



## High school rigor and good advice: Setting up students to succeed

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We know that around two-thirds of the future jobs in the United States will require some sort of post-secondary education. Job reports show that by 2018, there will be 47 million jobs created by new industries and a retiring workforce (Carnevale, Smith and Strohl 2010). Of these jobs, 33 percent will require at least a bachelor's degree and 30 percent will require an associate's degree or some college training (Carnevale, Smith and Strohl 2010).

The demand for workers with a college education is growing faster than the supply of graduates. By 2018, we will have produced 3 million fewer college graduates than the labor market demands (Carnevale, Smith and Strohl 2010). President Obama has set a national goal to produce 8 million more graduates by 2020 in order to make the United States the world leader in college attainment.

One effective way to get us on the path to reaching this goal is to prevent the students who enter college from leaving before they earn a credential. Results vary between institutions, but overall in 2009 only 57.8 percent of students attending a four-year institution graduated in less than six years (Knapp, Kelly-Reid and Ginder 2012 ). Only 32.9 percent of students attending two-year institutions graduated in three years (Knapp, Kelly-Reid and Ginder 2012 ). If instead 90 percent of our current freshmen persisted to degree, we would produce an additional 3.8 million graduates by 2020 -- enough to meet the labor market's needs in this decade and nearly halfway to meeting the President's 2020 goal. Further, if graduation rates for 2-year institutions increased to 60 percent and 90 percent for 4-year institutions, they would produce an additional 6.6 million graduates by 2020—enough to meet the labor market's needs in this decade as well as the President's 2020 goal.<sup>1</sup>

### **Main Findings**

- **High-level mathematics:** *Students improved their likelihood of staying on track toward a credential in two- and four-year colleges by 10 to 20 percent if they had taken high school math through pre-calculus and calculus.*
- **Advanced Placement/International Baccalaureate courses:** *Taking an AP/IB course also had a dramatic effect on students' chance of persisting even when students fail the end-of-course AP test. The more of these courses a student took, the higher their persistence rates were.*
- **Academic advising:** *Talking to an academic advisor in college either "sometimes" or "often" significantly improved students' persistence rates as much as 53 percent. This relationship held true for students in two- and four-year institutions.*

*In all cases, the impact was greatest for low SES students who began high school as low achievers.*

The logical place to begin is to examine first to second year persistence rates because students are more likely to drop out their first year than any other year of college (NCHEMS 2010). In this report "persistence" refers to first-year students in a two- or four-year institution, and are still in college one year after. This is sometimes called "first-year retention" or "first-year persistence", and these phrases could be used synonymously in this report. Of all entering first time freshman in 2004, 79 percent returned for the second year of college. The rate is much lower for two-year institution students, with only 64 percent persisting.<sup>2</sup>

Keep in mind, students who transfer from one institution to another are still considered "persisting." However, many individual

colleges report much lower persistence rates because of the sizable number of students who transfer following their first year.

This report aims to provide a better understanding of which students are not persisting past their first year of college, and what kinds of factors influence this. If state policymakers, post-secondary institutions, school districts, and high schools can implement policies that increase first to second year persistence, we believe it can dramatically increase the amount of students who eventually obtain a post-secondary degree.

The main findings in this report point to the highest level of math in high school, taking an AP/IB course, and meeting with college academic advisors as factors that can greatly improve the chances that a student will persist to their second year of college. This report separates four-year from two-year institutions so that we can see the differences in their student populations and persistence. After describing the findings, this report will provide some suggested actions that school districts and policymakers can take to help improve student post-secondary persistence.

## Defining the Student Groups Used in This Study

To better isolate the effects of the high school experience we controlled for the socioeconomic status (SES) and prior academic achievement of the students. This allowed us to compare students with similar SES levels and academic achievement. Although we could not control completely for other potential factors like student motivation, this approach still provides a closer apples to apples comparison of the effects of certain variables. There is a common argument that schools can only do so much to help students succeed because poverty and other factors associated with low SES, as well as the level of academic performance that the student shows are such determinant factors for success. While it is true that these can be related to persistence in college, this report finds that even after taking a student's SES and prior achievement into account, strategies emerge that high schools can implement to improve persistence.

In order to analyze the impact of these high school variables, we grouped the students in this study into several categories. We looked at students with high SES and high prior academic achievement, those with low SES<sup>3</sup> and low prior academic achievement, and those with middle SES and middle prior academic achievement. For the SES measure we use a definition used by the

### ***Reasoning for Student Group Rankings***

*We chose to compare students between the 21<sup>st</sup> and 80<sup>th</sup> percentiles in both SES and 10<sup>th</sup> grade standardized scores. There are two reasons for this:*

- *First, the number of four-year institution students in the bottom quartile of SES and achievement is very small. Conversely, there are not many two-year institution students in the top quintile of SES and achievement. If we used just the highest and lowest ranked students it would not give as accurate a portrayal of the characteristics of the majority of college students.*
- *Second, the student groups in this analysis do not represent the extremes of SES or academic achievement. Any differences between the low and high SES/achievement group is conservative. Surprisingly, this report did not have to compare the extreme top and bottom quintiles of SES/achievement in order to show the dramatic differences in persistence between both groups.*

federal government and a specific variable in the ELS survey.<sup>4</sup> We use 10<sup>th</sup> grade standardized test scores as a proxy for a student's previous academic achievement.<sup>5</sup>

In no way should this suggest that all students with a low SES have low academic achievement or those students with high SES will have high academic achievement. There are many students that have a low SES and a very high 10<sup>th</sup> grade standardized scores, but they are outside of the scope of this report. These groupings are meant to demonstrate the effects that the variables of this report have on groups that traditionally have a better chance of persisting and students who have a worse chance of persisting.

