/78	42	0/98
HSGPA	Low	41	0.45	0.39/0.47	64	59/78	19	0/55	58	45/73	52	2/93
(3.03)	Mid	41	0.52	0.50/0.54	65	63/79	12	0/44	66	58/79	48	1/88
	High	41	0.57	0.55/0.59	66	59/82	7	-1/32	72	64/82	42	1/85
ACTC &	Low	42	0.45	0.33/0.47	68	60/82	25	0/64	61	45/72	57	0/100
HSGPA[a]	Mid	42	0.52	0.37/0.53	68	63/79	15	0/57	69	47/79	48	0/100
	High	42	0.56	0.46/0.58	69	60/82	8	0/51	73	54/83	42	0/98
Progress to degree year 2												
ACTC	Low	41	0.47	0.43/0.49	68	56/83	34	4/66	55	43/60	79	21/100
(21)	Mid	41	0.53	0.49/0.57	64	60/76	20	1/51	61	53/68	75	14/96
	High	41	0.56	0.51/0.60	62	57/72	13	-2/41	64	56/71	69	11/96
HSGPA	Low	41	0.44	0.40/0.46	67	56/82	33	5/63	53	22/62	75	21/100
(3.38)	Mid	41	0.52	0.49/0.54	65	61/77	21	1/53	61	51/69	69	18/97
	High	41	0.57	0.56/0.60	64	58/72	14	0/42	68	60/74	65	19/93
ACTC &	Low	41	0.45	0.38/0.47	69	57/83	34	6/66	56	46/63	74	26/96
HSGPA[a]	Mid	41	0.51	0.48/0.54	67	62/78	22	1/54	63	52/70	68	18/91
	High	41	0.56	0.52/0.60	66	59/73	16	0/43	68	58/74	62	17/91

Table D-6 (cont.)

Predictor variable (median SV)	Family income	*K*	Group-specific probability of success		Accuracy rate (AR)		Increase in AR (ΔAR)		Success rate (SR)		Observed percentage below	
			Med	Min/Max	Med	Min/Max	Med	Min/Max	Med	Min/Max	Med	Min/Max
Progress to degree year 3												
ACTC (23)	Low	41	0.46	0.44/0.50	72	58/86	43	12/71	53	37/58	92	42/100
	Mid	41	0.52	0.49/0.56	66	58/80	30	3/61	58	52/63	88	34/99
	High	41	0.55	0.50/0.59	62	57/75	20	-1/51	60	52/67	83	30/99
HSGPA (3.62)	Low	36	0.44	0.41/0.46	71	56/82	41	11/64	50	42/60	85	43/99
	Mid	36	0.52	0.50/0.54	67	59/75	31	5/50	59	52/67	80	36/98
	High	36	0.57	0.55/0.59	64	60/71	20	0/41	63	57/72	76	37/98
ACTC & HSGPA[a]	Low	41	0.45	0.41/0.48	73	58/86	44	12/71	53	40/60	85	46/100
	Mid	41	0.51	0.47/0.53	68	59/81	32	5/62	60	48/68	80	39/98
	High	41	0.56	0.49/0.58	65	61/76	24	1/50	64	55/72	75	33/98

Note. All statistics presented in the table are evaluated at the institution-specific total-group optimal selection values that were associated with the maximum ARs. Total-group optimal selection values (SV) varied substantially across institutions (see Radunzel & Noble, 2012a); median SVs are shown in table. *K* = number of institutions with viable total-group models. There were 43 and 42 institutions with available outcomes data for associate's degree completion and progress to degree analyses, respectively. There were 40 institutions with data available for associate's degree or transfer to a four-year institution by year 3. Med = Median; Min = Minimum; Max = Maximum; ACTC = ACT Composite; HSGPA = high school grade point average. Low is for lower-income students (annual family income < $30,000), Mid is for middle-income students (annual family income between $30,000 and $60,000), and High is for higher-income students (annual family income > $60,000).

[a]Multiple combinations of ACTC score and HSGPA corresponded to a probability of 0.50 for the total-group joint models.

Table D-7

Results for Achieving Levels of Year 6 College Cumulative GPA at Four-Year Institutions based on ACTC Score and HSGPA Models by Family Income at Total-Group Optimal Selection Values (SV)

Predictor variable (median SV)	Family income	*K*	Group-specific probability of success		Accuracy rate (AR)		Increase in AR (ΔAR)		Success rate (SR)		Observed percentage below	
			Med	Min/Max	Med	Min/Max	Med	Min/Max	Med	Min/Max	Med	Min/Max
3.00 or higher												
ACTC	Low	57	0.50	0.42/0.55	67	61/75	19	6/46	65	57/71	53	24/89
(20)	Mid	57	0.52	0.50/0.55	66	62/72	10	3/30	67	61/75	40	15/82
	High	57	0.54	0.51/0.57	67	63/75	7	2/23	71	63/78	33	14/76
HSGPA	Low	57	0.45	0.37/0.51	70	62/75	23	9/46	63	56/71	49	28/80
(3.17)	Mid	57	0.49	0.47/0.53	70	64/75	17	4/36	69	59/77	40	18/76
	High	57	0.53	0.51/0.59	71	66/76	12	3/31	74	63/80	36	16/77
ACTC &	Low	57	0.48	0.40/0.53	72	64/79	30	9/53	67	57/75	58	33/82
HSGPA[a]	Mid	57	0.49	0.47/0.52	72	65/75	20	5/38	70	62/77	45	15/76
	High	57	0.52	0.50/0.56	72	68/77	14	4/32	74	66/80	39	16/70
3.50 or higher												
ACTC	Low	57	0.51	0.43/0.54	84	71/93	68	41/87	58	51/66	96	84/100
(27)	Mid	57	0.52	0.47/0.56	79	66/90	56	25/79	60	54/68	93	72/100
	High	57	0.53	0.48/0.60	77	68/87	51	30/72	62	53/71	89	69/98
HSGPA	Low	40	0.42	0.37/0.48	83	71/92	67	38/84	48	39/58	89	75/98
(3.86)	Mid	40	0.50	0.47/0.52	79	67/86	56	22/72	56	49/64	85	59/97
	High	40	0.53	0.51/0.58	77	67/83	50	24/65	59	53/65	84	59/95
ACTC &	Low	57	0.47	0.42/0.50	87	70/94	73	37/87	57	49/64	93	79/99
HSGPA[a]	Mid	57	0.50	0.48/0.51	82	66/91	62	20/82	60	55/66	90	61/98
	High	57	0.51	0.48/0.54	80	69/88	56	25/75	64	56/70	85	66/98

Note. All statistics presented in the table are evaluated at the institution-specific total-group optimal selection values that were associated with the maximum ARs. Total-group optimal selection values (SV) varied substantially across institutions (see Radunzel & Noble, 2012a); median SVs are shown in table. *K* = number of institutions with viable total-group models. Students' cumulative GPAs at degree completion were included in year 6 GPA analyses for students who graduated with a bachelor's degree before the end of year 6. There were 57 institutions with data available for the year 6 college GPA analyses. Med = Median; Min = Minimum; Max = Maximum; ACTC = ACT Composite; HSGPA = high school grade point average. Low is for lower-income students (annual family income < $30,000), Mid is for middle-income students (annual family income between $30,000 and $60,000), and High is for higher-income students (annual family income > $60,000).

[a]Multiple combinations of ACTC score and HSGPA corresponded to a probability of 0.50 for the total-group joint models.

