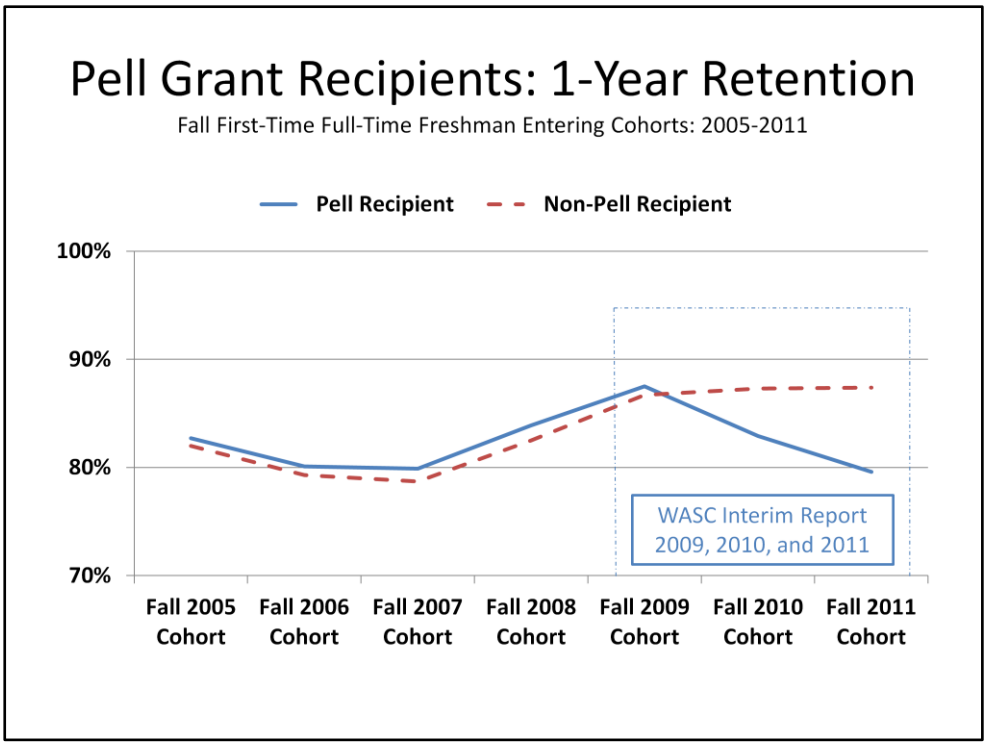
First year success and four-year graduation rates of first-time, full-time entering fall cohorts of freshmen

Institutional Research and Decision Support

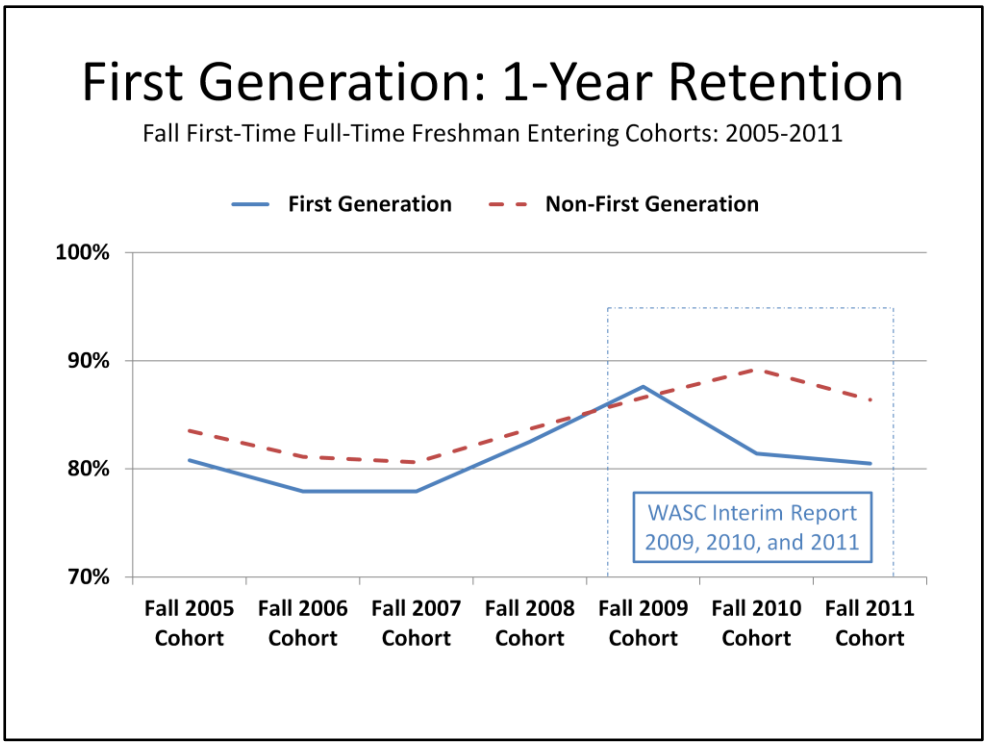
This presentation focuses on first-time, full-time, entering fall cohorts of freshmen, who historically account for approximately 84% of UC Merced's entering undergraduate students and over 99% of new fall freshmen. Because these analyses were concerned with exploring fundamental relationships and patterns, variance was controlled by excluding transfer students, part-time students, and students who first enroll in the spring. The excluded groups collectively account for about 16% of entering students.

As a general rule, we have attempted to use as many cohort classes as were available. That means that we were limited to the 2006 cohort when examining six-year graduation rates, but could use the 2006-2008 cohorts when examining four-year graduation rates and more cohorts when examining freshman year success. Because Merced has a short history and has changed in many ways over a short period of time, including tremendous enrollment growth, results do not exhibit the stability that we have seen in studies at other universities.

