HIGHER EDUCATION RESEARCH INSTITUTE AT UCLA
home of the COOPERATIVE INSTITUTIONAL RESEARCH PROGRAM
HERI

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The Higher Education Research Institute (HERI) is based in the Graduate School of Education & Information Studies at the University of California, Los Angeles. The Institute serves as an interdisciplinary center for research, evaluation, information, policy studies, and research training in postsecondary education.

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Acknowledgements:
We wish to thank the generous support of the Ford Foundation (1090-0517) for this publication and also the National Institutes of Health (5R01GM071968) and National Science Foundation (DUE-0757076) that supported data collection, which also resulted in several other studies on degree attainments among students in science fields. This independent research and the views expressed here do not indicate endorsement by the sponsors.

Cover design by Escott & Associates. Page layout and text design by The Oak Co.
The authors wish to thank Melissa Aragon, Jennifer Berdan, Adrianna Ruiz, and Marcia Fuentes for their expert assistance in the preparation of the manuscript.

Published by the Higher Education Research Institute.
Suggested citation:
DeAngelo, L., Franke, R., Hurtado, S., Pryor, J. H., & Tran, S. (2011). *Completing college: Assessing graduation rates at four-year institutions*. Los Angeles: Higher Education Research Institute, UCLA.

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ISBN 978-1-878477-52-1 (paperback)
ISBN 978-1-878477-53-8 (e-book)

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FOREWORD

Although decades of research have focused on understanding student retention, persistence, and degree attainment, national statistics remain fairly constant. Modifications to Tinto's (1987, 1993) original theory of student departure have been proposed that take into account diverse populations (Hurtado & Carter, 1997; Rendon, Jalomo, & Nora, 2000), a rethinking of academic integration (Braxton & Lien, 2000), and psychological theories to improve a model that was framed using a sociological perspective (Bean & Eaton, 2000). Despite extensive research and multiple theoretical viewpoints, we have not made much progress in terms of moving more students toward degree attainment.

How should we assess various institutions and hold them accountable? This monograph, the latest in a series of reports from the Higher Education Research Institute (HERI) on graduation rates, reiterates the need to consider a method of evaluating graduation rates that was pioneered by Alexander Astin, HERI's founder, who first insisted that we must take into account the characteristics of students that enroll in different types of colleges. Previous HERI findings (Astin & Oseguera, 2005) and this current study indicate that a large portion of what predicts graduation in four, five, or six years can be found in the characteristics of the incoming class. Thus, a true measure of institutional effectiveness in moving students towards degree attainment may lie in understanding the difference between how many students we would *expect* to graduate and how many *actually* graduate. Ideally, we expect to graduate all students but the probabilities differ for the students we enroll—are institutions adequately addressing the needs of students who have lower probabilities for completion?

A guiding principal of this project has been to develop data-driven tools for institutions to help reexamine their graduation rates. We wanted institutions using the CIRP Freshman Survey to be able to quickly, and easily, utilize their survey results to calculate their expected graduation rates for four, five, and six years. Thus, an important companion piece to this report is an electronic calculator using the results from multivariate analyses in this report. We import the relevant information from the cohort taking the CIRP Freshman Survey and provide an expected graduation rate for four, five and six year graduation. A spreadsheet form allows institutions to forecast potential expected graduation rates if certain aspects of the incoming class were to change. For instance, what would be the impact on the expected graduation rate if an institution were to offer 10% more on-campus housing for incoming first-year students? This tool will be very useful to institutions focused on improving student degree attainment in targeted time frames.

This report is the first step in using a rich database that merges the CIRP Freshman Survey and completion data from the National Student Clearinghouse. HERI plans a series of

studies that will examine degree attainment and time to graduation among specific populations as well as student mobility, which influences degree attainment.

HERI's additional work on retention and persistence uses the longitudinal follow-up surveys to the *CIRP Freshman Survey,* examining experiences that affect retention after the first year *(Your First College Year Survey)* and up to the senior year (the *College Senior Survey*). With our newest survey, the *Diverse Learning Environments Survey,* we examine refinements to Tinto's original theory focusing on diverse populations. We hope that the findings from this report and HERI studies will be useful in moving more students toward degree attainment, and in institutional planning, especially towards achieving equity in graduation rates among diverse students.

John Pryor, Director
Cooperative Institutional Research Program

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INTRODUCTION

Many consider college degree completion rates to be among one of the most important indicators of institutional quality. This is primarily because of the consistent research regarding the benefits of a college degree to individuals and to society. For example, college graduates are more likely to be satisfied with their jobs, and place a greater premium on the need to feel that their work is important (Baum, Ma, & Payea, 2010). They are also more likely to engage civically, with higher rates of volunteering and voting (Knox, Lindsay, & Kolb, 1993). Greater educational attainment is associated with both higher salaries and lower unemployment rates (U.S. Department of Labor, 2010). Increasing student degree attainment is, therefore, vital to the economic health of the United States.

Increasing student degree attainment is, therefore, vital to the economic health of the United States.

Despite the value of a college degree, only 27.4% of the adult population in the United States has completed college (U.S. Census Bureau, 2009). There are, moreover, wide disparities in degree attainment by race/ethnicity and gender. Just 19% of African Americans and 12% of Hispanics (of any race) between the ages of 25 and 29 have a college degree compared to 37% of Whites in this age group. Further, in a reversal of the previous gender gap in educational attainment which favored men, more women than men among the young adult population (ages 25 to 29) currently have a college degree, 35% vs. 27%. Degree attainment gaps are also increasing rather than decreasing (Astin & Oseguera, 2004; Kane, 2004).

Public colleges and universities are now called upon to address low graduation rates by their state legislatures, and both public and private institutions feel pressure by regional accrediting associations to improve retention. Pressure to improve is also the result of college ranking systems which now incorporate and publish graduation rates as a measure of college quality. Further, a national priority has been established: President Barack Obama, in the *American Graduation Initiative*, has set the goal that the United States must add five million more graduates to the workforce in this decade to remain competitive in the global marketplace (White House Office of the Press Secretary, 2009). In order to meet this goal, higher education institutions must radically improve degree completion rates that have been relatively stable, achieve equity in attainment gaps between groups, and decrease student time-to-degree.

The United States Congress began recognizing the importance of degree completion in 1990 with the passage of the *Student Right-to-Know and Campus Security Act* which requires institutions to report their retention and graduation rates publically. These raw graduation rates can be misleading however, since different types of institutions admit and enroll students with very different characteristics, past academic experiences and

If institutions are to improve their degree completion rates they must first be able to accurately assess how effective they are in moving the students they enroll toward graduation.

achievements, and goals. If institutions are to improve their degree completion rates they must first be able to accurately assess how effective they are in moving the students they enroll toward graduation. Further, portraying raw graduation rates as a measure of institutional quality and effectiveness without first taking into account the types of students that enroll at an institution strongly favors the most selective institutions and tends to penalize institutions that offer broad access or enroll large numbers of first-generation students, even if these institutions are successful in helping their students earn degrees. A focus on improving raw graduation rates can influence institutions to attempt to raise admissions standards in order to improve the retention bottom-line rather than improve the college's efforts to enhance degree completion success among the students they already enroll through changes in policy or programs. This can also discourage institutions from enrolling and working toward success with a broad range of students who rely on higher education for social and economic mobility, a practice that works solidly against raising the level of degree attainment among the population in the United States overall. In order to actually improve degree completion rates at an institutional, as well as state and national level, the focus needs to be squarely on creating conditions for success for all students who begin college.

The purpose of this report is to provide data-driven information regarding more complex ways of assessing institutional graduation rates, taking into account the characteristics of students that institutions enroll as first-time freshmen. Other reports on variation in institutional graduate rates have used comparisons of similar institution types to alert the public about low or high degree attainment rates of particular colleges (Hess, Schneider, Kelley, & Carey, 2009). Unfortunately, such reports rely on aggregate data and therefore are not actually comparing institutions with similar types of students.

A second important purpose is to provide equations that institutions can use to evaluate their own rates relative to others, accounting for the probabilities associated with the characteristics of the students they educate. Finally, we also provide degree completion calculators to allow institutions to evaluate how their own rates can be improved using alternative scenarios. These are available online at (http://www.heri.ucla.edu/GradRateCalculator.php). In short, the focus is on data-driven assistance to help institutions improve their retention and graduation rates.

In order to support institutional degree completion, we created a unique dataset that extends previous degree completion work at the Higher Education Research Institute (Astin, Tsui, & Avalos, 1996; Astin & Oseguera, 2005). In these previous HERI reports, the authors combined data from the Cooperative Institutional Research Program's (CIRP) Freshman Survey (given to students at college entry) with degree completion data obtained six years later from the registrars of the colleges and universities that had participated in

the CIRP Freshman Survey in 1985 (Astin, Tsui, & Avalos, 1996) and in 1994 (Astin & Oseguera, 2005). In both reports, the authors found that degree completion could be fairly accurately predicted by the characteristics of the entering student cohort as measured by the CIRP Freshman Survey.

In this report, we update and expand upon the previous HERI degree completion research by using the 2004 CIRP Freshman Survey merged with data from the National Student Clearinghouse (NCS), which collects unit record data from cooperating college registrars from a variety of institutions that participate in order to track individual students toward completion. This has the immediate effect of providing a much richer source of data with greater breadth and allows for the tracking of full cohorts of students. The degree completion section of this report differs from other recent reports (see Knapp, Kelly-Reid, & Ginder, 2011) in that we study only non-proprietary four-year institutions and focus on presenting degree completion results that are specific for this group.[1] We report degree completion figures at three different intervals—four, five, and six years after entering college, broken down by institutional type, gender, first-generation status, and race/ethnicity. We also compare today's degree completion figures where appropriate with degree completion figures from the last study HERI completed on degree attainment with students who started college a decade earlier (see Astin & Oseguera, 2005). Although the extremely low graduation rates at the for-profit schools are surely an area for further examination, since those schools were not part of the pool of institutions that participated in the 2004 CIRP Freshman Survey, they are not included in this study.

Data and Methodology

The data for this study comes from the 2004 CIRP Freshman Survey (TFS) and the National Student Clearinghouse (NSC). Student responses to the TFS were augmented by retention and degree completion data from the NSC. The NSC has been tracking enrollment and degree completion for participating institutions for over 15 years. Currently over 3,700 postsecondary institutions participate in the NSC and submit degree progress and completion information. Through merging these two data sources, we created a unique dataset that allows us to examine retention and degree attainment of 210,056 first-time, full-time students at 356 four-year non-profit institutions.

In order to preserve the full dataset in its near entirety, multiple imputation using the multivariate normal (MVN) approach in STATA was performed to compensate for missing values on the TFS.[2] Further, a weighting scheme was applied to approximate the population of nearly 1.3 million entering first-year students in 2004.[3] The weighting procedure is

[1] Reports such as the NCES report by Knapp, Kelly-Reid, and Ginder (2011) include data for proprietary institutions in their calculations of overall degree completion; therefore their figures are lower and not directly comparable to the figures we present in this monograph.
[2] For details on missing data handling and the imputation method, see Appendix E.
[3] For details on the weighting procedure, see also Appendix E.

identical to what has been used in the previous editions of this report, thus allowing us to compare figures and examine trends in degree attainment over time. The primary analytic method used to model and predict degree completion in this study is logistic regression.[4] This method is appropriate for studies in which the dependent variable is dichotomous, coded as "1" for individuals that graduated either within four, five, or six years and "0" if they did not.

For the purpose of this study, we restrict our analyses to first-time, full-time students at four-year institutions who graduated either within four, five, or six years at the institution of initial enrollment and where the TFS was administered. Similar to previous HERI studies, we have limited this analysis to degree completion at the institution of initial enrollment because institutions are most accountable for these degree completion figures, and because this is how degree completion is defined in the 1990 *Student Right-to-Know and Campus Security Act*. We acknowledge, however, that a small percentage of students transfer and graduate from institutions other than the institution where they initially enroll, and that in the dataset for this study these students would be considered "dropouts." Forthcoming studies from HERI using this dataset will comprehensively examine the population of students who transfer and graduate from institutions other than where they initially enroll, as well as all other forms of student enrollment mobility.

Degree Completion Rates

The steep increase in degree completion between four and five years reinforces the common notion that many students today take five years to complete a baccalaureate degree.

The overall degree completion rates at four-, five-, and six-year intervals are shown in Figure 1. Just fewer than four in ten students (38.9%) complete a degree after four years. The degree completion figure increases by 17.5 percentage points to 56.4% after five years, and by only another 4.8 percentage points to 61.2% after six years.[5] The steep increase in degree completion between four and five years reinforces the common notion that many students today take five years to complete a baccalaureate degree. By looking at all three time points, it is clear that the likelihood that a student will eventually complete a degree quickly decreases after five years.

These degree attainment rates are an improvement over the figures HERI reported for students who started college a decade earlier (see Astin & Oseguera, 2005). As shown in Figure 2, only 36.3% of the entering cohort of 1994 earned a degree at their initial institution after four years and by six years

[4] In the previous editions, ordinary least squares (OLS) regressions were carried out to examine degree attainment. Due to the methodological differences in OLS and logistic regression, we cannot directly compare estimated coefficients and fit-statistics in this study with results from previous reports.

[5] These figures are within 3 percentage points or less of figures derived from IPEDS for the entering cohort of 2002 for the same population of institutions.

57.6% had earned a degree.[6] Compared to the figures of 38.9% and 61.2% that we report for the entering cohort of 2004, we see a 2.6 percentage point increase in degree completion after four years, and an overall degree completion improvement of 3.6 percentage points for six-year degree completion.

Students' rates of degree completion vary substantially by institutional type (see Table 1), especially four-year degree completion figures. Private universities have the highest four-year degree completion rate (64.0%), whereas public four-year colleges have the lowest (23.5%). With just over two out of every ten students at a public four-year college graduating after four years, the chance that a student attending a private university will graduate after four years is almost three times greater (a difference of 40.5 percentage points).

Figure 1. Weighted Four-, Five-, and Six-Year Degree Attainment Rates, Across All Institutions

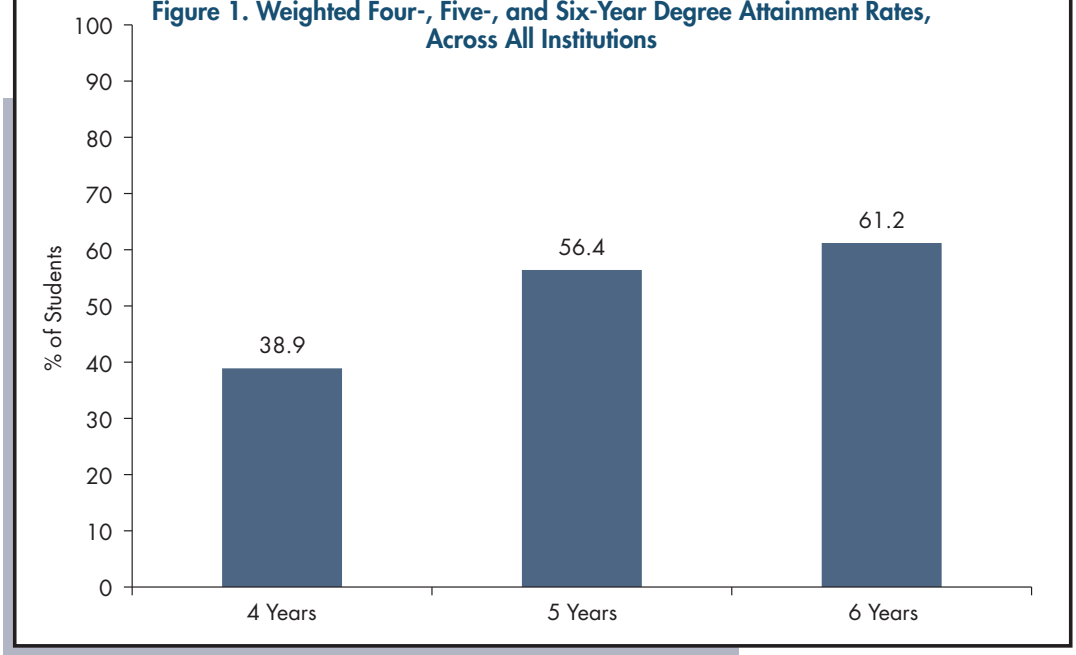
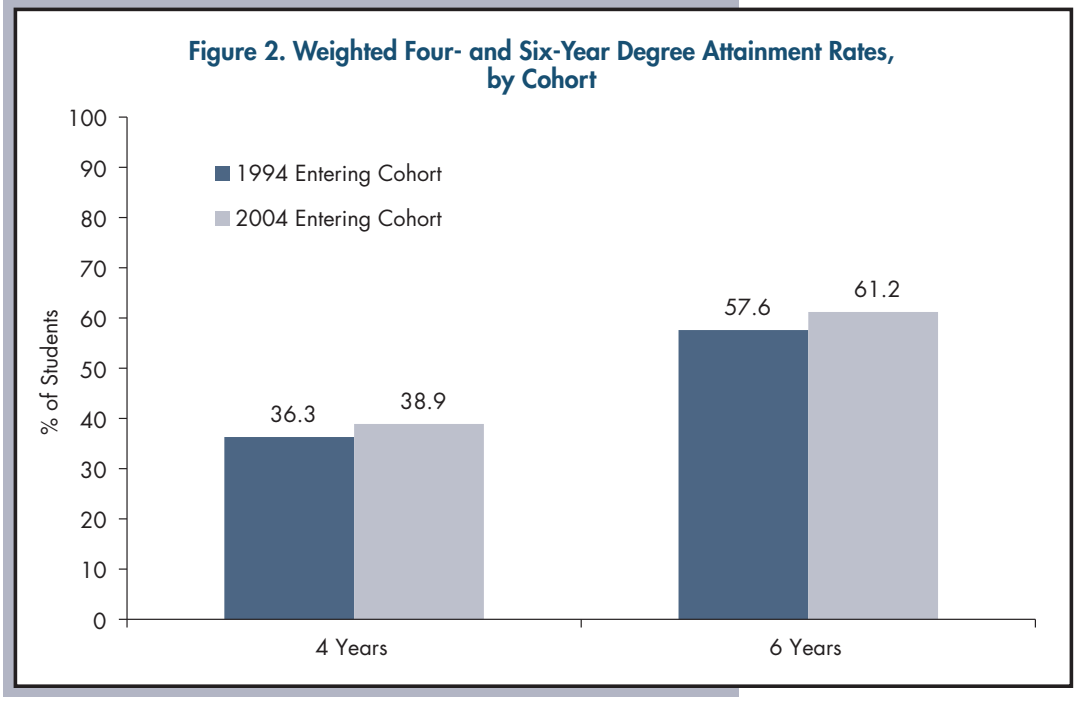


Figure 2. Weighted Four- and Six-Year Degree Attainment Rates, by Cohort



[6] Degree completion figures for the entering cohort of 1994 as reported in Astin & Oseguera (2005) are within 3 percentage points or less of figures derived from IPEDS for the same population of institutions for the entering cohort of 1996. IPEDS 1996 to 2002 degree completion figures show an increase in degree completion of a similar magnitude as the figures reported here.