Table D-8

Results for Achieving Levels of Year 3 College Cumulative GPA at Two-Year Institutions based on ACTC Score and HSGPA Models by Family Income at Total-Group Optimal Selection Values (SV)

Predictor variable (median SV)	Family income	*K*	Group-specific probability of success		Accuracy rate (AR)		Increase in AR (ΔAR)		Success rate (SR)		Observed percentage below	
			Med	Min/Max	Med	Min/Max	Med	Min/Max	Med	Min/Max	Med	Min/Max
3.00 or higher												
ACTC (20)	Low	42	0.52	0.48/0.57	66	61/74	25	6/45	62	58/67	74	36/94
	Mid	42	0.53	0.51/0.57	66	62/69	20	4/34	64	59/71	65	33/91
	High	42	0.49	0.45/0.55	65	60/68	20	4/33	61	53/71	57	27/84
HSGPA (3.30)	Low	42	0.49	0.47/0.51	68	61/74	29	6/45	60	57/64	69	34/88
	Mid	42	0.51	0.50/0.53	68	63/71	23	6/38	65	61/70	63	30/82
	High	42	0.50	0.47/0.53	68	64/72	24	6/41	63	57/72	59	31/83
ACTC & HSGPA[a]	Low	42	0.50	0.47/0.52	70	62/76	31	8/49	64	58/70	72	40/87
	Mid	42	0.51	0.48/0.52	70	64/73	26	7/39	66	61/72	62	33/81
	High	42	0.48	0.45/0.52	70	64/72	26	7/40	64	58/73	57	29/76
3.50 or higher												
ACTC (26)	Low	42	0.52	0.47/0.57	86	75/90	71	48/79	59	50/65	98	88/100
	Mid	42	0.53	0.49/0.56	83	72/88	65	39/76	61	49/66	97	84/100
	High	42	0.50	0.48/0.55	82	75/87	63	46/74	58	41/68	95	81/100
HSGPA (3.98)	Low	5	0.45	0.42/0.46	80	78/83	61	57/67	47	42/49	95	90/97
	Mid	5	0.52	0.50/0.53	75	74/80	49	48/61	53	51/55	92	86/95
	High	5	0.53	0.52/0.57	77	74/80	51	45/60	54	53/61	90	84/95
ACTC & HSGPA[a]	Low	42	0.49	0.44/0.54	86	75/91	72	49/82	57	49/64	97	88/100
	Mid	42	0.50	0.47/0.53	84	72/89	66	41/78	60	52/64	95	84/99
	High	42	0.50	0.47/0.54	83	76/88	64	49/77	60	52/65	94	81/99

Note. All statistics presented in the table are evaluated at the institution-specific total-group optimal selection values that were associated with the maximum ARs. Total-group optimal selection values (SV) varied substantially across institutions (see Radunzel & Noble, 2012a); median SVs are shown in table. *K* = number of institutions with viable total-group models. Students' cumulative GPAs at degree completion were included in year 3 GPA analyses for students who graduated with an associate's degree before the end of year 3. There were 42 institutions with data available for the year 3 college GPA analyses.Med = Median; Min = Minimum; Max = Maximum; ACTC = ACT Composite; HSGPA = high school grade point average. Low is for lower-income students (annual family income < $30,000), Mid is for middle-income students (annual family income between $30,000 and $60,000), and High is for higher-income students (annual family income > $60,000).

[a]Multiple combinations of ACTC score and HSGPA corresponded to a probability of 0.50 for the total-group joint models.

Table D-9

Results for Bachelor's Degree Completion and Progress to Degree at Four-Year Institutions based on ACTC Score and HSGPA Models by Gender at Total-Group Optimal Selection Values (SV)

Predictor variable (median SV)	Gender	*K*	Group-specific probability of success		Accuracy rate (AR)		Increase in AR (ΔAR)		Success rate (SR)		Observed percentage below	
			Med	Min/Max	Med	Min/Max	Med	Min/Max	Med	Min/Max	Med	Min/Max
Bachelor's degree completion by year 6												
ACTC	Female	58	0.55	0.50/0.59	63	53/83	19	0/65	61	55/76	85	0/100
(25)	Male	58	0.45	0.41/0.52	66	54/86	31	0/72	51	45/66	82	0/99
HSGPA	Female	56	0.51	0.49/0.54	65	57/78	19	0/53	60	52/79	61	2/95
(3.57)	Male	56	0.48	0.44/0.51	67	59/81	29	0/62	55	46/74	73	4/98
ACTC &	Female	61	0.52	0.49/0.55	66	57/83	21	0/65	60	55/79	65	2/99
HSGPA[a]	Male	61	0.47	0.43/0.52	67	59/86	31	0/72	55	47/73	76	4/99
Progress to degree year 1												
ACTC	Female	44	0.55	0.49/0.62	72	62/86	2	0/55	74	65/86	20	0/90
(18)	Male	44	0.47	0.42/0.52	68	58/82	6	0/62	65	55/80	26	0/87
HSGPA	Female	48	0.51	0.49/0.55	74	66/88	4	0/48	75	58/88	20	0/88
(2.80)	Male	48	0.49	0.46/0.52	71	63/82	8	0/54	69	58/82	33	0/90
ACTC &	Female	48	0.52	0.49/0.60	75	67/86	4	0/56	77	67/86	21	0/87
HSGPA[a]	Male	48	0.48	0.44/0.62	73	64/83	10	0/62	70	61/81	32	0/87
Progress to degree year 2												
ACTC	Female	49	0.55	0.50/0.59	66	59/82	7	0/62	67	61/80	52	0/95
(20)	Male	49	0.46	0.42/0.50	64	55/86	17	0/70	58	50/73	51	0/94
HSGPA	Female	50	0.51	0.49/0.55	69	63/81	11	0/58	67	54/81	38	1/95
(3.13)	Male	50	0.48	0.45/0.52	68	58/83	19	0/65	62	54/75	53	2/96
ACTC &	Female	50	0.52	0.49/0.55	70	63/83	12	0/64	68	61/80	43	4/93
HSGPA[a]	Male	50	0.48	0.44/0.50	69	59/86	22	1/70	63	58/73	54	8/94

Table D-9 (cont.)

Predictor variable (median SV)	Gender	*K*	Group-specific probability of success		Accuracy rate (AR)		Increase in AR (ΔAR)		Success rate (SR)		Observed percentage below	
			Med	Min/Max	Med	Min/Max	Med	Min/Max	Med	Min/Max	Med	Min/Max
Progress to degree year 3												
ACTC	Female	50	0.55	0.52/0.61	64	57/82	15	0/64	64	59/80	66	0/97
(22)	Male	50	0.45	0.41/0.50	64	54/87	24	0/73	55	48/71	65	0/96
HSGPA	Female	50	0.52	0.49/0.55	67	60/80	17	0/60	64	51/79	51	2/97
(3.39)	Male	50	0.48	0.45/0.51	68	58/84	28	1/69	59	50/71	64	3/97
ACTC &	Female	50	0.52	0.49/0.55	67	60/83	18	0/65	65	59/78	54	5/95
HSGPA[a]	Male	50	0.47	0.44/0.50	69	59/87	29	2/73	60	54/70	65	9/95
Progress to degree year 4												
ACTC	Female	48	0.55	0.49/0.58	64	56/82	17	0/63	63	58/75	70	0/99
(24)	Male	48	0.46	0.42/0.50	66	54/85	29	0/70	53	46/66	72	0/97
HSGPA	Female	49	0.51	0.50/0.56	67	59/79	19	0/57	62	50/79	55	3/97
(3.46)	Male	49	0.48	0.46/0.52	68	57/83	30	1/66	57	48/71	68	5/97
ACTC &	Female	50	0.52	0.49/0.55	67	59/82	20	0/63	63	57/78	58	4/96
HSGPA[a]	Male	50	0.47	0.45/0.50	69	58/85	31	2/69	58	51/70	69	8/96

Note. All statistics presented in the table are evaluated at the institution-specific total-group optimal selection values that were associated with the maximum ARs. Total-group optimal selection values (SV) varied substantially across institutions (see Radunzel & Noble, 2012a); median SVs are shown in table. *K* = number of institutions with viable total-group models. There were 61 and 50 institutions with available outcomes data for bachelor's degree completion and progress to degree analyses, respectively. Med = Median; Min = Minimum; Max = Maximum; ACTC = ACT Composite; HSGPA = high school grade point average.

[a]Multiple combinations of ACTC score and HSGPA corresponded to a probability of 0.50 for the total-group joint models.