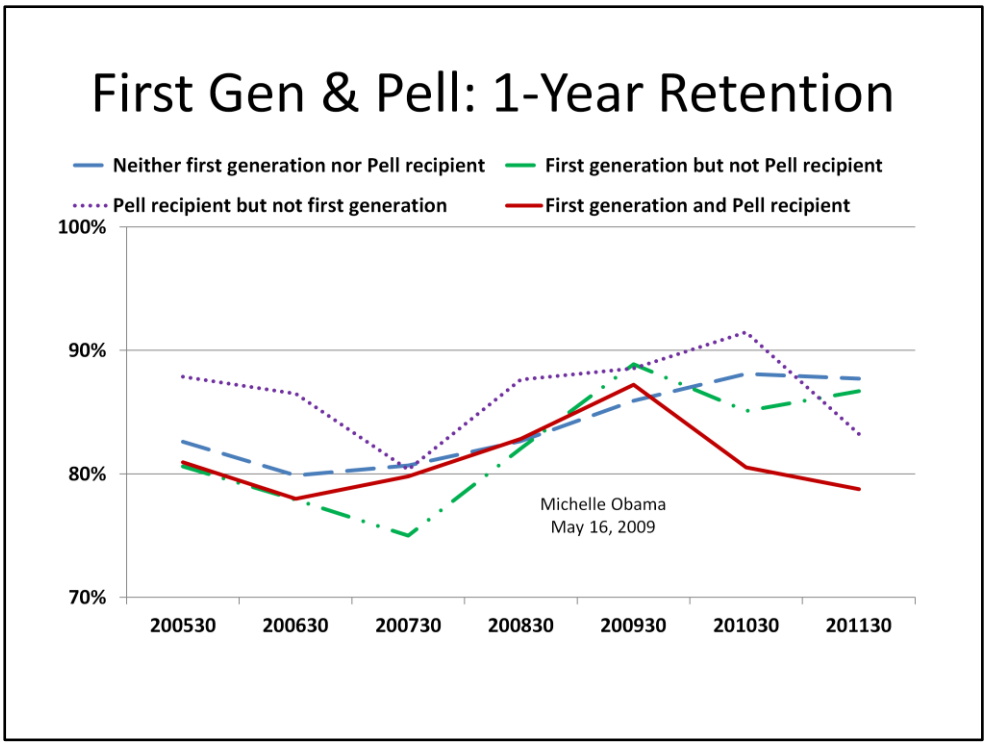
An earlier version of this PowerPoint was presented to the Undergraduate Student Success Committee on May 3, 2013. This version contains additional notes and follow up analyses to respond to members' questions and to clarify and further substantiate what was presented on May 3rd.



Last meeting we looked at a WASC retention report for Pell Recipients that only showed data for 2009, 2010, and 2011. This slide adds broader context. Whether the downturn in one-year retention rates for Pell Recipients over the past three years is a trend worthy of concern remains to be seen, but clearly the increasing difference over the past two years is inconsistent with longer term patterns. Two contrasting explanations are that the groups with and without Pell Grants changed or that the student experience changed for Pell Grant recipients. Subsequent results suggest that the student experience has not changed.

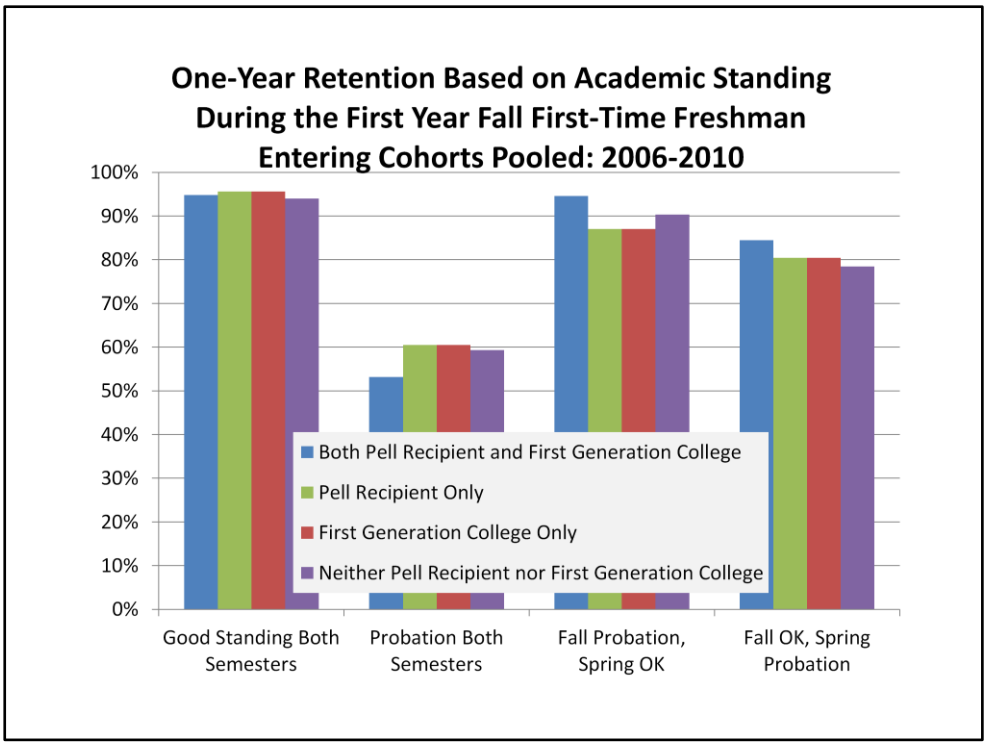


At our first meeting on March 15, the committee asked us to investigate the success of First Generation students, because the WASC tables we reviewed at the meeting do not track student success for First Generation students. The trend for First Generation students above roughly parallels the trend for Pell Recipients on the previous slide, and the trend for Non-First Generation students above roughly parallels the trend for Non-Pell Recipients on the previous slide.

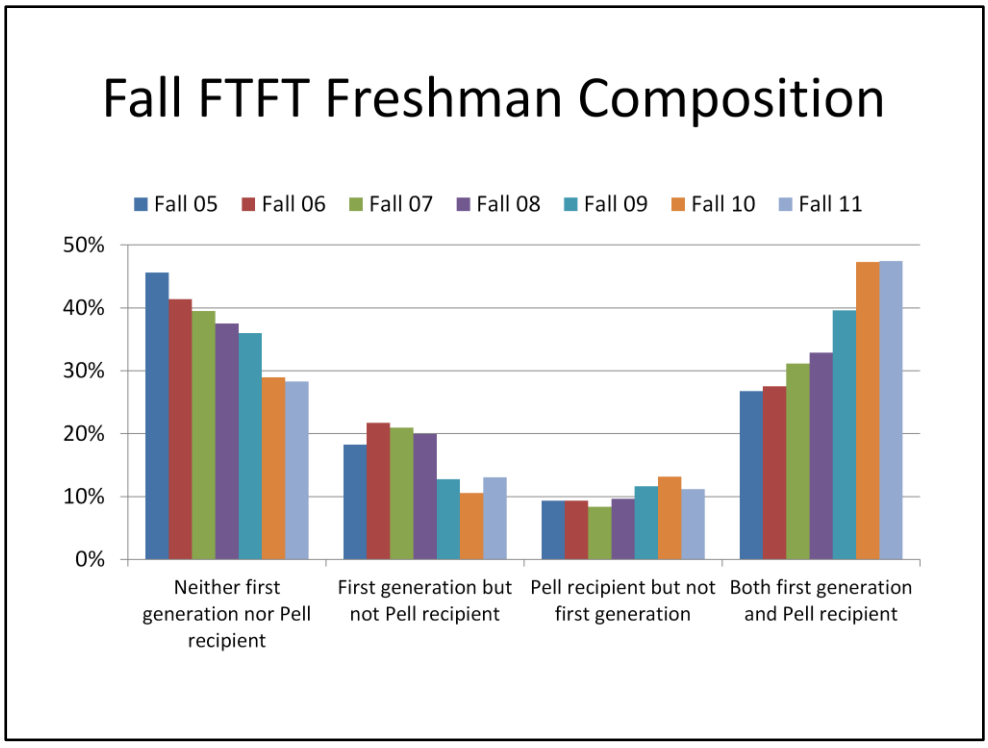


When we examine the possible permutations of Pell Recipient status and First Generation status, we see that the group with the gentlest curve (least variation) is the group comprised of students who are neither First Generation nor Pell Recipients, but that this group does not necessarily have better one-year retention rates than other groups. In fact, for the Fall 2009 entering class, it had the lowest one-year retention rate. In general it appears that students who are Pell Recipients but not First Generation do better than the other three groups.

