THE ASSOCIATION OF STUDENT PERSISTENCE IN COLORADO PUBLIC HIGHER EDUCATION WITH COLORADO STUDENT ASSESSMENT PROGRAM (CSAP) SCORES AND THE ADMISSION ELIGIBILITY INDEX

A REPORT PRESENTED TO THE COLORADO DEPARTMENT OF HIGHER EDUCATION

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Introduction

The team of Augenblick, Palaich, and Associates (APA) and R-Squared Research, LLC was hired by the Colorado Department of Higher Education (DHE) to conduct several analyses of data from the Student Unit Record Data System (SURDS). This paper contains a descriptive analysis of SURDS data in combination with information from Colorado Department of Education (CDE) Colorado Student Assessment Program (CSAP). The analysis was conducted by R-Squared Research, LLC.

Since 2005 R-Squared Research, LLC has been providing analysis and evaluation to improve education policy. R-Squared Research, LLC has a history of completing highly rigorous education research and evaluation projects that provide valuable information to stakeholders. R-Squared Research, LLC applies a strong combination of qualitative and quantitative skills to improve policy and practice at the school, district, institution, and state levels.

This analysis was conducted in response to a September 20, 2011 Request for Proposals Project #4: Colorado's Admissions Standards Impact Study. That Project described a wide-ranging set of studies around student enrollment, admissions, post-secondary persistence, and success.

This study is focused on correlates with post-secondary persistence. This study should not be considered exhaustive. The SURDS/CSAP data set created for this analysis is rich with additional details on student characteristics, preparation, program participation (such as ASCENT or concurrent enrollment), persistence, institutional practices, and diversity. There is a plethora of practical studies that can be performed on this data to inform current policy decisions.

Given the wide-ranging list of potential studies listed under Project #4, there was a need to focus this work. Per the proposal, we worked with staff from DHE to narrow scope of work. Based upon these discussions this analysis focuses on the association of CSAP scores and the Admissions Index with persistence.

The CSAP data provides new information that has never before been analyzed in conjunction with the SURDS data. First, it provides Colorado's standards-based student assessment results. Second, the CSAP data contains new information on student characteristics: low-income status (as measured by free and reduced lunch eligibility), English proficiency, and disability.

The other source of information used in this analysis is the Colorado Commission on Higher Education Admission Eligibility Index (Index). The Index is one component of Colorado's Higher Education Admissions Requirements (HEAR) for public four-year institutions. The other component is a set of course completion requirements. This Index is based on a combination of national college entrance assessment results (ACT or SAT) and high school performance (class rank or GPA).

Research Questions

This research focused on the following questions:

CSAP Analysis

- Question 1: Does the CSAP predict whether a student will attend a 4-year or 2-year institution?

- Question 2: Does the CSAP predict persistence in two-year institutions?
- Question 3: Does the CSAP predict persistence in four-year institutions?

Admissions Index Analysis

- Question 4: How are institutions using the Admissions Index?
- Question 5: Which is a better predictor of persistence, the CSAP or the Admissions Index?
- Question 6: Is there a relationship between required Admission Index and persistence?

Each section provides a descriptive analysis of the data and, as appropriate, more sophisticated analysis of the data.

Data and Methods

The core task in preparing for this analysis was to consolidate multiple records for each person into a single record that will be used for the analysis, i.e. creation of the analysis dataset. The analysis data set combines information from the SURDS enrollment, applicant, and remedial files along with CDE CSAP data.

The 10th grade CSAP was used because it was the most closely connected (in terms of time) with the college behavior being studied. Only CSAP records that match with SURDS enrollment data are included (*i.e.* the analysis does not include people who took the CSAP but did not attend public higher education in Colorado).

There are four 10th grade CSAP assessments: reading, writing, math and science.[1] The assessment results are all correlated at a level of from .7 to .79. This high correlation creates un-stable results when using regression analysis. To avoid this problem, only one assessment was used in the analysis. The math assessment was used because of it was better at predicting persistence then the other assessments.

The SURDS applicant file was used to calculate the Admissions Index. If a student had multiple Index scores, the highest Index was used. Student without the necessary information to calculate an Index, were categorized as missing their Index.

The indicator of persistence used in this analysis is whether a student completed 30 credit hours as measured by the SURDS variable "Cumulative Credit Hours". The completed 30 credit hours is a yes-no or dichotomous outcome variable. It measures whether a person completed 30 hours towards a degree anytime in academic years 2008 through 2011 at ANY public higher education institution in Colorado.[2] A student who started in 2008 has more opportunities to complete 30 hours than a student who started in 2010. A statistical control is included in the regression analysis to correct for this difference.

Institutions are identified by where a freshman began his/her higher education career.

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[1] The CSAP data t also includes 11th grade ACT and 9th grade CSAP but this data is not the focus of the current analysis. Science data was not analyzed because many fewer records had science results.

[2] Academic year is used to describe years in this analysis. Academic year is the year the school year ends. For example, 2008 is the academic year for the school year that runs from summer 2007 through spring 2008.

Logistic regression analysis used to analyze the relationship between student persistence and student characteristics, and in some cases, institutions. Logistic regression is appropriate when the outcome variable is dichotomous. The logistic regression creates coefficients that represent the change in the log odds-ratio of the outcome (completing 30 hours) associated with a one unit change in the variable, all other things held equal. The log odds-ratio has been changed to a marginal change that represents the change in the probability of the outcome with a one unit change in the variable, at the average probability of the outcome.

The Sample

Understanding the analysis samples is central to interpreting the results. The analysis is focused on academic years 2008 to 2010. These years were picked to fit the available 2005 to 2007 10th grade CSAP data. The analysis is not of all students who are new to Colorado public higher education institutions. Instead it focuses on a smaller subset of students based on the availability of the CSAP and Index data, as well as the questions being addressed.

There are four analysis data sets, all of first-time, in-state public higher education students, who were under 20, and were:

1. Students with CSAP data in two-year institutions,
2. Students with CSAP data in four-year institutions,
3. Students with Index data, or
4. Students with both CSAP and Index data.

Table 1 provides information on the sample. The first three columns shows changes that occurred as the universe of all students that were relatively new to college campuses was narrowed to a subset of younger, more academically proficient, recent high school graduates. Note that the demographic and persistence measures are provided for all students in the sample. The academic descriptors (CSAP and Index) are only for the students with that information.

Column 1 describes the 245,502 students who first appeared in the SURDS between academic years 2008 and 2010 (regardless of term and program). These are undergraduate, public higher education students who had had not been enrolled in Colorado public higher education anytime between 2004 and 2007. They were majority female (47% male) and mostly white (64%). The minority of students attended 4-year colleges (39%). In terms of persistence, 43% of the students completed 30 credit hours. CSAP scores are available for about 26% of this population or about 63,500 of students described in column 1. The mean 10th grade CSAP in math for this sample was 611.5; higher than the 2007 statewide mean of 586.[3]

Column 2 shows how the sample changed by dropping out-of-state students and those in cash-funded courses. This reduces the sample by about 65,000 students. The group described in column 2 was in-state students, who were not in cash funded courses. This group was similar in terms of race and age to universe shown in column 1, but has a smaller proportion of students in four-year colleges (33% compared to 39%).

The third column describes the group when it is narrowed to first-time students. First-time students do not include transfer, high-school concurrent, or continuing students. This reduces the

[3] Colorado Department of Education, (2007). *2007 CSAP Technical Report*. Downloaded April 20, 2012

sample by another 67,000 students. This group is slightly younger, more male and Hispanic than the universe described in column 1.

Table 1: Sample Descriptive Information

Variables	1.Students who have not been in CO Higher Ed w/in past 5 years	2.In-state only	3.In-state and First time students	*4a. CSAP Analysis 2- year*	*4b. CSAP Analysis 4-year*	*5. Index Analysis*	*6. Combined Index & CSAP Analysis*
				In state, first-time, under 20, w/ CSAP, 2-year	In state, first-time, under 20, w/ CSAP, 4-year	In state, first time, Under 20, 4-year	In state, first time, under 20, w/ Index & CSAP, 4-year
% Male	47%	46%	48%	49%	48%	48%	48%
% Hispanic	13%	14%	15%	18%	10%	10%	10%
% White	64%	65%	64%	62%	70%	70%	71%
% Four-Year	39%	33%	37%	0%	100%	100%	100%
Age	25	25.4	24	18.0	18.03	18.04	18.03
Persistence Measure							
% Complete 30 Credits	43%	43%	42%	60%	81%	78%	83%
Academic Descriptors							
Mean 10th Grade Math CSAP	611.5*	609.4*	608.5*	582.7	627.2	627.6*	627.8
Admissions Index	106.0*	104.9*	104.5*	93.2*	106.9*	107.1*	109.0
Count of students	245,502	180,075	113,008	16,371	26,032	35,631	24,790

* Not all students in this sample (column) have CSAP or Index scores.

The four analysis samples are of undergraduate, in-state tuition paying, first-time freshman (based on registration status), who are under 20 years old (part of the HEAR requirements and it matches the expected progression of students from high school directly to college).

The first two analysis samples are shown in Columns 4a and 4b describing freshman with CSAP data in two and four-year institutions respectively. Together these two groups represent 42,403 students or about a sixth of the universe shown in column 1. The two-year group is 16,371 students and has a higher proportion of Hispanic students (18%) compared to any of the other analysis samples, which average 10% Hispanic. Also note that the persistence measures are higher in the four-year sample (81%) than the two-year sample (60%).

Column 5 provides descriptive for freshmen who are expected to have Index data based on their first-time status in four-year institutions. Column 6 describes students who have both Index and CSAP data. This final sample is similar to the original universe show in in column 1, but younger (average 18 instead of 25), more white (71% instead of 64%) and less Hispanic (10% instead of 13%).

The analysis is focused on a small sub-set of the universe of students who are new to Colorado higher education. This subset is more likely to persist in college (partially because students in short term programs have been dropped). The analysis sample is younger, has a higher proportion of white students, and is more likely to be in a four-year institution. As the sample focuses on the Index only students, the academic descriptors also increase. Additional detail for each sample is contained in Appendix A under the descriptives for each model (see Table 18, Table 21, Table 24, and Table 27.

Limitations

The most important limitation of this analysis is that it focuses on a select sample of the entire universe of new students. As such, conclusions from the analysis should only be applied to first-time, in-state students who are under 20 (*e.g.* went directly from high school to higher education).

A second limitation is that this analysis is only of students who entered Colorado public higher education and were identified in the SURDS enrollment file. It does not shed any light on students who did not enter Colorado public higher education.