It is also important to note that the students in this study were in college before the global recession hit in 2008. While financial concerns do have a role in persistence, these findings are not affected by the recession. For this report the following groups refer to:

- **High SES/Achievement Group:** Students with a high level of SES and high prior academic achievement. These students have a higher chance of persistence than the other student groups
- **Middle SES/Achievement Group:** Students with an average level of SES and average prior academic achievement. This group represents students with neither a high or low chance of persisting
- **Low SES/Achievement Group:** Students with a low level of SES and below low prior academic achievement. These students have a lower chance of persistence than the other groups

*High SES/Achievement Group:* These students have above average levels of SES, the 61<sup>st</sup> to 80<sup>th</sup> percentile (4<sup>th</sup> quintile) of all students. SES can represent an economic or social position in comparison to other students. Students with a high SES could have any combination of family income, parents' education, or any of the five factors that make up the SES variable in ELS 2002 data that would rank it higher than the other students.<sup>6</sup> This ranking is highly correlated with academic success including persistence in college. High SES/achievement students also had above average scores on 10<sup>th</sup> grade standardized tests (61<sup>st</sup> to 80<sup>th</sup> percentile or 4<sup>th</sup> quintile). This group attempts to show the effects that the variables in this report have on persistence for students who already have a better-than-most chance of persistence.

*Middle SES/Achievement Group:* Students in this group are in the middle levels of SES. They also scored in the middle range on their 10<sup>th</sup> grade standardized tests. They are in the 41<sup>st</sup> to 60<sup>th</sup> percentile of both characteristics (3<sup>rd</sup> quintile). They represent a category of students that has no clear advantage or disadvantage over the other two groups when it comes to persistence in college.

*Low SES/Achievement Group:* These students have below average levels of SES and scored lower on 10<sup>th</sup> grade standardized tests, in the 21<sup>st</sup> to 40<sup>th</sup> percentile of both (2<sup>nd</sup> quintile). This student group represents students who persist at lower levels than the other two groups. The low SES could present financial concerns in college which could negatively impact their chances persisting. It is also important to note that students from low SES families are more likely to be first generation college students and may be less familiar with college expectations and requirements, factors which could prevent them from persisting. Similarly achieving students from higher SES families are more likely to have a family history of going to college and would be more likely to persist.

## Technical notes on methodology

### The ELS 2002 data

This report examines postsecondary education persistence using the Educational Longitudinal Study (ELS) from 2002. The study collected data from a nationally representative sample of 2002 high school sophomores, and collected follow-up data from them in 2004 as seniors, and again in 2006. From the original sample of over 16,000 students this report looked at the 9,060 students who:

1. Graduated high school
2. Enrolled in a two or four-year institution immediately following their senior year
3. Were still enrolled in January of 2006

### Issues in Measuring Persistence

These 9,060 students represent over two million students in the United States. For the definition of persistence in this report, a student who started school in a four-year college the summer or fall immediately out of high school (2004) was counted as persisting if in January of 2006 they were either still enrolled in that college, transferred to another four-year college, or transferred to a two-year institution. Conversely, if a student started at a two-year institution and transferred to a four-year college then this was also counted as persisting. This definition of persistence reflects the national goal of increasing the number of students with some sort of post-secondary degree. One assumption of this report is that a student who transfers from a four-year to a two-year institution should count as persisting towards obtaining a degree, and vice versa.

There are many critiques of using the particular definition of persistence in this report. First of all, not all students start college in the summer or fall term directly after high school. There is a modest bias in drawing samples from students who enroll immediately after high school. Earlier longitudinal studies show that of college-going 12<sup>th</sup> graders who start college within a year after high school, 6 percent in the summer, 82 percent start in the fall, and 12 percent in the winter/spring (Adelman 2006). The definition of persistence used in this report might therefore overestimate the true persistence of students from their first to second year because Latino students, African American students, and students with a low socio-economic status are less likely to start in the fall. These student populations have higher rates of non-persistence. However, this slight bias is unlikely to drastically effect persistence calculations in this report, and the sample has an appropriate number of students from every SES level and from the traditionally underrepresented races. This report looks at students that start immediately after high school because we can more easily find correlations between high school variables and their effects on persistence. While imperfect, this definition is adequate to look at which types of student persist more, and which characteristics contribute to their persistence.

### College-Readiness

Policy researchers have attempted to point out the difference between a student that is college-eligible and a student that is college-ready (Conley 2007). Policy advocates believe that U.S. high schools are creating college-eligible students who can meet state graduation requirements and public college admissions requirements, but they are not in fact college-ready (Conley 2007). Being college-ready means a student should enroll and succeed in first-year college course without needing remediation. Remediation can stall entry into college “gateway” courses which can lead to falling behind in credits or non-persistence. In the first year of college a student’s preparation is tested and most reflects the preparation the student had in high school.

## The findings

### High-level math courses

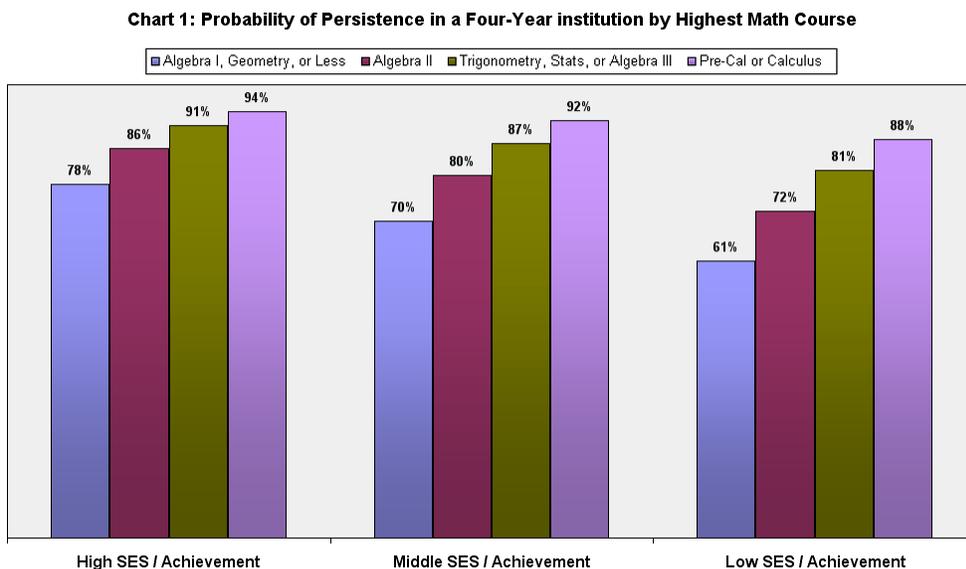
Previous studies suggest that the highest level of math in high school can be one of the strongest predictors of college success (Adelman 2006). College Algebra is one of the most failed and dropped courses in college with Calculus following closely behind (Adelman 2006). These math courses can often be a “gateway” course into majors that have to be taken in the first year of college. In this report we see the same effects of math in persistence. We looked at two indicators of math ability: the highest level of math that the student took in high school and the math standardized test scores of all college-bound students based on the math sections of college-entrance exams ACT and SAT and the ELS 12<sup>th</sup> grade math assessment.