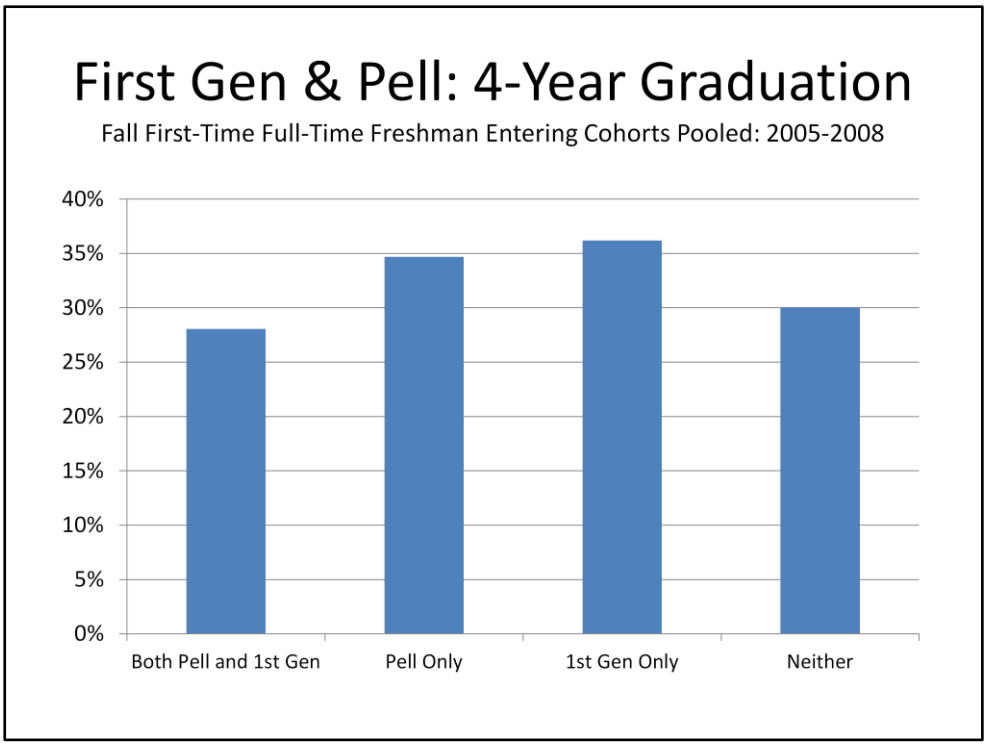
It is possible that the improved retention rates for the 2008 and 2009 entering cohorts were part of a "Michelle Obama" inspired effect. If so, then the apparent decrease in retention rates after that effect wore off should be viewed as a return to normal.



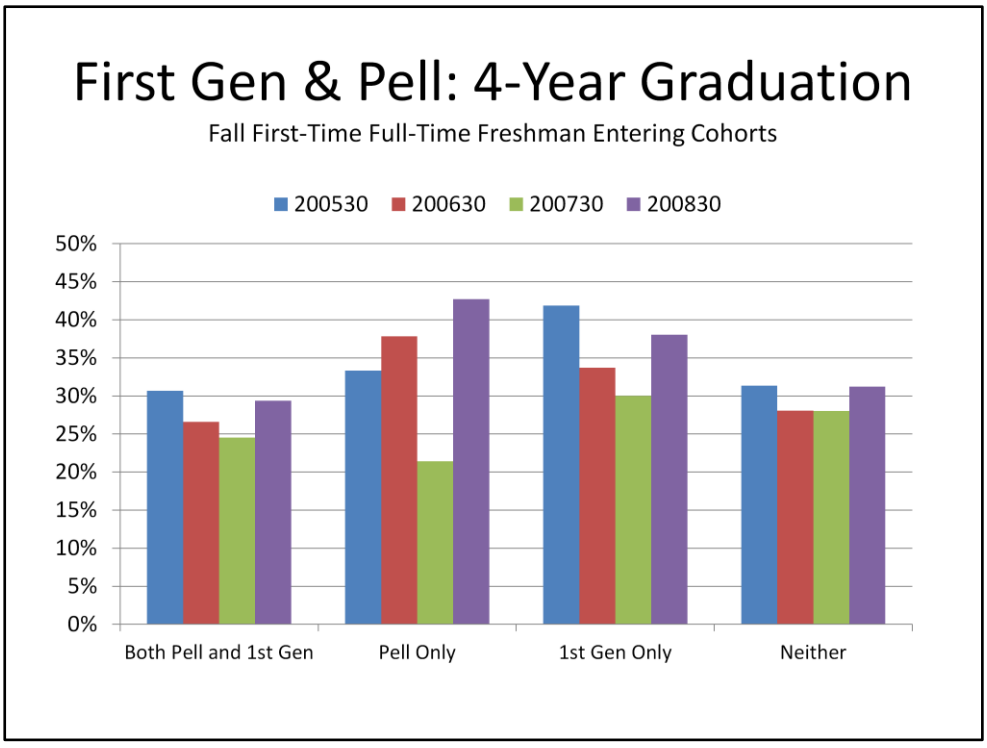
This graph extends the examination of one-year retention by adding academic performance as measured by academic standing during students' first two semesters. The four possible student clusters are arrayed across the X axis: good academic standing both semesters, probation both semesters, fall probation only and spring probation only. Among the findings are the obvious and surprising. Obviously, students on probation both semesters are much less likely to return for a second year and students in good academic standing both semesters are very likely to return (> 90%). Surprisingly, given conventional wisdom, being a first-generation student, Pell Grant recipient, both or neither was of little additional importance. That is a result that will be subsequently confirmed and could be useful in assuring prospective students that those factors are of little importance at UC Merced. An interesting result is that an improving record (probation in fall not in spring) was associated with higher retention than a declining record (good standing in the fall and probation in the spring). It might be possible to improve retention in the declining record group with a summer intervention.