The regression analysis performed assumes there are log-linear relationships between variables being analyzed and persistence. This may not be true. This analysis should be treated as initial and exploratory and the nature of relationships may need to be further explored to understand these relationships.

Finally, the regression analysis treats the CSAP and Index as if they are continuous scale measures of a student's capacity. For example, the assumption is that the difference between an Index of 70 and 71 is the same in terms of student capacity as the difference between an Index of 100 and 101. The nature of CSAP scaled scores means this assumption is reasonable for the CSAP but may not be an accurate assumption for the Index.

CSAP Analysis

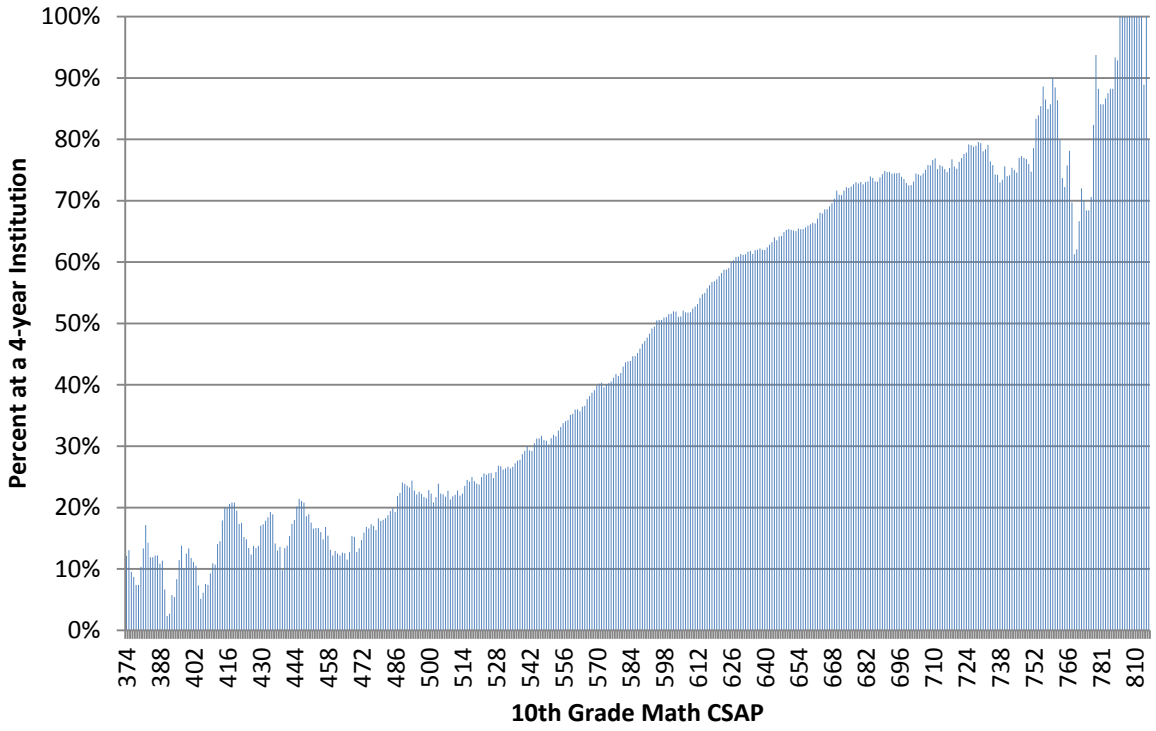
Question 1: Does the CSAP predict whether a student will attend a 4-year or 2-year institution?

The first analysis describes predictors of attendance in two- or four-year institutions. This analysis investigates whether CSAP scores and other characteristics of students (disability, low-income, and English language proficiency) are related to attendance at two- or four-year institutions.

Figure 1 shows the relationship between attending a four-year institution and the 10th grade math CSAP scores. The x-axis shows the math CSAP scale scores. The y-axis shows a rolling average

of the number students with those scale scores who first entered higher education at a four-year institution. There is a clear linear relationship in the middle of the distribution. Between 470 and 680, for every one point change in a student's scale score the proportion of students attending four-year institutions increases by .3 percentage points. At the top and bottom ends of the CSAP score distribution the relationship is less linear. This is partially because there are fewer students at the top and bottom of the distribution to smooth out small changes in attendance patterns. This pattern of a linear relationship in the middle of distributions with less linear relationships at the tails is a common pattern throughout this paper.

Figure 1: Relationship Between CSAP Scores and Attendance at Four-year Institutions



While there is a strong relationship between CSAP scores and attendance at a four-year institution, other factors may also play a role in this outcome. Regression analysis was used to examine other factors and their relationship to attending a two- or four-year institution holding all other things (including CSAP scores) constant. The regression model equation is shown below in Equation 1. The outcome is attending a four-year institution (y) as a function of:

- English language proficiency (l) for English language learners,
- Low-income status (p) as measured with free and reduced lunch eligibility,
- Achievement (a) as measured with the 10 grade mathematics CSAP,
- Gender indicator from the enrollment data (s)
- Race/ethnicity indicators from the enrollment data (r)
- Disability (q) as measured with multiple indicators including Learning disability, speech language disability, physical disability, and hearing/visual or deaf-blind disability,
- Remediation (d) as measured by the number of remedial courses a person took, and

- An error term (e).

Equation 1: Model of Probability of Attending a Four-year Institution

$$y = f(l, p, a, s, r, q, d, +e)$$

A summary of results are shown in Table 2. Full results and model descriptives are shown in Appendix A (see Table 18 through Table 19). The first columns shows the variable, second is the marginal change in the base probability of 61% of students attending a four-year institution from a one unit change in the variable, and the third columns shows whether the coefficient is statistically significant. The changes in probability are relative to a white, female student, who was not an English language learner, and does not have a disability

Table 2: Marginal Change in Probability of Attending a Four-Year Institution

Variable	Marginal Change in Probability	Significance
Not English proficient	-.06	
Limited English proficient	.00	
Fluent English proficient	-.01	
Free lunch eligible	-.06	**
Reduced lunch eligible	-.06	**
Math total scaled score, 10th grade	.003	**
Male	-.05	**
Black	.09	**
Hispanic	-.02	**
Asian or Pacific Islander	.08	**
American Indian	.08	**
More than one race, unknown or non-resident alien	.01	
Hearing, visual, or deaf-blind disability	.02	
Specific learning disability	-.05	**
Speech language disability	-.01	
Limited intellectual, emotional, multiple, autism and brain Injury	-.26	**
Physical disability	-.11	**
Count of remedial courses with 0 for those who did not take a remedial course	-.10	**

* = significant at the .1 level
** = significant at the .05 level

The language variables are not significant, suggesting no relationship between English language proficiency for English language learners and attending two- or four-year colleges. The marginal change for being low-income (i.e. participating in either free or reduced lunch) are significant

and negative, which indicates that students who qualify for these programs are six percentage points less likely to attend four-year colleges, holding student assessments scores constant.

The relationship between student assessment scores is the same as seen in Figure 1 above: a 1 scale score point increase on the math CSAP is equal to a .3 percentage point increase in the probability of attending a four-year institution.

Hispanic students are less likely to attend four-year institutions while black, American Indian, and Asian students are more likely to attend them. The disability indicators are mixed. Students with speech language, physical, and the group that includes limited intellectual disabilities are more likely to attend two-year institutions. Finally, the more remedial courses a student took, the more likely he/she was to attend a two-year institution.

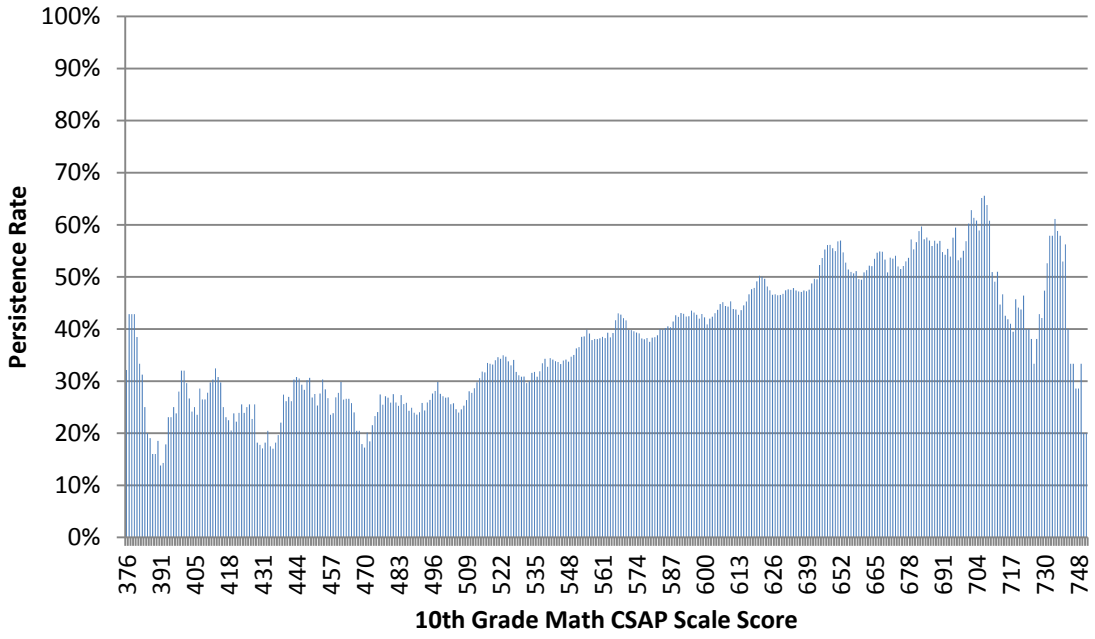
The key implications of this analysis are the results related to race and poverty. This analysis shows that Hispanic and low-income students of equal achievement as measured on the CSAP are less likely to enter higher education at the four-year level. Given higher graduation rates at four-year institutions, and our state's growth in both the Hispanic and low-income populations, this may negatively impact our state's ability to meet its higher education completion goals.

Question 2: Does the CSAP predict persistence in two-year institutions?

The next step is to look at the relationship between persistence and CSAP scores. The analysis is conducted separately for students who started higher education at the two- and four-year levels given the significant differences in student persistence at each level (41% compared to 81%).

Figure 2 shows the relationship between completion of 30 credit hours and CSAP mathematics scores in 10th grade at the two-year level. The relationship is linear, particularly between in the middle range of scale scores (between about 500 and 680). In this range, on average, an increase of one scale score point is related to a .2 percentage point increase in the proportion of students completing 30 credit hours. As with the chart in Figure 1, the relationship is not linear the top and bottom of the CSAP score distribution.