Table 1. Four-, Five-, and Six-Year Degree Attainment Rates, by Institutional Type

Institutional Type	Weighted Percent Completing Bachelor's Degree Within		
	4 Years	5 Years	6 Years
Public University	37.1	59.8	65.6
Private University	64.0	75.9	78.2
Public 4-Year College	23.5	43.1	49.5
Nonsectarian 4-Year College	48.7	59.3	61.8
Catholic 4-Year College	54.1	64.0	66.0
Other Religious 4-Year College	47.8	56.3	57.9

After six years the difference in graduation rates between these two institutional types shrinks considerably to 28.7 percentage points (78.2% vs. 49.5%), but private universities still graduate considerably more of the students that initially matriculate to their institutions than do public four-year colleges. Public universities also graduate fewer students after four years than private universities, and private four-year nonsectarian or religious colleges, but, with the exception of private universities, this gap in degree completion disappears at the end of the fifth year. By the sixth year, public universities have a degree completion figure as high, or higher, than all types of private four-year colleges, and the gap between public and private universities is reduced to 12.6 percentage points (65.6% vs. 78.2%). As was reported ten years ago (Astin & Oseguera, 2005), students at public institutions continue to take longer to earn a degree.

Differences in degree attainment by institutional type are related, at least in part, to differences in the academic preparation of entering students. In 2004, 41.9% of students entering private universities had an A/A+ high-school grade average compared to just 17.0% of students at public four-year colleges (Sax, Hurtado, Lindholm, Astin, Korn, & Mahoney, 2004). Although public universities had the second highest proportion of students reporting grades in this range (just 27.7% of students entering public universities reported average high-school grades this high), private universities enroll a much higher proportion of the most academically-prepared students.

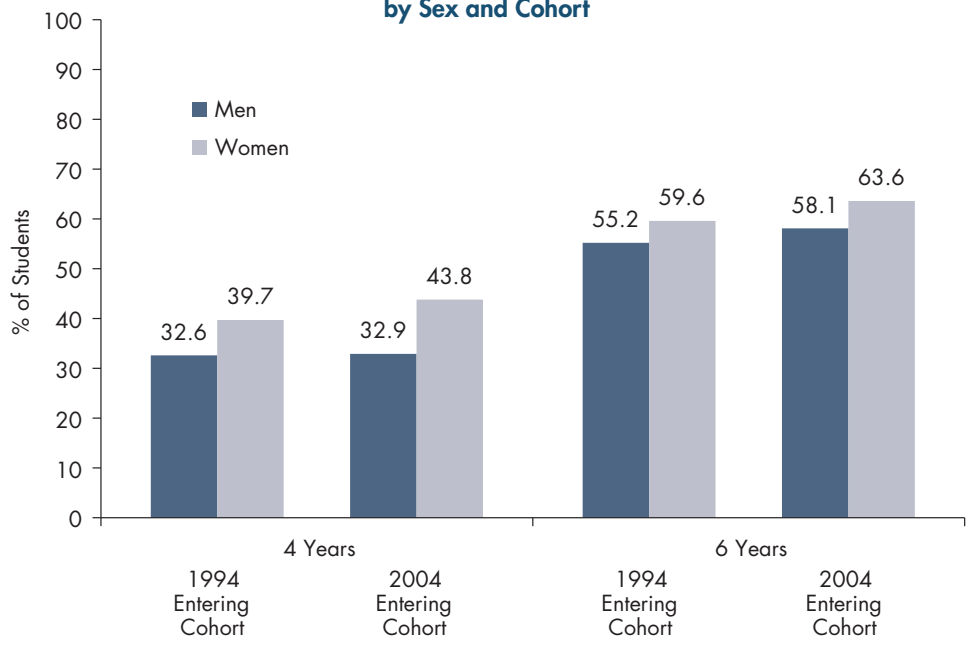
Degree Attainment by Gender

Women attain degrees at higher rates than men, and the gender gap in degree attainment has widened in the last decade. As shown in Figure 3, just 32.9% of men earn a degree after four years as compared to 43.8% of women, a gap of 10.9 percentage points. As reported in Astin & Oseguera (2005) for the entering cohort of 1994, the gap in degree attainment at four years was 7.1 percentage points (32.6% vs. 39.7%). A good portion of the gender gap among the most recent cohort disappears by the end of the fifth year. At this point 59.7% of women have finished college, compared to 52.4% of men, a gap of 7.3 percentage points.[7] Some of the shrinkage in this gap at five years is likely due at least in part to the higher proportion of men who graduate in fields such as engineering that traditionally take longer to degree. The gap in degree attainment shrinks further to 5.5 percentage points (58.1% vs. 63.6%) at the end of the sixth year, but was

[7] The five-year degree completion rate is not available for the entering cohort of 1994, and thus a comparison of the gender gap after five years cannot be computed.

4.4 percentage points (55.2% vs. 59.6%) for the entering cohort of 1994. Some of these differences in degree attainment between men and women likely stem from the academic achievement advantage women start college with both in terms of higher high-school grades and a more rigorous course load, including more high-school math and science courses (Cho, 2007).

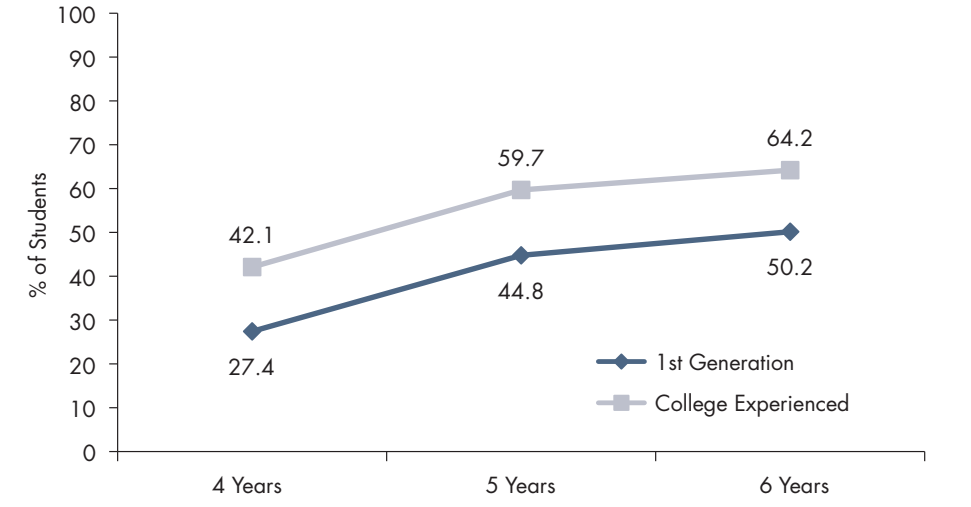
Figure 3. Weighted Four- and Six-Year Degree Attainment Rates, by Sex and Cohort



Degree Attainment by First-Generation Status[8]

Gaps in degree attainment are even larger and more persistent when examining if a student's parents attended college (see Figure 4). Significantly fewer first-generation students (27.4%) earn a degree after four years compared to a much larger percentage of students (42.1%) who come from families with parents who have higher education experience, a gap of 14.7 percentage points. After six years this gap remains basically unchanged at 14.0 percentage points, with just 50.2% of first-generation students completing their degrees as compared to 64.2% of their peers whose parents have college experience.

Figure 4. Weighted Four-, Five-, and Six-Year Degree Attainment Rates, by Generation in College



[8] First-generation students are defined as students for whom neither parent has attended college.

Table 2. Six-Year Degree Attainment Rates, by Institutional Type, Sex, and Generation in College

	Public University	Private University	Public 4-Year College	Nonsectarian 4-Year College	Catholic 4-Year College	Other Religious 4-Year College
Women	68.1	79.3	52.7	63.8	67.0	62.4
Men	62.9	77.0	45.3	59.3	64.5	52.1
1st Generation	54.1	68.3	43.0	54.0	54.9	48.7
College Experienced	68.2	79.6	52.3	63.9	69.3	60.3

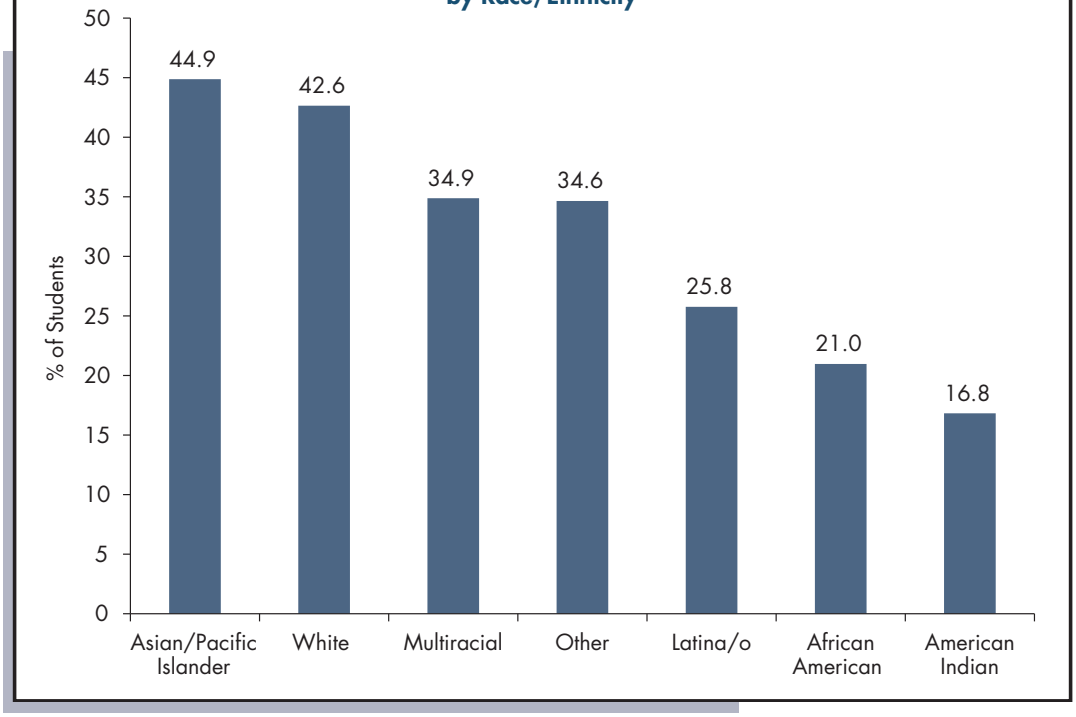
Differences in the gap between men and women and between first-generation students and their peers whose parents have college experience are also apparent by institutional type (see Table 2). After six years, men and women's degree attainment rates are closest at private universities and Catholic four-year colleges, where the difference in degree attainment between men and women is less than 3 percentage points. The largest gender gaps are at public four-year colleges (45.3% men vs. 52.7% women), and other religious four-year colleges (52.1% men vs. 62.4% women). With gaps of 7.4 and 10.3 percentage points respectively, the differences in degree attainment at public four-year colleges and other religious four-year colleges are more than twice as large as the differences at private universities and Catholic four-year colleges. Interestingly, in terms of enrollment, Catholic four-year colleges attract many more women than men, while men and women enroll in more equal percentages at private universities (Sax, et al., 2004).

All types of institutions have difficulty graduating first-generation students (see Table 2). The degree completion rate gap between first-generation students and their peers whose parents have college experience is largest at Catholic four-year colleges (54.9% vs. 69.3%, a gap of 14.4 percentage points), and public universities (54.1% vs. 68.2%, a gap of 14.1 percentage points). The gap between first-generation students and their peers whose parents have college experience is only somewhat better at other religious four-year colleges (48.7% vs. 60.3%, a gap of 11.6 percentage points), private universities (68.3% vs. 79.6%, a gap of 11.3 percentage points), public four-year colleges (43.0% vs. 52.3%, a gap of 9.3 percentage points), and non-sectarian four-year colleges (54.0% vs. 63.9%, a gap of 9.9 percentage points). Although the differences in degree attainment are sizeable at all types of institutions, these gaps are especially troublesome for public institutions, which also enroll the large majority of first-generation college students (Sáenz, Hurtado, Barrera, Wolf, & Yeung, 2007). In 2004, 43.0% of first-generation students beginning college at a four-year institution enrolled at a public four-year college, and another 27.2% enrolled at a public university (Sax, et al., 2004).

Degree Attainment by Race/Ethnicity

Large differences in degree attainment are also evident by race/ethnicity. As shown in Figure 5, Asian American and White students have the highest rate of four-year degree completion (44.9% and 42.6%, respectively), whereas the rates for Latino/a (25.8%), African American (21.0%), and American Indian (16.8%) students are considerably lower. In fact, Asian American and White students are twice as likely as African American students, and almost three times as likely as American Indian students to earn a degree in four years. With a gap of 19.1 percentage points with Asian American students, and

Figure 5. Weighted Four-Year Degree Attainment Rates, by Race/Ethnicity



16.8 percentage points with White students, Latino/a students are not fairing much better. The low degree completion rates for these students only further exacerbate the gaps in educational attainment overall for Latino/as, African Americans and American Indians. Among students starting college at a four-year institution in 2004, Latino/as, African Americans, and American Indians were only 13.5% of the population, with an additional 5.4% of the population being multiracial[9] (Sax et al., 2004). Multiracial students tend to fare better in degree completion than underrepresented groups, but not as well as White and Asian students.