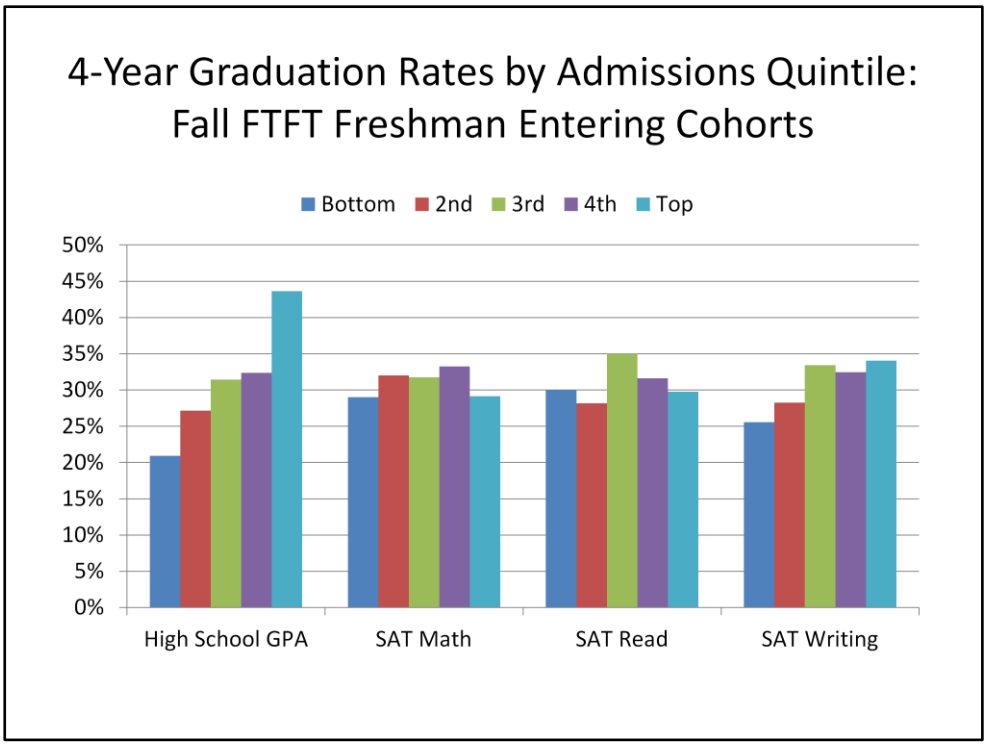
We mentioned in the first results slide, which shows increasing deviation in retention over the past two years, that changing student composition was a possible explanation for the deviation. This graph shows that student composition has dramatically changed over recent years. The percentage of entering freshmen classes who are neither First Generation nor Pell Recipients has decreased each year, and the percentage that are both First Generation and Pell Recipients has increased. There also appears to have been a decrease in the percentage of students who are First Generation but not Pell Recipients, and a slight increase in the percentage of students who are Pell Recipients by not First Generation. These patterns likely reflect the economic downturn.



Earlier slides looked at one-year retention rates. This slide extends analysis to four-year graduation rates. From the retention rate perspective, the students who were neither First Generation nor Pell Recipients did not do as well as students who were Pell Recipients but not First Generation. Focusing on four-year graduation rates, we see again that being a Pell Recipient or a First Generation student is not a risk factor for success. In fact, being neither a first generation college student nor a Pell grant recipient appears to be a "risk factor" relative to being one but not the other, and students who are neither have only slightly higher four-year graduation rates than students who are both. To reiterate, being first generation or a Pell recipient or both does not hamper the academic experience at UC Merced.

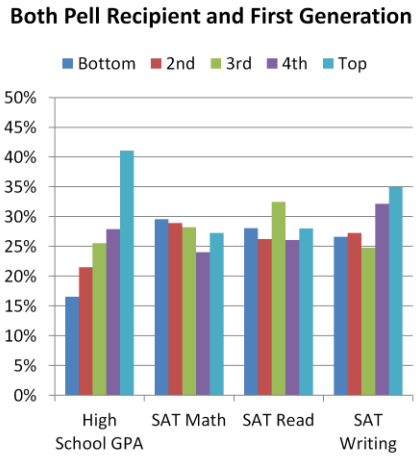


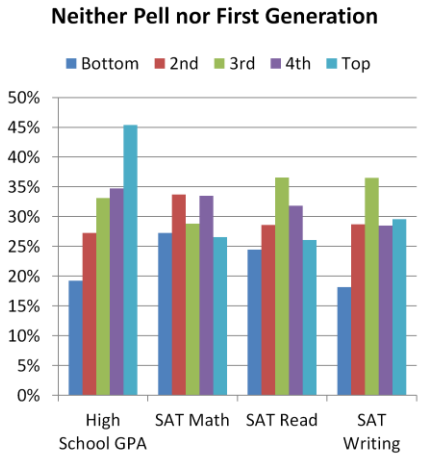
When we disaggregate these results by entering cohort, we see that the group that is neither has the most consistency of achievement (but not the highest level of achievement), followed closely by the group that is both. The Pell Only and First Generation Only groups have the most variation in four-year graduation rates. For all groups, the 2007 cohort had the lowest four-year graduation rate. Again, it is possible the 2008 “rebound” is due to the “Michelle Obama” effect. Only additional data points will tell.



Students with higher High School GPAs have higher 4-year graduation rates, but there are no differences in 4-year graduation rates between those with higher SAT scores and those with lower SAT scores. Thus, High School GPA is a likely predictor of four-year graduation rates, but SAT scores (with the possible exception of Writing) do not appear to be predictors at this level of aggregation.

4-Year Graduation Rates by Admissions Quintile





While the students who are neither Pell Recipients nor First Generation complete degrees at higher rates, the patterns and association or lack of association between Neither and Both are very similar, reinforcing the idea that only High School GPA is associated with 4-year graduation rates at this level of aggregation.

The Relationship Between Math and Writing Developmental Course Placements and Graduation in Four Years for Freshmen in 2006, 2007 and 2008

			Graduated in 4 years (Cohorts)				Placed Into Course (Cohorts)			
			2006	2007	2008	Sum	2006	2007	2008	Sum
Developmental Writing and Math Placements										
Writing 001	Placed into	%	26%	25%	30%	28%	60%	64%	60%	61%
	Not placed into	%	35%	30%	37%	35%	40%	36%	40%	39%
							100%	100%	100%	100%
Math 005	Placed into	%	22%	27%	27%	26%	33%	54%	50%	48%
	Not placed into	%	33%	27%	40%	34%	67%	46%	50%	52%
							100%	100%	100%	100%

Number of Developmental Placements		Graduated in 4 years (Cohorts)				Math and Writing Developmental Placements			
		2006	2007	2008	Sum	2006	2007	2008	Sum
0	%	36%	30%	42%	37%	31%	21%	25%	25%
1	%	31%	26%	34%	31%	46%	40%	39%	41%
2	%	18%	25%	25%	24%	23%	39%	35%	34%
						100%	100%	100%	100%

This table addresses whether developmental course placements were associated with lower four-year graduation rates. It is an especially important question because half or more of the matriculating freshmen were directed to developmental classes in writing or mathematics. Percentage placements are on the right half of the table. Four-year graduation rates are shown on the left half of the table. It was very often, but not always, the case that students placed into developmental classes were less likely to graduate in four years. In addition, there was significant variation in placement rates and graduation rates from year to year. It is probably the case that developmental course assignment is associated with lower four-year graduation rates and that two developmental course placements reduces the probability of graduating in four years more than one placement.