Figure 2: Relationship between 10th Grade Math CSAP Scores and Persistence at Two-year Institutions



Regression analysis was used to tease out differences between factors that impact student persistence. The variables used in the analysis are similar to the earlier analysis, with the addition of indicators of the different two-year institutions and the number of remedial hours completed by level. Course levels were derived from course numbers with 030 courses being the most basic and 099 courses being the most advanced.

The regression model equation used for predicting persistence is shown below in Equation 2. The outcome is persistence (completing 30 credit hours) (y) as a function of:

- English language proficiency (l),
- Low-income status (p) as measured with free and reduced lunch eligibility

- Achievement (a) as measured with the 10 grade mathematics CSAP,
- Institution measured (i) with indicators for each school, college, or university
- Gender indicator from the enrollment data (s)
- Race/ethnicity indicators from the enrollment data (r)
- Disability (q),
- Remediation (d) as measured by the number of remedial courses a person took and hours passed at each level,
- An error term (e)

Equation 2: Model of Probability of Persistence for Students at Two-year Institutions

$$y = f(l, p, a, i, s, r, q, d, +e)$$

The results are shown in Table 3. A full model and descriptives are located in Appendix A (see Table 19 through Table 21). The marginal change is from the average probability of 41% of completing 30 hours. These changes are relative to a white female student, who is not an English language learner, without a disability, attending Community College of Aurora.

Table 3: Marginal Change in Probability of Persistence for Students at Two-year Institutions

Variable	Marginal Change	Significance
Not English proficient	.25	**
Limited English proficient	.03	
Fluent English proficient	-.04	*
Free lunch eligible	-.05	**
Reduced lunch eligible	-.04	**
Math total scaled score, 10th grade	.001	**
Community College of Denver	.01	
Morgan Community College	.02	
Colorado Mountain College	.03	
Arapahoe Community College	.03	
Red Rocks Community College	.05	**
Front Range Community College	.06	**
Pueblo Community College	.07	**
Aims Community College	.08	**
Pikes Peak Community College	.08	**
Northeaster Junior College	.13	**
Trinidad Community College	.15	**
Colorado Northwestern Community College	.16	**
Lamar Community College	.39	**
Otero Junior College	.41	**
Male	-.05	**

Variable	Marginal Change	Significance
Black	-.03	
Hispanic	-.06	**
Asian or Pacific Islander	.04	
American Indian	-.08	**
More than one race, unknown or non-resident alien	-.06	**
Hearing, visual, or deaf-blind disability	-.11	
Specific learning disability	.03	
Speech language disability	.03	
Limited intellectual, emotional, multiple, autism and brain Injury	-.12	**
Physical disability	-.09	**
Count of remedial courses	-.12	**
Remedial hours passed level 099 or higher	.09	**
Remedial hours passed level 090	.07	**
Remedial hours passed level 060	.06	**
Remedial hours passed 030r	.08	**

* = significant at the .1 level
** = significant at the .05 level
Persistence is measured by completing 30 credit hours. Compared to a white, female student who was not an English language learner, without a disability attending Community College of Aurora

A surprising result is that not being English proficient is associated with a higher probability of completing 30 credit hours. Examination of the data confirms this finding. About 57% of this very small group of English language learner students (about 320 students) completed 30 credit hours compared to the average of 41% of all two-year students. These students were mostly Hispanic (59%) and the majority attended Aims Community College, Community College of Denver, or Front Range Community College.

The probability of low-income students persisting is about 4 percentage points less than students who do not qualify for free or reduced lunch.

As seen in

Figure 2, the probability of persistence increases with CSAP scores. After controlling for these other factors, a one scale score point increase is related to a .1 percentage point increase in the probability of persistence

The marginal change for each institution is essentially the relative persistence at each institution controlling for Index scores and the other factors in the analysis. Institutions with statistically similar results are colored the same. Statistically similar means the marginal change for institutions in this group are not statistically different. They are often different from adjacent groups of schools and always different from schools one color stripe away. The four colleges highlighted in green have similar persistence rates to Community College of Aurora. A blue band of eight institutions have higher persistence rates than the Community College of Aurora; however, their rates are not statistically different from each other. The final two schools have much higher persistence rates than Community College of Aurora and statistically higher rates than the other two-year institutions.

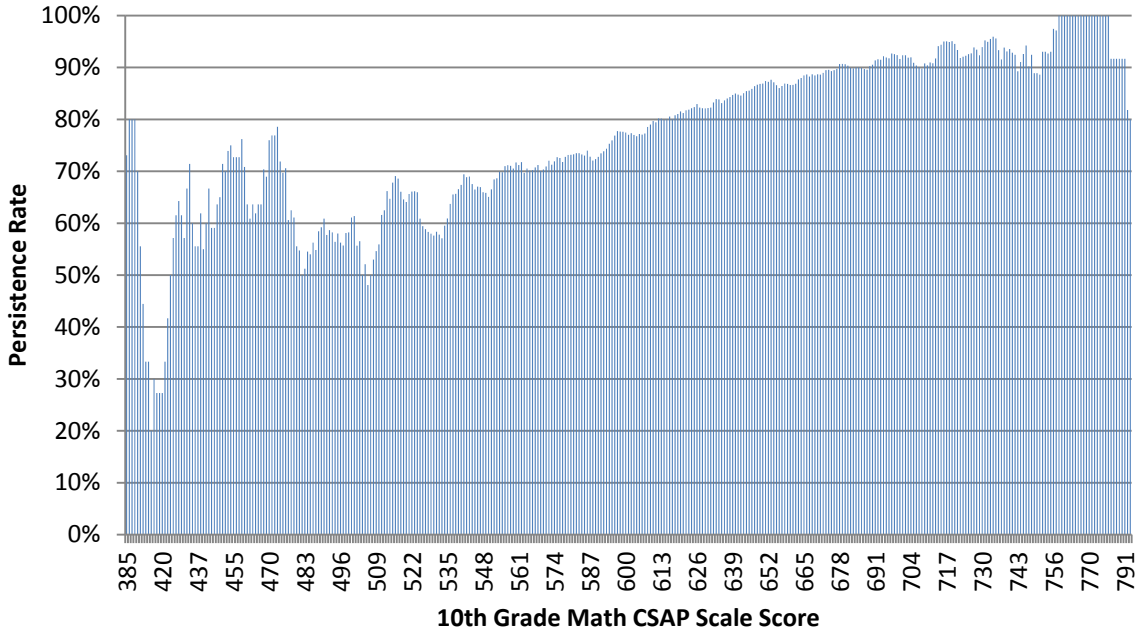
Male, Hispanic and American Indian students are less likely to persist, all other factors held equal. This is also true for students in the group of disabilities labeled limited intellectual as well as students with physical disabilities. At the same time, the probability of black freshmen persisting is equal to white students.

The remedial marginal effects are informative. This analysis suggests that while taking remedial courses reduces the probability of persistence, completing a course of two or more credit hours increases the probability of persistence. In other words, passing a remedial course (of 2 or more hours) regardless of the level compensates for the reduced probability of persistence associated with taking remedial courses.

Question 3: Does the CSAP predict persistence in four-year institutions?

The same analysis is applied to four-year institutions. Figure 3 shows the relationship between CSAP scores and the proportion of freshmen that persisted at four-year institutions. Again, the relationship is fairly linear in the middle of the distribution (between scores of 550 and 700). In this range, a one point scale score increase is related to a .2 percentage point increase in the proportion of students who completed 30 hours.

Figure 3: Relationship between 10th Grade Math CSAP Scores and Persistence at Four-year Institutions



Persistence was modeled at four-year institutions using the same basic model that was used for the two-year institutions. A full model and descriptives are located in Appendix A (see Table 22 through Table 24). In four-year institutions the average persistence rate is 81%. The results of the modeling are shown in Table 4. The marginal change is relative to a white, female student, who is not an English language learner, with no disability, attending University of Colorado Boulder.

Table 4: Marginal Change in Probability of Persistence for Students at Four-Year Institutions

Variable	Marginal Change	Significance
Not English proficient	.03	
Limited English proficient	.04	
Fluent English proficient	.01	
Free lunch eligible	-.08	**
Reduced lunch eligible	-.07	**
Math total scaled score, 10th grade	.001	**
Metropolitan State University of Denver	-.47	**

Variable	Marginal Change	Significance
Colorado State University - Pueblo	-.38	**
Adams State College	-.35	**
Western State College	-.26	**
University of Colorado at Colorado Springs	-.25	**
University of Colorado Denver	-.23	**
Fort Lewis College	-.22	**
University of Northern Colorado	-.17	**
Colorado State University	-.04	**
Colorado Mesa University	.03	**
Colorado School of Mines	.06	**
Male	-.08	**
Black	-.04	**
Hispanic	-.02	**
Asian or Pacific Islander	-.02	*
American Indian	-.05	**
More than one race, unknown or non-resident alien	-.04	**
Hearing, visual, or deaf-blind disability	.06	
Specific learning disability	.01	
Speech language disability	.04	
Limited intellectual, emotional, multiple, autism and brain Injury	-.09	
Physical disability	.03	
Count of remedial courses	-.11	**
Remedial hours passed level 099 or higher	.04	**
Remedial hours passed level 090	.02	**
Remedial hours passed level 060	.02	**
Remedial hours passed 030r	.06	**

* = significant at the .1 level
** = significant at the .05 level
Persistence is measured by completing 30 credit hours. Compared to a white, female student who was not an English language learner, without a disability attending University of Colorado at Boulder.

As with the two-year analysis, the measures associated with gaining English language proficiency are surprising. In this case all of the measures are not statistically significant indicating they are not related to persistence (negatively or positively).

As seen in prior analysis, low-income status is correlated with decreased persistence. The decrease of between seven and eight percentage points at four-year institution is higher than the decrease in persistence associated with low-income status in two-year institutions (two to four percentage points). However, this does not mean a low-income student was more likely to persist at a two-year institution than at a four-year institution. The marginal changes are relative to the average for two- or four-year institutions. Given the large difference in persistence rates

between two- and four-year institutions, a low-income student, had a higher probability of persisting at a four-year institution.

As seen in Figure 3, increased CSAP scores are associated with increased persistence. In four-year institutions, a one scale score point increase in the mathematics CSAP is correlated with a .1 percentage point increase in the probability of persisting.

There are large differences in persistence by institution, even when assessment scores are held constant. Metropolitan State University, Colorado State University - Pueblo, and Adams State College have the lowest levels of persistence and are statistically similar. The next five institutions (shown in the red band) have statistically similar persistence rates that are between .26 and .17 less than the persistence rate for a student at University of Colorado at Boulder. Colorado State University's rate is slightly lower than at the University of Colorado Boulder. Persistence at Colorado Mesa University and Colorado School of Mines is slightly higher than persistence at the University of Colorado Boulder when holding CSAP scores constant.