Although degree attainment rates nearly double for American Indian, African American, and Latino/a students by end of the sixth year, overall degree attainment rates for these groups are still much lower than they are for their White, and, especially, Asian American peers (see Table 3). Significantly fewer American Indian (38.1%) and African American (41.3%) students, and half of Latino/a (51.4%) students earn a degree at the institution where they initially matriculated after six years compared to 64.3% of White and 73.2% of Asian American students. The gap in degree attainment between Latino/a and White students is 12.9 percentage points, and with Asian Americans students 21.8 percentage points. These degree attainment gaps are even larger for African American and American Indian students. Between African Americans and White students the gap

Table 3. Four-, Five-, and Six-Year Degree Attainment Rates, by Race/Ethnicity

	Weighted Percent Completing Bachelor's Degree Within		
Racial/Ethnic Group	4 Years	5 Years	6 Years
African American	21.0	35.6	41.3
American Indian	16.8	33.2	38.1
Asian/Pacific Islander	44.9	66.8	73.2
Latina/o	25.8	44.0	51.4
White	42.6	60.2	64.3
Multiracial	34.9	51.5	56.1
Other	34.6	54.0	60.1

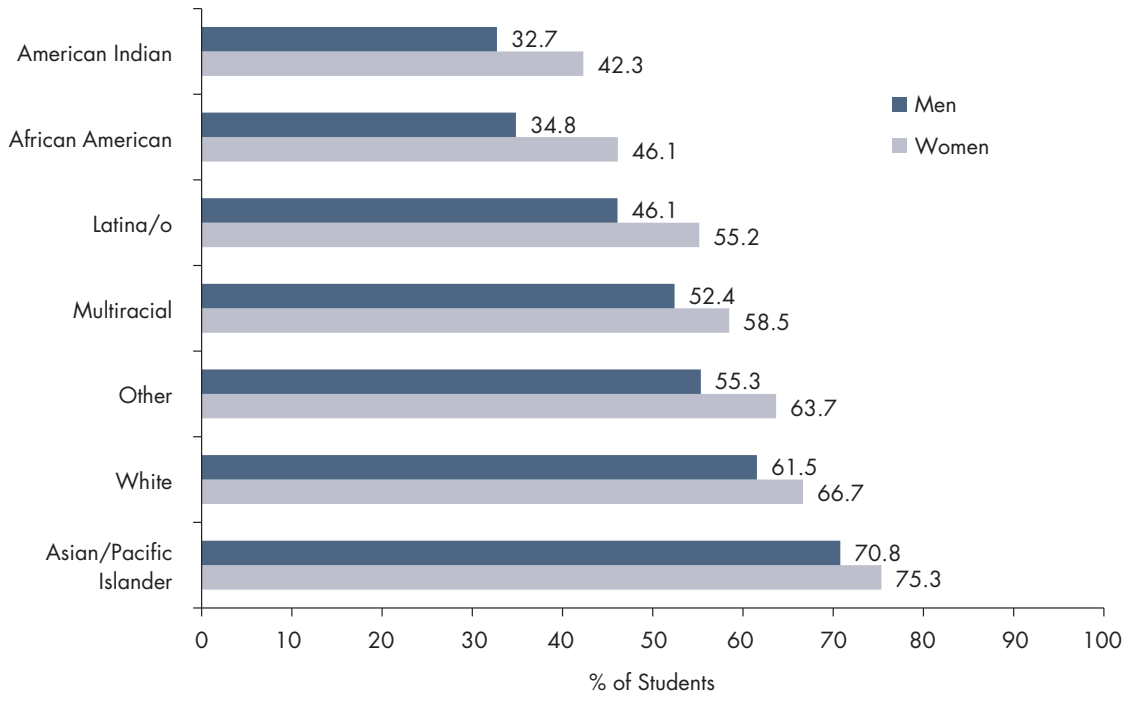
[9] Multiracial students checked two or more races/ethnicities on the CIRP Freshman Survey (TFS).

at six years is 23.0 percentage points, and with Asian American students the gap is 31.9 percentage points. For American Indian students the six-year gap with White students is 26.2 percentage points, and with Asian American students the gap is 35.1 percentage points. Asian American students are almost twice as likely to earn a bachelor's degree in six years as their American Indian peers.

Within each racial/ethnic group, men and first-generation students are less likely to earn a degree than women and students whose parents have attended college. As shown in Figure 6, at the end of six years White and Asian American male students are only somewhat less likely to earn a degree (61.5% and 70.8%, respectively) than are their female counterparts (66.7% and 75.3%, respectively). The gender gap for African American students (34.8% vs. 46.1%, a gap of 11.3 percentage points) is twice as large as it is for White and Asian American students (5.2 and 4.5 percentage points respectively). The gap is not much smaller for American Indian (32.7% vs. 42.3%, a gap of 9.6 percentage points), or Latino/a (46.1% vs. 55.2%, a gap of 9.1 percentage points) students. Given the much lower overall rates of degree attainment for these groups, these large gaps in degree attainment between men and women are particularly worrisome.

On the other hand, Latino/as have one of the smallest gaps in degree attainment by first-generation status (48% first-generation vs. 54.9% college-experienced, a gap of

Figure 6. Weighted Six-Year Degree Attainment Rates, by Sex and Race/Ethnicity



6.9 percentage points) (see Figure 7). Despite the smaller discrepancy in attainment rates, first-generation status remains a significant negative predictor of six-year degree attainment in multivariate studies of this group (Arellano, 2011). Differences in degree attainment by first-generation status are largest for American Indian and African American students. First-generation American Indian students are 10.7 percentage points less likely to earn a degree after six years than their counterparts whose parents have college experience (30.8% vs. 41.5%, respectively), and African American first-generation students are 10.1 percentage points less likely to earn a degree than their counterparts whose parents have college experience (34.5% vs. 44.6%). Interestingly, the gap between first-generation and non-first-generation multiracial and White students is the largest at 14.4 and 13.9 percentage points, respectively. Although only a small minority (17.4%) of White students starting college at a four-year institution were first-generation in 2004 (Sax et al., 2004), the obstacles for these students appear to be similar at least in part to first-generation students from other groups in terms of earning a degree. In fact, a recent study found that while low family expectations for earning a college degree (which is tied to parental education levels), were negatively associated with degree expectations among all students, White students were disproportionately affected (Wells, Seifert, Padgett, Park, & Umbach, 2011).

Regardless of race/ethnicity, degree attainment for students is highest at private universities and lowest at public four-year colleges (see Table 4). At each institutional type the

Figure 7. Weighted Six-Year Degree Attainment Rates, by Race/Ethnicity and Generation in College

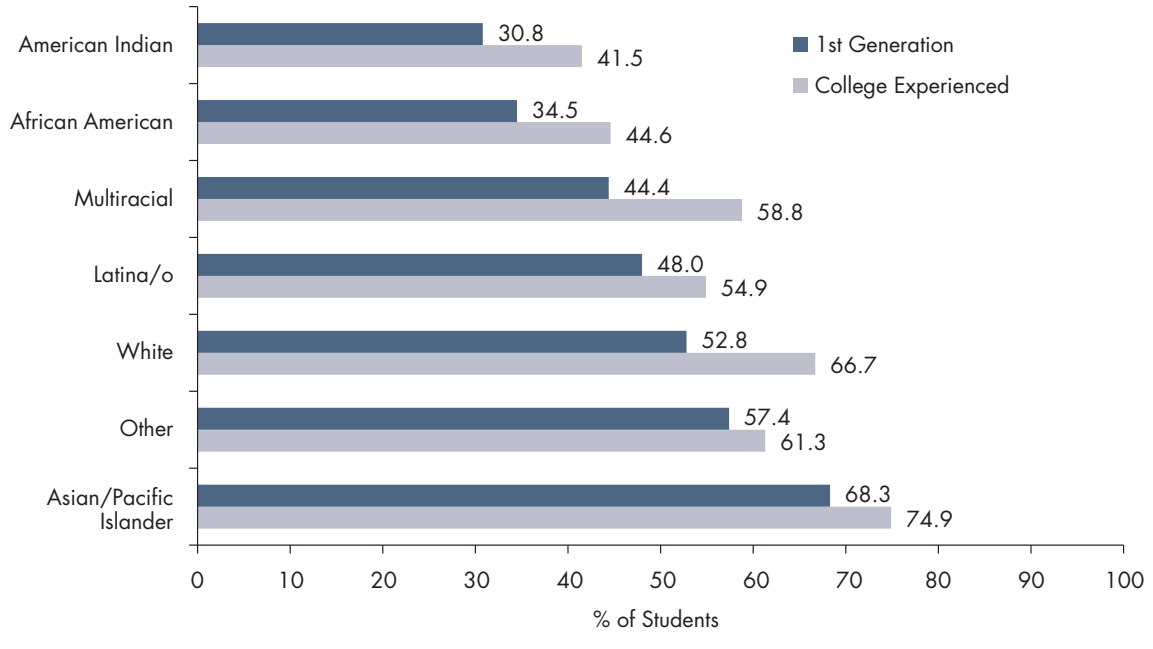


Table 4. Six-Year Degree Attainment Rates, by Race/Ethnicity and Institutional Type

Racial/Ethnic Group	Institutional Type					
	Public University	Private University	Public 4-Year College	Nonsectarian 4-Year College	Catholic 4-Year College	Other Religious 4-Year College
African American	46.7	67.9	36.2	40.0	44.2	38.3
American Indian	45.1	79.0	26.9	46.2	37.9	38.8
Asian/Pacific Islander	76.4	85.2	54.8	73.4	72.6	55.7
Latina/o	57.7	70.3	38.6	60.0	53.9	44.2
White	66.9	79.4	55.3	65.2	69.4	60.4
Multiracial	60.8	73.2	43.6	55.8	59.2	51.1
Other	63.1	73.2	48.6	62.9	58.4	56.7

percentage of American Indian, African American, and Latino/a students who earn a degree is smaller than the percentage is for Asian American and White students. At public four-year colleges the chance that an African American or Latino/a student will complete the degree they initially started is less than two in five (36.2% and 38.6%, respectively), and for an American Indian student the chance is even smaller at just over one in four (26.9%). In 2004, among students who began college at four-year institutions 41.8% of American Indian, 37.2% of Latino/a, and 50.1% of African American students began at a public four-year college (Sax, et al., 2004). Because public four-year colleges enroll such a large proportion of students from these groups compared with other four-year institutions, the prospects for degree completion for students from these groups are lessened. Though this is the case, it is important to remember that even at private universities, which enroll on average the most academically-prepared students, there are large gaps in degree completion between African American, American Indian, and Latino/a students and their Asian American and White peers. For instance, at private universities the gap between African American and Asian American degree attainment is 17.3 percentage points (67.9% vs. 85.2%), and with White students the gap is 11.5 percentage points (67.9% vs. 79.4%).

Overall, these data show continuing racial/ethnic gaps: A much smaller percentage of the African American, American Indian, and Latino/a students who are beginning college at a four-year institution are earning degrees than are students from other racial/ethnic groups. These students also take longer to earn a degree. Since the likelihood of achieving a degree goes down as a function of time, especially after five years, this extra time to degree is potentially impacting degree attainment for these groups. African American, American Indian, and Latino/a female students and students whose parents have attended college fare better than their male and first-generation peers, but even for these students degree attainment rates are much lower than they are for their White and Asian American counterparts.

Degree Attainment by Institution Type and Academic Background

Differences in degree attainment rates by institutional type (Tables 1, 2, and 4) are attributable at least in part to differences in the characteristics and academic backgrounds of the students who attend these institutions (see also Astin & Oseguera, 2005). Prior academic

achievement and its impacts on degree attainment can be examined through high-school grades and Scholastic Aptitude Test (SAT) scores.[10] Table 5 shows that high-school grade point averages, as reported on the CIRP Freshman Survey, have a strong relationship with degree completion. Students with higher grades in high school are more likely to complete college than students with lower high-school grades. Prior academic achievement has a particularly large effect on which students are likely to graduate in four years, but only students with A/A+ grades have a four-year graduation rate above 50%. Even students with an A- average in high school are less likely to earn a degree in four years than are students with an A/A+ average. Students with these top A/A+ grades are more than twice as likely to earn a degree after four years than are students with B averages in high school. These gaps in degree attainment shrink considerably by the end of the sixth year, but, even after this much time has passed, students with B averages graduate at a much lower rate than the rate for students with A/A+ high-school grade averages.

Table 5. Four-, Five-, and Six-Year Degree Attainment Rates, by High-School Grade Average

	Weighted Percentage of Students Who Received Bachelor's Degrees Within		
High-School Grade Average	4 Years	5 Years	6 Years
A+, A	58.3	75.6	79.3
A-	47.8	66.3	70.6
B+	35.9	54.7	59.8
B	25.2	43.3	48.7
B-	15.5	30.5	36.6
C+	9.8	22.4	27.7
C or less	6.3	16.0	21.2

Table 6. Four-, Five-, and Six-Year Degree Attainment Rates, by SAT Composite Score

	Weighted Percentage of Students Who Received Bachelor's Degrees Within		
SAT Composite Score	4 Years	5 Years	6 Years
1300+	62.2	78.2	81.6
1200–1299	51.9	69.5	73.3
1100–1199	42.9	61.2	65.6
1000–1099	34.8	53.7	58.6
900–999	24.6	44.0	49.9
800–899	17.2	34.1	40.5
Less than 800	10.5	23.9	30.4

The effects of SAT comprehensive scores mirror the effects of high-school grades on degree completion (see Table 6). Students with SAT comprehensive scores of 1300 or higher graduate after four years at a rate of 62.2%, and 81.6% after six years. Among students who score only slightly lower (between 1200 and 1299) the four-year graduation rate drops 10.3 percentage points (51.9%), and 8.3 percentage points (73.3%) at six years. Although their graduation rates are still very high, they are measurably lower than those who score at the top. Students who score in the middle on the SAT (between 1000 and 1099) graduate at rates that are substantially lower than students who score at the top. After four years only 34.8% of students who score in this range graduate. After six years, however, this figure rises to 58.6%, showing differences of 27.4 and 23.0 percentage points, respectively. After six years, SAT/ACT is less likely to predict degree completion than high-school grades (Bowen, Chingos, & Mcpherson, 2009).

[10] ACT composite scores were converted to equivalent SAT composite scores. See Appendix C.

Table 7. Six-Year Degree Completion Rates, by High-School GPA, SAT Scores, and Cohort

High-School Grade Average	1994 Entering Cohort	2004 Entering Cohort	SAT Composite Score	1994 Entering Cohort	2004 Entering Cohort
A+, A	77.5	79.3	1300+	76.5	81.6
A-	68.2	70.6	1200–1299	73.1	73.3
B+	59.0	59.8	1100–1199	68.0	65.6
B	47.8	48.7	1000–1099	63.2	58.6
B-	39.5	36.6	900–999	52.3	49.9
C+	32.5	27.7	800–899	45.2	40.5
C or less	20.0	21.2	Less than 800	39.8	30.4

By examining high-school grades and SAT comprehensive scores between the entering cohort of 1994 (Astin & Oseguera, 2005) and the entering cohort of 2004, it becomes clear that much of the growth over the last decade in degree completion has been among the most academically-prepared students (see Table 7). Results show, almost without exception, that an even higher percentage of the most academically-prepared students in terms of high-school grades and SAT scores are graduating today as compared to a decade ago. Similarly, fewer of the less academically-prepared students are graduating today as compared to a decade ago. With the exception of the slight increase in graduation rates over the last decade for students with high-school grades of C or less, fewer students starting college in 2004 with average high-school grades of B- or less or SAT scores below 1200 earned degrees after six years of college as compared to those who started college in 1994. For example, among students starting college with SAT scores in the range of 1000 to 1099 in 1994, 63.2% earned a degree after six years compared to only 58.6% for the entering cohort of 2004, a dip of 4.6 percentage points. The largest gains in degree attainment over the last decade were among students with SAT scores of 1300 or more. For the entering cohort of 2004, 81.6% earned a degree after six years as compared to 76.5% for the cohort of 1994, an increase of 5.1 percentage points. Thus, in the last decade, colleges are doing better at graduating their most academically-prepared students, but are not doing as well with students who begin college less academically prepared. Given that degree attainment rates for students starting college in the mid range of achievement were already low in the 1990s, institutions must do more to improve degree attainment outcomes for these students.

Fewer of the less academically-prepared students are graduating today as compared to a decade ago.

The results presented thus far make it clear that in order to judge how effective an institution is in graduating its students we must first take into account the types of students that enroll at the institution, and especially the academic preparation of those students. As mentioned in our introduction, previous HERI research on degree attainment has shown that much of the variation between institutions in degree attainment can be attributed to differences among the students who attend different types of institutions (Astin, 1997; Astin & Oseguera, 2005). If institutions are to improve their degree completion rates they

must first be able to accurately assess how effective they are with the students they enroll by predicting expected graduation and comparing these rates to their actual rates. It is only through this type of examination that institutions will be able to assess how well they are doing with regard to degree attainment.

To judge how effective an institution is in graduating its students we must first take into account the types of students that enroll.

Predicting Degree Completion Rates

Predicting an expected graduation rate based upon the characteristics of the incoming first-year class is essential for any institution evaluating its degree attainment. In this section we begin by reviewing a series of formulas that can be used to predict estimated four-, five-, and six-year degree completion. We do this to review how expected degree completion rates are calculated and to demonstrate that precision increases when additional data on students is included in the prediction equation. We then introduce and discuss how using data from the CIRP Freshman Survey can help an institution more accurately predict expected degree attainment, and conclude this section with a discussion of some of the factors from the CIRP Freshman Survey that significantly predict degree completion.

Many schools can, and do, create a basic expected graduation rate calculator using readily-available data such as high-school grade point average, SAT composite score (or ACT scores), gender, and race/ethnicity. We also use these student characteristics in our review of the formulas used to predict expected graduation. The formulas and coefficient estimates we discuss here are derived using first-time, full-time entering first-year students at non-profit institutions. Hence, we do not recommend applying these formulas to part-time and transfer students, or to students at proprietary institutions.