Budget Act of 2013 (Proposed)

- Prohibits tuition increases for four years
- Provides a 20% General Fund increase over four years
  - ~10% increase in core operating revenues
  - Contingent on meeting 7 performance outcomes
    - 1% improvement by end of first year
    - 3% improvement by end of second year
    - 6% improvement by end of third year
    - 10% improvement by end of fourth year

Here are some of the key features of the Governor's academic performance proposal for the University of California.

Performance Outcome Measures

- Increase four-year graduation rates for freshmen
- Increase two-year graduation rates for CCC transfers
- Increase number of new CCC transfers enrolled
- Increase degree completions by first time freshmen
- Increase degree completions by CCC transfers
- Increase degree completions by low income students (Pell or Cal Grant recipients)
- Increase undergrad degree completions per 100 FTE

For the University of California, the performance would be measured by these measurable goals.

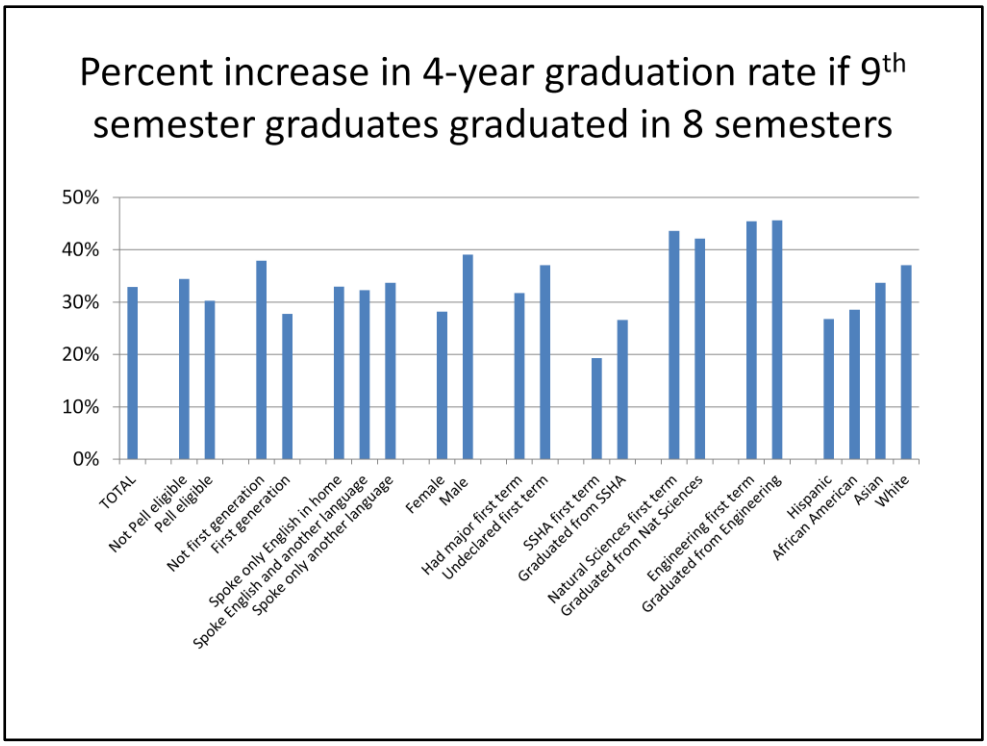
Four Year Graduation Rates

	Fall 2005	Fall 2006	Fall 2007	Fall 2008
Entering FTFT cohort	706	396	668	922
Percent graduated in 4 years	33.3%	29.8%	26.8%	33.6%
Number graduated in 4 years	235	118	179	310
Increase required to meet year 1 goal	2	1	2	3
Increase required to meet year 2 goal	7	4	5	9
Increase required to meet year 3 goal	14	7	11	19
Increase required to meet year 4 goal	24	12	18	31
Graduated one semester late (9th sem)	84	42	49	88
Not enrolled during 9th semester	23	17	11	N/A

This and the next two slides present a possible procedural solution and associated positive outcomes if ninth semester graduates, especially those not even enrolled that term, graduated in four years (eight semesters). Displayed are recent cohorts, four-year graduations, and the additional number of members of each entering freshman cohort that would have had to graduate within four years to meet the first of the Governor's performance goals. It also shows the number of students who graduated one semester late and the number who graduated one semester late but were not enrolled at UC Merced during that semester. If all students who graduated one semester late would have graduated one semester earlier, UC Merced would have far surpassed the Governor's proposed 10% increase in four year graduation rates. The red numbers indicate the goals that could have been met if all the students who graduated one semester late but were not enrolled at UC Merced during the semester they graduated could have graduated on time. Some of these students who graduated during their ninth semester even though they were not enrolled at UC Merced during their ninth semester may have been completing coursework at another institution that was required to graduate, but some may have simply failed to submit paperwork required to graduate on time. Improving graduation rates for these students is probably a first, most efficient and least disruptive strategy.

Graduated within Five Years

- 59% of entering cohorts who graduated within five years graduated within four years.
- 19% graduated one semester late
- 29% of those who graduated one semester late were not enrolled at UC Merced during the term they graduated.



This figure shows many associated effects if all students who graduated one semester late graduate on time. For example, there would be a slight increase in the four year graduation rate of students who are not Pell Eligible relative to students who are Pell Eligible, but that effect is far less pronounced that the difference between students who are Not First Generation and those who are. Overall, the effect on graduation rates of students who were raised in homes where different languages were spoken would be even, but the effect on male graduation rates would be more pronounced that the effect on female graduation rates (largely because females have higher four year graduation rates). The groups that would see the greatest increase in four-year graduation rates if students who graduated in nine semesters graduated in eight semesters would be engineering majors, natural sciences majors, males, non-first generation students, and white students.

The following slides focus on establishing relationships among variables that can be used to predict academic performance and graduation, many of which are malleable. The 2008 cohort was the data source for these analyses.

Graduation Rates for Groups Defined by Admissions and Enrollment Variables

	Yes	No
Demographic Variables		
First-Generation College	33%	34%
English Only 1st Language	32%	35%
Pell Grant Recipient	32%	34%
Not White/Asian/International	30%	36%
✔ Gender	26%	41%

A straightforward graduation rate methodology is to simply report four-year graduation rates for students by a variety of variables. The first, most simple variables by which students might be described are demographic. Comparing four-year graduation rates for these groups of students shows very little difference associated with first generation college, English as the only first language, or being a Pell recipient. The difference between historically underserved racial/ethnic groups was slightly larger at 6%, but the largest difference was associated with gender. Males were much less likely to graduate in four years. The gender variable was therefore flagged for subsequent use as a "challenge" to graduation in four-years. (Please note that six-year graduation rates did not show a gender difference.)