For the highest level of math, high school math courses were grouped into the following categories<sup>7</sup>:

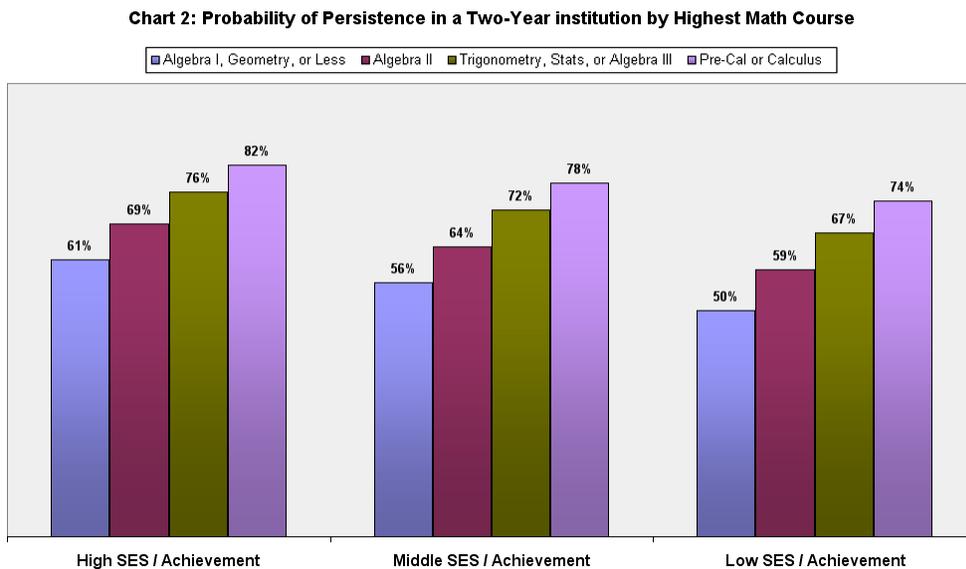
- Algebra I, Geometry, or Less
- Algebra II
- Trigonometry, Statistics/Probabilities, or Algebra III
- Pre-Calculus or Calculus

The higher the math course a student takes in high school, the greater the probability that a student will persist, no matter the level of SES or prior academic achievement. Chart 1 and Chart 2 show the increase in probability for persisting for each Student Group. Only 5.5 percent of students in four-year institutions had not taken Algebra II. Surprisingly, 33 percent of students in two-year institutions had taken less than Algebra II. This is striking, because simply taking Algebra II in addition to Algebra I and Geometry raises the probability of persisting for two-year institution students by 10 to 20 percent, and around the same for four-year institution students.

*Four-year institution:* A student in the high SES/achievement group has a 10 percent better chance in a four-year institution of persisting if that student took Pre-Calculus or Calculus rather than Algebra II. For the low SES/achievement group they are 22 percent more likely to persist.



*Two-year institution:* If they took Pre-Calculus or Calculus beyond Algebra II, a student in the high SES/achievement group is about 18 percent more likely to persist compared to the low SES/achievement group which is 27 percent more likely to persist. In two-year institutions, 33 percent of students enter with Algebra I, Geometry, or less as their highest level of high school math. Only around half of these students persist to their second year, and these students represent almost half of all non-persisting students in two-year institutions. What is also striking is a student in the low SES/achievement group who takes one math course higher than Algebra II, has a better chance of persisting than a high or middle SES/achievement student with only Algebra I. Low SES/achievement students can increase their chances of persisting by 44 percent by taking Pre-Calculus or Calculus instead of only Algebra I or Geometry.



### Math test scores

*Four-year institutions:* Math skills appear to be a very important predictor of persistence in four-year institutions. Looking at math scores from college entrance exams such as SAT/ACT<sup>8</sup> shows persistence rates are higher as you get higher scores. There are not an adequate amount of students with high ACT/SAT math scores for college-goers in two-year institutions for analysis (about 5 percent), so we only looked at four-year institutions. If we just look at the ACT Math scores (or equivalent SAT Math scores) of all college-going students, there is a dramatic effect from achieving a high score<sup>9</sup>. When comparing students with similar SES and prior achievement at four-year institutions, the increased chances from scoring high instead of low on the College-going ACT/SAT Math scores are as follows:

- *High SES/Achievement Group:* Scoring a 28 rather than an 18 on the ACT (or equivalent SAT Math score) increases your chances of persisting by 9 percent.
- *Middle SES/Achievement Group:* Scoring a 28 rather than an 18 on the ACT (or equivalent SAT Math score) increases your chances of persisting by 12 percent.
- *Low SES/Achievement Group:* Scoring a 28 rather than an 18 on the ACT (or equivalent SAT Math score) increases your chances of persisting by 15 percent.

The same phenomenon is seen in 12<sup>th</sup> grade standardized math scores. In four-year institutions, 27 percent of students in the bottom quintile of the standardized math scores of college-goers do not persist. The same is true for two-year institutions where 47 percent of students in the bottom quintile of the standardized math scores of college-goers do not persist.

Simply being prepared for math in college is important. As the college-going standardized math test scores indicate, students who have more knowledge in math persist more often than those who do not. However, there is another aspect beyond just subject knowledge that contributes to persistence – a rigorous curriculum. Not only does a student learn higher levels of math when they take Pre-Calculus or Calculus, but these courses are typically harder and more rigorous than other high school courses. This report compares students with similar math and reading standardized scores from 10<sup>th</sup> grade, so students taking a higher level of math are not necessarily more intelligent than others. This section and the next section on AP/IB courses suggest that students taking more challenging courses have better chances of success in their first year of college. Even more interesting is that students from the low SES/achievement group show bigger gains than the other groups from more challenging math courses. These students even narrow the gaps between them and the high SES/achievement group through this rigorous math curriculum.