Table D-10

Results for Associate's Degree Completion and Progress to Degree at Two-Year Institutions based on ACTC Score and HSGPA Models by Gender at Total-Group Optimal Selection Values (SV)

Predictor variable (median SV)	Gender	*K*	Group-specific probability of success		Accuracy rate (AR)		Increase in AR (ΔAR)		Success rate (SR)		Observed percentage below	
			Med	Min/Max	Med	Min/Max	Med	Min/Max	Med	Min/Max	Med	Min/Max
Associate's degree completion by year 3												
ACTC	Female	25	0.56	0.42/0.63	80	69/92	60	36/84	59	44/65	100	92/100
(29)	Male	25	0.44	0.38/0.55	83	61/95	65	21/90	48	35/57	99	91/100
HSGPA	Female	5	0.52	0.49/0.52	70	69/72	38	36/44	53	52/55	88	80/92
(3.92)	Male	5	0.48	0.47/0.53	75	69/76	50	35/53	50	49/56	92	86/96
ACTC &	Female	25	0.52	0.39/0.56	81	69/92	62	37/83	56	41/62	99	80/100
HSGPA[a]	Male	25	0.46	0.23/0.56	82	61/95	65	22/90	49	41/58	99	85/100
Associate's degree completion or transfer to four-year institution by year 3												
ACTC	Female	38	0.54	0.42/0.61	76	63/88	53	21/76	59	46/66	99	76/100
(27)	Male	38	0.47	0.43/0.52	77	59/89	55	17/77	52	40/59	97	76/100
HSGPA	Female	14	0.49	0.41/0.52	69	65/75	37	23/50	54	44/60	83	58/96
(3.75)	Male	14	0.52	0.48/0.56	70	60/76	38	18/51	56	50/62	90	70/98
ACTC &	Female	38	0.51	0.41/0.54	77	65/88	53	24/76	56	46/62	97	61/100
HSGPA[a]	Male	38	0.49	0.41/0.55	78	60/89	55	19/78	54	42/63	97	71/100
Progress to degree year 1												
ACTC	Female	41	0.54	0.36/0.62	66	59/76	14	0/52	67	62/74	53	0/99
(19)	Male	41	0.50	0.39/0.56	65	55/84	16	0/67	62	39/73	54	0/99
HSGPA	Female	41	0.50	0.32/0.52	66	62/76	14	0/44	65	56/76	44	1/89
(3.03)	Male	41	0.51	0.46/0.57	65	59/77	16	0/54	63	52/78	56	2/91
ACTC &	Female	42	0.50	0.20/0.59	69	63/77	17	0/52	68	59/76	48	0/99
HSGPA[a]	Male	42	0.50	0.37/0.56	67	59/83	18	0/66	66	36/78	54	0/100

Table D-10 (cont.)

Predictor variable (median SV)	Gender	*K*	Group-specific probability of success		Accuracy rate (AR)		Increase in AR (ΔAR)		Success rate (SR)		Observed percentage below	
			Med	Min/Max	Med	Min/Max	Med	Min/Max	Med	Min/Max	Med	Min/Max
Progress to degree year 2												
ACTC	Female	41	0.54	0.39/0.58	65	53/77	24	2/53	63	51/68	76	14/99
(21)	Male	41	0.48	0.39/0.56	65	59/81	27	-1/63	56	45/66	74	17/96
HSGPA	Female	41	0.50	0.34/0.53	66	54/75	25	6/51	60	52/67	67	13/97
(3.38)	Male	41	0.50	0.42/0.56	66	62/83	29	0/66	58	45/69	76	23/97
ACTC &	Female	41	0.51	0.35/0.54	67	55/78	27	6/53	63	52/68	67	15/94
HSGPA[a]	Male	41	0.49	0.41/0.56	67	62/83	30	0/66	59	51/70	73	24/92
Progress to degree year 3												
ACTC	Female	41	0.54	0.41/0.62	67	57/80	31	7/60	61	49/69	89	35/100
(23)	Male	41	0.47	0.40/0.56	69	57/86	37	0/72	53	46/62	87	39/99
HSGPA	Female	36	0.50	0.36/0.53	67	55/76	32	11/52	57	48/65	80	31/98
(3.62)	Male	36	0.50	0.42/0.56	69	59/82	36	2/64	55	44/68	85	45/99
ACTC &	Female	41	0.51	0.37/0.57	69	57/80	33	11/60	60	49/65	79	34/99
HSGPA[a]	Male	41	0.48	0.39/0.56	70	59/86	39	3/73	56	47/68	85	46/98

Note. All statistics presented in the table are evaluated at the institution-specific total-group optimal selection values that were associated with the maximum ARs. Total-group optimal selection values (SV) varied substantially across institutions (see Radunzel & Noble, 2012a); median SVs are shown in table. *K* = number of institutions with viable total-group models. There were 43 and 42 institutions with available outcomes data for associate's degree completion and progress to degree analyses, respectively. There were 40 institutions with data available for associate's degree or transfer to a four-year institution by year 3. Med = Median; Min = Minimum; Max = Maximum; ACTC = ACT Composite; HSGPA = high school grade point average.

[a]Multiple combinations of ACTC score and HSGPA corresponded to a probability of 0.50 for the total-group joint models.

Table D-11

Results for Achieving Levels of Year 6 College Cumulative GPA at Four-Year Institutions based on ACTC Score and HSGPA Models by Gender at Total-Group Optimal Selection Values (SV)

Predictor variable (median SV)	Gender	*K*	Group-specific probability of success		Accuracy rate (AR)		Increase in AR (ΔAR)		Success rate (SR)		Observed percentage below	
			Med	Min/Max	Med	Min/Max	Med	Min/Max	Med	Min/Max	Med	Min/Max
3.00 or higher												
ACTC	Female	57	0.60	0.55/0.65	68	64/78	7	1/23	75	70/83	39	18/83
(20)	Male	57	0.40	0.37/0.44	65	60/75	20	7/50	57	50/65	44	17/87
HSGPA	Female	57	0.56	0.53/0.59	71	66/79	9	1/27	75	63/83	34	17/74
(3.17)	Male	57	0.43	0.39/0.44	69	62/75	26	10/48	62	52/68	49	25/84
ACTC &	Female	57	0.56	0.54/0.59	72	66/79	13	3/30	77	68/84	41	21/74
HSGPA[a]	Male	57	0.40	0.36/0.43	71	63/78	29	10/53	61	52/69	53	24/84
3.50 or higher												
ACTC	Female	57	0.62	0.57/0.70	76	65/90	48	23/79	70	60/75	93	79/100
(27)	Male	57	0.39	0.34/0.47	84	71/94	69	46/89	47	40/57	92	72/99
HSGPA	Female	40	0.54	0.52/0.58	76	65/84	47	19/68	61	54/69	83	63/96
(3.86)	Male	40	0.41	0.38/0.46	84	70/91	68	41/81	47	40/53	89	68/98
ACTC &	Female	57	0.57	0.53/0.61	80	66/91	55	18/81	67	59/73	88	67/99
HSGPA[a]	Male	57	0.39	0.32/0.43	87	71/95	73	41/89	51	45/59	91	69/99

Note. All statistics presented in the table are evaluated at the institution-specific total-group optimal selection values that were associated with the maximum ARs. Total-group optimal selection values (SV) varied substantially across institutions (see Radunzel & Noble, 2012a); median SVs are shown in table. *K* = number of institutions with viable total-group models. Students' cumulative GPAs at degree completion were included in year 6 GPA analyses for students who graduated with a bachelor's degree before the end of year 6. There were 57 institutions with data available for the year 6 college GPA analyses. Med = Median; Min = Minimum; Max = Maximum; ACTC = ACT Composite; HSGPA = high school grade point average.

[a]Multiple combinations of ACTC score and HSGPA corresponded to a probability of 0.50 for the total-group joint models.