In the four-year institutions, all of the demographic indicators (male and race/ethnicity) are associated with statistically significant negative marginal decreases persistence ranging from two to four percentage points for the race/ethnic categories and negative eight percentage points for males.

The disability categories do not have a statistically significant relationship to persistence. As in the two-year institutions, participating in remedial education reduced the probability of persistence, while passing courses is associated with increased persistence. However, contrary to what was found at the two-year level, the increase in persistence associated with passing remedial courses is not large enough to overcome the negative impact of taking remedial courses in the first place.

Use of Index Analysis

Question 4: How are institutions using the Admissions Index?

This section begins with an introduction to the Admissions Index. Then it describes the use of the Index by categorizing freshman as either:

- Having an Index above institutional minimums
- Having an Index below the institutional minimums, or
- Not having an Index.

The proportion of students in each category is described by institution for each category. The persistence of these students is described in a later section.

In 2003 the Colorado Commission on Higher Education adopted HEAR. These requirements have two components: a set of course requirements and the Admissions Index. This analysis focuses on the Admissions Index. The HEAR applies to first time freshman who graduated from high school in academic year 2008 and entered higher education in academic year 2009.

The Index was created in 1987 for use by institutions to evaluate academic performance. The Index combines information on high school performance (GPA or class rank) with admissions test results (ACT or SAT). The Index ranges from 45 to 146.

Starting in academic year 2009 schools had to use the Admission Index listed below as minimum criteria in admissions. The institutions had been calculating and using the Index before academic year 2008, but some minimum scores were increased prior to 2008. Each institution has its own minimum Index as shown in Table 5. Institutions are not required to select students with an Index above the minimum.

Table 5: Institution Freshman Admissions Index

Institution	Minimum Admissions Index
Adams State College	80
Colorado School of Mines	110
Colorado State University	101
Colorado State University – Pueblo	86
Fort Lewis College	92
Colorado Mesa University	85
Metropolitan State University of Denver	76
University of Colorado at Boulder	103
University of Colorado at Colorado Springs	92
University of Colorado Denver	93
University of Northern Colorado	94
Western State College	80

Institutions can select students with scores below the minimum Index. Each institution is assigned a proportion of students that can be admitted if they do not meet the HEAR (based on the Index or course requirements). The proportions of students that institutions can admit who do not meet HEAR requirements are called the "admissions window". A student who enters through the window may have not met the minimum Index and/or not met high school coursework requirement. This analysis only looks at students who did not meet the Index portion of the HEAR.

Table 6 shows the size of the admissions window for each institution between 2008 and 2010. The size of the window is very similar for most institutions (either 19% or 20%). Only Colorado School of Mines, University of Colorado Boulder, and Colorado State University have windows that are not in the 19% to 20% range.

Table 6: Allowable Window Size for Freshman Admission Standards[4]

[4] Colorado Department of Higher Education, Policy Archive, Admissions Standards Policy, Section I Part F, Effective May 4, 2007

Institution	Window Size Academic
Colorado School of Mines	10%
University of Colorado at Boulder	14%
Colorado State University	16%
Fort Lewis College	19%
University of Colorado at Colorado Springs	19%
University of Colorado Denver	19%
University of Northern Colorado	19%
Adams State College	20%
Colorado State University – Pueblo	20%
Colorado Mesa University	20%
Metropolitan State University of Denver	20%
Western State College	20%

In this analysis, freshmen were categorized as having an Index was above the minimum, below the minimum, or missing. The sample for this analysis is 35,631 first-time, in-state freshmen, who are under 20 years old attending four-year institutions. Table 7 shows the proportion of freshmen in each category by year. About 89% of students across all institutions had an Index above their institution's minimum, while 9% did not, and another 2% did not have an Index.

Table 7: Proportion of First-Time In-State Freshman in each Admissions Index Category by Year

Academic Year	Index Above Minimum	Index Below Minimum	No Index
2008	88%	10%	2%
2009	89%	9%	2%
2010	89%	9%	2%
Total	89%	9%	2%
Count	31,602	3,258	771

There are differences in the race/ethnicity of students in different Index categories as seen in Table 8. There is a higher proportions of Hispanic, Black and Native American students with Indexes below the minimum. At the same time, the proportion of white and Asian students is lower in the Below Minimum group.

Table 8: Race/Ethnicity of First-Time In-State in Each Admissions Index Category

Race/Ethnicity	Index Above Minimum	Index Below Minimum	No Index	TOTAL
Black or African American	3%	8%	5%	4%
American Indian or Alaska Native	1%	2%	2%	1%
Asian or Pacific Islander	5%	4%	3%	5%

Hispanic	10%	16%	13%	10%
White, non-Hispanic	72%	59%	64%	70%
Unknown, non-resident alien, or more than one race/ethnicity	9%	10%	12%	9%

This indicates that the "admissions window" is being used by a higher proportion of minority students.

Table 9 shows the gender of freshmen by Index category. Males are over-represented in the group of freshmen whose Index scores are below the minimum.

Table 9: Gender of First-Time In-State Freshman in Each Admissions Index Category

Gender	Index Above Minimum	Index Below Minimum	No Index	TOTAL
Male	48%	55%	50%	49%
Female	52%	45%	50%	51%

Table 8 and Table 9 together indicate the window is being used more often for minority and male students.

The proportion of freshmen who have an Index above the minimum varies by institution as shown in Table 10. University of Colorado at Boulder and the Colorado School of Mines have the highest proportion of students with an Index at or above the minimum at 97% and 96% respectively. These two institutions also have the smallest windows as shown in Table 6.

While the differences in window size are very similar for most institutions (either 19% or 20%) there are large differences between institutions in the proportion of students who are at or above the minimum. Adams State College, Fort Lewis College, and Colorado Mesa University had the lowest proportion of students at or above the minimum Index (under 80%).

The proportion of students without an Index is generally under 3%, with a low of 0% at Colorado State University. Metropolitan State University, Adams State College, and Colorado Mesa University had relatively high proportions of students who did not have an Index (6% or more).

Table 10: Proportion of First-Time In-State Freshman in Each Admissions Index Category by Institution

Institution	Index Above Minimum	Index Below Minimum	No Index	Count of Students
Colorado School of Mines	97%	2%	1%	1,072
University of Colorado at Boulder	96%	4%	1%	6,815

Institution	Index Above Minimum	Index Below Minimum	No Index	Count of Students
University of Colorado Denver	93%	6%	1%	2,098
University of Colorado at Colorado Springs	92%	6%	2%	2,206
Metropolitan State University of Denver	92%	2%	6%	3,917
Western State College	92%	6%	2%	955
Colorado State University	91%	9%	0%	7,863
University of Northern Colorado	83%	16%	1%	4,433
Colorado State University - Pueblo	81%	16%	2%	1,405
Adams State College	79%	15%	7%	851
Fort Lewis College	78%	21%	1%	1,388
Colorado Mesa University	71%	21%	8%	2,628
TOTAL	89%	9%	2%	35,631

Use of the Admissions Index changed over time for some institutions, as shown in Table 11. In particular, Fort Lewis College increased the proportion of students with an Index at or above the minimum by 12 percentage points. At the other end, the proportion of students with an Index at or above the minimum decreased by four percentage points at Colorado State University.

Table 11: Proportion of First-Time In-State Freshman in Each Admissions Index Category by Institution by Year

Institution	Above the Index 2008	Above the Index 2009	Above the Index 2010	Change between 2008 & 2010
Fort Lewis College	59%	81%	83%	12
Fort Lewis College	71%	82%	83%	5
University of Colorado Denver	91%	92%	95%	3
Colorado School of Mines	96%	98%	99%	2
University of Colorado at Boulder	95%	96%	96%	2
Adams State College	78%	78%	80%	1
Western State College	90%	93%	92%	0
Colorado State University	91%	91%	91%	0
University of Colorado at Colorado Springs	92%	92%	92%	0
Colorado State University - Pueblo	82%	81%	82%	0
University of Northern Colorado	84%	81%	84%	-1
Colorado Mesa University	71%	72%	70%	-4
TOTAL	88%	89%	89%	0.5

One question is whether students with an Index below the minimum actually have lower academic capacity. The CSAP scores can be used to shed light on this question. Note, as shown in Column 6 of Table 1 the combined sample of freshman with CSAP and Index scores is

smaller than the sample with Index scores. The CSAP and Index sample and may not accurately represent the entire sample of Index students.

Table 12 shows students with an Index below the minimum have math CSAP scores that are, on average, 51 scale score points below students with an Index above the minimum.

The sample of people without an Index but with a CSAP was very small (2,005) and is not reported for any cell with under 20 freshman. The average CSAP score of those with no Index are generally about the same as those with an Index above the minimum on a school by school basis.

Table 12: Mean CSAP Scores of First-Time In-State Freshman by Admissions Index Category by Institution

Institution	Mean CSAP Score when Index is above minimum	Mean CSAP Score when Index is below minimum	Mean CSAP Score when there is no Index
Adams State College	595	551	600
Colorado School of Mines	682	633	
University of Northern Colorado	622	585	
Colorado State University	642	597	
Fort Lewis College	622	582	668
Colorado Mesa University	613	557	573
Metropolitan State University of Denver	607	559	595
Colorado State University - Pueblo	602	563	592
University of Colorado at Boulder	657	594	
University of Colorado Denver	626	584	
University of Colorado at Colorado Springs	632	583	
Western State College	611	555	
TOTAL	633	581	598

This analysis focused on the Admission Index scores (derived from SURDS) for first-time, in-state freshman who essentially came to higher education strait from high school (before they turned 20). A couple of key conclusions can be made. First, the statewide proportion of freshmen in each Index category remained fairly steady from 2008 through 2010. The window, as indicated by having scores below institutional minimums, is being used more often by minority and male students.

There is large variation between institutions in the proportion of freshmen with an Index at or above the minimum: ranging from 71% to 97%. Some institutions had a relatively high proportion of students without an Index (6% at Metropolitan State University), others had a high proportion with Index scores below their assigned minimum (Fort Lewis College at 21%), and another had high proportions of freshman with low Index or with no Index (Colorado Mesa University). Over time application of the Index changed in some institutions, particularly Fort

Lewis College, where the proportion of students with an Index at or above the minimum increased by 12 percentage points between 2008 and 2010.

For the sample of students with both Index and CSAP scores, students with an Index below institutional minimums also have lower CSAP scores.