Each model in Tables 8–10 was derived with the dependent variable—degree completion in a particular year—coded as "1 (degree attained)" or "0 (degree not attained)." Separate sets of models are presented for degree completion at the initial institution of enrollment within four years (Table 8),

Table 8. Predicting Bachelor's Degree Completion in Four Years Using Different Combinations of Input Variables

Input Variable	b coefficient using formula			
	1	2	3	4
Average High-School Grades[a]	.493	.350	.309	.309
SAT Composite (Verbal + Math)[b]		.027	.031	.030
Sex: Female[c]			.555	.558
Race/Ethnicity: American Indian[d,e]				-1.003
Race/Ethnicity: Asian				-.060
Race/Ethnicity: African American				-.250
Race/Ethnicity: Latina/o				-.337
Race/Ethnicity: Other				-.158
Race/Ethnicity: Multiracial				-.321
Constant (a)	-3.571	-5.715	-6.776	-4.409
Nagelkerke R^2	.137	.181	.198	.202

[a] High-school grading coding scheme: A or A+=8, A-=7, B+=6, B=5, B-=4, C+=3, C=2, D=1
[b] SAT Composite score rescaled so that one unit increment represents 10 points on the original scale.
[c] Sex coding scheme: Female=2, Male=1
[d] Race coding scheme: White (yes=2, no=1), African American (yes=2, no=1), American Indian (yes=2, no=1), Asian American (yes=2, no=1), Latina/o (yes=2, no=1), Multiracial (yes=2, no=1), Other Race (yes=2, no=1)
[e] White is reference group
Note: Degree Completed=1; not completed=0

Table 9. Predicting Bachelor's Degree Completion in Five Years Using Different Combinations of Input Variables

Input Variable	b coefficient using formula			
	1	2	3	4
Average High-School Grades[a]	.475	.348	.324	.323
SAT Composite (Verbal + Math)[b]		.025	.027	.025
Sex: Female[c]			.317	.322
Race/Ethnicity: American Indian[d,e]				-.844
Race/Ethnicity: Asian				.181
Race/Ethnicity: African American				-.278
Race/Ethnicity: Latina/o				-.264
Race/Ethnicity: Other				-.060
Race/Ethnicity: Multiracial				-.326
Constant (a)	-2.662	-4.621	-5.200	-3.323
Nagelkerke R^2	.142	.179	.185	.190

[a] High-school grading coding scheme: A or A+=8, A-=7, B+=6, B=5, B-=4, C+=3, C=2, D=1
[b] SAT Composite score rescaled so that one unit increment represents 10 points on the original scale.
[c] Sex coding scheme: Female=2, Male=1
[d] Race coding scheme: White (yes=2, no=1), African American (yes=2, no=1), American Indian (yes=2, no=1), Asian American (yes=2, no=1), Latina/o (yes=2, no=1), Multiracial (yes=2, no=1), Other Race (yes=2, no=1)
[e] White is reference group
Note: Degree Completed=1; not completed=0

Table 10. Predicting Degree Attainment in Six Years Using Different Combinations of Input Variables

Input Variable	b coefficient using formula			
	1	2	3	4
Average High-School Grades[a]	.461	.341	.324	.322
SAT Composite (Verbal + Math)[b]		.024	.025	.023
Sex: Female[c]			.228	.232
Race/Ethnicity: American Indian[d,e]				-.820
Race/Ethnicity: Asian				.328
Race/Ethnicity: African American				-.223
Race/Ethnicity: Latina/o				-.149
Race/Ethnicity: Other				.022
Race/Ethnicity: Multiracial				-.309
Constant (a)	-2.357	-4.206	-4.616	-3.230
Nagelkerke R^2	.135	.168	.171	.176

[a] High-school grading coding scheme: A or A+=8, A-=7, B+=6, B=5, B-=4, C+=3, C=2, D=1
[b] SAT Composite score rescaled so that one unit increment represents 10 points on the original scale.
[c] Sex coding scheme: Female=2, Male=1
[d] Race coding scheme: White (yes=2, no=1), African American (yes=2, no=1), American Indian (yes=2, no=1), Asian American (yes=2, no=1), Latina/o (yes=2, no=1), Multiracial (yes=2, no=1), Other Race (yes=2, no=1)
[e] White is reference group
Note: Degree Completed=1; not completed=0

five years (Table 9), and six years (Table 10). Although the following discussion is limited to the use of the four-year prediction models, the procedures are identical for the five- and six-year models.

Calculating Basic Expected Degree Completion Rates

To demonstrate how a degree completion calculator is built and the increased ability to predict graduation rates when additional relevant information about incoming students is included in the prediction, we sequentially report results for four different regression models for each degree completion measure: (1) HSGPA only, (2) HSPGA and SAT composite score, (3) HSGPA, SAT, and gender, and (4) HSGPA, SAT, gender, and race/ethnicity. Race/ethnicity information in our calculations includes seven categories (American Indian, Asian American/Pacific Islander, African American, White, Latino/a, Multiracial, and Other) which were converted and inserted as dummy variables in the analysis. White students were used as the reference group in the equation. Coefficients for these models are shown in columns 1–4 of Table 8, respectively.

To estimate a student's probability of completing a degree in four, five, or six years the general formula[11] is as follows:

(I) $Probability\ degree\ completion = \frac{EXP(X)}{[1+EXP(X)]}$, where

(II) $X = a + B_1x_1 + B_2x_2 + B_3x_3 \ldots. + B_ix_i$, with

a – Constant
B_i – Coefficient estimate from the logistic regression (see Models 1–4 in Table 8)
x_i – Independent variable, whose value can come from an individual student or the mean of a cohort of students

The following example illustrates the simplest model, and uses only the student's grade point average in high school (see Model 1 in Table 8). To estimate a student's likelihood of completing a degree in four years using only high-school grades, the formula (II) would be applied as follows:

$$X = a + B_1 (HSGPA) = -3.571 + .493 (HSGPA)$$

If, for example, a student has a converted[12] average high-school GPA of "A-," multiply 7 (converted "A-" grade) by .493 (the regression coefficient) and add -3.571 (the constant), yielding -.120. The equation would be:

$$X = -3.571 + .493 * 7 = -.120$$

This value (-.120) is then inserted into the general degree completion formula (I):

$$Probability\ degree\ completion_{\ 4\ year} = \frac{EXP(-.120)}{[1+EXP(-.120)]} = 47.0\%$$

Using this formula with just one variable—high-school grades—yields a four-year degree completion probability of 47.0%, for a student entering with an "A-." By contrast, if a student's average grade in high school is "C+" (code=3), the probability of completing a degree in four years would be calculated as follows: multiply 3 by .493 and add -3.571, yielding -2.092.

$$X = a + B_1 (HSGPA) = -3.571 + .493 * 3 = -2.092$$

$$Probability\ degree\ completion_{\ 4\ year} = \frac{EXP(-2.092)}{[1+EXP(-2.092)]} = 11.0\%$$

[11] This formula is different from what has been used in the previous edition of this report (Astin & Oseguera, 2005). Analyses in that edition were based on ordinary least squares (OLS) regressions, whereas logit regression has been utilized for all models in this report.

[12] High-school GPA must first be converted to the same coding scheme shown in footnote "a" of Table 8 (for institutions using CIRP TFS data, this variable already comes pre-coded accordingly).

When inserting this value into formula (I), the result yields a probability of 11.0%. Thus, an entering student with an average high-school GPA of "C+" has only about one chance in nine of finishing a college degree within four years, a much lower rate than the student with the "A-" average GPA.

This formula can also be used to calculate the probability of degree completion for an entire first-year cohort. For this, we only have to insert the average high-school GPA of all entering first-year students into the formula, instead of an individual student's score. Making inferences on degree attainment from just a single variable, however, will likely have a large margin of error, regardless of whether this is done for an individual student or an entire cohort. Indeed, the Nagelkerke R^2 for this model is only .137.

Model 2 in Table 8 adds college admission test scores to the equation. Although the calculation uses composite SAT scores, ACT data can be converted into SAT composite mathematics and critical reading scores (see Appendix C for the conversion calculation). Please note that we rescaled SAT composite scores in our analyses, so that one unit on the rescaled variable represents 10 points on the original SAT score. Applying Model 2 to the general formula yields:

$$X = a + B_1\,(HSGPA) + B_2\,(SAT\ comp.) = -5.715 + .350\,(HSGPA) + .027\,(SAT\ comp.)$$

To illustrate, take a first-year student with an "A-" average high-school GPA (code=7) and an SAT composite score of 1350 (rescaled to 135) on the critical reading and mathematics tests. Inserting these values into the formula and multiplying each of these two variables by its respective coefficient, summing the products, and adding the (negative) constant yields a value of .380. This value now needs to be inserted in formula (I), which yields:

$$Probability\ degree\ completion_{\ 4\ year} = \frac{EXP(.380)}{[1+EXP(.380)]} = 59.4\%$$

Thus, a little less than two-thirds (59.4%) of first-year students who enter college with an "A-" average GPA and 1350 test scores would be expected to earn a bachelor's degree within four years. In contrast, a first-year student with a "C+" high-school GPA (code=3) and an SAT composite score of 900, has only a 9.7% probability of graduating in four years. As with the previous model, this formula can also be used to calculate the degree completion rate for an entire cohort by using group means instead of individual scores. With both high-school grades and test scores in the model the Nagelkerke R^2 increases to .181. Although Nagelkerke R^2 values have a somewhat different meaning in logistic regression than R^2 values in OLS regression, we interpret this change in the Nagelkerke R^2 as an increase in the accuracy of the prediction.

The procedures for Models 3 and 4 are very similar. Model 3 adds data on gender, and Model 4 includes high-school GPA, SAT or ACT, gender, and adds data on race/ethnicity. In reviewing these formulas it is important to remember that when using these "dummy"

variables, they are coded either "1" or "2," rather than the more traditional "0" and "1" (see footnotes "b" and "c" in Table 8). Attention should be paid in particular to the race/ethnicity variables, as it is essential that each student receive a score on all six variables. For example, an African American student would receive a score of "2" on the variable "Race/ethnicity: African American" and scores of "1" in all other race/ethnicity variables. For an African American female student, formula (II) would look like this:

$$X = a + B_1(HSGPA) + B_2(SAT) + B_3(Gender) + B_4(American\ Indian) + B_5(Asian/PI) + B_6(African\ American) + B_7(Latino/a) + B_8(Other) + B_9(Multiracial)$$

Using the coefficients from Model 4 in Table 8 we get:

$$X = -4.409 + .309(HSGPA) + .03(SAT) + .558(Gender) + (-1.003)(American\ Indian) + (-.06)(Asian/PI) + (-.25)(African\ American) + (-.337)(Latino/a) + (-.158)(Other) + (-.321)(Multiracial)$$

Assuming further that this student entered college with an "A-" (code=7) and an SAT score of 1350 (rescaled to 135), the adjusted formula (II) would yield a value of .541. Using this value with formula (I) reveals that such a student would have a predicted four-year degree completion probability of 63.2%.

The accuracy of the prediction increases again with the addition of more variables (see Table 8). With high-school grades, test scores, gender, and race/ethnicity in the model the Nagelkerke R^2 increases to .202, up from .137 when just high-school grades was in the model. While the race/ethnicity variables increase the Nagelkerke R^2 by only .004, the size and significance of the coefficients for this variable suggest that race/ethnicity background can potentially play a vital role in a student's likelihood of finishing college in four years.

Investigators wishing to compute expected degree completion rates for five or six years should use Models 1–4 in Tables 9 and 10 with formulas (I) and (II). The most stringent dependent variable of degree completion, however, the four-year degree attainment rate, is predicted better using entering student characteristics than the five- and six-year rates, given that the Nagelkerke R^2 declines as the length of time-to-degree completion increases. The more time that passes from the point of initial enrollment, the more difficult it is to predict the probability of degree attainment just from the characteristics of students as they enter college. This confirms previous findings in the literature (Astin, 1975; Astin & Oseguera, 2005) and suggests that the reasons why students take longer to degree have as much to do with the institution students are attending and their experiences at the institution as with the students' characteristics as they begin college. Hence, completion rates are more difficult to predict as time-to-degree increases when using only entering student data.

HERI has created a degree attainment calculator, using the formula for Model 4 (HSGPA, SAT/ACT score, gender and race/ethnicity) and Tables 8–10, that is available for free use

on the HERI website at http://www.heri.ucla.edu/GradRateCalculator.php. Note that this calculator does not encompass the Models 1–3 with fewer variables nor the more complex models discussed in the next section.

More Accurate Predictions of Degree Attainment Using CIRP Data

In the previous section we limited our calculation of expected degree attainment rates to readily available information usually conveyed through the application and admissions process. We also demonstrated that adding additional information about incoming students allows us to more accurately predict whether a student will attain a degree in four, five, or six years. Research on retention and degree completion suggests that a number of other factors can influence actual degree attainment rates at colleges and universities (Arbona & Nora, 2007; Berger & Braxton, 1998; Cabrera, Nora, & Castaneda, 1992; Crisp, Nora, & Taggart, 2009; Oseguera & Rhee, 2009, Titus, 2006). By including more detailed information on the entering characteristics of students from the CIRP Freshman Survey we are able to build out a model to provide even more precise predictions of expected degree attainment rates. Because the CIRP Freshman Survey has multiple uses, and is not limited to predicting degree attainment, we first selected variables to include in our analysis.

Selection of the survey items that were included in the analytic model was based on previous research, particularly prior editions of this study (Astin, 1997; Astin & Oseguera, 2005), and a general survey of recent retention and degree attainment literature (Arbona & Nora, 2007; Braxton & Hirschy, 2005; Bean, J. P., 2005; Crisp, Nora, & Taggert, 2009; Fischer, 2007; Hoffman & Lowitzki, 2005; Hu & St. John, 2001; Ishitani, 2006; Lipscomb, 2007; Nora, Barlow, & Crisp, 2005; Stage & Hossler, 2000; Vigil Laden, Milem, & Crowson, 2000).

For instance, one factor that can impact degree attainment rates and thus the discrepancy between expected and actual rates is the number of students living in campus residence halls during the first year. Institutions with mandatory first-year student residency or a large percentage of new students in campus residence halls tend to have higher degree completion rates, whereas colleges and universities with a large commuter population tend to have lower rates. Research also indicates differential completion rates among the different majors available to students. The CIRP Freshman Survey asks students about their first-year housing and what subject they intend to major in, and so this information is included in the expanded model.

To maximize the utility of the model for institutions using the CIRP Freshman Survey in different years, we limited the model to include only survey items that are repeated from year to year and exclude those that are asked only occasionally. Even with this restriction, the analytic logistic regression models contained 132 variables. We created essentially two complex models: one that includes all the student and institutional variables including SAT composite scores, and a second model that excludes SAT scores. This allows us to

examine the predictive impact of SAT data on degree completion once other TFS variables are incorporated into the analysis. This also allows institutions without SAT or ACT data to calculate their expected degree attainment rates. Finally, a variable's presence in the model was also driven by the goal of maximizing prediction precision, and so the analytic model was created in a way that optimizes the accuracy of the prediction of four-, five-, and six-year attainment rates.

The predictors in the regression models are grouped as follows:

- Background and academic characteristics
- High-school background
- Student background
- Parental background
- Student finances
- Activities in past year (as senior in high school)
- Hours spent per week in the last year (as senior in high school)
- College choice
- Students' self-ratings
- Students goals and values (including degree aspirations and choice of major)
- College plans (including planned place of residence in the first year)
- Institutional characteristics (including selectivity and institutional type)

A summary of some of the statistics related to the logistic regression models is included in Table 11. The inclusion of the CIRP Freshman Survey information substantially improves the prediction of degree completion over the results when using only high-school GPA, SAT, gender, and race/ethnicity alone (Model 4 above or the short model). Both the percent of cases that can be classified correctly in the logistic regression and the Pseudo-R^2 increase with the inclusion of the CIRP Freshman Survey variables. Adding the CIRP variables increases the Nagelkerke R^2

Table 11. Summary of Logistic Regression Prediction Equations

Prediction Formulas	% Cases Correctly Classified	Nagelkerke R-Square
Four-Year Prediction Formulas		
Short Model—HSGPA, SAT, Gender, Race/Ethnicity Only	68.3	.202
Full Model With SAT Scores	73.3	.335
Full Model Without SAT Scores	73.3	.332
Five-Year Prediction Formulas		
Short Model—HSGPA, SAT, Gender, Race/Ethnicity Only	67.0	.190
Full Model With SAT Scores	71.0	.292
Full Model Without SAT Scores	71.0	.291
Six-Year Prediction Formulas		
Short Model—HSGPA, SAT, Gender, Race/Ethnicity Only	67.8	.176
Full Model With SAT Scores	71.4	.269
Full Model Without SAT Scores	71.4	.268

Analyses also show that SAT test scores add only marginally to the prediction of degree completion once the CIRP Freshman Survey variables are included.

by 65.8%, for the four-year degree completion rate, up from .202 in the short model to .335 in the full model. Results for all other attainment rates also improve significantly, with a 53.7% increase in the Nagelkerke R^2 for five-year prediction, and a 52.8% increase for six-year prediction. Again, the six-year attainment rates are less precise since the Nagelkerke R^2 decreases. As with our limited model, as time-to-degree increases, it gets harder to predict degree completion outcomes for students based upon data collected from students as they begin college.

The analyses also show that SAT test scores add only marginally to the prediction of degree completion once the CIRP Freshman Survey variables are included. For example, inserting SAT to predict four-year degree completion only adds .003 to the Nagelkerke R^2. Similar to what has been found previously (Astin & Oseguera, 2005), the CIRP Freshman Survey variables contain virtually all of the relevant information contained in SAT scores when predicting degree attainment.