Table D-12

Results for Achieving Levels of Year 3 College Cumulative GPA at Two-Year Institutions based on ACTC Score and HSGPA Models by Gender at Total-Group Optimal Selection Values (SV)

Predictor variable (median SV)	Gender	*K*	Group-specific probability of success		Accuracy rate (AR)		Increase in AR (ΔAR)		Success rate (SR)		Observed percentage below	
			Med	Min/Max	Med	Min/Max	Med	Min/Max	Med	Min/Max	Med	Min/Max
3.00 or higher												
ACTC	Female	42	0.58	0.49/0.63	65	62/69	18	5/36	68	62/78	66	33/92
(20)	Male	42	0.43	0.39/0.55	66	61/72	30	3/45	53	48/65	67	34/91
HSGPA	Female	42	0.53	0.42/0.56	67	61/70	20	8/35	66	59/74	61	24/83
(3.30)	Male	42	0.45	0.42/0.53	69	62/76	34	5/51	56	52/65	70	37/89
ACTC &	Female	42	0.53	0.43/0.56	69	63/72	22	10/39	69	62/77	62	29/81
HSGPA[a]	Male	42	0.44	0.40/0.53	71	63/77	37	6/53	58	52/66	69	39/89
3.50 or higher												
ACTC	Female	42	0.59	0.50/0.66	82	72/88	63	40/77	67	56/75	97	84/100
(26)	Male	42	0.41	0.35/0.48	86	75/92	72	50/84	49	37/56	96	84/100
HSGPA	Female	5	0.53	0.48/0.54	77	73/78	54	44/55	55	48/56	91	86/94
(3.98)	Male	5	0.46	0.43/0.53	80	77/85	61	53/72	49	44/53	95	90/97
ACTC &	Female	42	0.54	0.48/0.59	82	73/89	64	42/77	63	56/69	96	82/100
HSGPA[a]	Male	42	0.41	0.33/0.51	87	77/93	75	53/86	50	39/58	96	87/99

Note. All statistics presented in the table are evaluated at the institution-specific total-group optimal selection values that were associated with the maximum ARs. Total-group optimal selection values (SV) varied substantially across institutions (see Radunzel & Noble, 2012a); median SVs are shown in table. *K* = number of institutions with viable total-group models. Students' cumulative GPAs at degree completion were included in year 3 GPA analyses for students who graduated with an associate's degree before the end of year 3. There were 42 institutions with data available for the year 3 college GPA analyses. Med = Median; Min = Minimum; Max = Maximum; ACTC = ACT Composite; HSGPA = high school grade point average.

[a]Multiple combinations of ACTC score and HSGPA corresponded to a probability of 0.50 for the total-group joint models.

Appendix E

Tables E-1 to E-3

Table E-1

Distributions of Percentages of Students Meeting ACT Benchmarks across Institutions by Applicant/Enrollment Status, Type of Institution, and Race/Ethnicity

Institution type	ACT Benchmark	Race/ethnicity	Applicant pool		Enrolled students	
			Med	Min/Max	Med	Min/Max
Four-year (n = 61)	English	Minority	47	30/66	58	20/100
		White	75	56/88	83	39/97
	Mathematics	Minority	14	3/32	17	0/67
		White	35	16/66	42	4/91
	Reading	Minority	31	13/48	37	11/70
		White	57	39/74	64	26/90
	Science	Minority	7	0/20	11	0/35
		White	25	11/46	31	9/63
Two-year (n = 43)	English	Minority	36	20/51	33	20/83
		White	58	47/68	58	46/72
	Mathematics	Minority	7	1/20	6	1/31
		White	15	8/43	15	6/42
	Reading	Minority	22	6/50	22	5/44
		White	36	25/53	36	24/53
	Science	Minority	4	0/11	4	0/15
		White	11	5/22	11	3/24

Note. The ACT College Readiness Benchmarks are 18, 22, 21, and 24 in English, mathematics, reading, and science, respectively. Underrepresented minority students include African American, American Indian, and Hispanic students. For the typical numbers of students per institution see those reported in Tables A-1 and A-2. Med = median; Min = minimum; Max = maximum.

Table E-2

Distributions of Percentages of Students Meeting ACT Benchmarks across Institutions by Applicant/Enrollment Status, Type of Institution, and Family Income

Institution type	ACT Benchmark	Family income	Applicant pool		Enrolled students	
			Med	Min/Max	Med	Min/Max
Four-year (n = 61)	English	Low	59	26/74	72	24/92
		Mid	71	37/83	81	39/95
		High	78	47/89	83	38/97
	Mathematics	Low	21	3/45	30	4/71
		Mid	32	6/56	39	6/83
		High	41	11/69	43	0/90
	Reading	Low	41	13/61	51	12/75
		Mid	52	19/70	62	16/83
		High	56	25/75	64	21/89
	Science	Low	14	2/34	21	2/51
		Mid	21	3/42	27	3/54
		High	26	4/50	31	0/62
Two-year (n = 43)	English	Low	44	29/64	43	31/74
		Mid	56	42/69	56	39/71
		High	60	47/73	59	44/79
	Mathematics	Low	10	3/37	10	3/38
		Mid	14	8/39	14	6/37
		High	19	10/40	18	4/42
	Reading	Low	29	14/47	28	15/53
		Mid	34	23/48	34	19/47
		High	39	26/52	38	23/59
	Science	Low	8	2/16	7	2/17
		Mid	10	4/25	10	2/28
		High	13	3/23	11	2/22

Note. The ACT College Readiness Benchmarks are 18, 22, 21, and 24 in English, mathematics, reading, and science, respectively. Low is for lower-income students (annual family income < $30,000), Mid is for middle-income students (annual family income between $30,000 and $60,000), and High is for higher-income students (annual family income > $60,000). For the typical numbers of students per institution see those reported in Tables A-3 and A-4. Med = median; Min = minimum; Max = maximum.

Table E-3

Distributions of Percentages of Students Meeting ACT Benchmarks across Institutions by Applicant/Enrollment Status, Type of Institution, and Gender

Institution type	ACT Benchmark	Gender	Applicant pool		Enrolled students	
			Med	Min/Max	Med	Min/Max
Four-year (n = 61)	English	Female	72	34/87	82	39/97
		Male	65	28/82	75	22/94
	Mathematics	Female	28	5/53	36	5/82
		Male	34	5/66	43	5/90
	Reading	Female	53	18/71	62	18/85
		Male	49	14/68	56	11/83
	Science	Female	18	2/39	24	2/48
		Male	25	3/51	31	2/65
Two-year (n = 43)	English	Female	55	39/70	56	40/76
		Male	48	35/62	48	31/67
	Mathematics	Female	11	5/38	11	5/36
		Male	16	9/39	15	4/41
	Reading	Female	35	19/51	34	18/55
		Male	31	18/42	30	17/44
	Science	Female	8	3/18	7	1/20
		Male	12	5/25	12	3/27

Note. The ACT College Readiness Benchmarks are 18, 22, 21, and 24 in English, mathematics, reading, and science, respectively. For the typical numbers of students per institution see those reported in Tables A-5 and A-6. Med = median; Min = minimum; Max = maximum.

Appendix F

Tables F-1 to F-6

Table F-1

Results for Bachelor's Degree Completion, Progress to Degree, and Achieving Levels of Year 6 College Cumulative GPA at Four-Year Institutions based on ACT College Readiness Benchmarks by Race/Ethnicity

Subject area (median total-group probability of success)	Race/ ethnicity	Group-specific probability of success at Benchmark		Success rate (SR)		Increase in SR (ΔSR)	
		Med	Min/Max	Med	Min/Max	Med	Min/Max
Bachelor's degree completion by year 6							
English	White	0.34	0.12/0.77	46	22/80	4	1/7
(0.35)	Minority	0.28	0.10/0.64	36	16/70	8	4/13
Mathematics	White	0.47	0.23/0.79	53	30/82	11	2/24
(0.46)	Minority	0.42	0.21/0.69	48	29/74	17	7/31
Reading	White	0.41	0.18/0.79	48	23/81	4	1/9
(0.39)	Minority	0.32	0.14/0.68	39	18/72	8	4/16
Science	White	0.48	0.24/0.80	52	29/81	9	1/17
(0.47)	Minority	0.42	0.22/0.72	45	26/74	14	5/25
Progress to degree year 1							
English	White	0.60	0.29/0.84	73	48/89	5	1/14
(0.59)	Minority	0.53	0.17/0.80	61	29/85	13	6/22
Mathematics	White	0.74	0.55/0.87	82	67/90	13	3/39
(0.73)	Minority	0.71	0.35/0.86	79	46/89	26	9/53
Reading	White	0.69	0.40/0.87	75	50/90	5	1/16
(0.67)	Minority	0.61	0.24/0.84	67	33/87	14	4/26
Science	White	0.77	0.55/0.90	81	61/91	10	2/32
(0.76)	Minority	0.72	0.41/0.87	76	47/89	23	6/43
Progress to degree year 2							
English	White	0.47	0.17/0.75	60	34/82	6	1/10
(0.45)	Minority	0.39	0.14/0.72	50	23/78	11	7/18
Mathematics	White	0.61	0.38/0.78	70	49/84	13	4/31
(0.61)	Minority	0.58	0.28/0.77	65	37/82	25	11/40
Reading	White	0.54	0.27/0.80	62	36/84	6	2/12
(0.53)	Minority	0.44	0.18/0.77	51	24/81	11	6/19
Science	White	0.63	0.39/0.83	69	47/84	12	2/26
(0.62)	Minority	0.60	0.31/0.81	64	37/83	24	7/37

Table F-1 (cont.)