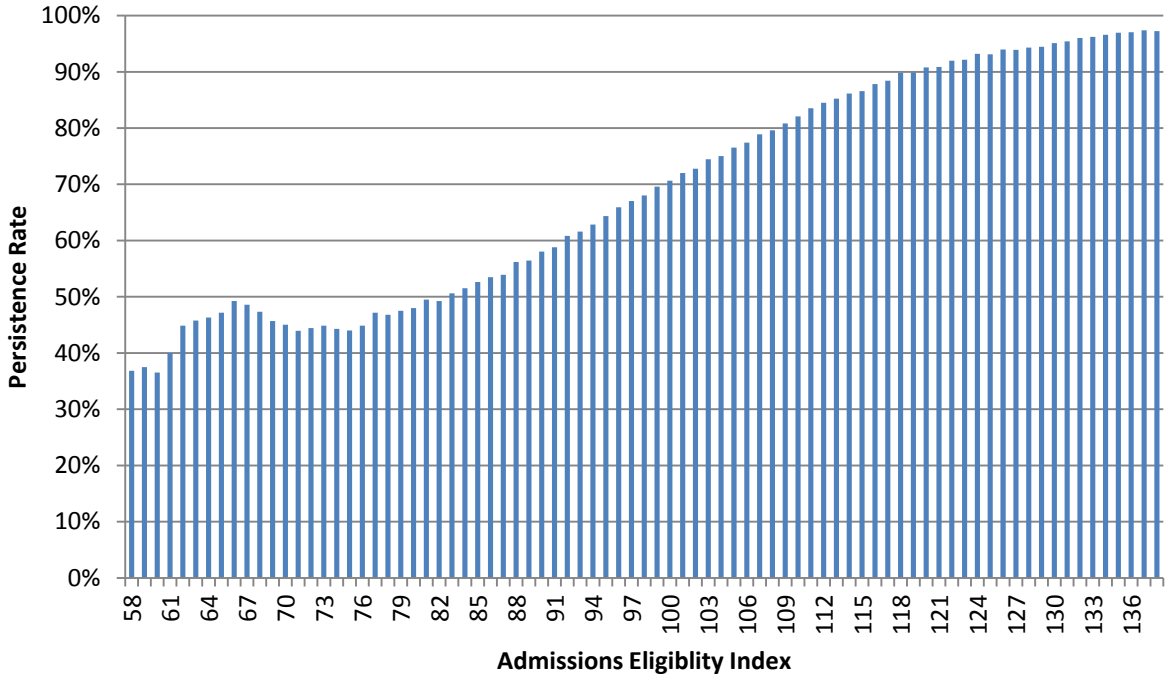
Admissions Index and Persistence Analysis

The earlier analysis of the CSAP and persistence showed a strong upward sloping relationship between CSAP scores and persistence (see

Figure 2 and Figure 3). Figure 4 below shows the relationship between the Index and persistence.

Above an Index of about 75, the relationship between the Index and persistence is fairly linear: a one point increase in the Index is associated with a .8 percentage point increase in the proportion of students that persisted. However, below an Index of 75 the relationship is not linear. In particular, Index scores of 66 and 82 both have a 49% persistence rate. A 66 is below the minimum Index for all institutions, while a 81 is above the minimum for several institutions. As will be shown later (see Figure 6), this hump in the distribution for lower Index scores flattens when institutional minimums are taken into account. Retention for students with the top index scores also declines.

Figure 4: Relationship between Admission Index and Persistence at Four-year Institutions



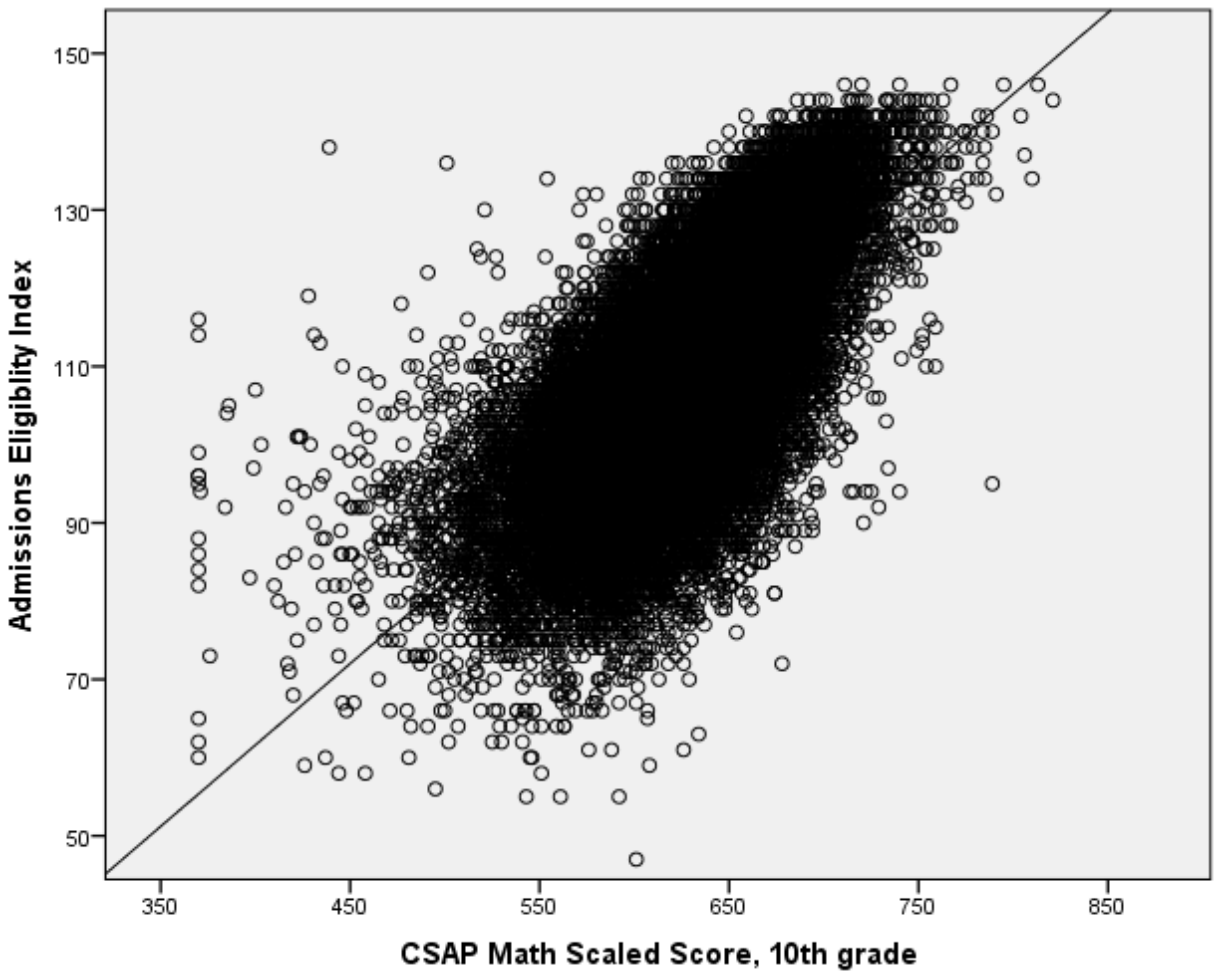
Given that both the Index and CSAP scores are related to persistence, the question of which is a better predictor of persistence becomes important.

Question 5: Which is a better predictor of persistence, the CSAP or the Admissions Index?

This section looks at the relationship between CSAP scores, the Admissions Index and student persistence. As discussed in the sample section, CSAP and the Index are available for a sub-group of students. These students are all in four-year institutions and have higher persistence rates than other samples analyzed for this paper (84%).

The CSAP scale scores are correlated with the Admissions Index. Figure 5 is a scatterplot of math CSAP scores and the Admissions Index. The scatterplot shows that the scale scores and Index are correlated throughout the range of scores. This medium level of correlation r= .69.

Figure 5: Scatterplot of the 10th grade Math CSAP and Admission Index.



One method of testing which is a better predictor of persistence is comparing the pseudo r-squared from logistic regression models using either the CSAP or the Index to predict persistence. The Cox and Snell pseudo r-squared is a measure of how well the model predicts the outcome variable; and increase in this measure indicates the model is doing a better job at predicting the outcome.

Table 13 shows the Cox and Snell r-squared for two regression models for predicting persistence; one using CSAP and the other using the Index. The models used same data and the only other variables used were year indicators. The Cox and Snell is 100% higher for the Admissions Index model indicating the Index is a better predictor of persistence than the CSAP. This analysis was repeated with similar results for all of the 10th grade CSAP tests and using OLS regression with similar results.

Table 13: Comparison of the Admissions Index and CSAP in Predicting Persistence

Model	Cox & Snell R Squared	Percent Correctly

		Predicted
Admissions Index	.116	83.5%
Mathematics 10th Grade CSAP	.057	83.2%

However, by another measure, proportion of students that are correctly identified by the model, the two measures are similar. The Admissions Index model predicted persistence correctly for 83.5% of the observations, compared to 83.2% of the observations using the CSAP based models. These results are essentially the same for either model. It is important to note that the persistence rate for this sample is fairly high. The results might be different for a measure that has more variation (such as graduation).

Taken together, this information suggests the Index and CSAP are comparable in predicting persistence, but the Index is generally better. The strength of the Index is not surprising. The Admissions Index uses multiple measures, high school performance and assessment scores, which provides a richer measure than assessment scores alone. Additionally, the Index is comprised of measures taken closer in time to college admission, which also carry more consequences than the CSAP.

Question 6: Is there a relationship between required Admission Index and persistence?

While it is valuable and important that the Index is positively related to persistence, this does not address the different missions and student populations served by Colorado's institutions of higher education. A key question is whether institutions are able to identify and support the success of students admitted using the Admissions Index and other criteria. To address this question, a new measure was created by subtracting required minimum Index from each student's Index.

Table 14 shows the persistence rate for first-time, in-state freshmen who were under 20 when they entered Colorado public Higher Education by Index category. The column on the far right shows the total persistence rate for each institution. This rate varies greatly from 95% at Colorado school of Mines, to 48% at Adams State College.

The three middle columns show persistence for freshman with an Index at above the minimum, below the minimum, and with no Index. The persistence rates for freshmen with an Index above the minimum are highest. They range from a high of 95% at Colorado School of Mines to a low of 52% for Metropolitan State University.

The middle column shows the persistence rates for freshman with Index scores below the minimum. These persistence rates are lower than the persistence rate for freshman with Index scores above the minimum. To the extent that students below the minimum Index represent "window students", then window students, on average, persist at lower rates. The difference in persistence rates for those with Indexes above and below the minimum ten percentage points or less at Colorado School of Mines and Colorado State University. In other words, the persistence rates for window admissions in these two institutions are similar to the persistence rate non-

window admissions. Adams State College has the largest difference between persistence rates for those with an Index above and below the minimum (35 percentage points).