Additional Factors that Influence Degree Attainment

Part of the value that these comprehensive models provide is an assessment of the student characteristics and experiences that are more likely to influence eventual degree attainment. We include as Table 12 some of the stronger predictors of degree attainment related to students' high-school experiences, college choice process, self-ratings, and expectations and plans for college that institutions may wish to consider as they evaluate their success with degree attainment (see Appendix A & B for the full models). Such information can be useful in guiding decisions about the makeup of the first-year class or environmental aspects an institution might seek to alter (such as increasing the availability and utilization of housing on campus).

Table 12 displays odds ratios for the selected areas and is organized with the larger positive predictors of degree attainment listed first in size order followed by the larger negative predictors in size order. Odds ratios larger than 1 are positive predictors of degree attainment and odds ratios less than 1 are negative predictors. Odds ratios can be interpreted as either an increase or decrease in the likelihood or odds that an event will occur, in this case degree completion in a particular year, when all of the other factors in the model are held constant.

The importance students place in the college choice process on selecting their institution because of early action/early decision admittance, the overall cost of attending, and the size of the college are the three factors that have the largest positive impact on degree completion. Specifically, at the four-year graduation mark, choosing a college based on early action/early decision raises the odds of degree completion by 12.8% for each incremental increase in importance, choosing based on the overall cost of attending raises the odds of degree completion by 10.0% for each incremental increase in importance, and choosing because of the size of the college raises the odds of degree completion by 7.8% at each incremental increase in importance. These three choice factors are positive

Table 12. Selected Strong Predictors of Four-, Five-, and Six-Year Degree Attainment* (Odds Ratios)

	4 Years	5 Years	6 Years
Early Action/Early Decision (reason for choosing your college)	1.128	1.075	1.068
Cost of Attending College (reason for choosing your college)	1.100	1.092	1.083
Size of College (reason for choosing your college)	1.078	1.053	
Used Internet for Research/Homework (senior year HS experience)	1.077	1.080	1.076
A Visit to Campus (reason for choosing your college)	1.064		
Participate in Student Clubs/Groups (college expectation)	1.063	1.073	1.079
Emotional Health (self-rating)	1.062	1.060	1.064
Drive to Achieve (self-rating)	1.061	1.083	1.085
Change Career Choice (college expectation)	1.060	1.079	1.085
HPW on Studying/Homework (senior year HS experience)	1.058	1.062	1.065
I Wanted to Live Near Home (reason for choosing your college)	1.049	1.059	1.060
Performed Volunteer Work (senior year HS experience)	1.049		
To Gain a General Education (reason for going to college)		1.053	1.049
Graduates Get Good Jobs (reason for choosing your college)			1.052
Other Private Home or Residence (compared to residence hall plans)	0.648	0.622	0.679
Live with Family or Relatives (compared to residence hall plans)	0.718	0.734	0.794
Transfer to Another College (college expectation)	0.844	0.810	0.796
Came Late to Class (senior year HS experience)	0.881	0.910	0.926
Work Full-time While Attending College (college expectation)	0.940	0.916	0.910

*Each of the predictors shown impacts the probability of the respective degree attainment rate by at least +/- 5 percent per unit increase. For instance: An increase in a student's "Drive to Achieve" score from *average* (3 on scale) to *above average* (4 on scale), which represents a one-unit increase, raises the likelihood of graduating in four years by 6.1%. Increasing it from *average* (3 on scale) to *highest 10%* (5 on scale), which represents a two-unit increase, raises the probability by 12.2%.

and significant at each degree completion year interval. The odds ratios are largest at the four-year mark and, in the case of size of college, not that strong at the six-year mark. This indicates that making a choice on which college to attend based on these factors not only assists students to complete their degrees at the institution where they initially matriculate, but helps them complete their degrees earlier.

Starting college already having had experience using the internet for research and homework, as measured by the frequency of such use during the senior year of high school, has a large impact on degree completion at each of the graduation year intervals. This type of usage of the internet increases the odds of graduation by 7.7% at four years, 8.0% at five years, and 7.6% at six years with each incremental increase in frequency. This seemingly indicates that one of the places where high schools can have the largest impact on preparing students to successfully complete college is in preparing them to effectively use the internet in the learning process and increase information literacy associated with the use of online materials.

The importance of a visit to campus in choosing which college to attend is also positively associated with degree completion, with an effect large enough to be considered among the stronger effects only at the four-year mark, where it increases the odds of graduation at this time interval by 6.4% for each incremental increase in importance. Like the three

Expecting to participate in student clubs and groups during college, self-ratings on emotional health and drive to achieve, openness to changing one's choice of career, the hours per week as a senior in high school spent on studying and homework, and choosing the college to attend based on wanting to live near home are also factors that are positively associated with degree completion.

college choice factors discussed earlier—early action/early decision, cost of attending, and size of college—making a choice based on a visit to campus seems to be a factor that indicates both that students are likely to stay and complete college at the institution where they initially matriculate, and that students will take fewer years to complete their degree. Institutions wishing to maximize retention, speed time-to-degree, and eventual degree completion will want to consider how they can help students accurately assess their institution related to these factors before making a choice.

Expecting to participate in student clubs and groups during college, self-ratings on emotional health and drive to achieve, openness to changing one's choice of career, the hours per week as a senior in high school spent on studying and homework, and choosing the college to attend based on wanting to live near home are also factors that are positively associated with degree completion at each of the degree completion intervals of four, five, and six years. Unlike the factors discussed thus far, as time-to-degree increases, the strength of these factors actually increases rather than decreases. For instance, at the six-year mark the self-rating on drive to achieve increases the odds of degree completion by 8.5% at each incremental increase, whereas at the four-year mark the incremental increase is 6.1%. This means that having a strong drive to achieve becomes more important to actually finishing a degree in six years regardless of the factors that might be increasing time-to-degree. Thus, rather than these factors lengthening time-to-degree, they are associated with assisting students to complete their degrees even in the face of other factors that might diminish such chances.

Other positive factors of degree completion include the frequency of performing volunteer work during the senior year of high school, going to college to gain a general education, and choosing a college based on the importance of graduates getting good jobs. These factors are all significantly related to graduation in some of the year intervals but not others. The frequency of performing volunteer work as a high-school senior increases the odds of degree completion in four years by 4.9% at each incremental frequency increase, but is not related to five- or six-year degree completion. Attending college to gain a general education is not related to finishing college in four years, but is related to finishing in five and six years, increasing the likelihood of degree completion by 5.3% and 4.9%, respectively, at each incremental increase in importance. And, choosing to attend a particular college because graduates get good jobs increases the odds of finishing college after six years by 5.2% at each incremental increase in importance, and is significantly, though not strongly, related to degree completion at the five-year mark.

Lastly, in terms of positive factors the importance of living on campus during the first year of college to degree completion cannot be overstated. Students who plan to live in a private home or residence (but not with family) as compared to living in a residence hall during

their first year are at the greatest risk of attrition and not completing a degree. At the four-year mark these students have 35.2% lower odds of having completed a degree than do students who plan to live in campus residence halls, and at six years the odds of degree completion are not much improved at 32.1%, lower than students who have first-year residence hall plans. Students who plan to live with family during the first year fare somewhat better, but still are at a significant attrition risk compared to their peers who plan to live in residence halls. At the four-year mark these students' odds of completing their degree are 28.2% lower than those with residence hall plans and, at six years, their odds of graduating are 20.6% lower than those with residence hall plans. For institutions that can increase the number of students they house in residence halls during the first year, these results strongly suggest that plans in this direction should be considered. For commuter institutions or those for which housing additional students in residence halls is not an option, these results make it clear that the benefits students receive from living on campus need to be captured through alternative programming such as non-residential learning communities.

Institutions should find ways to better accommodate working students, assisting with aid that reduces work hours while encouraging a full course load, provide counseling concerning transfer inclinations, and facilitate behaviors known to foster academic success.

Students who come to campus with plans to transfer are at a significant attrition risk, as are students who during their senior year of high school display poor academic habits (as measured by the frequency with which they report coming late to class). At four-year degree completion, for each incremental increase in the expectation of transfer, the odds of graduation decrease by 15.6%. For each incremental increase in the frequency of coming late to class, the odds of graduation decrease by 11.9%. Students who plan to work full-time during college also have lowered odds of graduation. At the four-year mark the odds of graduation decrease by 6.0% for each incremental increase in the expectation of working full-time. For the intention to transfer and work full-time during college, we see an increase at six years to 20.4% and 9.0%, respectively. The attrition risk, therefore, grows related to these factors as time-to-degree increases. To improve graduation rates, institutions should find ways to better accommodate working students, assisting with aid that reduces work hours while encouraging a full course load, provide counseling concerning transfer inclinations, and facilitate behaviors known to foster academic success.

To assist in the assessment of retention and degree completion, HERI has created reports for institutions that use the CIRP Freshman Survey that not only provide institutions with their expected degree attainment rates, but also allow institutions to forecast expected degree attainment rates by changing the parameters of the incoming class. For instance, an institution can examine the expected change in predicted four-year graduation by bringing more students to campus for an admissions visit, or housing more students on campus. Information about obtaining HERI's Expected Graduation Rate Calculator can be found at http://www.heri.ucla.edu/GradRateCalculator.php.

Using Expected Degree Completion Rates for Institutional Advancement

Expected degree attainment rates provide essential information by which to assess institutional degree attainment success. Institutions that are highly successful in retaining and graduating their students would be projected to have actual degree attainment rates that exceed their expected rates. In contrast, those institutions that are relatively less effective in graduating their students would be projected to have actual attainment rates that fall substantially short of their expected rates. Although institutions should decide the threshold by which they consider expected rates to be substantially different from actual rates, in this study at the institutional level we consider a discrepancy of ±10.0 percentage points between actual and expected rates as significant from both a practical as well as a statistical perspective. Comparing expected and actual degree attainment rates can illustrate how an institution is performing relative to moving students towards degree. Conversations on campus about how these rates compare can trigger organizational change processes that seek to reduce detrimental factors and strengthen success factors in retention and degree completion. Additional information on how the college experience impacts retention and degree completion can then be obtained using tools such as the CIRP follow-up surveys. In particular, the *Your First College Year Survey* and the *Diverse Learning Environments Surveys* both provide research-driven information on factors relevant to degree attainment.

Reassessing Degree Attainment

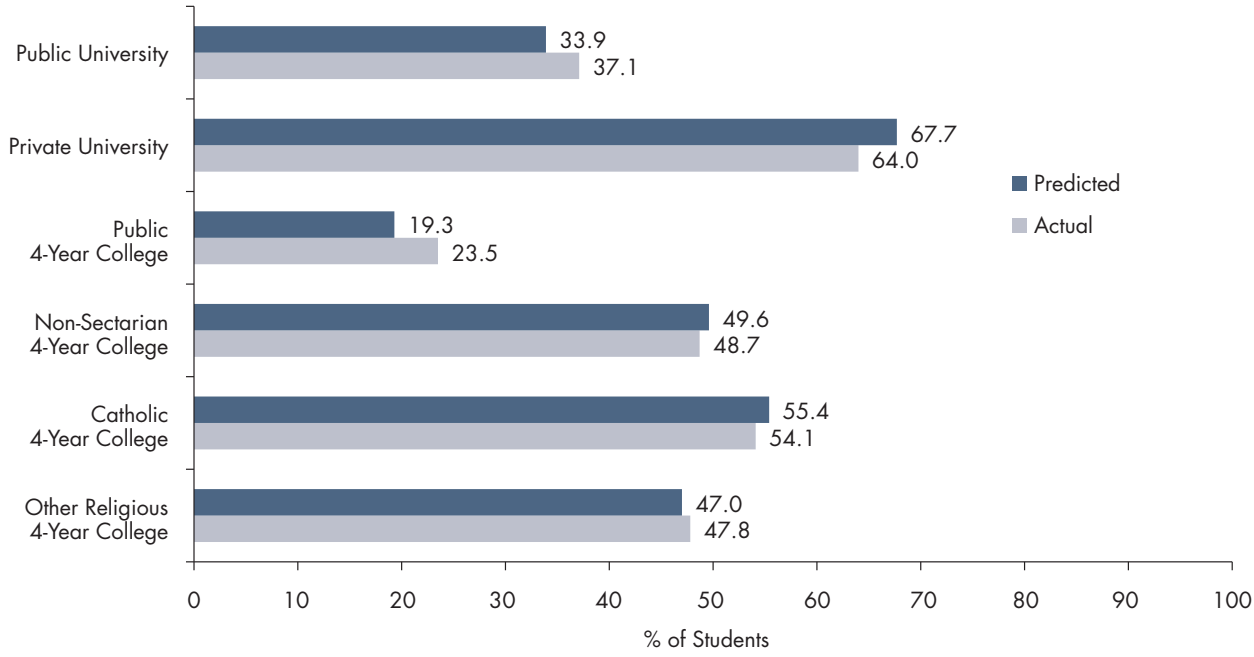
In concluding this study, we return to the gap in degree completion between institutional types as was discussed in Table 1, recalling that public four-year colleges had the lowest degree completion rates and that private universities had the highest. Now, instead of comparing the raw degree completion rates of different institutional types, we can reexamine how well each institutional type performs in moving students towards degree completion based on the characteristics and experiences of the students whom they enroll.

Using this type of performance as a benchmark for success, public four-year colleges emerge at the top and private universities at the bottom (see Figure 8).[13] After four years, public four-year colleges graduate more of their students than expected (actual rate, 23.5% vs. expected rate, 19.3%), 22% better than expected. Private universities, by contrast, graduate fewer of their students than expected (64.0% vs. 67.7%). In addition, public universities outperform expectations in four-year degree completion by 9% (actual rate, 37.1% vs. expected rate, 33.9%); while non-sectarian private, Catholic, and other religious universities all perform essentially as expected.

By comparing expected and actual graduation rates, it is clear that much of the success private institutions and private universities, in particular, have in degree completion is in

[13] See Appendix D for a comparison of predicted versus actual rates at five and six years with SAT scores, and for four, five, and six years without SAT scores.

Figure 8. Weighted Four-Year Predicted and Actual Degree Attainment Rates, by Institutional Type



the strength of the students they enroll. And, though public institutions have lower overall graduation rates, they are having relatively more success in moving the students they enroll towards graduation.

In order to examine institutional success further, we illustrate what would happen if we sent students with the characteristics and expectations of private university students to public four-year colleges instead. Using our long calculators with SAT scores, we predict a four-year graduation rate of 56.4% for the private university students if they attended public four-year colleges instead, a decrease of 12% as compared to their actual four-year graduation rate of 64.0%. When we compare this predicted four-year graduation rate of 56.4% to the actual rate of 23.5% at public four-year colleges, we see a difference of 32.9 percentage points. This means that if public four-year colleges were to enroll students with the characteristics of private university students instead they could expect an increase in four-year degree attainment of an astonishing 140%. Of course, most public four-year colleges offer broader access and are not able to attract the same students as private universities. The idea is to focus on assessing institutions based on the degree of talent development that they actually achieve and provide more valid comparisons relative to institutions with similar types of students.

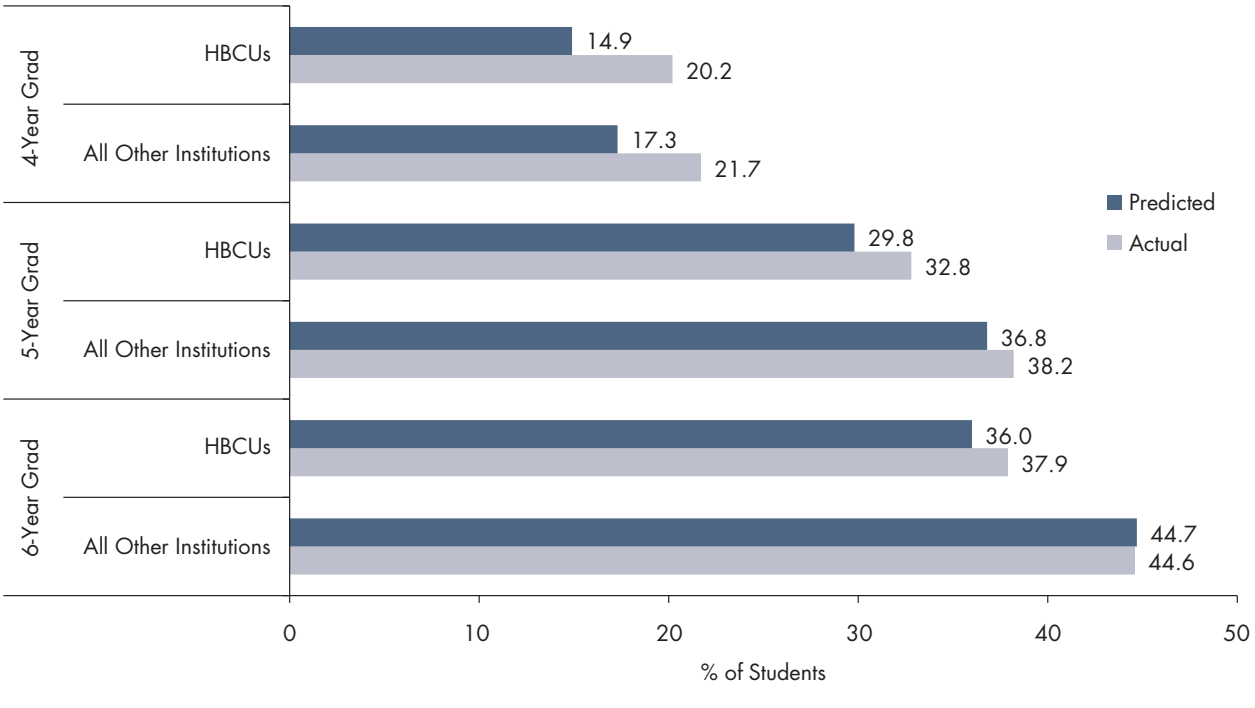
If public four-year colleges were to enroll students with the characteristics of private university students instead they could expect an increase in four-year degree attainment of an astonishing 140%.