Subject area (total-group probability of success)	Race/ ethnicity	Group-specific probability of success at Benchmark		Success rate (SR)		Increase in SR (ΔSR)	
		Med	Min/Max	Med	Min/Max	Med	Min/Max
Progress to degree year 3							
English	White	0.40	0.13/0.73	52	28/80	5	2/9
(0.39)	Minority	0.33	0.11/0.69	42	18/76	10	6/14
Mathematics	White	0.54	0.31/0.76	62	43/81	14	3/27
(0.53)	Minority	0.49	0.23/0.74	57	31/80	22	11/36
Reading	White	0.47	0.22/0.78	54	29/81	6	2/10
(0.46)	Minority	0.37	0.15/0.74	44	20/78	10	6/18
Science	White	0.56	0.32/0.80	61	39/82	13	2/23
(0.56)	Minority	0.50	0.25/0.79	55	30/81	21	8/34
Progress to degree year 4							
English	White	0.38	0.13/0.74	49	26/80	5	2/8
(0.37)	Minority	0.31	0.11/0.67	39	17/74	9	6/13
Mathematics	White	0.51	0.28/0.76	58	38/81	13	3/23
(0.51)	Minority	0.45	0.21/0.73	53	28/78	21	10/33
Reading	White	0.44	0.21/0.78	52	27/81	5	2/10
(0.43)	Minority	0.35	0.14/0.72	41	18/76	10	6/17
Science	White	0.53	0.30/0.80	58	36/82	11	2/20
(0.53)	Minority	0.47	0.22/0.76	51	27/79	18	7/31
Year 6 cumulative GPA 3.00 or higher							
English	White	0.50	0.34/0.66	68	51/79	7	4/11
(0.46)	Minority	0.34	0.20/0.62	47	34/69	14	10/20
Mathematics	White	0.68	0.50/0.79	76	60/86	14	6/24
(0.66)	Minority	0.55	0.38/0.75	65	48/80	28	19/42
Reading	White	0.63	0.45/0.73	72	53/82	9	5/13
(0.59)	Minority	0.43	0.32/0.68	54	41/73	18	13/24
Science	White	0.73	0.54/0.82	77	60/86	14	7/21
(0.72)	Minority	0.60	0.46/0.78	66	51/80	30	21/40

Note. These analyses were based on all institutions with available data for each outcome (61 institutions for bachelor's degree completion, 50 for progress to degree outcomes, and 57 institutions for year 6 cumulative GPA). Students' cumulative GPAs at degree completion were included in year 6 GPA analyses for students who graduated with a bachelor's degree before the end of year 6. The ACT College Readiness Benchmarks are 18, 22, 21, and 24 in English, mathematics, reading, and science, respectively. Underrepresented minority students include African American, American Indian, and Hispanic students. Med = Median; Min = Minimum; Max = Maximum.

Table F-2

Results for Associate's Degree Completion, Progress to Degree, and Achieving Levels of Year 3 College Cumulative GPA at Two-Year Institutions based on ACT College Readiness Benchmarks by Race/Ethnicity

Subject area (total-group probability of success)	Race/ ethnicity	Group-specific probability of success at Benchmark		Success rate (SR)		Increase in SR (ΔSR)	
		Med	Min/Max	Med	Min/Max	Med	Min/Max
Associate's degree completion by year 3							
English	White	0.13	0.04/0.36	19	6/42	4	1/8
(0.12)	Minority	0.10	0.03/0.31	15	4/40	6	2/12
Mathematics	White	0.22	0.07/0.51	29	10/59	13	3/23
(0.22)	Minority	0.19	0.06/0.50	24	8/59	16	5/31
Reading	White	0.16	0.05/0.38	19	7/43	5	2/8
(0.15)	Minority	0.12	0.04/0.34	15	5/41	6	2/13
Science	White	0.23	0.08/0.49	26	9/53	11	4/18
(0.23)	Minority	0.20	0.06/0.48	23	7/53	13	4/25
Associate's degree completion or transfer to four-year institution by year 3							
English	White	0.22	0.10/0.43	30	15/52	5	3/10
(0.21)	Minority	0.18	0.08/0.39	25	11/49	9	4/15
Mathematics	White	0.36	0.17/0.62	42	21/70	18	9/26
(0.36)	Minority	0.31	0.13/0.60	37	17/68	21	11/33
Reading	White	0.26	0.12/0.47	31	15/53	6	3/10
(0.25)	Minority	0.21	0.08/0.42	25	11/49	9	4/14
Science	White	0.36	0.16/0.59	39	18/63	14	8/19
(0.35)	Minority	0.30	0.12/0.55	33	15/61	18	8/25
Progress to degree year 1							
English	White	0.51	0.17/0.78	63	28/82	10	4/14
(0.49)	Minority	0.44	0.11/0.79	55	16/84	18	5/25
Mathematics	White	0.71	0.24/0.86	78	30/89	24	8/37
(0.70)	Minority	0.68	0.18/0.89	75	31/92	36	17/48
Reading	White	0.58	0.22/0.80	65	29/83	11	4/18
(0.56)	Minority	0.50	0.13/0.80	56	21/84	19	8/29
Science	White	0.70	0.31/0.85	74	39/87	20	10/31
(0.70)	Minority	0.65	0.21/0.88	69	30/90	31	15/46

Table F-2 (cont.)

Subject area (total-group probability of success)	Race/ ethnicity	Group-specific probability of success at Benchmark		Success rate (SR)		Increase in SR (ΔSR)	
		Med	Min/Max	Med	Min/Max	Med	Min/Max
Progress to degree year 2							
English	White	0.40	0.11/0.63	50	16/70	8	2/11
(0.38)	Minority	0.33	0.08/0.60	42	11/68	13	3/19
Mathematics	White	0.57	0.14/0.78	63	17/82	21	4/28
(0.57)	Minority	0.53	0.12/0.78	60	19/83	30	9/39
Reading	White	0.45	0.13/0.66	51	16/71	9	3/12
(0.44)	Minority	0.37	0.09/0.62	43	13/69	14	6/19
Science	White	0.57	0.17/0.75	61	20/78	18	7/24
(0.57)	Minority	0.51	0.13/0.75	55	17/79	26	9/35
Progress to degree year 3							
English	White	0.33	0.06/0.56	42	10/64	7	2/9
(0.32)	Minority	0.28	0.04/0.53	36	5/61	12	2/16
Mathematics	White	0.49	0.09/0.71	55	11/77	20	3/24
(0.49)	Minority	0.45	0.07/0.71	52	12/78	27	7/34
Reading	White	0.37	0.08/0.59	43	11/64	8	2/9
(0.37)	Minority	0.31	0.05/0.56	37	8/62	13	4/17
Science	White	0.49	0.10/0.69	52	12/73	16	4/21
(0.49)	Minority	0.44	0.07/0.69	47	9/73	23	5/29
Year 3 cumulative GPA 3.00 or higher							
English	White	0.44	0.33/0.62	57	45/73	10	7/15
(0.42)	Minority	0.37	0.24/0.56	47	31/67	17	12/20
Mathematics	White	0.63	0.50/0.82	70	57/87	22	14/29
(0.63)	Minority	0.59	0.42/0.80	65	47/87	35	27/41
Reading	White	0.51	0.41/0.68	61	48/77	13	8/19
(0.50)	Minority	0.43	0.29/0.60	52	33/69	20	9/25
Science	White	0.64	0.52/0.80	69	56/84	20	15/27
(0.63)	Minority	0.58	0.41/0.76	63	45/80	31	24/44

Note. These analyses were based on all institutions with available data for each outcome (43 institutions for associate's degree completion, 40 for associate's degree completion or transfer to a four-year institution, and 42 for progress to degree outcomes and year 3 cumulative GPA). Students' cumulative GPAs at degree completion were included in year 3 GPA analyses for students who graduated with an associate's degree before the end of year 3. The ACT College Readiness Benchmarks are 18, 22, 21, and 24 in English, mathematics, reading, and science, respectively. Underrepresented minority students include African American, American Indian, and Hispanic students. Med = Median; Min = Minimum; Max = Maximum.