Graduation Rates for Groups Defined by Admissions and Enrollment

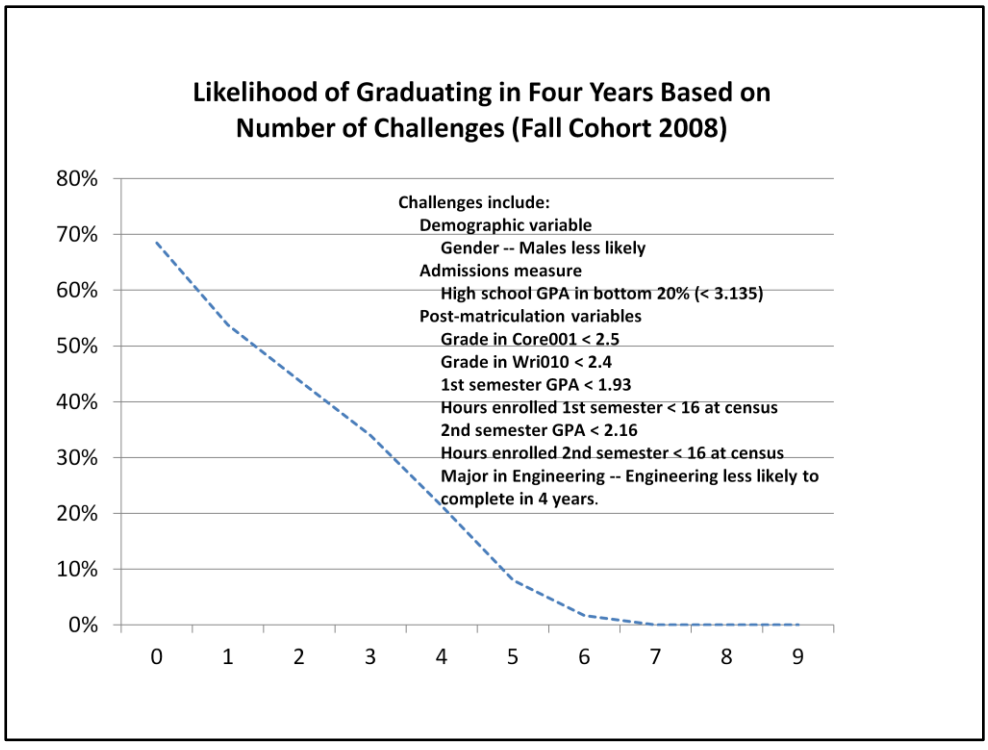
	Yes	No
Admissions Variables		
✔ High School GPA < 3.135	21%	37%
SAT Math < 445	33%	34%
SAT Writing < 425	32%	34%
SAT Reading < 415	30%	35%

Admissions measures are assumed to be associated with four-year graduation because they are associated with first year academic performance. This slide shows that only the group identified by a high school GPA less than 3.125 (the bottom 20%) was clearly associated with a lower rate of four-year graduation. High school GPA in the bottom 20% is flagged as the second “challenge” variable.

Graduation Rates for Groups Defined by Admissions and Enrollment Variables

	Yes	No
Post-Matriculation Behaviors		
✔ Grade in Core001 (< 2.5)	11%	45%
✔ Grade in Wri010 (< 2.5)	18%	41%
✔ GPA Earned 1st Semester < 1.93	13%	40%
✔ Hours Enrolled 1st Semester (< 16 at census)	25%	43%
✔ GPA Earned 2nd Semester < 2.16	12%	42%
✔ Hours Enrolled 2nd Semester (< 16 at census)	17%	45%
Major Undeclared	26%	35%
Major SSHA	46%	27%
✔ Major Engineering	19%	37%
Major Natural Sciences	35%	32%

After matriculation, we have many freshman year measures of performance and academic choices that are more clearly associated with graduating in four years. Among those that can be added to the "challenge" variables were grades earned in Core 001 and Wri 010, GPA and hours enrolled in the first and second semesters, and the decision to major in Engineering. Engineering students were less likely to graduate in four years. Of these variables, hours enrolled in the first semester would be one of the easiest to change and has been shown by the University of Minnesota, UC Davis and others to be counterintuitive. These other universities have shown that a very full academic schedule is associated with better academic performance even after controlling for academic ability. The lack of free time is one explanation offered to explain better outcomes. At this point, we have nine challenge variables and it is reasonable to assume that graduation rate would suffer with each additional challenge.



This graph shows that graduation rate declined as the number of challenges increased. The relationship was very nearly linear up to six challenges. It is also interesting to note that students who met none of the challenge conditions completed a degree in four years at a rate of 68%.

The notion of a challenge index and the independent examination of variables is helpful but not analytically adequate.

Comparing Stability of Important Logistic Model Variables for Four-Year Graduation (Cohort 2006, 2007 and 2008)

	2006	2007	2008	Three-Years
Admissions and Post-Matriculation				
• High School GPA quintiles			✔	✔
• SAT Math quintiles				
• Social Sciences, Humanities and Arts			✔	✔
• SAT Writing quintiles				
Zero if white, Asian, or international				
Engineering	✔	✔		✔
Gender	✔		✔	✔
• First generation				
• SAT Reading quintiles	✔			✔
• Natural Sciences			✔	
• Set to 1 if "English only" was first language in home				
• Pell recipients		✔		
Is coded 0 if first Core001 grade was less than 2.5	✔	✔	✔	✔
Is coded 0 if first Writ010 grade was less than 2.5	✔	✔		✔
Is coded 0 if 1st semester credit hours at census was less than 16			✔	✔
First semester cumulative GPA quintiles				
Is coded 0 if 2nd semester credit hours at census was less than 16			✔	✔
Second semester cumulative GPA quintiles	✔	✔	✔	✔