### **AP/IB Course-taking**

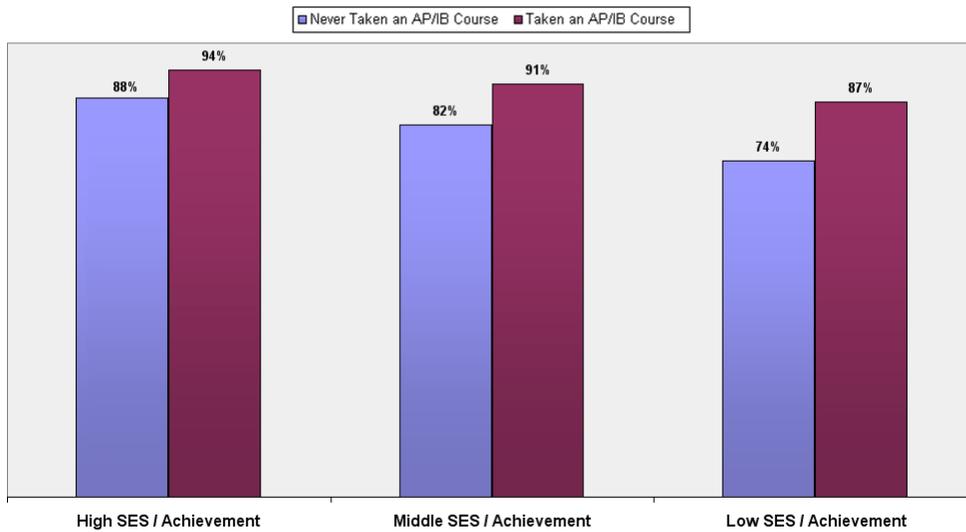
Many policy studies have shown that high schools are not producing enough graduates who are ready for college. In a report by the Center for Public Education, [Is High School Tough Enough?](#), the Center identifies several commonly used strategies used by school districts to improve high school curriculum including: Advanced Placement and International Baccalaureate (AP/IB), Dual Enrollment, and College Credit courses. The Center's report shows that students who took AP courses were at least twice as likely to graduate college within five years (CPE 2012). Our study shows that some of these traditional indicators of high school rigor also have an effect on persistence in college.

It is difficult to separate the effects of AP/IB coursework from the abilities of students motivated enough to take them. However, as an attempt to control for ability, this report compares students with similar 10<sup>th</sup> grade standardized test scores and SES. These 10<sup>th</sup> grade tests will occur before the majority of students take an AP/IB course. There could be alternative reasons why a student would take AP/IB, but in this study it should not be SES or prior academic achievement. This variable simply tests the effect of ever having taken an AP/IB course.

The AP/IB variable includes high school students who took the AP/IB tests and those who did not, as well as students who passed the AP/IB tests (scored three or higher) and those that did not. This variable includes all subjects of AP/IB courses.

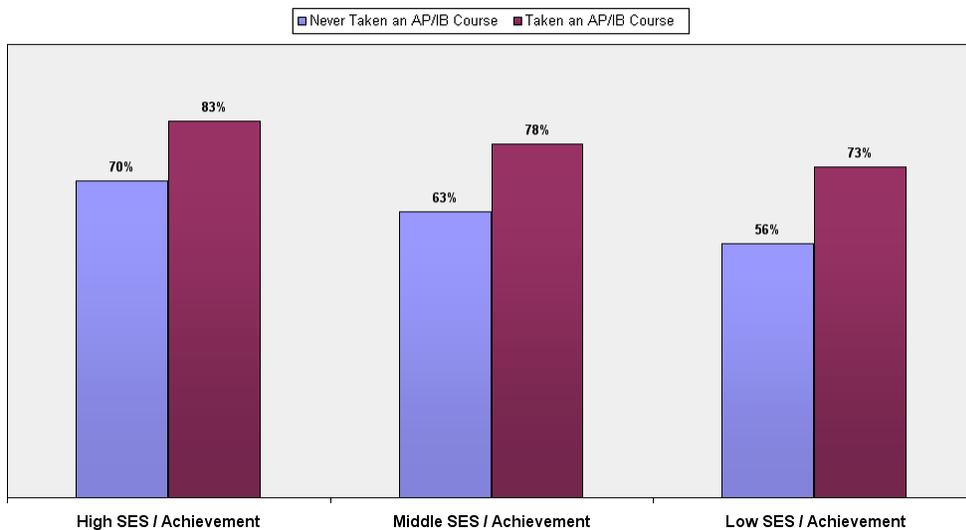
*Four-year institutions:* For four-year institution students, those who took an AP/IB course were dramatically more likely to persist than those who did not. For the high SES/achievement group, taking an AP/IB course increased the chance of persistence by 7 percent. For a student in middle SES/achievement group, taking an AP/IB course improved their chances by 11 percent. For the low SES/achievement group it is a 17 percent increase. Students in the low SES/achievement group see a greater increase in persistence from taking an AP/IB course than students in the high SES/achievement group. Taking AP/IB is even more important for students starting off at two-year institutions.