Table F-3

Results for Bachelor's Degree Completion, Progress to Degree, and Achieving Levels of Year 6 College Cumulative GPA at Four-Year Institutions based on ACT College Readiness Benchmarks by Family Income

Subject area (total-group probability of success)	Family income	Group-specific probability of success at Benchmark		Success rate (SR)		Increase in SR (ΔSR)	
		Med	Min/Max	Med	Min/Max	Med	Min/Max
Bachelor's degree completion by year 6							
English (0.35)	Low	0.29	0.09/0.73	38	15/76	6	2/11
	Mid	0.35	0.12/0.75	44	22/79	5	1/12
	High	0.39	0.15/0.78	50	27/82	4	1/10
Mathematics (0.46)	Low	0.41	0.17/0.75	48	23/79	14	5/30
	Mid	0.45	0.23/0.78	52	30/81	12	3/28
	High	0.50	0.27/0.81	57	34/84	10	2/25
Reading (0.39)	Low	0.34	0.12/0.74	39	15/76	6	1/12
	Mid	0.41	0.18/0.77	46	23/79	5	1/12
	High	0.45	0.22/0.81	52	27/83	4	1/13
Science (0.47)	Low	0.42	0.17/0.76	46	20/77	11	3/23
	Mid	0.48	0.25/0.79	51	29/80	10	2/23
	High	0.52	0.29/0.82	57	34/83	9	1/23
Progress to degree year 1							
English (0.59)	Low	0.54	0.19/0.81	63	33/84	8	3/19
	Mid	0.58	0.28/0.84	71	46/87	6	2/20
	High	0.62	0.30/0.86	76	52/90	5	1/17
Mathematics (0.73)	Low	0.68	0.46/0.84	77	59/87	18	6/52
	Mid	0.74	0.53/0.87	82	66/90	14	4/43
	High	0.77	0.55/0.89	85	69/92	11	2/37
Reading (0.67)	Low	0.60	0.28/0.83	66	36/85	8	2/20
	Mid	0.68	0.37/0.85	74	48/89	6	2/20
	High	0.72	0.41/0.88	78	53/91	5	1/19
Science (0.76)	Low	0.69	0.44/0.85	74	51/87	17	5/42
	Mid	0.77	0.55/0.88	81	63/90	12	3/39
	High	0.80	0.58/0.91	84	66/92	9	2/36

Table F-3 (cont.)

Subject area (total-group probability of success)	Family income	Group-specific probability of success at Benchmark		Success rate (SR)		Increase in SR (ΔSR)	
		Med	Min/Max	Med	Min/Max	Med	Min/Max
Progress to degree year 2							
English	Low	0.38	0.12/0.71	51	22/76	7	4/14
(0.45)	Mid	0.46	0.17/0.73	58	33/80	6	3/14
	High	0.50	0.19/0.77	63	39/84	5	1/13
Mathematics	Low	0.54	0.30/0.74	63	41/79	18	8/38
(0.61)	Mid	0.62	0.37/0.76	69	49/82	15	5/35
	High	0.66	0.40/0.80	73	54/85	12	4/32
Reading	Low	0.44	0.18/0.75	52	25/78	7	3/15
(0.53)	Mid	0.54	0.26/0.78	60	35/82	6	2/14
	High	0.59	0.29/0.82	66	40/85	6	2/15
Science	Low	0.55	0.31/0.79	60	37/80	16	5/31
(0.62)	Mid	0.63	0.40/0.81	69	49/83	13	4/31
	High	0.68	0.43/0.85	73	53/86	11	2/30
Progress to degree year 3							
English	Low	0.33	0.08/0.68	44	17/73	7	3/13
(0.39)	Mid	0.39	0.13/0.72	51	26/78	6	3/13
	High	0.43	0.15/0.75	56	33/81	5	1/12
Mathematics	Low	0.47	0.23/0.71	56	33/76	17	6/32
(0.53)	Mid	0.53	0.30/0.75	63	42/80	15	4/31
	High	0.57	0.34/0.78	66	48/83	12	3/28
Reading	Low	0.38	0.13/0.72	45	19/75	7	3/15
(0.46)	Mid	0.47	0.20/0.76	53	29/79	6	3/12
	High	0.52	0.24/0.79	59	34/83	6	2/13
Science	Low	0.49	0.23/0.75	53	28/77	16	5/28
(0.56)	Mid	0.56	0.32/0.79	62	40/81	13	3/27
	High	0.61	0.37/0.82	67	46/84	12	2/28

Table F-3 (cont.)

Subject area (total-group probability of success)	Family income	Group-specific probability of success at Benchmark		Success rate (SR)		Increase in SR (ΔSR)	
		Med	Min/Max	Med	Min/Max	Med	Min/Max
Progress to degree year 4							
English	Low	0.31	0.09/0.68	41	16/73	6	3/12
(0.37)	Mid	0.37	0.13/0.72	49	25/78	6	2/11
	High	0.41	0.15/0.75	54	31/81	5	1/10
Mathematics	Low	0.44	0.21/0.71	51	30/76	16	5/27
(0.51)	Mid	0.50	0.28/0.75	58	38/80	14	4/26
	High	0.54	0.32/0.78	62	43/83	12	3/24
Reading	Low	0.36	0.13/0.71	42	18/74	7	3/13
(0.43)	Mid	0.43	0.19/0.76	51	27/79	6	2/11
	High	0.49	0.23/0.80	56	32/82	5	2/12
Science	Low	0.44	0.22/0.74	50	26/76	14	5/25
(0.53)	Mid	0.52	0.30/0.78	58	37/80	12	3/23
	High	0.57	0.34/0.82	63	42/83	11	2/24
Year 6 cumulative GPA 3.00 or higher							
English	Low	0.42	0.29/0.64	60	44/74	12	8/20
(0.46)	Mid	0.46	0.33/0.61	65	49/78	9	5/17
	High	0.48	0.35/0.63	68	52/80	7	4/14
Mathematics	Low	0.64	0.44/0.76	73	54/85	24	12/42
(0.66)	Mid	0.66	0.48/0.78	75	60/86	17	10/31
	High	0.68	0.50/0.79	77	61/87	14	7/26
Reading	Low	0.54	0.40/0.67	65	50/76	15	9/24
(0.59)	Mid	0.59	0.43/0.71	70	52/81	11	7/19
	High	0.62	0.45/0.73	73	54/83	9	5/17
Science	Low	0.68	0.50/0.80	74	55/85	24	14/39
(0.72)	Mid	0.71	0.54/0.81	76	60/86	18	12/30
	High	0.73	0.55/0.83	78	61/87	15	8/24

Note. These analyses were based on all institutions with available data for each outcome (61 institutions for bachelor's degree completion, 50 for progress to degree outcomes, and 57 institutions for year 6 cumulative GPA). Students' cumulative GPAs at degree completion were included in year 6 GPA analyses for students who graduated with a bachelor's degree before the end of year 6. The ACT College Readiness Benchmarks are 18, 22, 21, and 24 in English, mathematics, reading, and science, respectively. Low is for lower-income students (annual family income < $30,000), Mid is for middle-income students (annual family income between $30,000 and $60,000), and High is for higher-income students (annual family income > $60,000). Med = Median; Min = Minimum; Max = Maximum.