The persistence rate for students with no Index is shown in the second from the left column. This persistence rate varies greatly. It is generally lower than the persistence rate for freshman with an Index above the minimum, and often lower than those with an Index below the minimum. However, persistence rates for freshmen without an Index fairly similar to the persistence rate for freshman with an Index below the minimum Colorado State University.

Table 14: Four-Year Persistence Rate of First-Time, Instate-state Freshmen by Index Category

Institution	Persistence Rate for Freshman w/ Index Above Minimum	Persistence Rate for Freshman w/ Index Below Minimum	Persistence Rate for Freshman w/ No Index	Total Freshman Persistence Rate
Colorado School of Mines	95%	85%	75%	94%
University of Colorado at Boulder	93%	79%	82%	92%
Colorado State University	90%	83%	89%	89%
Colorado Mesa University	86%	69%	50%	80%
University of Northern Colorado	79%	66%	63%	77%
University of Colorado Denver	76%	63%	61%	75%
Fort Lewis College	75%	57%	35%	71%
University of Colorado at Colorado Springs	74%	53%	37%	72%
Western State College	68%	42%	50%	66%
Colorado State University - Pueblo	57%	31%	30%	52%
Adams State College	56%	21%	9%	48%
Metropolitan State University of Denver	52%	29%	26%	50%
Total	80%	64%	42%	78%

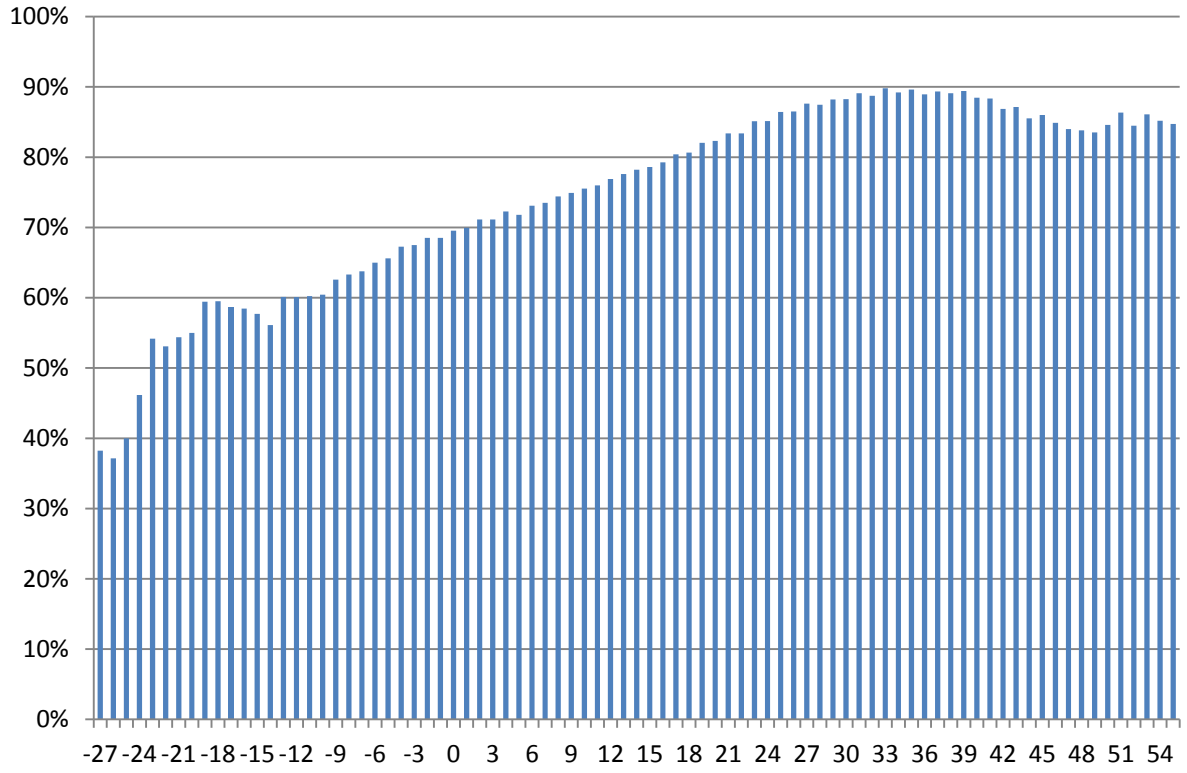
Figure 6 shows the relationship between the difference between a freshman's Admission Index and the Institutional minimum and persistence. A positive number means a student's Admission Index was above the institution's minimum. A negative number means a freshman's Index was below the institution's minimum. This measure essentially adjusts the Index for the requirements of the institution the freshman attended.

As with our other charts, the relationship is linear and positive in the middle of the distribution. Between -13 to 35 the persistence rate increases by about .6 percentage points for every one Index point increase. This is very similar to the .7 percentage point increases in persistence rates associated with the Admissions Index shown in Figure 4. The adjustment does significantly dampen the bump in persistence seen at the lower end of the Index in Figure 4. And the retention at the very high end has declined. This may be due to students with mid-level Index

scores attending institutions with low Index requirements and not persisting. The difference between Index scores and required minimums will be large.

While the overall relationship of higher Index scores and persistence is retained, the difference between the two figures suggests at least some students with lower index scores are successful at institutions with lower minimum admissions requirements. And students with mid-level Index scores do not persist at schools with low minimum Index scores.

Figure 6: Relationship between Difference between Freshmen's Admission Index and Institutional Minimum and Persistence at Four-year Institutions



Regression Analysis of Relationship Between Persistence and Index Scores

Regression analysis was used to tease out differences between factors that impact student persistence. The variables used in this analysis are similar to the earlier analysis. In this analysis the Admission Index measure used is same as shown inFigure 6. Complete results and variable Descriptives are included in Appendix A (see Table 25 to Table 27).

The regression model equation used for predicting persistence is shown below in Equation 3. The outcome is persistence (completing 30 credit hours) (y) as a function of:

- Admissions Eligibility Index (a),
- Institution (i) measured with indicators for each school, college or university
- Gender indicator (s)

- Race/ethnicity indicators (e)
- Remediation (d) as measured by the number of remedial courses a person took and hours passed at each level,
- An error term (e)

Equation 3: Model of Probability of Persistence of Students with Index Scores

$$y = f(a, i, s, r, d, d, +e)$$

Results from this regression analysis are shown in Table 15. The marginal changes are from the base probability of persistence of 78% and are relative to a white, female at University of Colorado Boulder.

The .8 percentage point increase in retention for a one unit increase the Index is similar the marginal change shown above in Figure 6.

Institutions with statistically similar results are grouped by color ordered from lowest to highest marginal effect on persistence.

The results in this analysis are very similar to the results of the CSAP analysis shown in Table 4. For example, the rank order of institutions in the Index analysis is very similar to the CSAP analysis. Metropolitan State, Adams State and Colorado State – Pueblo rank near the bottom in terms of persistence while Colorado School of Mines, University of Colorado at Boulder, Colorado Mesa University, and Colorado State University all rank near the top in terms of persistence.

Table 15: Marginal Change in Probability of Persistence for Four-Year Students with an Index

Variable	Marginal Change	Significance
Index	0.008	**
Metropolitan State University of Denver	-0.32	**
Colorado State University - Pueblo	-0.30	**
Adams State College	-0.23	**
University of Colorado at Colorado Springs	-0.20	**
University of Colorado Denver	-0.16	**
Western State College	-0.15	**

Variable	Marginal Change	Significance
Fort Lewis College	-0.15	**
University of Northern Colorado	-0.09	**
Colorado State University	-0.01	
Colorado School of Mines	0.03	
Colorado Mesa University	0.07	**
Male	-0.04	**
Black	-0.03	**
Hispanic	-0.04	**
Asian Pacific Islander	-0.01	
American Indian	-0.02	
Other Race, no race/ethnic or multiple	-0.03	**
Remedial Count of Courses	-0.09	**
Count of 099 Hours Passed	0.04	**
Count of 090 Hours Passed	0.03	**
Count of 060 Hours Passed	0.02	**
Count of 030 Hours Passed	0.05	**

** = significant at the .05 level
Persistence is measured by completing 30 credit hours. Compared to a white, female student who was not an English language learner, without a disability attending University of Colorado at Boulder.

As seen in the CSAP analysis, males and most racial ethnic groups (all except Asian/Pacific Islander and American Indian) had statistically lower persistence rates than whites. Black, Hispanic and the Other race groups had statistically similar lower persistence rates: between three and four percentage points less than white students.

As seen in earlier regressions, taking a remedial course is associated with a reduced probability of persistence, while passing these courses is associated with improved persistence. If the courses are three or more hours, then passing the remedial courses essentially negates the negative impact of taking the course.

Conclusions

This analysis examined factors associated with freshman persistence. In particular it looked at the relationship between measures of student capacity as measured through the CSAP and Admissions Index and persistence along with other factors such as poverty, race/ethnicity, English language proficiency, and disability.

These results must be contextualized by the sample of freshman being studied. These were in-state, first-time students under 20 years old. It is a sub-set of the 245,502 relatively new to higher education universe of students who appeared on Colorado's public higher education campuses between 2008 and 2010.

Several patterns repeated throughout the analysis. Hispanic persistence is lower at both two- and four-year institutions, even after controlling for capacity (measured by the CSAP and Index) and

English language learner status. Blacks had statically lower persistence in four-year institutions but did not at two-year institutions. Third, male persistence is lower in all institutions.

The association with persistence of additional factors from the CSAP data was analyzed. Low-income status is associated with lower persistence rates with no statistical difference between reduced lunch eligibility and the lower–income category of free lunch eligibility. English language learner status is generally not associated with lower persistence. Disabilities are not associated with lower persistence at the four-year institutions. Physical and a grouping of limited intellectual, emotional, multiple, autism and brain injury are associated with lower persistence at two-year institutions.

Taking remedial courses is associated with lower persistence, however passing those courses increased the probability of persistence. In many cases, passing a three-hour remedial course nullified the reduced persistence associated with having to take that course.

Persistence rates varied greatly between institution after controlling for student capacity and other factors. Within the two-year institutions the Community College of Denver, Community College of Aurora, Morgan Community College, Colorado Mountain College and Arapahoe Community College had statistically lower persistence rates, while Lamar Community College and Otero Junior College had statically higher rates of persistence. Among four-year institutions Metropolitan State, Colorado State – Pueblo and Adams State rank near the bottom in terms of persistence while Colorado School of Mines, University of Colorado Boulder, Colorado Mesa University, and Colorado State University all rank near the top in terms of persistence.