**Chart 3: Four-Year IHE Student Persistence by Having Taken and AP/IB Course**



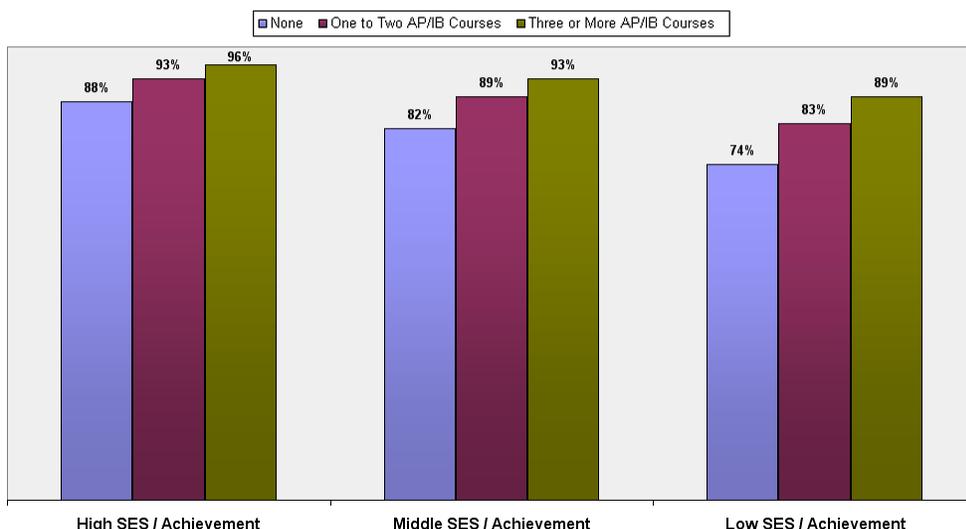
*Two-year institution:* For a two-year institution student in the high SES/achievement group, there is a 17 percent better chance of persisting if the student took an AP/IB course. Middle SES/achievement students have a 24 percent better chance of persisting, and low SES/achievement students have a 30 percent better chance.

**Chart 4: Two-Year IHE Persistence by Having Taken an AP/IB Course**



It's noteworthy that for both two and four-year institutions, low SES/achievement students who take an AP/IB class have as good or better chance of persisting than high SES/achievement students who do not take an AP/IB course. Taking more AP/IB courses is also associated with a higher probability of persisting. This is difficult to measure for two-year institutions because there are so few students that attend who have taken more than two AP/IB courses. However, for four-year institution students, the chance of persistence increases with the number of AP/IB course taken (Chart 5).

**Chart 5: Four-Year Institution Student Persistence by How Many AP/IB Courses Taken**



These combined findings indicate that a rigorous high school curriculum is strongly related to the chances a student will persist in post-secondary institutions. Just having taken an AP/IB course is associated with a higher persistence, and taking even more AP/IB courses continues to improve it. This happens no matter the SES of the student or their previous academic achievement. One concern that is brought up when discussing AP courses is whether or not it is just as beneficial for students who do not pass the AP exam at the end of the course. AP teacher quality and instruction can vary across schools, and some critics claim that students who pass the AP exam are the ones who are showing increased college success (CPE 2012). However, this report specifically looked at students who passed one or more AP exams (scored 3 or higher). We see about the same increase in the probability a student will persist if they passed AP exams or not as we do looking at whether a student takes an AP/IB course or not.

It is important to note that the test-taker variable only includes those students who took an AP exam and does not include those in IB curriculum although IB students are included in the course-taking variable. Not having IB test-takers in this variable is slightly problematic, but it still lends itself to comparison on the difference between students who pass the AP exams (scoring a 3 or higher on a 5 point scale) and those who simply taking one of these rigorous courses but fail to score at least a 3.

Only 2.7 percent of two-year institution students have passed at least one AP exam, so we will again just look at four-year institution students. The high SES/achievement group saw a 6.3 percent increase in their chances of persisting if they passed at least one AP exam. The middle SES/achievement group showed a 10 percent increase, and the low SES/achievement group showed a 16 percent increase. Both the percent increase and the chance of persisting is almost identical whether a student passes an AP exam, or just takes at least one AP/IB course. This suggests that it is the rigor of the AP/IB curriculum that improves student persistence in college rather than simply mastering the content.

### **Academic advising**

One simple thing that high schools and parents can do to help persistence is to make sure the student knows the importance of meeting with an academic advisor in their first year of college. Both four-year and two-year students who reported talking to an academic advisor either “sometimes” or “often” had

significantly higher persistence rates than those who did not. There was a surprising amount of students who entered college in 2004 who never spoke to an academic advisor in college; 11 percent of four-year and 25 percent of two-year institution students report never having met with an academic advisor.

Looking at just the middle SES/achievement group of four-year institution students, those who “never” met with an advisor had a 71 percent chance of persisting. If they reported seeing an advisor “sometimes” their chance increases to 85 percent (20 percent increase). If they report seeing a counselor “often” they have a 93 percent chance of persisting. This phenomenon is true across all SES levels and prior achievement as well as for two-year IHE students.

As we have seen in other parts of this report, the low SES/achievement group makes the most gains in persistence when they report going to see an academic advisor in college. In fact, four-year institution students were 53 percent (Chart 6) more likely to persist if they met with their academic advisor “often” than students who “never” met with their advisor. For two-year IHE students that can increase their chances by 43 percent (Chart 7).

The findings seem to suggest that meeting with someone in college that helps the student navigate through the college experience is important. But schools do not have to wait until a student reaches their college academic advisor to start this process. High school counselors can provide support filling out the FAFSA, helping with financial literacy, and preparing students for what life will be like in college. At the very least, these findings suggest that students need to understand what resources are available to them in college that can help them succeed.