Table F-4

Results for Associate's Degree Completion, Progress to Degree, and Achieving Levels of Year 3 College Cumulative GPA at Two-Year Institutions based on ACT College Readiness Benchmarks by Family Income

Subject area (total-group probability of success)	Family income	Group-specific probability of success at Benchmark		Success rate (SR)		Increase in SR (ΔSR)	
		Med	Min/Max	Med	Min/Max	Med	Min/Max
Associate's degree completion by year 3							
English (0.12)	Low	0.11	0.04/0.30	17	6/36	5	2/10
	Mid	0.13	0.04/0.37	20	6/44	4	1/8
	High	0.13	0.04/0.37	20	7/43	3	1/7
Mathematics (0.22)	Low	0.21	0.07/0.47	27	10/55	15	4/27
	Mid	0.24	0.07/0.53	29	10/61	14	4/24
	High	0.22	0.07/0.49	27	9/57	11	3/20
Reading (0.15)	Low	0.13	0.04/0.32	18	6/38	5	2/11
	Mid	0.17	0.05/0.39	21	7/45	5	2/9
	High	0.17	0.05/0.39	21	7/44	4	1/9
Science (0.23)	Low	0.21	0.07/0.45	25	9/49	12	4/22
	Mid	0.24	0.07/0.51	28	9/55	12	3/19
	High	0.23	0.07/0.49	27	9/54	10	3/17
Associate's degree completion or transfer to four-year institution by year 3							
English (0.21)	Low	0.18	0.08/0.36	25	11/44	6	3/11
	Mid	0.23	0.09/0.44	31	13/54	6	3/10
	High	0.26	0.12/0.47	35	17/56	5	3/9
Mathematics (0.36)	Low	0.31	0.13/0.55	37	17/64	19	10/30
	Mid	0.38	0.15/0.64	45	19/72	19	10/26
	High	0.40	0.18/0.63	45	23/70	16	9/22
Reading (0.25)	Low	0.21	0.08/0.39	25	10/46	7	4/12
	Mid	0.27	0.10/0.48	32	13/55	7	3/11
	High	0.31	0.13/0.52	36	16/58	7	3/10
Science (0.35)	Low	0.30	0.12/0.52	34	14/56	15	7/22
	Mid	0.37	0.14/0.61	41	16/65	15	7/21
	High	0.41	0.17/0.62	44	21/66	14	8/18

Table F-4 (cont.)

Subject area (total-group probability of success)	Family income	Group-specific probability of success at Benchmark		Success rate (SR)		Increase in SR (ΔSR)	
		Med	Min/Max	Med	Min/Max	Med	Min/Max
Progress to degree year 1							
English	Low	0.44	0.14/0.75	57	23/79	14	5/22
(0.49)	Mid	0.51	0.16/0.80	63	27/84	11	5/18
	High	0.55	0.18/0.83	67	27/86	9	3/16
Mathematics	Low	0.67	0.22/0.85	75	29/88	31	10/48
(0.70)	Mid	0.72	0.23/0.87	79	30/90	25	9/40
	High	0.73	0.24/0.88	79	28/90	19	7/35
Reading	Low	0.50	0.18/0.76	59	24/80	15	6/28
(0.56)	Mid	0.57	0.21/0.81	65	28/84	12	4/21
	High	0.62	0.23/0.84	70	27/86	11	3/20
Science	Low	0.66	0.27/0.84	70	33/85	26	13/38
(0.70)	Mid	0.71	0.30/0.86	75	36/88	21	10/37
	High	0.74	0.31/0.88	78	42/90	18	7/33
Progress to degree year 2							
English	Low	0.34	0.09/0.57	43	13/64	10	2/16
(0.38)	Mid	0.41	0.10/0.64	51	14/71	8	2/13
	High	0.45	0.12/0.68	56	16/75	7	2/12
Mathematics	Low	0.53	0.12/0.74	60	15/80	26	5/36
(0.57)	Mid	0.58	0.12/0.79	65	16/84	22	4/30
	High	0.60	0.15/0.80	66	17/84	19	3/28
Reading	Low	0.39	0.10/0.59	45	13/65	11	3/18
(0.44)	Mid	0.46	0.11/0.67	52	15/72	9	3/14
	High	0.51	0.14/0.70	56	16/75	8	2/14
Science	Low	0.52	0.14/0.71	57	17/74	21	7/30
(0.57)	Mid	0.59	0.15/0.77	63	18/79	19	6/28
	High	0.62	0.17/0.78	66	22/81	17	8/25

Table F-4 (cont.)

Subject area (total-group probability of success)	Family income	Group-specific probability of success at Benchmark		Success rate (SR)		Increase in SR (ΔSR)	
		Med	Min/Max	Med	Min/Max	Med	Min/Max
Progress to degree year 3							
English	Low	0.29	0.05/0.50	37	8/58	9	2/13
(0.32)	Mid	0.34	0.05/0.58	43	9/65	8	2/11
	High	0.38	0.07/0.61	48	10/68	6	2/9
Mathematics	Low	0.45	0.08/0.67	53	10/74	23	4/31
(0.49)	Mid	0.51	0.08/0.73	58	10/78	21	3/28
	High	0.52	0.09/0.73	58	11/78	17	3/24
Reading	Low	0.33	0.06/0.53	39	9/59	10	2/13
(0.37)	Mid	0.38	0.07/0.61	44	10/66	9	2/11
	High	0.42	0.09/0.64	48	10/69	7	2/10
Science	Low	0.44	0.09/0.65	48	10/69	19	3/26
(0.49)	Mid	0.50	0.09/0.71	54	10/74	18	3/25
	High	0.54	0.10/0.73	57	12/76	15	4/22
Year 3 cumulative GPA 3.00 or higher							
English	Low	0.42	0.34/0.60	53	45/67	14	9/17
(0.42)	Mid	0.43	0.34/0.59	57	45/72	12	8/15
	High	0.41	0.29/0.58	56	41/72	10	7/15
Mathematics	Low	0.64	0.53/0.79	70	59/85	29	19/36
(0.63)	Mid	0.64	0.53/0.80	71	60/86	24	17/30
	High	0.60	0.47/0.79	67	54/86	21	15/28
Reading	Low	0.48	0.41/0.62	58	49/71	17	10/24
(0.50)	Mid	0.52	0.42/0.67	62	49/75	15	10/20
	High	0.49	0.37/0.65	59	44/75	13	8/19
Science	Low	0.63	0.54/0.76	68	58/80	27	22/33
(0.63)	Mid	0.65	0.54/0.79	70	58/83	24	18/31
	High	0.60	0.47/0.77	66	50/82	20	13/27

Note. These analyses were based on all institutions with available data for each outcome (43 institutions for associate's degree completion, 40 for associate's degree completion or transfer to a four-year institution, and 42 for progress to degree outcomes and year 3 cumulative GPA). Students' cumulative GPAs at degree completion were included in year 3 GPA analyses for students who graduated with an associate's degree before the end of year 3. The ACT College Readiness Benchmarks are 18, 22, 21, and 24 in English, mathematics, reading, and science, respectively. Low is for lower-income students (annual family income < $30,000), Mid is for middle-income students (annual family income between $30,000 and $60,000), and High is for higher-income students (annual family income > $60,000). Med = Median; Min = Minimum; Max = Maximum.

Table F-5

Results for Bachelor's Degree Completion, Progress to Degree, and Achieving Levels of Year 6 College Cumulative GPA at Four-Year Institutions based on ACT College Readiness Benchmarks by Gender

Subject area (total-group probability of success)	Gender	Group-specific probability of success at Benchmark		Success rate (SR)		Increase in SR (ΔSR)	
		Med	Min/Max	Med	Min/Max	Med	Min/Max
Bachelor's degree completion by year 6							
English	Female	0.37	0.12/0.77	48	23/81	5	1/11
(0.35)	Male	0.32	0.11/0.74	41	18/77	5	1/11
Mathematics	Female	0.52	0.28/0.81	59	36/84	14	5/32
(0.46)	Male	0.39	0.18/0.75	47	25/78	11	3/28
Reading	Female	0.43	0.18/0.80	50	25/82	5	1/13
(0.39)	Male	0.36	0.15/0.76	42	19/78	5	1/12
Science	Female	0.54	0.29/0.82	58	34/84	13	3/27
(0.47)	Male	0.41	0.19/0.77	46	24/78	10	2/21
Progress to degree year 1							
English	Female	0.63	0.25/0.86	74	45/90	6	1/20
(0.59)	Male	0.54	0.25/0.81	66	41/85	7	2/22
Mathematics	Female	0.80	0.60/0.90	87	73/93	16	4/49
(0.73)	Male	0.67	0.42/0.83	77	58/87	14	3/44
Reading	Female	0.71	0.37/0.88	77	48/91	6	2/21
(0.67)	Male	0.62	0.32/0.82	69	42/87	7	2/20
Science	Female	0.83	0.60/0.92	86	67/93	14	4/47
(0.76)	Male	0.70	0.45/0.85	75	54/88	13	3/39
Progress to degree year 2							
English	Female	0.48	0.16/0.76	62	33/84	6	2/15
(0.45)	Male	0.42	0.15/0.70	54	29/78	7	3/16
Mathematics	Female	0.67	0.43/0.81	74	55/87	18	6/41
(0.61)	Male	0.54	0.29/0.71	63	44/79	14	5/34
Reading	Female	0.56	0.26/0.82	64	36/85	6	2/16
(0.53)	Male	0.48	0.21/0.76	56	31/80	7	3/15
Science	Female	0.69	0.45/0.86	75	53/88	16	5/39
(0.62)	Male	0.56	0.32/0.78	63	41/81	13	4/30

Table F-5 (cont.)