Historically black colleges and universities (HBCUs) are another type of broad access institution. Although graduation rates for African Americans are low as we discussed earlier

(see Figure 5 and Table 3), African American students are graduating at rates higher than predicted, with differences more pronounced at HBCUs (see Figure 9). After four years we predict that only 14.9% of African Americans at HBCUs and 17.3% of African Americans at other institutions would graduate. The actual graduation rate for HBCUs is 20.2% and for other institutions 21.7%. Thus, African American students at HBCUs graduate at a rate 36% higher than predicted as compared with 25% higher than expected at other institutions. After five and six years differences between predicted and actual are much closer at both HBCUs and other types of institutions, but HBCUs continue at each of these marks to do better than expected.

Taken together these results again reinforce what has been learned in this study; that much of the difference between institutions in their degree completion rates is attributable to differences in the characteristics and profiles of the enrolled students. As we move forward to dramatically ramp up degree completion at an institutional, state, and national level it will be important to understand exactly how we can move students toward degree completion. These talent development efforts, facilitated by data-driven planning and assessment, will allow us to focus on creating the conditions for success for all types of students at all types of institutions.

Figure 9. Weighted Four-, Five-, and Six-Year Predicted and Actual Degree Attainment Rates for African Americans, by Institutional Type



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APPENDICES

Appendix A

Logistic Regression Predicting Four-, Five-, and Six-Year College Completion Using Student and Institutional Variables with SAT Scores

Variable Name and Coding	Unstandardized Coefficient		
	4 Years	5 Years	6 Years
Average high-school grade (1 = D, 2 = C, 3 = C+, 4 = B-, 5 = B, 6 = B+, 7 = A-, 8 = A or A+)	**0.276**	**0.264**	**0.254**
SAT score (SAT Critical Reading + SAT Mathematics) (Rescaled into increments of 10 points)	**0.013**	**0.011**	**0.010**
Gender: Female	**0.313**	**0.180**	**0.098**
Race			
(Reference group: White)			
American Indian (1 = No, 2 = Yes)	**-0.572**	**-0.507**	**-0.560**
Asian/Pacific Islander (1 = No, 2 = Yes)	0.048	**0.161**	**0.227**
African American (1 = No, 2 = Yes)	**-0.133**	**-0.099**	-0.014
Latino/a (1 = No, 2 = Yes)	**-0.301**	**-0.264**	**-0.181**
Other Race/Ethnicity (1 = No, 2 = Yes)	-0.043	0.054	0.096
Multiracial (1 = No, 2 = Yes)	**-0.211**	**-0.197**	**-0.176**
Student Background			
Age (1 = 16 or younger, 2 = 17, 3 = 18, 4 = 19, 5 = 20, 6 = 21–24, 7 = 25–29, 8 = 30–39, 9 = 40–54, 10 = 55 or older)	**-0.058**	**-0.040**	**-0.044**
Citizenship Status			
(Reference group: US Citizen)			
Neither US citizen nor permanent resident (1 = No, 2 = Yes)	-0.003	-0.085	-0.078
Permanent resident (green card) (1 = No, 2 = Yes)	0.068	0.018	0.024
Native English speaker (1 = No, 2 = Yes)	-0.086	**-0.178**	**-0.203**
Student's religious preference			
(Reference group: Protestant/Christian [Baptist, Church of Christ, Episcopalian, Lutheran, Methodist, Presbyterian, Quaker, Seventh Day Adventist, Unitarian/Universalist, United Church of Christ/Congregational, Other Christian, LDS])			
Catholic (1 = No, 2 = Yes)	**0.228**	**0.205**	**0.208**
Jewish (1 = No, 2 = Yes)	**0.447**	**0.286**	**0.280**
Other Religion (Buddhist, Eastern Orthodox, Hindu, Islamic) (1 = No, 2 = Yes)	0.063	0.004	0.021
No Religion (1 = No, 2 = Yes)	0.039	-0.012	-0.002
Political orientation (1 = Far right, 2 = Conservative, 3 = Middle-of-the-road, 4 = Liberal, 5 = Far left)	0.011	0.014	0.005

Appendix A (continued)

Variable Name and Coding	Unstandardized Coefficient 4 Years	5 Years	6 Years
High-School Background			
Type of high school			
(Reference group: Public school [not charter or magnet])			
Public charter school (1 = No, 2 = Yes)	**-0.265**	-0.144	**-0.189**
Public magnet school (1 = No, 2 = Yes)	-0.047	-0.023	0.012
Private religious/parochial school (1 = No, 2 = Yes)	**-0.069**	-0.009	-0.003
Private independent college-prep school (1 = No, 2 = Yes)	-0.058	-0.059	-0.042
Home school (1 = No, 2 = Yes)	-0.183	-0.053	-0.049
Year graduated from high school	-0.085	**-0.191**	**-0.199**
Parents' Background			
Father's education	**0.027**	**0.032**	**0.037**
(1 = Junior high/Middle school or less, 2 = Some high school, 3 = High-school graduate, 4 = Postsecondary school other than college, 5 = Some college, 6 = College degree, 7 = Some graduate school, 8 = Graduate degree)			
Mother's education	**0.013**	**0.017**	**0.016**
(1 = Junior high/Middle school or less, 2 = Some high school, 3 = High-school graduate, 4 = Postsecondary school other than college, 5 = Some college, 6 = College degree, 7 = Some graduate school, 8 = Graduate degree)			
Status of parents			
(Reference group: Both alive and living with each other)			
One or both parents deceased (1 = No, 2 = Yes)	**-0.146**	**-0.181**	**-0.195**
Both parents alive, divorced, or living apart (1 = No, 2 = Yes)	**-0.212**	**-0.254**	**-0.260**
Parental Income			
(Reference group: Low Income $29,999 or less)			
Middle Income $30,000 to $149,999 (1 = No, 2 = Yes)	0.048	0.032	0.013
High Income $150,000 or more (1 = No, 2 = Yes)	-0.033	-0.060	**-0.088**
Student Finances			
Concern about ability to finance college education (1 = None, 2 = Some, 3 = Major)	**-0.079**	**-0.075**	**-0.067**
Source of funds for first-year expenses			
(1 = None, 2 = Less than $1,000, 3 = $1,000–2,999, 4 = $3,000–5,999, 5 = $6,000–9,999, 6 = $10,000+)			
Family resources	**0.067**	**0.055**	**0.050**
My own resources	**0.028**	0.013	0.010
Aid which need not be repaid	0.004	0.011	0.011
Aid which must be repaid	**-0.015**	**-0.022**	**-0.026**
Other	0.007	0.013	0.017

Appendix A (continued)

Variable Name and Coding	Unstandardized Coefficient 4 Years	5 Years	6 Years
Activities in Past Year			
(1 = Not at all, 2 = Occasionally, 3 = Frequently)			
Was bored in class	0.014	0.019	0.019
Tutored another student	-0.013	-0.019	-0.028
Studied with other students	-0.006	-0.016	-0.009
Felt overwhelmed by all I had to do	0.031	**0.040**	**0.055**
Felt depressed	**-0.106**	**-0.104**	**-0.097**
Performed volunteer work	**0.048**	0.029	0.021
Asked a teacher for advice	-0.015	-0.008	-0.006
Discussed politics	0.018	0.017	0.002
Voted in student election	-0.006	0.002	0.003
Socialized with someone of a different race	**-0.092**	**-0.092**	**-0.084**
Came late to class	**-0.126**	**-0.094**	**-0.077**
Used the Internet for research or homework	**0.074**	**0.077**	**0.073**
Did community service as part of class	-0.010	-0.006	-0.007
Worked on political campaign	-0.019	-0.037	-0.036
Average Hours Spent in a Typical Week During Last Year of High School			
(1 = None, 2 = Less than 1 hour, 3 = 1–2, 4 = 3–5, 5 = 6–10, 6 = 11–15, 7 = 16–20, 8 = Over 20)			
Studying or homework	**0.057**	**0.060**	**0.063**
Socializing with friends	**-0.022**	**-0.027**	**-0.025**
Talking with teacher outside class	**-0.023**	-0.015	-0.012
Exercise or sports	-0.006	-0.004	-0.003
Partying	**-0.031**	**-0.030**	**-0.028**
Working for pay	-0.003	**-0.008**	**-0.011**
Student clubs/groups	**0.030**	**0.023**	**0.025**
Household/childcare duties	**-0.014**	**-0.029**	**-0.030**
Reading for pleasure	**-0.043**	**-0.047**	**-0.046**
Playing video/computer games	**-0.027**	-0.011	-0.010
College Choice			
Reason to attend college			
(1 = Not important, 2 = Somewhat important, 3 = Very important)			
To be able to get a better job	-0.024	-0.011	-0.012
To gain a general education	0.031	**0.052**	**0.048**
To make me a more cultured person	0.006	0.000	-0.001
To be able to make more money	0.020	0.027	0.022
To learn more about things that interest me	-0.032	**-0.041**	-0.037
To prepare for graduate or professional school	**0.031**	0.017	0.021
To get training for a specific career	**-0.046**	-0.003	0.003
Choice of this institution	0.001	**0.040**	**0.041**
(1 = Less than third choice, 2 = Third choice, 3 = Second choice, 4 = First choice)			

Appendix A (continued)

Variable Name and Coding	Unstandardized Coefficient 4 Years	5 Years	6 Years
Number of colleges applied (1 = None, 2 = 1, 3 = 2, 4 = 3, 5 = 4, 6 = 5, 7 = 6, 8 = 7–10, 9 = 11 or more)	**0.053**	**0.047**	**0.039**
Distance from college to home (1 = 5 or less, 2 = 6–10, 3 = 11–50, 4 = 51–100, 5 = 101–500, 6 = Over 500)	-0.002	**-0.046**	**-0.059**
Reason to attend this particular college (1 = Not important, 2 = Somewhat important, 3 = Very important)			
My relatives wanted me to come here	0.013	**0.037**	**0.045**
My teacher advised me	0.014	-0.006	-0.002
College has very good academic reputation	-0.035	-0.011	0.011
College has good reputation for social activities	0.023	-0.007	-0.024
I was offered financial assistance	-0.007	-0.013	-0.019
The cost of attending this college	**0.096**	**0.088**	**0.080**
High-school guidance counselor advised me	0.006	-0.007	-0.013
Private guidance counselor advised me	-0.027	0.002	0.017
I wanted to live near home	**0.048**	**0.057**	**0.058**
Not offered aid by first choice	0.025	0.020	0.017
College's graduates gain access to top graduate/professional schools	-0.012	-0.022	-0.026
College's graduates get good jobs	0.009	**0.041**	**0.051**
Religious affiliation	**-0.062**	-0.036	-0.035
Size of college	**0.075**	**0.052**	**0.041**
Rankings in national magazines	-0.027	0.005	0.011
Information from a website	-0.002	**-0.030**	**-0.039**
Admitted through an Early Action or Early Decision program	**0.120**	**0.072**	**0.066**
A visit to the campus	**0.062**	**0.041**	**0.030**
Students' Self-rating (1 = Lowest 10%, 2 = Below average, 3 = Average, 4 = Above average, 5 = Highest 10%)			
Academic ability	0.033	0.021	0.030
Artistic ability	**-0.065**	**-0.051**	**-0.044**
Computer skills	**-0.052**	**-0.078**	**-0.074**
Cooperativeness	0.024	**0.029**	0.023
Creativity	**-0.046**	**-0.029**	**-0.026**
Drive to achieve	**0.059**	**0.080**	**0.081**
Emotional health	**0.060**	**0.058**	**0.062**
Leadership ability	-0.012	-0.017	-0.026
Math ability	-0.004	-0.007	-0.008
Physical health	**0.027**	**0.044**	**0.032**
Public speaking ability	**0.029**	**0.027**	**0.036**
Self-confidence (intellectual)	**-0.046**	**-0.060**	**-0.054**
Self-confidence (social)	-0.011	0.003	0.001
Self-understanding	-0.009	-0.023	**-0.032**
Spirituality	-0.015	-0.007	-0.008
Understanding of others	**-0.033**	-0.025	**-0.026**
Writing ability	-0.009	**-0.038**	**-0.042**

Appendix A (continued)

Variable Name and Coding	Unstandardized Coefficient		
	4 Years	5 Years	6 Years
Goals and Values			
Highest degree planned at any institution (1 = less than bachelor's degree 2 = Bachelor's degree, 3 = Master's degree or higher)	-0.021	-0.017	0.002
Intended Major (Reference group: Undecided)			
Agriculture (1 = No, 2 = Yes)	0.207	0.146	0.098
Biological Science (1 = No, 2 = Yes)	**-0.110**	-0.070	**-0.110**
Business (1 = No, 2 = Yes)	**0.229**	**0.169**	**0.132**
Education (1 = No, 2 = Yes)	0.014	**0.117**	**0.141**
Engineering (1 = No, 2 = Yes)	**-0.843**	**-0.369**	**-0.224**
English (1 = No, 2 = Yes)	**0.275**	**0.162**	0.108
Fine Arts (1 = No, 2 = Yes)	**-0.212**	-0.013	0.006
Health Profession (1 = No, 2 = Yes)	**-0.363**	**-0.404**	**-0.332**
History/Political Science (1 = No, 2 = Yes)	**0.271**	**0.145**	0.069
Humanities (1 = No, 2 = Yes)	**0.205**	**0.128**	0.071
Math/Statistics (1 = No, 2 = Yes)	-0.001	-0.031	-0.061
Physical Science (1 = No, 2 = Yes)	**-0.147**	**-0.140**	**-0.154**
Social Science (1 = No, 2 = Yes)	**0.309**	**0.162**	**0.091**
Other Technical (1 = No, 2 = Yes)	**-0.249**	**-0.143**	**-0.139**
Other (1 = No, 2 = Yes)	**0.226**	**0.139**	**0.091**
Importance of the following: (1 = Not important, 2 = Somewhat important, 3 = Very important, 4 = Essential)			
Becoming accomplished in one of the performing arts	-0.023	**-0.023**	-0.018
Becoming an authority in my field	-0.008	-0.017	-0.016
Obtaining recognition from colleagues for contributions to special field	**0.034**	**0.033**	**0.030**
Influencing the political structure	-0.024	-0.027	-0.021
Influencing social values	0.028	**0.035**	**0.038**
Raising a family	**0.037**	0.018	0.011
Being very well off financially	**-0.034**	-0.016	-0.013
Helping others who are in difficulty	-0.019	-0.026	-0.021
Making a theoretical contribution to science	-0.022	-0.014	-0.011
Writing original works	0.022	0.009	0.001
Creating artistic works	-0.014	0.003	0.005
Being successful in a business of my own	**-0.024**	**-0.030**	**-0.026**
Becoming involved in programs to clean up the environment	-0.030	-0.008	-0.003
Developing a meaningful philosophy of life	-0.016	-0.016	-0.014
Participating in a community action program	-0.005	-0.004	-0.006
Helping to promote racial understanding	0.005	-0.007	-0.015
Keeping up to date with political affairs	0.006	0.007	0.011
Becoming a community leader	0.013	0.018	0.010
Improving my understanding of other countries and cultures	**-0.031**	-0.012	-0.005

Appendix A (continued)