**Chart 6: Four-Year Student Persistence by Meeting with an Academic Advisor in College**

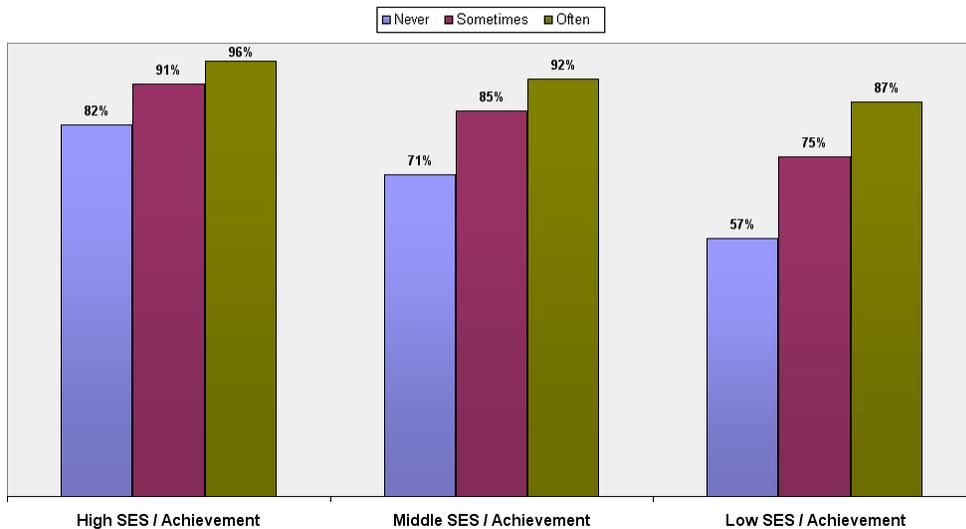
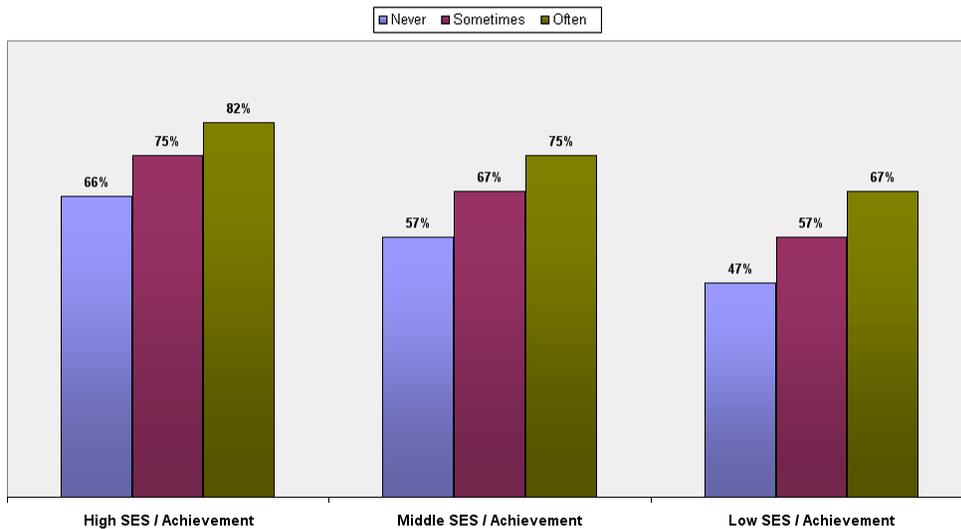


Chart 7: Two-Year Institution Student Persistence by Meeting with an Academic Advisor in College



### Other important factors

The three predictors we highlight as important for student persistence in their first-year of college were a student's highest level of high school math, taking an AP/IB course, and meeting with a college academic advisor. There are several other variables we look at in this report that we also found to be related to persistence. They are described here.

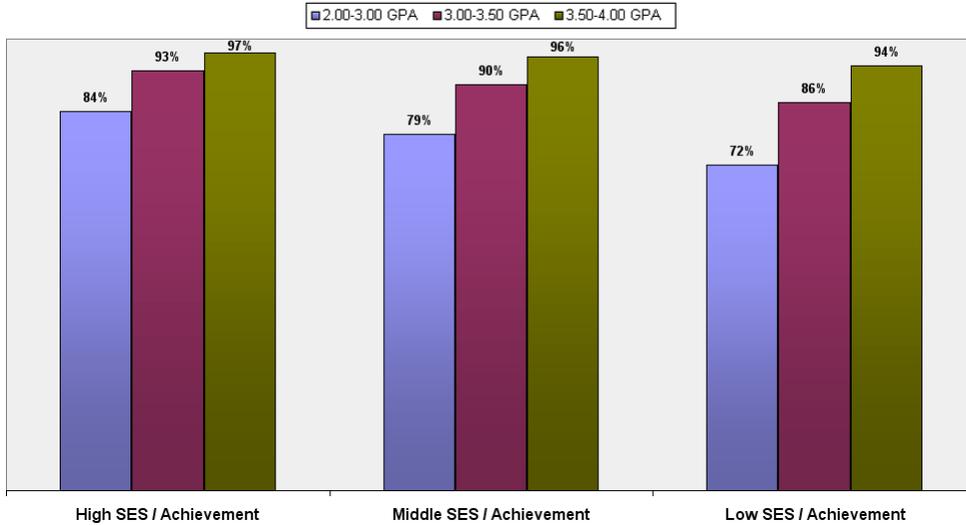
### High School Grade Point Average

Students with higher Grade Point Averages (GPA) in high school were more likely to persist in college. In both two and four-year institutions, having a higher GPA improved chances of persisting significantly, particularly for students from the low SES/achievement group.

*Four-year Institutions:* Only 2.9 percent of students had a GPA lower than a 2.00 (Equivalent to a C). The majority of students, 68 percent, had a GPA between a 3.00 (Equivalent to a B) and a 4.00 (Equivalent to an A).

- Moving from the 2.00 to 3.00 range into the 3.00 to 3.50 range had large benefits
  - *High SES/Achievement Group:* Students had a 10 percent better chance of persisting
  - *Middle SES/Achievement Group:* Students had a 14 percent better chance of persisting
  - *Low SES/Achievement Group:* Students had a 20 percent better chance of persisting
- A student in the high SES/achievement group with a 3.00 to a 3.50 GPA had a 93 percent chance of persistence
- A student in the low SES/achievement group with a 3.50 to a 4.00 GPA had a 94 percent chance of persistence

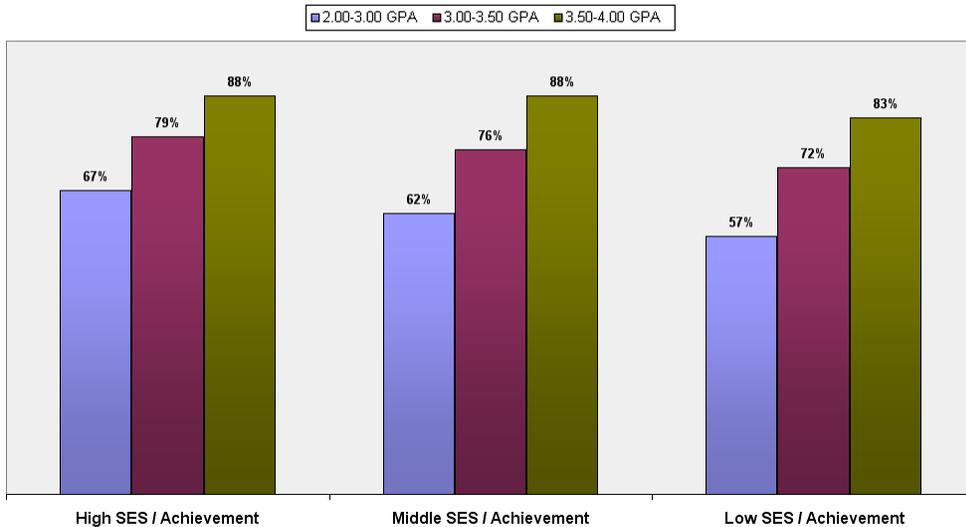
**Chart 8: Four-Year Institution Student Persistence by High School GPA**