Subject area (total-group probability of success)	Gender	Group-specific probability of success at Benchmark		Success rate (SR)		Increase in SR (ΔSR)	
		Med	Min/Max	Med	Min/Max	Med	Min/Max
Progress to degree year 3							
English	Female	0.42	0.12/0.77	53	26/82	6	2/13
(0.39)	Male	0.35	0.11/0.69	46	23/75	6	3/13
Mathematics	Female	0.59	0.35/0.80	68	48/85	18	5/36
(0.53)	Male	0.47	0.24/0.69	56	37/76	14	4/29
Reading	Female	0.49	0.20/0.81	57	29/84	6	2/15
(0.46)	Male	0.40	0.17/0.73	49	25/76	7	2/13
Science	Female	0.62	0.37/0.84	68	45/86	16	5/36
(0.56)	Male	0.50	0.26/0.75	55	34/78	13	4/27
Progress to degree year 4							
English	Female	0.40	0.12/0.77	51	25/82	5	2/12
(0.37)	Male	0.33	0.11/0.69	44	22/75	6	3/12
Mathematics	Female	0.56	0.32/0.80	63	43/85	17	5/32
(0.51)	Male	0.43	0.22/0.69	52	34/76	13	4/25
Reading	Female	0.46	0.19/0.81	54	27/83	6	2/14
(0.43)	Male	0.38	0.16/0.73	46	24/76	7	2/12
Science	Female	0.59	0.34/0.83	64	41/85	16	5/29
(0.53)	Male	0.46	0.24/0.75	51	31/77	12	4/22
Year 6 cumulative GPA 3.00 or higher							
English	Female	0.53	0.39/0.69	72	56/84	9	4/19
(0.46)	Male	0.39	0.28/0.51	55	40/68	10	5/19
Mathematics	Female	0.76	0.59/0.87	84	69/93	20	12/35
(0.66)	Male	0.52	0.36/0.65	64	47/78	20	10/35
Reading	Female	0.66	0.50/0.78	76	60/87	12	7/22
(0.59)	Male	0.49	0.35/0.60	59	43/72	12	7/20
Science	Female	0.81	0.66/0.89	85	72/92	20	14/35
(0.72)	Male	0.58	0.42/0.71	67	48/78	19	11/32

Note. These analyses were based on all institutions with available data for each outcome (61 institutions for bachelor's degree completion, 50 for progress to degree outcomes, and 57 institutions for year 6 cumulative GPA). Students' cumulative GPAs at degree completion were included in year 6 GPA analyses for students who graduated with a bachelor's degree before the end of year 6. The ACT College Readiness Benchmarks are 18, 22, 21, and 24 in English, mathematics, reading, and science, respectively. Med = Median; Min = Minimum; Max = Maximum.

Table F-6

Results for Associate's Degree Completion, Progress to Degree, and Achieving Levels of Year 3 College Cumulative GPA at Two-Year Institutions based on ACT College Readiness Benchmarks by Gender

Subject area (total-group probability of success)	Gender	Group-specific probability of success at Benchmark		Success rate (SR)		Increase in SR (ΔSR)	
		Med	Min/Max	Med	Min/Max	Med	Min/Max
Associate's degree completion by year 3							
English	Female	0.13	0.04/0.32	20	7/40	4	1/9
(0.12)	Male	0.11	0.03/0.40	16	5/44	4	1/9
Mathematics	Female	0.27	0.09/0.53	34	13/61	19	5/28
(0.22)	Male	0.18	0.05/0.49	24	6/57	11	2/23
Reading	Female	0.17	0.05/0.36	21	8/43	6	2/10
(0.15)	Male	0.13	0.04/0.42	17	5/45	5	1/9
Science	Female	0.27	0.09/0.51	31	11/55	15	6/23
(0.23)	Male	0.18	0.05/0.48	22	6/52	9	2/18
Associate's degree completion or transfer to four-year institution by year 3							
English	Female	0.21	0.10/0.40	30	15/50	6	3/10
(0.21)	Male	0.22	0.08/0.44	28	11/52	6	3/11
Mathematics	Female	0.39	0.19/0.64	46	25/71	23	13/30
(0.36)	Male	0.32	0.12/0.58	39	16/67	16	8/26
Reading	Female	0.25	0.11/0.45	31	15/52	8	4/12
(0.25)	Male	0.24	0.09/0.46	29	11/52	7	4/11
Science	Female	0.38	0.18/0.60	42	21/64	19	11/24
(0.35)	Male	0.32	0.12/0.56	35	14/61	13	7/20
Progress to degree year 1							
English	Female	0.49	0.17/0.77	63	30/82	11	6/22
(0.49)	Male	0.49	0.15/0.80	59	21/83	12	4/20
Mathematics	Female	0.76	0.29/0.88	82	38/91	30	13/47
(0.70)	Male	0.65	0.17/0.86	74	22/88	24	6/40
Reading	Female	0.57	0.23/0.79	65	31/83	14	6/27
(0.56)	Male	0.53	0.17/0.80	62	23/83	13	4/26
Science	Female	0.75	0.37/0.87	78	46/89	25	13/42
(0.70)	Male	0.64	0.24/0.85	69	31/87	21	9/34

Table F-6 (cont.)

Subject area (total-group probability of success)	Gender	Group-specific probability of success at Benchmark		Success rate (SR)		Increase in SR (ΔSR)	
		Med	Min/Max	Med	Min/Max	Med	Min/Max
Progress to degree year 2							
English	Female	0.38	0.11/0.60	50	16/68	9	3/17
(0.38)	Male	0.38	0.09/0.64	46	11/70	9	2/14
Mathematics	Female	0.63	0.17/0.80	70	21/84	27	6/37
(0.57)	Male	0.50	0.09/0.76	58	10/81	20	2/32
Reading	Female	0.45	0.14/0.64	52	18/70	11	3/18
(0.44)	Male	0.41	0.09/0.65	47	12/70	9	2/16
Science	Female	0.61	0.20/0.77	65	24/79	23	10/33
(0.57)	Male	0.51	0.11/0.74	56	14/77	18	5/27
Progress to degree year 3							
English	Female	0.33	0.07/0.53	43	11/62	8	2/13
(0.32)	Male	0.31	0.04/0.58	39	6/65	8	1/11
Mathematics	Female	0.55	0.11/0.73	62	15/78	26	5/33
(0.49)	Male	0.42	0.05/0.70	50	6/76	19	2/29
Reading	Female	0.38	0.09/0.57	45	12/63	10	3/12
(0.37)	Male	0.34	0.05/0.60	40	7/64	9	2/11
Science	Female	0.53	0.13/0.71	57	15/74	22	6/30
(0.49)	Male	0.43	0.06/0.68	47	8/72	16	2/22
Year 3 cumulative GPA 3.00 or higher							
English	Female	0.46	0.34/0.64	59	45/77	12	8/15
(0.42)	Male	0.36	0.27/0.61	47	37/67	12	8/16
Mathematics	Female	0.71	0.57/0.90	78	63/93	30	19/35
(0.63)	Male	0.50	0.39/0.70	59	46/79	23	16/34
Reading	Female	0.55	0.42/0.73	64	49/81	16	10/20
(0.50)	Male	0.42	0.33/0.62	51	40/67	15	9/18
Science	Female	0.71	0.57/0.88	75	62/90	27	22/34
(0.63)	Male	0.53	0.41/0.72	59	44/76	22	16/29

Note. These analyses were based on all institutions with available data for each outcome (43 institutions for associate's degree completion, 40 for associate's degree completion or transfer to a four-year institution, and 42 for progress to degree outcomes and year 3 cumulative GPA). Students' cumulative GPAs at degree completion were included in year 3 GPA analyses for students who graduated with an associate's degree before the end of year 3. The ACT College Readiness Benchmarks are 18, 22, 21, and 24 in English, mathematics, reading, and science, respectively. Med = Median; Min = Minimum; Max = Maximum.

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