The probability of persistence increases with higher CSAP or Academic Index scores. The CSAP and Index are correlated and they are comparable predictors of persistence, although the Index is more effective on one measure. As has been shown by CDE the CSAP is highly correlated the ACT, which one of the inputs to the Index.[5] Given this, the CSAP may be an appropriate addition to the Admissions Index.

Students who were admitted with Index scores below minimum institutional requirements, *i.e.* "window admissions" were more likely to be Hispanic, Black, or American Indian/Alaskan Native and male, with lower CSAP scores than students with Index scores above the minimum.

Institutions vary significantly by the proportion of "window admissions." Colorado Mesa University had one of the highest proportions of students with either no Index or Index scores below the minimum, but also had relatively high persistence rates. Fort Lewis College significantly decreased the proportion of "window" students admitted between 2008 and 2010.

Next Steps

There are many other factors around student success within the SURDS data system that can be explored to inform policy and practice. This includes a broader exploration of measures of success such as different measures of persistence (GPA, courses attempted, etc.) and the connection of persistence with graduation. The connection of HEAR and success should be

[5] Huchton, M. (March 4, 2011)). *Predicting Colorado ACT Performance Using CSAP Results*. Colorado Department of Education

explored further including examining the HEAR course requirements as well as a deeper examination of institutional level pattern of success. Examination of institutional patterns of success could include the relationship of success with programs (*i.e*. majors) as well as remediation patterns. The relationship to student success of various programs for high school students to gain college credits and success should also be explored. The relationships between transfer policy, student transfers and success should also be explored.

The SURDS/CSAP data provides a connection between schools and districts and post-secondary access and success. Factors that should be further explored include relationships between post-secondary access and success with high school and district characteristics such as size, locale (rural, urban, etc.), and peer success. The connection of financial aid and low-income indicators from the CSAP data and success is a rich direction for exploration. Equally important, the wide range of assessment measures in this data, 8th and 9th grade CSAP scores, ACT scores, across all of the different subjects studied, can provide additional insights on access and success.

This analysis provides new information about student persistence connected to the CSAP and the Admissions Index and illustrates the types of information that can be extracted from state education databases. This information is intended to inform policymakers and practitioners as the work to improve outcomes for Colorado's students. This analysis is a small portion of the information contained in state databases. There are many potential future directions for research. Working with policymaker and practitioners to identify those directions will increase the value of the research.

Appendix 1: Model Descriptives and Full Results

Model 1: Probability of Attending a Four-year Institution Model Descriptives as Predicted by CSAP Scores

The following three tables provide detail on the model of the probability of attending a four-year institution shown in Table 2.

Table 16: Model Summary, Probability of Attending a Four-year Institution

-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
46,965.04	.188	.255
Overall Percentage Correctly Predicted		72.6%

Table 17: Complete Model of Probability to Attend a Four-year Institution as Predicted by CSAP Scores

Variable	B	S.E.	Sig.	Exp(B)
Academic year 2009	.02	.03	.50	1.02
Academic year 2010	-.19	.03	.00	0.82
Not English Proficient	-.26	.22	.23	0.77
Limited English Proficient	.01	.11	.93	1.01
Fluent English Proficient	-.04	.06	.54	0.96
Free lunch eligible	-.24	.04	.00	0.78
Reduced lunch eligible	-.26	.06	.00	0.77
Math total scaled score, 10th grade	.01	.00	.00	1.01
Male	-.21	.02	.00	0.81
Black	.38	.06	.00	1.47
Hispanic	-.09	.04	.01	0.91
Asian or Pacific Islander	.34	.06	.00	1.40
American Indian	.38	.10	.00	1.46
More than one race, unknown or non-resident alien	.06	.04	.14	1.06
Hearing, visual, or deaf-blind disability	.10	.29	.73	1.10
Specific learning disability	-.22	.08	.01	0.81
Speech language disability	-.04	.18	.83	0.96
Limited intellectual, emotional, multiple, autism and brain Injury	-1.07	.18	.00	0.34
Physical disability	-.44	.13	.00	0.64
Count of remedial courses with 0 for those who did not take	-.39	.01	.00	0.67
Constant	-6.04	.16	.00	0.00

Table 18: Descriptives of the Variables Included In Model of the Probability of Attending A Four-year Institution as Predicted by CSAP Scores

Variable	N	Min	Max	Mean	Std. Deviation
Four year public indicator	42,403	0	1	.61	.49
Academic year 2009	42,403	0	1	.34	.47
Academic year 2010	42,403	0	1	.42	.49
Not English Proficient	42,403	0	1	.004	.07
Limited English Proficient	42,403	0	1	.01	.11

Variable	N	Min	Max	Mean	Std. Deviation
Fluent English Proficient	42,403	0	1	.03	.18
Free lunch eligible	42,403	0	1	.10	.29
Reduced lunch eligible	42,403	0	1	.04	.19
Math total scaled score, 10th grade	41,802	370	821	610.10	57.15
Male	42,393	0	1	.49	.50
Black	42,403	0	1	.04	.21
Hispanic	42,403	0	1	.13	.33
Asian or Pacific Islander	42,403	0	1	.04	.20
American Indian	42,403	0	1	.01	.12
More than one race, unknown or non-resident alien	42,403	0	1	.10	.30
Hearing, visual, or deaf-blind disability	42,403	0	1	.00	.04
Specific learning disability	42,403	0	1	.03	.16
Speech language disability	42,403	0	1	.005	.07
Limited intellectual, emotional, multiple, autism and brain Injury	42,403	0	1	.01	.08
Physical disability	42,403	0	1	.01	.09
Count of remedial courses with 0 for those who did not take	42,403	0	17	.68	1.60

Model 2, Probability of Persistence in Two-Year Institutions as Predicted by CSAP Scores

The following three tables provide detail on the model of the probability of persisting in a two-year institution shown in Table 3

Table 19: Model Summary, Probability of Persistence at a Two-year Institution as Predicted by CSAP Scores

-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
17,664.45	.223	.301
Overall Percentage Correctly Predicted		72.3%

Table 20: Complete Model of Probability to Persist in a Two-year Institution as Predicted by CSAP Scores

Variable	B	S.E.	Sig.	Exp (B)
Academic year 2009	-.59	.05	.00	.55
Academic year 2010	-1.95	.05	.00	.14
Not English Proficient	1.01	.23	.00	2.74
Limited English Proficient	.12	.15	.40	1.13
Fluent English Proficient	-.17	.10	.09	.85
Free lunch eligible	-.19	.06	.00	.83
Reduced lunch eligible	-.18	.09	.05	.84
Math total scaled score, 10th grade	.01	.00	.00	1.01
Community College of Denver	.06	.10	.57	1.06
Morgan Community College	.07	.16	.65	1.08
Colorado Mountain College	.12	.13	.37	1.12
Arapahoe Community College	.14	.10	.15	1.15
Red Rocks Community College	.21	.09	.02	1.24

Variable	B	S.E.	Sig.	Exp (B)
Front Range Community College	.24	.08	.01	1.27
Pueblo Community College	.28	.12	.02	1.32
Aims Community College	.32	.10	.00	1.37
Pikes Peak Community College	.33	.09	.00	1.39
Northeaster Junior College	.53	.11	.00	1.71
Trinidad Community College	.59	.14	.00	1.80
Colorado Northwestern Community College	.66	.18	.00	1.94
Lamar Community College	1.78	.25	.00	5.91
Otero Junior College	1.87	.19	.00	6.47
Male	-.19	.04	.00	.82
Black	-.11	.09	.22	.89
Hispanic	-.23	.06	.00	.79
Asian or Pacific Islander	.17	.11	.11	1.18
American Indian	-.36	.18	.04	.70
More than one race, unknown or non-resident alien	-.24	.07	.00	.79
Hearing, visual, or deaf-blind disability	-.46	.44	.29	.63
Specific learning disability	.13	.10	.17	1.14
Speech language disability	.12	.21	.58	1.12
Limited intellectual, emotional, multiple, autism and brain Injury	-.54	.20	.01	.58
Physical disability	-.38	.17	.02	.68
Count of remedial courses with 0 for those who did not take	-.54	.02	.00	.58
Remedial hours passed level 099 or higher with 0 for those who did not take	.36	.02	.00	1.44
Remedial hours passed level 090 with 0 for those who did not take	.29	.01	.00	1.34
Remedial hours passed level 060 with 0 for those who did not take	.24	.02	.00	1.27
Remedial hours passed 030r with 0 for those who did not take	.31	.03	.00	1.37
Constant	-2.58	.25	.00	.08

Table 21: Descriptives of the Variables Included in Model of the Probability of Persisting in a Two-year Institution as Predicted by CSAP Scores

Variable	N	Min	Max	Mean	Std. Deviation
Completed 30 or more hours	16,371	0	1	.41	.49
Academic Year 2008	16,371	0	1	.23	.42
Academic year 2009	16,371	0	1	.32	.47
Academic year 2010	16,371	0	1	.45	.50
Language proficient, not ESL	16,371	0	1	.93	.26
Not English Proficient	16,371	0	1	.01	.09
Limited English Proficient	16,371	0	1	.02	.14
Fluent English Proficient	16,371	0	1	.04	.21
Free lunch eligible	16,371	0	1	.14	.35
Reduced lunch eligible	16,371	0	1	.05	.21
Math total scaled score, 10th grade	16,052	370	772	582.73	59.33
Aims Community College	16,371	0	1	.07	.26
Arapahoe Community College	16,371	0	1	.09	.28
Colorado Mountain College	16,371	0	1	.03	.17
Colorado Northwestern Community College	16,371	0	1	.01	.11

Variable	N	Min	Max	Mean	Std. Deviation
Community College of Aurora	16,371	0	1	.06	.24
Community College of Denver	16,371	0	1	.09	.29
Morgan Community College	16,371	0	1	.02	.12
Front Range Community College	16,371	0	1	.24	.43
Lamar Community College	16,371	0	1	.01	.08
Northeaster Junior College	16,371	0	1	.05	.21
Otero Junior College	16,371	0	1	.01	.12
Pikes Peak Community College	16,371	0	1	.14	.35
Pueblo Community College	16,371	0	1	.05	.21
Red Rocks Community College	16,371	0	1	.11	.31
Trinidad Community College	16,371	0	1	.02	.15
Male	16,363	0	1	.49	.50
White	16,371	0	1	.62	.49
Black	16,371	0	1	.06	.23
Hispanic	16,371	0	1	.18	.38
Asian or Pacific Islander	16,371	0	1	.03	.18
American Indian	16,371	0	1	.01	.11
More than one race, unknown, or non-resident alien	16,371	0	1	.10	.30
Hearing, visual, or deaf-blind disability	16,371	0	1	.00	.05
No Disability	16,371	0	1	.91	.28
Specific learning disability	16,371	0	1	.04	.21
Speech language disability	16,371	0	1	.01	.09
Limited intellectual, emotional, multiple, autism and brain Injury	16,371	0	1	.01	.11
Physical disability	16,371	0	1	.02	.12
Count of remedial courses with 0 for those who did not take	16,371	0	17	1.38	2.14
Remedial hours passed level 099 or higher with 0 for those who did not take	16,371	0	10	.23	.93
Remedial hours passed level 090 with 0 for those who did not take	16,371	0	17	1.27	2.47
Remedial hours passed level 060 with 0 for those who did not take	16,371	0	15	.75	1.80
Remedial hours passed 030r with 0 for those who did not take	16,371	0	11	.29	.84

Model 3: Probability of Persisting at a Four-year Institution as Predicted by CSAP Scores

The following three tables provide detail on the model of the probability of persisting in a four-year institution shown in Table 4.