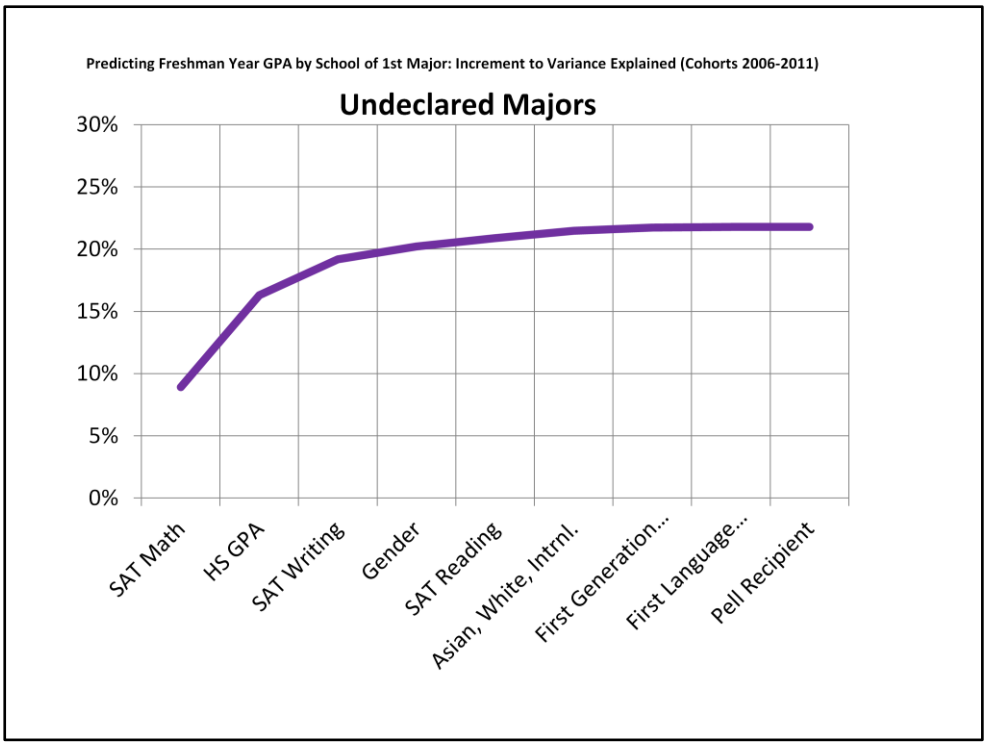
Note: The three cohorts were equally weighted.

* Could be considered in admissions processes.

This table displays the results of a more appropriate technique, logistic regression, that considers the variables collectively. Specifically, the earlier measures were included in comprehensive models attempting to predict whether students would graduate in four years or not. The analyses were done independently for three cohorts (2006, 2007 and 2008) to establish stability and for a combined group comprised of samples of equal sizes from the three years to prevent later years from differentially impacting the outcomes. Variables shown to be significant are checked.

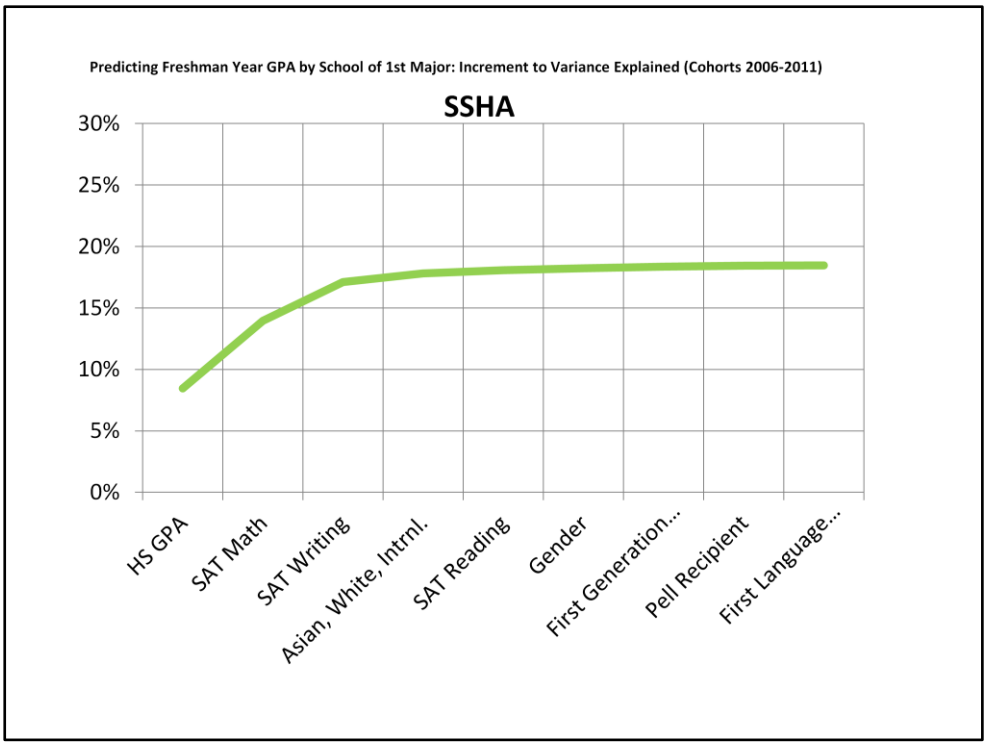
As shown in earlier analyses, high school GPA is an important indicator of completion in four years. Those in the bottom 20% are less likely to graduate in four years. Majors in SSHA are more likely to complete a bachelors in four years and majors in Engineering are less likely to do so. Surprisingly, SAT Reading appeared as an important variable. (Finding variables that are useful in the context of several other variables is an advantage of logistic regression.) Not surprisingly, academic performance in common courses and performance in the second semester were important. It was also clear that enrolling for 16 or more hours each semester was important.

In the next slides, we shift our focus from predicting graduation within four years to predicting GPA earned during the freshman year. We apply an appropriate statistical analysis, linear regression, at the level of school of major.

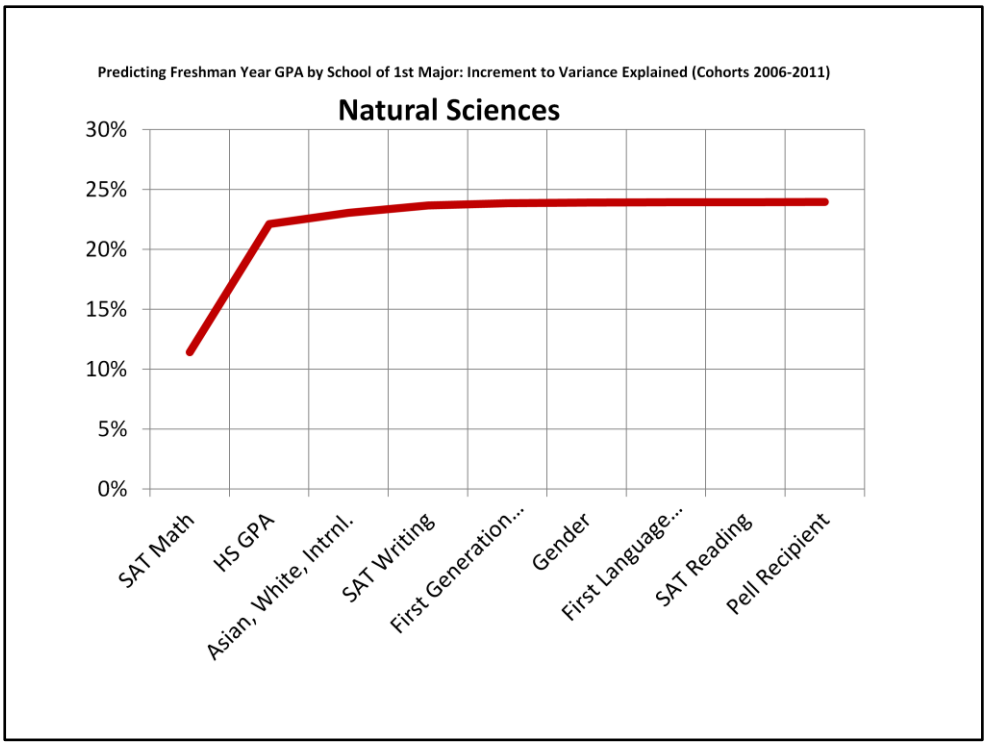


The next five graphs show the sequential contribution of each "challenge" variable to the ability to predict cumulative GPA at the end of the freshman year. That is, the vertical axis shows the percent of variance explained by the model as each predictor variable shown on the horizontal axis is added to the equation.