*Two-year institutions:* Only 16 percent of students had a GPA lower than a 2.00. The majority of students, 53 percent, had a GPA between a 2.00 and 3.00

- Moving from the 2.00 to 3.00 range into the 3.00 to 3.50 range has large benefits
  - *High SES/Achievement Group:* Students had a 18 percent better chance of persisting
  - *Middle SES/Achievement Group:* Students had a 23 percent better chance of persisting
  - *Low SES/Achievement Group:* Students had a 26 percent better chance of persisting
- A student in the high SES/achievement group with a 3.00 to a 3.50 GPA had a 79 percent chance of persistence
- A student in the low SES/achievement group with a 3.50 to a 4.00 GPA had a 83 percent chance of persistence

**Chart 9: Two-Year Institution Student Persistence by High School GPA**



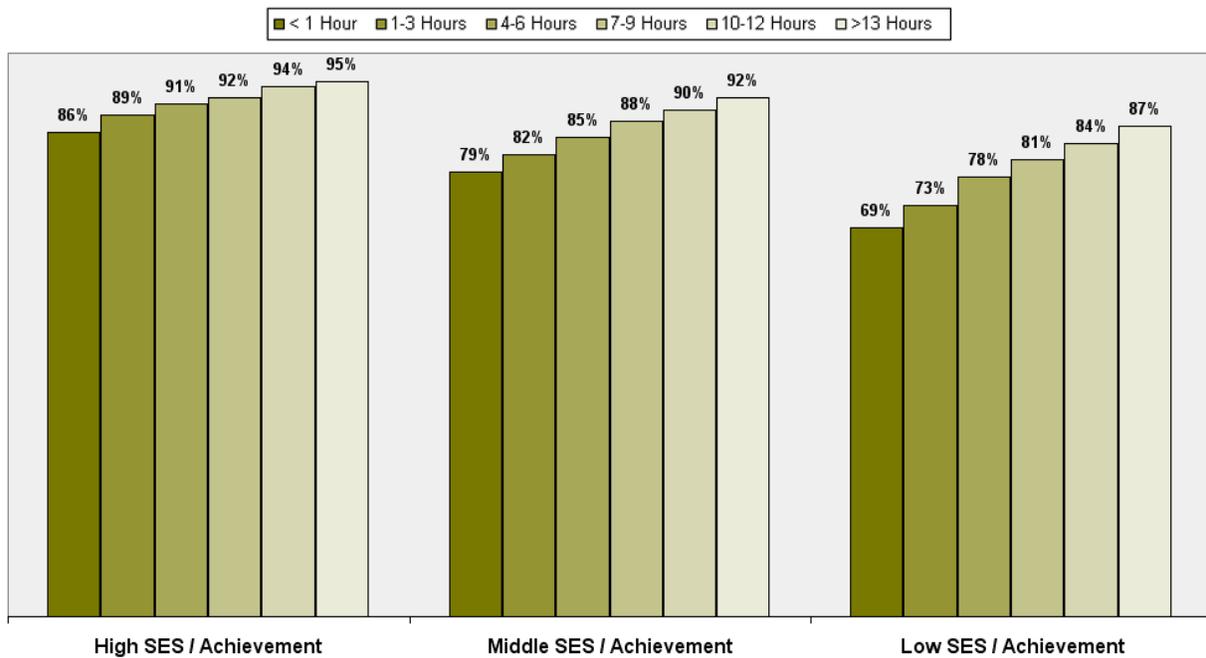
Students with low SES/achievement can show bigger gains in persistence than students with high SES/achievement when their GPA rises. Moving from the 3.00 to 3.50 GPA range into the 3.50 to 4.00 range closes the gap in persistence between the low and high SES/achievement groups in both two and four-year institutions

### Homework in high school

Another predictive characteristic of persistence is the amount of homework that a student did per week in high school. This was shown to be significant in college persistence, even when controlling for SES and prior academic achievement. All students in the survey self-identified how many hours of homework they do in or out of school in a week. For every SES/achievement group we see an increase in the probability they will persist for every increase in reported hours/week of homework.