Variable Name and Coding	Unstandardized Coefficient 4 Years	5 Years	6 Years
College Plans			
Plan to live in the fall			
(Reference group: College residence hall)			
With family or other relatives (1 = No, 2 = Yes)	**-0.331**	**-0.310**	**-0.231**
Other private home, apartment, or room (1 = No, 2 = Yes)	**-0.435**	**-0.475**	**-0.388**
Fraternity or sorority house (1 = No, 2 = Yes)	-0.103	0.018	0.076
Other campus student housing (1 = No, 2 = Yes)	**-0.222**	**-0.243**	**-0.226**
Other (1 = No, 2 = Yes)	-0.303	**-0.326**	**-0.382**
College expectations			
(1 = No chance, 2 = Very little chance, 3 = Some chance, 4 = Very good chance)			
Change major field	-0.029	0.003	0.010
Change career choice	**0.058**	**0.076**	**0.082**
Participate in student government	0.009	-0.001	-0.005
Get a job to help pay for college expenses	0.012	0.010	0.014
Work full-time while attending college	**-0.062**	**-0.088**	**-0.094**
Join a social fraternity or sorority	**-0.055**	-0.019	-0.011
Play intercollegiate athletics (e.g., NCAA or NAIA-sponsored)	**-0.024**	-0.017	-0.021
Make at least a B average	**0.036**	-0.006	-0.015
Take part in a student protest	0.020	**0.026**	**0.029**
Transfer to another college before graduating	**-0.169**	**-0.210**	**-0.228**
Be satisfied with college	0.001	-0.002	0.003
Participate in volunteer or community service work	**0.044**	**0.033**	**0.043**
Seek personal counseling	-0.017	0.000	0.005
Communicate regularly with professors	0.015	-0.007	-0.017
Socialize with someone of another racial/ethnic group	**-0.062**	**-0.041**	**-0.043**
Participate in student clubs/groups	**0.061**	**0.071**	**0.076**
Participate in a study abroad program	**0.026**	**0.034**	**0.035**
Institutional Factors			
Institutional selectivity	**0.027**	**0.029**	**0.028**
HBCU (1 = No, 2 = Yes)	**0.735**	**0.570**	**0.483**
Institutional type			
(Reference group: Private university)			
Public university (1 = No, 2 = Yes)	**-0.454**	-0.043	**0.078**
Public four-year college (1 = No, 2 = Yes)	**-0.500**	**-0.082**	0.046
Nonsectarian four-year college (1 = No, 2 = Yes)	**0.153**	0.054	0.036
Catholic four-year college (1 = No, 2 = Yes)	**0.423**	**0.246**	**0.192**
Other religious four-year college (1 = No, 2 = Yes)	**0.220**	-0.035	-0.081
Constant (a)	**-4.088**	**-3.377**	**-3.079**
Nagelkerke R Squared	0.335	0.292	0.268

bolded coefficients are significant at p<.001

Appendix B

Logistic Regression Predicting Four-, Five-, and Six-Year College Completion Using Student and Institutional Variables Without SAT Scores

Variable Name and Coding	Unstandardized Coefficient		
	4 Years	5 Years	6 Years
Average high-school grade (1 = D, 2 = C, 3 = C+, 4 = B-, 5 = B, 6 = B+, 7 = A-, 8 = A or A+)	**0.290**	**0.275**	**0.265**
Gender: Female	**0.281**	**0.154**	**0.074**
Race			
(Reference group: White)			
American Indian (1 = No, 2 = Yes)	**-0.628**	**-0.554**	**-0.604**
Asian/Pacific Islander (1 = No, 2 = Yes)	0.079	**0.182**	**0.246**
African American (1 = No, 2 = Yes)	**-0.247**	**-0.188**	**-0.096**
Latino/a (1 = No, 2 = Yes)	**-0.371**	**-0.317**	**-0.229**
Other Race/Ethnicity (1 = No, 2 = Yes)	-0.065	0.036	0.079
Multiracial (1 = No, 2 = Yes)	**-0.229**	**-0.212**	**-0.191**
Student Background			
Age (1 = 16 or younger, 2 = 17, 3 = 18, 4 = 19, 5 = 20, 6 = 21–24, 7 = 25–29, 8 = 30–39, 9 = 40–54, 10 = 55 or older)	**-0.067**	**-0.046**	**-0.050**
Citizenship Status			
(Reference group: US Citizen)			
Neither US citizen nor permanent resident (1 = No, 2 = Yes)	0.010	-0.073	-0.067
Permanent resident (green card) (1 = No, 2 = Yes)	0.053	0.007	0.014
Native English speaker (1 = No, 2 = Yes)	-0.056	**-0.153**	**-0.180**
Student's religious preference			
(Reference group: Protestant/Christian [Baptist, Church of Christ, Episcopalian, Lutheran, Methodist, Presbyterian, Quaker, Seventh Day Adventist, Unitarian/Universalist, United Church of Christ/Congregational, Other Christian, LDS])			
Catholic (1 = No, 2 = Yes)	**0.226**	**0.206**	**0.209**
Jewish (1 = No, 2 = Yes)	**0.468**	**0.304**	**0.297**
Other Religion (Buddhist, Eastern Orthodox, Hindu, Islamic) (1 = No, 2 = Yes)	0.059	0.001	0.019
No Religion (1 = No, 2 = Yes)	0.052	0.000	0.009
Political orientation (1 = Far right, 2 = Conservative, 3 = Middle-of-the-road, 4 = Liberal, 5 = Far left)	0.013	0.016	0.007
High-School Background			
Type of high school			
(Reference group: Public school [not charter or magnet])			
Public charter school (1 = No, 2 = Yes)	**-0.283**	**-0.161**	**-0.205**
Public magnet school (1 = No, 2 = Yes)	-0.025	-0.005	0.029
Private religious/parochial school (1 = No, 2 = Yes)	-0.052	0.005	0.009
Private independent college-prep school (1 = No, 2 = Yes)	-0.027	-0.036	-0.020
Home school (1 = No, 2 = Yes)	-0.141	-0.020	-0.019
Year graduated from high school	-0.074	**-0.182**	**-0.191**

Appendix B (continued)

Variable Name and Coding	Unstandardized Coefficient 4 Years	5 Years	6 Years
Parents' Background			
Father's education	**0.034**	**0.037**	**0.042**
(1 = Junior high/Middle school or less, 2 = Some high school, 3 = High-school graduate, 4 = Postsecondary school other than college, 5 = Some college, 6 = College degree, 7 = Some graduate school, 8 = Graduate degree)			
Mother's education	**0.018**	**0.021**	**0.020**
(1 = Junior high/Middle school or less, 2 = Some high school, 3 = High-school graduate, 4 = Postsecondary school other than college, 5 = Some college, 6 = College degree, 7 = Some graduate school, 8 = Graduate degree)			
Status of parents			
(Reference group: Both alive and living with each other)			
One or both parents deceased (1 = No, 2 = Yes)	**-0.149**	**-0.182**	**-0.196**
Both parents alive, divorced, or living apart (1 = No, 2 = Yes)	**-0.218**	**-0.258**	**-0.263**
Parental Income			
(Reference group: Low Income $29,999 or less)			
Middle Income $30,000 to $149,999 (1 = No, 2 = Yes)	**0.076**	**0.055**	0.034
High Income $150,000 or more (1 = No, 2 = Yes)	0.008	-0.028	-0.058
Student Finances			
Concern about ability to finance college education	**-0.080**	**-0.076**	**-0.067**
(1 = None, 2 = Some, 3 = Major)			
Source of funds for first-year expenses			
(1 = None, 2 = Less than $1,000, 3 = $1,000–2,999, 4 = $3,000–5,999, 5 = $6,000–9,999, 6 = $10,000+)			
Family resources	**0.068**	**0.056**	**0.051**
My own resources	**0.027**	0.012	0.010
Aid which need not be repaid	0.013	**0.018**	**0.017**
Aid which must be repaid	**-0.019**	**-0.025**	**-0.029**
Other	0.003	0.010	0.014
Activities in Past Year			
(1 = Not at all, 2 = Occasionally, 3 = Frequently)			
Was bored in class	**0.038**	**0.039**	**0.038**
Tutored another student	-0.002	-0.011	-0.020
Studied with other students	-0.008	-0.018	-0.011
Felt overwhelmed by all I had to do	0.028	**0.038**	**0.053**
Felt depressed	**-0.105**	**-0.103**	**-0.097**
Performed volunteer work	**0.052**	**0.033**	0.024
Asked a teacher for advice	-0.023	-0.015	-0.013
Discussed politics	**0.034**	0.030	0.015
Voted in student election	-0.009	0.000	0.001
Socialized with someone of a different race	**-0.087**	**-0.087**	**-0.079**
Came late to class	**-0.115**	**-0.086**	**-0.069**
Used the Internet for research or homework	**0.077**	**0.080**	**0.076**

Appendix B (continued)

Variable Name and Coding	Unstandardized Coefficient 4 Years	5 Years	6 Years
Did community service as part of class	-0.020	-0.013	-0.014
Worked on political campaign	-0.018	-0.036	-0.036
Average hours spent in a typical week during last year of high school (1 = None, 2 = Less than 1 hour, 3 = 1–2, 4 = 3–5, 5 = 6–10, 6 = 11–15, 7 = 16–20, 8 = Over 20)			
Studying or homework	**0.059**	**0.062**	**0.065**
Socializing with friends	**-0.019**	**-0.025**	**-0.023**
Talking with teacher outside class	**-0.030**	**-0.021**	-0.017
Exercise or sports	-0.007	-0.005	-0.004
Partying	**-0.031**	**-0.031**	**-0.028**
Working for pay	-0.004	**-0.008**	**-0.012**
Student clubs/groups	**0.031**	**0.024**	**0.025**
Household/childcare duties	**-0.016**	**-0.031**	**-0.032**
Reading for pleasure	**-0.034**	**-0.040**	**-0.039**
Playing video/computer games	**-0.025**	-0.010	-0.009
College Choice			
Reason to attend college (1 = Not important, 2 = Somewhat important, 3 = Very important)			
To be able to get a better job	-0.016	-0.006	-0.007
To gain a general education	0.024	**0.045**	**0.042**
To make me a more cultured person	0.013	0.006	0.005
To be able to make more money	0.021	0.028	0.023
To learn more about things that interest me	-0.030	**-0.040**	-0.036
To prepare for graduate or professional school	0.026	0.012	0.017
To get training for a specific career	**-0.060**	-0.014	-0.008
Choice of this institution (1 = Less than third choice, 2 = Third choice, 3 = Second choice, 4 = First choice)	-0.003	**0.037**	**0.038**
Number of colleges applied (1 = None, 2 = 1, 3 = 2, 4 = 3, 5 = 4, 6 = 5, 7 = 6, 8 = 7–10, 9 = 11 or more)	**0.055**	**0.049**	**0.041**
Distance from college to home (1 = 5 or less, 2 = 6–10, 3 = 11–50, 4 = 51–100, 5 = 101–500, 6 = Over 500)	0.000	**-0.044**	**-0.057**
Reason to attend this particular college (1 = Not important, 2 = Somewhat important, 3 = Very important)			
My relatives wanted me to come here	0.009	**0.033**	**0.041**
My teacher advised me	0.011	-0.008	-0.004
College has very good academic reputation	-0.036	-0.012	0.011
College has good reputation for social activities	0.011	-0.017	**-0.033**
I was offered financial assistance	-0.001	-0.009	-0.014
The cost of attending this college	**0.102**	**0.094**	**0.085**
High-school guidance counselor advised me	0.006	-0.007	-0.014
Private guidance counselor advised me	-0.030	0.001	0.015
I wanted to live near home	**0.045**	**0.054**	**0.056**

Appendix B (continued)

Variable Name and Coding	Unstandardized Coefficient 4 Years	5 Years	6 Years
Not offered aid by first choice	0.025	0.019	0.017
College's graduates gain access to top graduate/professional schools	-0.013	-0.023	-0.027
College's graduates get good jobs	0.004	**0.037**	**0.047**
Religious affiliation	**-0.070**	**-0.042**	**-0.041**
Size of college	**0.076**	**0.053**	**0.042**
Rankings in national magazines	-0.023	0.009	0.015
Information from a website	-0.008	**-0.036**	**-0.044**
Admitted through an Early Action or Early Decision program	**0.121**	**0.073**	**0.066**
A visit to the campus	**0.061**	**0.040**	**0.029**
Students' Self-rating			
(1 = Lowest 10%, 2 = Below average, 3 = Average, 4 = Above average, 5 = Highest 10%)			
Academic ability	**0.087**	**0.065**	**0.071**
Artistic ability	**-0.064**	**-0.050**	**-0.044**
Computer skills	**-0.056**	**-0.080**	**-0.076**
Cooperativeness	0.015	0.022	0.017
Creativity	**-0.050**	**-0.032**	**-0.029**
Drive to achieve	**0.043**	**0.067**	**0.069**
Emotional health	**0.063**	**0.060**	**0.064**
Leadership ability	-0.020	-0.023	**-0.031**
Math ability	**0.028**	0.018	0.015
Physical health	0.021	**0.039**	**0.027**
Public speaking ability	**0.035**	**0.033**	**0.041**
Self-confidence (intellectual)	**-0.032**	**-0.050**	**-0.044**
Self-confidence (social)	-0.025	-0.008	-0.010
Self-understanding	-0.010	-0.024	**-0.032**
Spirituality	-0.019	-0.011	-0.011
Understanding of others	**-0.040**	**-0.030**	**-0.031**
Writing ability	0.010	-0.024	**-0.028**
Goals and Values			
Highest degree planned at any institution	-0.006	-0.005	0.013
(1 = less than bachelor's degree 2 = Bachelor's degree, 3 = Master's degree or higher)			
Intended Major			
(Reference group: Undecided)			
Agriculture (1 = No, 2 = Yes)	0.171	0.119	0.072
Biological Science (1 = No, 2 = Yes)	-0.092	-0.055	**-0.096**
Business (1 = No, 2 = Yes)	**0.229**	**0.169**	**0.133**
Education (1 = No, 2 = Yes)	0.002	**0.109**	**0.134**
Engineering (1 = No, 2 = Yes)	**-0.808**	**-0.344**	**-0.201**
English (1 = No, 2 = Yes)	**0.297**	**0.182**	0.126
Fine Arts (1 = No, 2 = Yes)	**-0.203**	-0.005	0.013
Health Profession (1 = No, 2 = Yes)	**-0.359**	**-0.401**	**-0.329**
History/Political Science (1 = No, 2 = Yes)	**0.278**	**0.152**	0.076

Appendix B (continued)

Variable Name and Coding	Unstandardized Coefficient		
	4 Years	5 Years	6 Years
Humanities (1 = No, 2 = Yes)	**0.215**	**0.138**	0.081
Math/Statistics (1 = No, 2 = Yes)	0.028	-0.006	-0.037
Physical Science (1 = No, 2 = Yes)	-0.125	-0.122	**-0.137**
Social Science (1 = No, 2 = Yes)	**0.314**	**0.166**	**0.095**
Other Technical (1 = No, 2 = Yes)	**-0.229**	**-0.127**	**-0.124**
Other (1 = No, 2 = Yes)	**0.222**	**0.137**	**0.089**
Importance of the following:			
(1 = Not important, 2 = Somewhat important, 3 = Very important, 4 = Essential)			
Becoming accomplished in one of the performing arts	-0.021	-0.022	-0.017
Becoming an authority in my field	-0.001	-0.012	-0.012
Obtaining recognition from colleagues for contributions to special field	**0.031**	**0.032**	**0.029**
Influencing the political structure	**-0.032**	**-0.033**	-0.027
Influencing social values	0.022	**0.031**	**0.034**
Raising a family	**0.041**	**0.021**	0.014
Being very well off financially	**-0.050**	**-0.029**	-0.025
Helping others who are in difficulty	-0.017	-0.025	-0.020
Making a theoretical contribution to science	-0.025	-0.017	-0.013
Writing original works	0.022	0.009	0.001
Creating artistic works	-0.014	0.002	0.004
Being successful in a business of my own	**-0.029**	**-0.034**	**-0.030**
Becoming involved in programs to clean up the environment	**-0.036**	-0.013	-0.008
Developing a meaningful philosophy of life	-0.009	-0.010	-0.008
Participating in a community action program	-0.009	-0.008	-0.010
Helping to promote racial understanding	0.001	-0.010	-0.018
Keeping up to date with political affairs	0.012	0.011	0.015
Becoming a community leader	0.015	0.019	0.010
Improving my understanding of other countries and cultures	**-0.029**	-0.011	-0.004
College Plans			
Plan to live in the fall			
(Reference group: College residence hall)			
With family or other relatives (1 = No, 2 = Yes)	**-0.351**	**-0.324**	**-0.244**
Other private home, apartment, or room (1 = No, 2 = Yes)	**-0.443**	**-0.481**	**-0.393**
Fraternity or sorority house (1 = No, 2 = Yes)	-0.137	-0.008	0.051
Other campus student housing (1 = No, 2 = Yes)	**-0.229**	**-0.249**	**-0.233**
Other (1 = No, 2 = Yes)	-0.329	**-0.348**	**-0.402**
College expectations			
(1 = No chance, 2 = Very little chance, 3 = Some chance, 4 = Very good chance)			
Change major field	**-0.032**	0.001	0.008
Change career choice	**0.065**	**0.081**	**0.087**
Participate in student government	0.011	0.001	-0.003
Get a job to help pay for college expenses	0.015	0.013	0.017
Work full-time while attending college	**-0.061**	**-0.087**	**-0.094**
Join a social fraternity or sorority	**-0.056**	**-0.020**	-0.012
Play intercollegiate athletics (e.g., NCAA or NAIA-sponsored)	**-0.029**	-0.021	**-0.025**

Appendix B (continued)