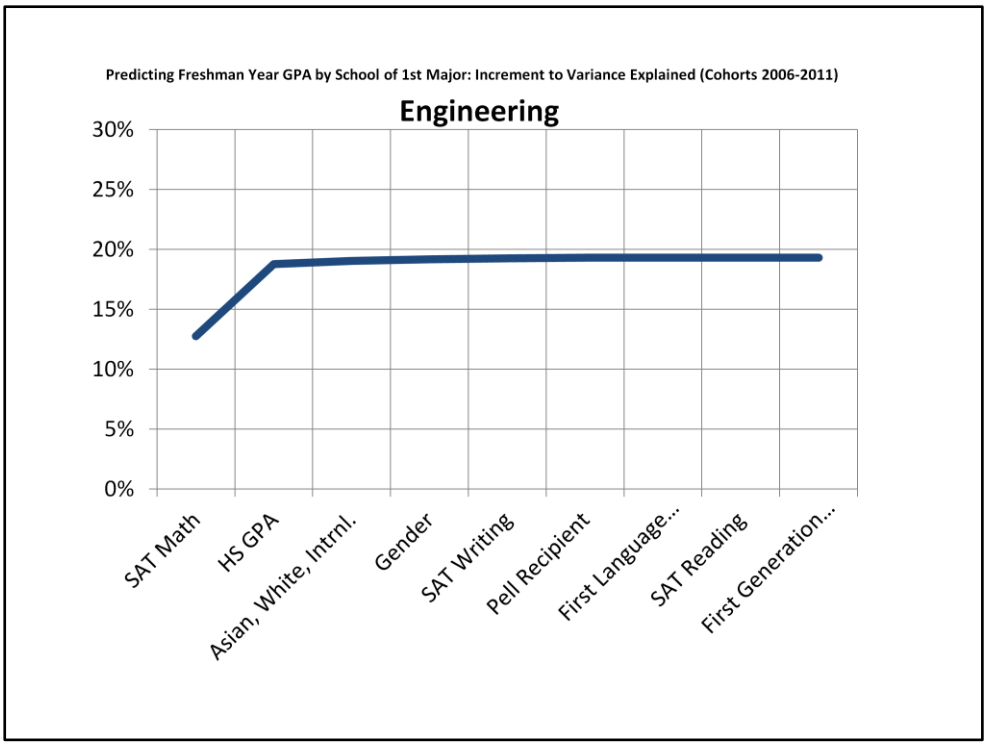
In this case, the variables that best predicted the academic performance of undeclared majors were SAT Math, followed by high school GPA and SAT Writing. The next five variables added little to predictive power. It is important to note here and subsequently, that gender, race/ethnicity, being first-generation or not, being a Pell recipient or not, and whether English was the only first language in students' homes were unimportant, not helpful predictors of academic performance at UC Merced.



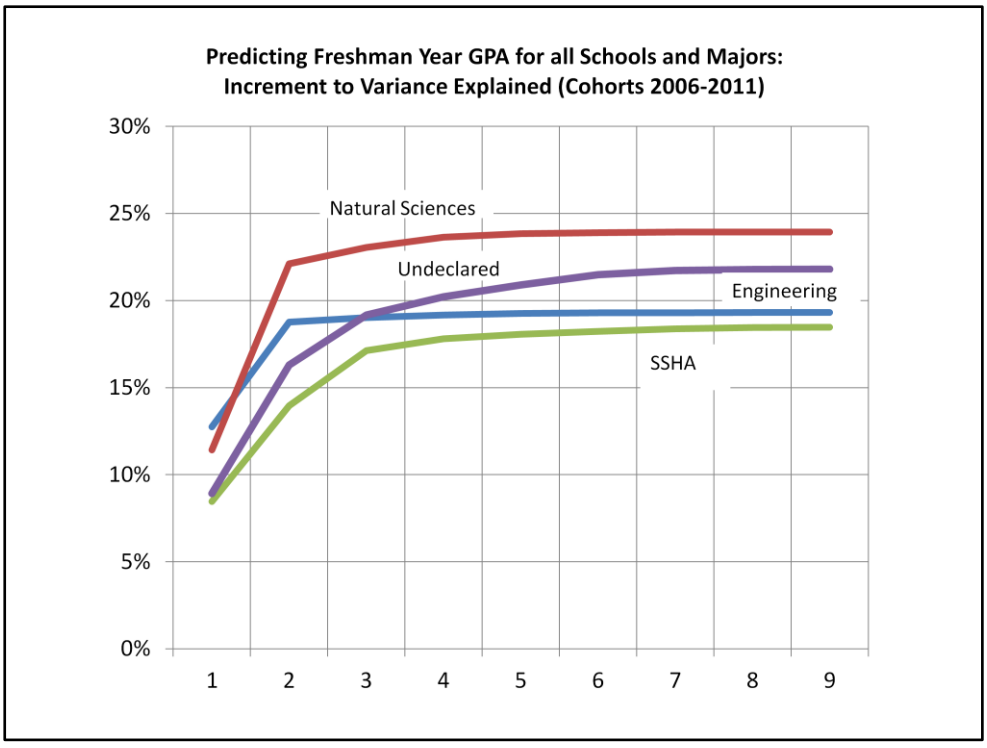
The results for SSHA were similar. SAT Math and Writing and high school GPA were helpful.



Only two variables improved the explanation of differences in the freshman year academic performance of Natural Sciences students by more than 5%: SAT Math and high school GPA.



The Engineering result was similar to Natural Sciences with SAT Math and high school GPA making important improvements in explaining academic performance during the freshman year.



To put the previous results in context, they are displayed together. Using "challenge" measures to explain freshman year performance was more successful for Natural Sciences majors than for Engineering and SSHA majors. That is, the "challenge" measures explained a larger percentage of the variation in cumulative GPA's earned during the freshman year by students majoring in Natural Science disciplines than for students majoring in disciplines in other schools.

In all cases, only two or three measures made important incremental improvements to prediction. SAT Math and high school GPA were always either first or second and, if there was a third important predictor, it was SAT Writing.

Caution should be used in accepting or applying the results presented herein. They are the best currently available, but UC Merced is young and growing and changing rapidly. It will probably be several years before the patterns begin to fluctuate within narrow ranges that are more useful for prediction and planning.