Table 22: Model Summary, Probability of Persistence at a Four-year Institution as Predicted by CSAP Scores

-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
20017.765[a]	.166	.270
Overall percentage Correctly Predicted		83.9%

Table 23: Complete Model of Probability to Persist in a Four-year Institution as Predicted by CSAP Scores

Variable	B	S.E.	Sig.	Exp(B)
Academic year 2009	-0.22	0.05	0.00	0.80
Academic year 2010	-1.29	0.05	0.00	0.28
Not English Proficient	0.18	0.39	0.64	1.20
Limited English Proficient	0.30	0.19	0.11	1.35
Fluent English Proficient	0.07	0.10	0.50	1.07
Free lunch eligible	-0.44	0.07	0.00	0.64
Reduced lunch eligible	-0.39	0.09	0.00	0.68
Math total scaled score, 10th grade	0.01	0.00	0.00	1.01
Metropolitan State University of Denver	-2.13	0.07	0.00	0.12
Colorado State University Pueblo	-1.74	0.10	0.00	0.18
Adams State College	-1.62	0.12	0.00	0.20
Western State College	-1.25	0.11	0.00	0.29
University of Colorado at Colorado Springs	-1.21	0.09	0.00	0.30
University of Colorado Denver	-1.15	0.09	0.00	0.32
Fort Lewis College	-1.10	0.11	0.00	0.33
University of Northern Colorado	-0.88	0.08	0.00	0.41
Colorado State University	-0.27	0.08	0.00	0.76
Colorado Mesa University	0.22	0.11	0.05	1.24
Colorado School of Mines	0.49	0.19	0.01	1.64
Male	-0.46	0.04	0.00	0.63
Black	-0.24	0.09	0.01	0.79
Hispanic	-0.16	0.06	0.01	0.86
Asian or Pacific Islander	-0.15	0.09	0.09	0.86
American Indian	-0.31	0.14	0.03	0.73
More than one race, unknown or non-resident alien	-0.23	0.06	0.00	0.79
Hearing, visual, or deaf-blind disability	0.49	0.56	0.38	1.64
Specific learning disability	0.04	0.14	0.81	1.04
Speech language disability	0.30	0.36	0.40	1.35
Limited intellectual, emotional, multiple, autism and brain Injury	-0.49	0.33	0.14	0.61
Physical disability	0.21	0.25	0.42	1.23
Count of remedial courses with 0 for those who did not take	-0.62	0.04	0.00	0.54
Remedial hours passed level 099 or higher with 0 for those who did not take	0.26	0.02	0.00	1.29
Remedial hours passed level 090 with 0 for those who did not take	0.13	0.02	0.00	1.14
Remedial hours passed level 060 with 0 for those who did not take	0.13	0.04	0.00	1.14
Remedial hours passed level 030 with 0 for those who did not take	0.46	0.08	0.00	1.58
Constant	0.03	0.29	0.92	1.03

Table 24: Descriptives of the Variables Included in Model of the Probability of Persisting in a Four-year Institution as Predicted by the CSAP Scores

Variable	N	Min	Max	Mean	Std. Deviation
Completed 30 or more hours	26,032	0	1	.81	.39
Academic Year 2008	26,032	0	1	.24	.43
Academic year 2009	26,032	0	1	.35	.48
Academic year 2010	26,032	0	1	.40	.49
Language proficient, not ESL	26,032	0	1	.96	.19
Not English Proficient	26,032	0	1	.00	.04
Limited English Proficient	26,032	0	1	.01	.08
Fluent English Proficient	26,032	0	1	.03	.17
Free lunch eligible	26,032	0	1	.07	.25
Reduced lunch eligible	26,032	0	1	.03	.17
Math total scaled score, 10th grade	25,750	370	821	627.16	48.48
Adams State College	26,032	0	1	.02	.15
Colorado Mesa University	26,032	0	1	.07	.25
Fort Lewis College	26,032	0	1	.03	.18
Colorado School of Mines	26,032	0	1	.03	.18
Colorado State University	26,032	0	1	.24	.43
Colorado State University Pueblo	26,032	0	1	.04	.19
Metropolitan State University of Denver	26,032	0	1	.13	.34
University of Colorado at Colorado Springs	26,032	0	1	.05	.22
University of Colorado Denver	26,032	0	1	.05	.22
University of Northern Colorado	26,032	0	1	.14	.35
Western State College	26,032	0	1	.03	.16
University of Colorado At Boulder	26,032	0	1	.16	.37
Male	26,030	0	1	.48	.50
White	26,032	0	1	.70	.46
Black	26,032	0	1	.04	.19
Hispanic	26,032	0	1	.10	.30
Asian or Pacific Islander	26,032	0	1	.05	.21
American Indian	26,032	0	1	.01	.12
More than one race, unknown or non-resident alien	26,032	0	1	.10	.30
Hearing, visual, or deaf-blind disability	26,032	0	1	.00	.04
No Disability	26,032	0	1	.98	.15
Specific learning disability	26,032	0	1	.01	.11
Speech language disability	26,032	0	1	.00	.05
Limited intellectual, emotional, multiple, autism and brain Injury	26,032	0	1	.00	.05
Physical disability	26,032	0	1	.00	.07
Count of remedial courses with 0 for those who did not take	26,032	0	11	.24	.87
Remedial hours passed level 099 or higher with 0 for those who did not take	26,032	0	16	.21	1.09
Remedial hours passed level 090 with 0 for those who did not take	26,032	0	13	.16	.91
Remedial hours passed level 060 with 0 for those who did not take	26,032	0	12	.06	.52
Remedial hours passed 030r with 0 for those who did not take	26,032	0	6	.03	.27

Model 4: Probability of Persistence in Four-year Institutions as Predicted by the Admissions Index

The following three tables provide detail on the model of the probability of persisting in a four-year institution shown in Table 15.

Table 25: Model Summary of Probability of Persistence in Four-year Institutions as Predicted by the Admissions Index

-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
29977.636	.166	.257
Overall percentage Correctly Predicted		80.7%

Table 26: Complete Model of Probability of Persistence in Four-year Institutions as Predicted by the Admissions Index

Variable	B	S.E.	Sig.	Exp(B)
Academic year 2009	-.08	.04	.02	.92
Academic year 2010	-.55	.04	.00	.58
Admission Eligibility Index	.05	.00	.00	1.05
Adams State College	-1.06	.10	.00	.35
Colorado Mesa University	.49	.08	.00	1.64
Fort Lewis College	-.72	.08	.00	.49
Colorado School of Mines	.18	.14	.22	1.19
Colorado State University	-.08	.06	.16	.92
Colorado State University - Pueblo	-1.34	.08	.00	.26
Metropolitan State University of Denver	-1.45	.06	.00	.23
University of Colorado at Colorado Springs	-.93	.07	.00	.39
University of Colorado Denver	-.77	.07	.00	.46
University of Northern Colorado	-.48	.06	.00	.62
Western State College	-.736	.091	.00	.48
Male	-.25	.03	.00	.78
Black	-.19	.07	.00	.82
Hispanic	-.24	.05	.00	.79
Asian or Pacific Islander	-.05	.07	.46	.95
American Indian	-.12	.12	.29	.88
More than one race, unknown or non-resident alien	-.16	.05	.00	.85
Count of remedial courses with 0 for those who did not take	-.46	.04	.00	.63
Remedial hours passed level 099 or higher with 0 for those who did not take	.26	.02	.00	1.30
Remedial hours passed level 090 with 0 for those who did not take	.17	.02	.00	1.18
Remedial hours passed level 060 0 for those who did not take	.15	.04	.00	1.16
Remedial hours passed level 030 with 0 for those who did not take	.35	.06	.00	1.42
Constant	2.11	.06	.00	8.28

Table 27: Descriptives of the Variables Included in Probability of Persistence in Four-year Institutions as Predicted by the Admissions Index

Variable	N	Min	Max	Mean	Std. Deviation
Completed 30 or more hours	34,860	0	1	.78	.41
Academic Year 2008	34,860	0	1	.34	.48
Academic year 2009	34,860	0	1	.34	.47
Academic year 2010	34,860	0	1	.31	.46
Admissions Eligibility Index	34,860	47	146	108.99	14.89
University of Colorado at Boulder	34,860	0	1	.19	.40
Adams State College	34,860	0	1	.02	.15
Colorado Mesa University	34,860	0	1	.07	.25
Fort Lewis College	34,860	0	1	.04	.19
Colorado School of Mines	34,860	0	1	.03	.17
Colorado State University	34,860	0	1	.23	.42
Colorado State University - Pueblo	34,860	0	1	.04	.19
Metropolitan State University of Denver	34,860	0	1	.11	.31
University of Colorado at Colorado Springs	34,860	0	1	.06	.24
University of Colorado Denver	34,860	0	1	.06	.24
University of Northern Colorado	34,860	0	1	.13	.33
Western State College	34,860	0	1	.03	.16
Male	34,860	0	1	.49	.50
Black	34,860	0	1	.04	.19
Hispanic	34,860	0	1	.10	.30
Asian or Pacific Islander	34,860	0	1	.05	.22
American Indian	34,860	0	1	.01	.12
More than one race, unknown or non-resident alien	34,860	0	1	.09	.29
Count of remedial courses with 0 for those who did not take	34,860	0	11	.21	.81
Remedial hours passed level 099 or higher with 0 for those who did not take	34,860	0	16	.19	1.03
Remedial hours passed level 090 with 0 for those who did not take	34,860	0	13	.13	.81
Remedial hours passed level 060 with 0 for those who did not take	34,860	0	12	.05	.47
Remedial hours passed level 030 with 0 for those who did not take	34,860	0	6	.02	.25