Variable Name and Coding	Unstandardized Coefficient 4 Years	5 Years	6 Years
Make at least a B average	**0.043**	-0.002	-0.011
Take part in a student protest	0.024	**0.029**	**0.031**
Transfer to another college before graduating	**-0.171**	**-0.211**	**-0.229**
Be satisfied with college	0.001	-0.002	0.004
Participate in volunteer or community service work	**0.054**	**0.040**	**0.049**
Seek personal counseling	-0.019	-0.001	0.004
Communicate regularly with professors	0.013	-0.008	-0.019
Socialize with someone of another racial/ethnic group	**-0.055**	**-0.036**	**-0.039**
Participate in student clubs/groups	**0.067**	**0.076**	**0.081**
Participate in a study abroad program	**0.027**	**0.034**	**0.035**
Institutional Factors			
Institutional selectivity	**0.032**	**0.033**	**0.032**
HBCU (1 = No, 2 = Yes)	**0.765**	**0.593**	**0.504**
Institutional type			
(Reference group: Private university)			
Public university (1 = No, 2 = Yes)	**-0.467**	-0.055	0.066
Public four-year college (1 = No, 2 = Yes)	**-0.516**	**-0.098**	0.031
Nonsectarian four-year college (1 = No, 2 = Yes)	**0.143**	0.047	0.030
Catholic four-year college (1 = No, 2 = Yes)	**0.409**	**0.235**	**0.182**
Other religious four-year college (1 = No, 2 = Yes)	**0.197**	-0.054	**-0.098**
Constant (a)	**-3.672**	**-3.059**	**-2.786**
Nagelkerke R Squared	0.332	0.291	0.268

bolded coefficients are significant at p<.001

Appendix C

Converting ACT Composite Scores* to SAT Critical Reading and Mathematics Equivalents

ACT Composite	SAT Critical Reading + Mathematics
12	660
13	690
14	730
15	760
16	800
17	850
18	900
19	950
20	980
21	1020
22	1050
23	1090
24	1130
25	1160
26	1200
27	1240
28	1280
29	1320
30	1360
31	1410
32	1460
33	1510
34	1550
35	1590

*The ACT Composite is the average of scores on English, Reading, Mathematics, and Science Reasoning

Appendix D
Predicted and Actual Four,- Five-, and Six-Year Degree Attainment, by Institutional Type

Institutional Type	Four-Year Rates with SAT*			Four-Year Rates without SAT**		
	Predicted	Actual	Difference	Predicted	Actual	Difference
Public University	33.9	37.1	3.2	33.8	37.1	3.3
Private University	67.7	64.0	-3.7	67.7	64.0	-3.7
Public four-year college	19.3	23.5	4.2	19.3	23.5	4.2
Non-sectarian four-year college	49.6	48.7	-0.9	49.4	48.7	-0.7
Catholic four-year college	55.4	54.1	-1.3	55.3	54.1	-1.2
Other religious four-year college	47.0	47.8	0.8	46.8	47.8	1.0
All Institutions	36.3	38.9	2.6	36.0	38.9	2.9
Institutional Type	**Five-Year Rates with SAT***			**Five-Year Rates without SAT****		
	Predicted	Actual	Difference	Predicted	Actual	Difference
Public University	62.3	59.8	-2.5	62.1	59.8	-2.3
Private University	80.5	75.9	-4.6	80.5	75.9	-4.6
Public four-year college	42.1	43.1	1.0	42.1	43.1	1.0
Non-sectarian four-year college	63.1	59.3	-3.8	62.9	59.3	-3.6
Catholic four-year college	67.2	64.0	-3.2	67.1	64.0	-3.1
Other religious four-year college	57.8	56.3	-1.5	57.6	56.3	-1.3
All Institutions	59.1	56.4	-2.7	58.8	56.4	-2.4
Institutional Type	**Six-Year Rates with SAT***			**Six-Year Rates without SAT****		
	Predicted	Actual	Difference	Predicted	Actual	Difference
Public University	69.0	65.6	-3.4	68.9	65.6	-3.3
Private University	82.5	78.2	-4.3	82.5	78.2	-4.3
Public four-year college	49.7	49.5	-0.2	49.8	49.5	-0.3
Non-sectarian four-year college	65.8	61.8	-4.0	65.6	61.8	-3.8
Catholic four-year college	69.3	66.0	-3.3	69.2	66.0	-3.2
Other religious four-year college	59.7	57.9	-1.8	59.6	57.9	-1.7
All institutions	64.7	61.2	-3.5	64.4	61.2	-3.2

*Utilizing formula from Appendix A
**Utilizing formula from Appendix B

Appendix E
Research Methodology

The data reported here have been weighted to provide a normative picture of the American first-time, full-time student population entering in the fall of 2004. This Appendix provides an overview of the methodology and describes the procedures used to weight the 2004 CIRP Freshman Survey results to produce the national normative estimates and to impute missing survey data.

The National Population for 2004

For the purposes of the 2004 CIRP Freshman Survey, the population has been defined as all institutions of higher education admitting first-time, first-year students and granting a baccalaureate-level degree or higher listed in the U.S. Department of Education's Integrated Postsecondary Education Data System (IPEDS). An institution is considered eligible if it was operating at the time of the IPEDS survey and had a first-time, full-time freshman class of at least 25 students. In addition, a small number of institutions or their branches are included even though their separate enrollments were not available from the IPEDS files. In 2004, the national population included 1,546 institutions. It should be noted that the population reflects institutions of "higher education," rather than "postsecondary education." Most proprietary, special vocational or semiprofessional institutions are not included.

Institutional Stratification Design

The institutions identified as part of the national population are divided into 19 stratification groups based on type (four-year college, university), control (public, private nonsectarian, Roman Catholic, other religious), and the "selectivity level" of the institution. Selectivity was defined as the median SAT Verbal and Math scores of the entering class (or ACT composite score). Table E1 shows the distribution of institutions across the stratification cells. The dividing lines between low, medium and high selectivity levels are different for different types of institutions and should not be used as a measure of institutional or program quality.

Having defined the population in terms of the stratification cell scheme, the IPEDS file is used to compute the male and female first-time, full-time (FTFT) population in each cell. These population counts form the target counts of the weighting procedure.

Table E1. 2004 CIRP Freshman Survey National Norms Sample and Population

Institution Type	Strat Cell	Selectivity		Institutions			First-time, Full-time Freshmen				Cell Weights	
								Weighted				
		Level	Average Score	Population	Survey	Norms Sample	Unweighted Number	Number	Men	Women	Men	Women
Public Universities	1	low	800–1069	54	15	10	11,885	117,784	44.4%	55.6%	5.75	6.05
	2	medium	1070–1149	54	14	11	19,237	148,128	47.2%	52.8%	4.27	4.76
	3	high	1150–1600	56	18	12	25,479	216,348	48.0%	52.0%	5.40	5.77
Private Universities	4	medium	800–1144	32	12	11	7,632	24,185	39.9%	60.1%	2.27	2.26
	5	high	1145–1319	36	14	11	10,943	55,692	45.5%	54.5%	3.03	3.03
	6	very high	1320–1600	30	19	15	14,938	44,643	50.9%	49.1%	1.99	1.93
Public 4-year Colleges	7	low	800–949	117	20	13	5,110	87,990	42.4%	57.6%	9.76	8.88
	8	medium	950–1029	128	35	22	18,482	137,932	43.3%	56.7%	4.82	4.58
	9	high	1030–1600	119	33	26	21,454	138,201	45.8%	54.2%	4.91	4.47
Private Nonsectarian 4-year Colleges	10	low	800–1009	162	20	13	3,475	46,736	44.6%	55.4%	10.70	8.38
	11	medium	1010–1099	68	28	22	7,587	27,303	42.5%	57.5%	2.83	2.57
	12	high	1100–1209	57	23	17	7,148	26,658	47.5%	52.5%	2.64	2.79
	13	very high	1210–1600	59	33	29	10,691	27,942	42.5%	57.5%	2.08	1.82
Catholic 4-year Colleges	14	low	800–989	58	13	9	1,694	12,318	31.3%	68.7%	6.17	4.95
	15	medium	990–1079	56	23	15	3,655	18,386	35.3%	64.7%	4.02	3.66
	16	high	1080–1600	47	25	22	11,386	31,157	42.8%	57.2%	2.15	1.92
Other Religious 4-year Colleges	17	low	800–1014	176	23	12	2,092	36,035	45.8%	54.2%	13.66	11.39
	18	medium	1015–1084	117	44	35	8,294	37,353	43.3%	56.7%	3.28	3.23
	19	high	1085–1600	120	59	51	18,874	53,501	42.6%	57.4%	2.05	2.07
All Institutions				**1,546**	**471**	**356**	**210,056**	**1,288,292**	**45.0%**	**55.0%**		

Note:
–The broad categories of Institution Control (i.e., public, private, and religious affiliation) are defined by data submitted to Integrated Postsecondary Educational Data System (IPEDS).
–Universities are those institutions defined by 2005 Basic Carnegie Classification as "Research Universities" or "Doctoral/Reseach Universities."
–Selectivity is based on median SAT Verbal + Math scores and/or ACT composite scores of the entering class as reported to IPEDS. Institutions with unknown selectivity are grouped with the low-selectivity institutions when computing National Norms. The stratification design presented here is used to group schools to develop population weights and should not be used as a measure of institutional or program quality.
–Cell Weights is the ratio between the number of first-time, full-time freshmen enrolled in all colleges and the number of first-time, full-time freshmen enrolled in the norms sample colleges.
–Two-year colleges are not included in the norms sample.

Identifying the Norms Sample

An institution is included in the national norms sample if it provided a representative sample based on two pieces of information reported to IPEDS: (1) the FTFT survey population was at least 50 percent of the institution's 2004 FTFT population, and (2) the FTFT survey population's degree completion rates were within 20 percentage points of the four-, five-, and six-year graduation rates.

Institutions whose sample proportions were less than but close to the 50 percent cutoff are included if the method used to administer the survey showed no systematic biases in first-year class coverage and if the FTFT survey population's graduation rates remain within 20 percentage points of the four-, five-, and six-year graduation rates.

The 2004 Data

There were 424,808 respondents at 720 colleges and universities who participated in the 2004 CIRP Freshman Survey. HERI requested enrollment and degree completion data from the National Student Clearinghouse (NSC) for 304,285 FTFT respondents from 531 participating schools. The requested population represents the FTFT survey population enrolled at baccalaureate institutions that also provide enrollment and degree data to the NSC. The NSC was able to return records for 241,801 survey respondents from 471 schools based on matching student information from the 2004 survey and from records provided to NSC from participating schools. As described above, the normative data presented here are based on responses from 210,056 FTFT freshmen entering 356 baccalaureate institutions. Enrollment and degree completion data from NSC were merged with student responses to the 2004 CIRP Freshman Survey.

Weighting the Sample

Those institutions identified as being part of the norms sample are weighted by a two-step procedure. The first weight is designed to adjust for response bias within institutions. Counts of the male and female FTFT population for each institution are divided by that institution's male and female FTFT respondent count. The resulting weights, when applied to each respondent, bring the male and female respondent counts up to the corresponding counts for the population at that institution.

The second weight is designed to compensate for nonparticipating institutions within each stratification cell. The weighted male and female counts for all participating institutions in each stratification cell are first summed, and then are divided into the national male and female FTFT counts for all institutions in that stratification cell, producing a second set of cell weights (see Table E1).

The final weight is simply the product of the first and second weights. Weighting each response in the norms sample using the final weight brings the male and female counts up to the national number of first-time full-time freshmen in each stratification cell (see Table E1).

Missing Data and Multiple Imputation

Overall missingness in the 2004 CIRP Freshman Survey data was on average only 4.2 percent. Supplemental missing value analyses revealed random missing data patterns. In order to preserve the full dataset in its near entirety, a multiple imputation was used to compensate for missing values on the 2004 survey items. This approach provides a more accurate estimation for missing data than options such as mean value replacement or maximum-likelihood estimations. Multiple imputation is also superior to a single imputation approach as it more precisely computes standard errors of parameters estimates through the introduction of between-imputation error (Little & Rubin, 2002).

In general, there are two major approaches to carry out a multiple imputation: fully conditional specification or "chained equations" and a multivariate normal approach (MVN). The chained equations approach is based on each conditional density of a variable given other variables, whereas the multivariate normal approach is based on the joint distribution of all the variables in the imputation model, including variables to be imputed and variables to be used only for the purpose of imputing other variables. For the latter approach, the joint distribution of all variables in the imputation model is assumed to be multivariate normal. In practice, however, both approaches lead to very similar results (Lee & Carlin, 2009; Graham, Olchowski, & Gilreath, 2007) and are often selected solely based on familiarity or practicability.

Due to the stronger theoretical underpinnings of the multivariate normal approach, we carried out a multiple imputation using the MVN in STATA 11.1. For the MVN, an imputation model was created that comprised of 213 independent variables. Missing values, however, were replaced only on a subset of variables; data on demographic variables such as gender and race/ethnicity and other dichotomous independent variables were not imputed and cases with missing data were deleted. Also, dependent variables were not included in the imputation model. During the imputation process, five copies of the data were created, each with missing values imputed. For data analyses, SPSS 18 was used and provided results on each imputed data set individually and pooled results across the entire five imputations and original data set.

ABOUT THE AUTHORS

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PUBLICATIONS LIST

The American Freshman: National Norms for Fall 2010*

December, 2010/69 pages
E-book with expanded table/165 pages

Provides national normative data on the characteristics of students attending American colleges and universities as first-time, full-time freshmen. In 2010, data from approximately 201,818 freshmen students are statistically adjusted to reflect the 1.5 million students entering college. The annual report covers: demographic characteristics; expectations of college; degree goals and career plans; college finances; and attitudes, values and life goals.

*Note: Publications from earlier years are also available.

The American Freshman: Forty Year Trends

March, 2006/261 pages

Summarizes trends data in the Cooperative Institutional Research Program (CIRP) Freshman Survey between 1966 and 2006. The report examines changes in the diversity of students entering college; parental income and students' financial concerns; and issues of access and affordability in college. Trends in students' political and social attitudes are also covered.

Completing College: Assessing Graduation Rates at Four-Year Institutions

November, 2011/55 pages

Provides latest information on four-, five-, and six-year degree attainment rates collected longitudinally from 356 baccalaureate-granting institutions. Differences by institutional type, gender, first-generation status and race/ethnicity are examined. The study highlights main predictors of degree completion and provides several formulas for calculating expected institutional completion rates.

The American College Teacher: National Norms for the 2007–08 HERI Faculty Survey*

February, 2009/298 pages

Provides an informative profile of teaching faculty at American colleges and universities. The 2007–08 Norms covers two areas: Activities and Beliefs about Undergraduate Education and Faculty Work-Life. Within these two areas the following topics are covered: goals for undergraduate education, working with underprepared students, teaching and research practice and perspectives, engaged scholarship and academic citizenship, attitudes and beliefs about diversity, institutional values and priorities as faculty perceive them, career satisfaction and perspectives, technology use, and health and wellness. Results are reported by: all faculty, male and female faculty, and faculty by academic rank and institutional type.

*Note: Publications from earlier years are also available: 2004–05, 2001–02, 1998–99, 1995–96, 1992–93

Advancing in Higher Education: A Portrait of Latina/o College Freshmen at Four-Year Institutions, 1975–2006

October, 2008/90 pages

The purpose of this report is to provide a portrait of Latina/o students entering four-year colleges and universities from 1975–2006. It is intended as a data resource for higher education in understanding the unique characteristics of the increasing numbers of Latina/o first-time, full-time freshmen. The national data come from the Cooperative Institutional Research Program (CIRP) Freshman Survey. For the first time, CIRP trends are disaggregated by specific Latina/o ethnic origin group and by gender, to highlight the heterogeneity in the population unavailable in other national reports on Hispanic college students.

Beyond Myths: The Growth and Diversity of Asian American College Freshmen: 1971–2005

September, 2007/63 pages

The first-year student trends examined in this report help to address some common characterizations of Asian American students, particularly with respect to their educational success, that are often overstated and taken out of context. The findings suggest that Asian Americans still have to overcome a number of obstacles, such as levels of family income and financial aid, to earn a coveted spot in higher education. This report features data collected from Cooperative Institutional Research Program (CIRP) Freshman Survey. It is based on the 361,271 Asian/Asian American first-time full-time college students from 1971–2005, representing the largest compilation and analysis of data on Asian American college students ever undertaken.

First in My Family: A Profile of First-Generation College Students at Four-Year Institutions Since 1971

February, 2007/62 pages

First-generation college students are receiving increasing attention from researchers, practitioners, and policymakers with the aim of better understanding their college decision-making process and supporting their progress in higher education. This report explores the changing dynamic between first-generation college students and their non-first-generation peers by utilizing longitudinal trends data collected through the CIRP Freshman Survey (1971–2005).

Black Undergraduates From *Bakke* to *Grutter*

November, 2005/41 pages

Summarizes the status, trends and prospects of Black college freshmen using data collected from 1971 to 2004 through the Cooperative Institutional Research Program (CIRP). Based on more than half a million Black freshman students, the report examines gender differences; socioeconomic status; academic preparation and aspirations; and civic engagement.

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