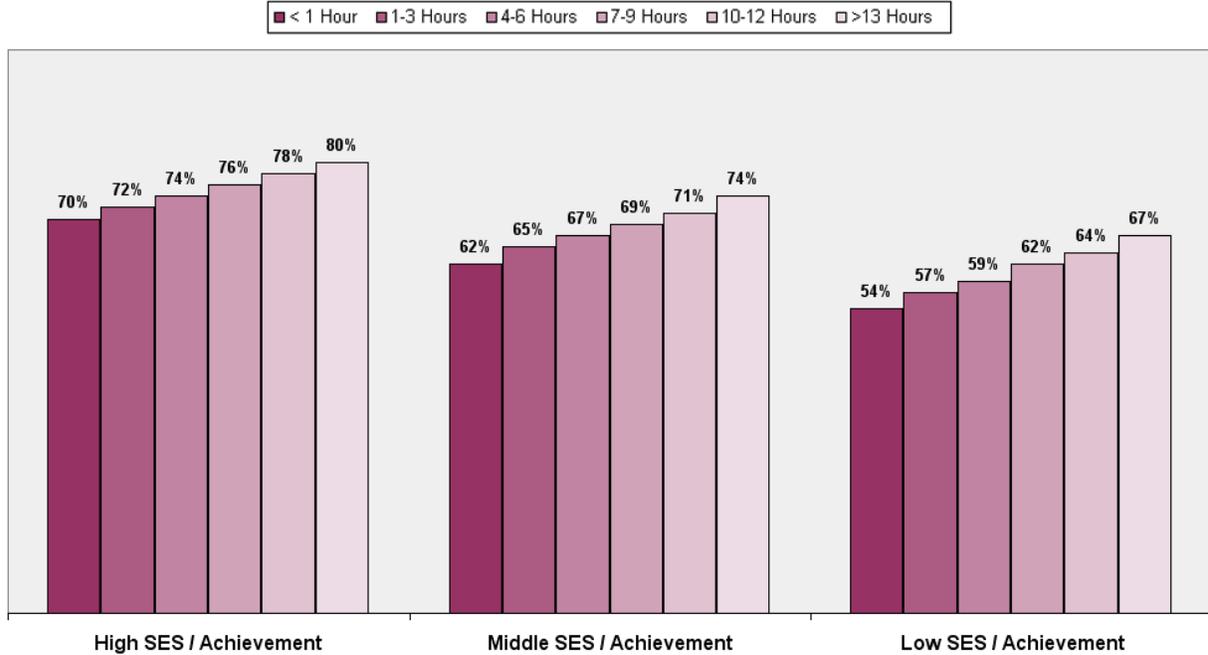
*Four-year institution:* A high SES/achievement student has a 4.2 percent better chance of persisting if they have seven to nine hours/week instead of one to three hours/week. A low SES/achievement student has an 11 percent better chance. The higher impact on the low SES/achievement group is consistent with the phenomena that have been shown from AP/IB and higher math courses.

**Chart 10: Four-Year Institution Persistence by Hours/Week of Homework**



*Two-year institutions:* We see these same gains in two-year institution students, including the greater impact on the low SES/achievement group. A low SES/achievement student in a two-year institution who reported having one to three hours of homework per week has a 57 percent chance of persisting. If that same student had seven to nine hours/week, they would have a 62 percent chance, a 9 percent increase. In comparison, the high SES/achievement group showed a 5.6 percent increase when having seven to nine hours of homework, while the middle SES/achievement group has a 7.2 percent increase in their chances of persisting.

**Chart 11: Two-Year Institution Persistence by Hours/Week of Homework**



The effect of homework, AP/IB, and math on the low SES/achievement group is consistently higher than the other groups. This group shows greater gains when given a rigorous curriculum than other students. A rigorous curriculum may help, in time, narrow some of the traditional gaps in college attainment.

**Students’ opinion of how they were prepared**

*Four-year institution:* Students surveyed in 2006 were asked while in college, “Did high school math prepare you for your first year of post-secondary education?” Half of four-year institution students answered “Not at all” or “Somewhat”, and the other half answered “A Great Deal.” These questions for English/Writing and Math were not statistically significant for two-year institution students. Answering “A Great Deal” to this question increased the chance of persistence for a four-year institution student in the high SES/achievement group by about 3 percent, and about 8 percent for the low SES/achievement group.

Students were also asked, “Did high school English/Writing prepare you for your first PSE?” If a high SES/achievement student in a four-year institution answered “A Great Deal” instead of “Not at all” or “Somewhat” their chances of persisting increased by 5 percent (87 percent to 92 percent chance). For a student in the low SES/achievement group, their chances increase by 15 percent (67 percent to 77 percent).

*Two-year institution:* The same question was asked for high school science, but it was not significant for four-year institution students. For two-year institution students, answering “A Great Deal” for the science preparation question increased the high SES/achievement group’s chances by 5 percent and the low SES/achievement group’s by 8 percent.

The question reflects the students' perception of how well high school prepared them for college. Naturally, if they are not succeeding in college when they take this survey, they probably will not think that high school prepared them very well. Nevertheless, the chance of persistence increases more for students in the low SES/achievement group if they think high school prepared them a "Great Deal" than for other student groups. This is just another indicator that preparation in high school matters in college, and those that feel better prepared succeed more often than those that do not.

## What school leaders and policymakers can do

There are many surprising findings in this report, but perhaps the most striking is that we were not forced to look at the extremes of SES and academic achievement in order to see major differences in first year persistence. In addition, the bigger effect that we see in college persistence for low SES/achievement groups is consistent across all variables even though we do not look at the extreme high or low SES/achievement levels. This conservative approach at comparing students implies two things:

1. Students at the extreme high and lows of SES/achievement have larger gaps in their chance of persisting than the groups examined in this report.
2. The benefits for low SES/achievement are larger for students at the lowest levels of SES and achievement. We can therefore help students that traditionally have experienced the least success in college by applying some of the practices recommended in this report.

The analysis also shows that rigor is important. It is surprising that we find that simply taking an AP/IB course in any subject improves persistence in college, and that whether a student passes a test for that course isn't as important. AP/IB courses should not just be for the students with the highest academic achievement; this report shows that even students with the lowest academic achievement in their sophomore year benefit from AP courses, and show higher gains than the high academic achieving students. The same is true for math courses. Taking a more challenging math course improves persistence more for students with lower prior academic achievement.

The good news in this report is that it points to steps that schools can take to improve the success of their students in college. A rigorous curriculum is important for college, and it is important for every type of student. No matter the characteristic of students, their SES level, or how well they do in school, every student can benefit from challenging subject matter. Far from setting them up to fail, rigorous curriculum is setting them up to succeed. Encouraging or requiring students to take higher levels of math courses should be a goal of all schools as well as providing the support students need to do well in high level courses.

The other major finding is the importance of academic advising to student persistence. While the report only examined advising in post-secondary institutions, we believe that the finding also bolsters the case for academic counseling in high school to make sure all students are prepared for success. Some students may not think they are smart enough to take a challenging course. It is the job of high schools to let them know the benefits of taking the course and that they can succeed. Schools need to flip the common thinking that challenging courses are for students who are higher achieving. Challenging courses are for all students, and it helps close gaps between students who have a high chance of persistence in college and those who don't.

One straightforward thing that teachers, administrators, and counselors can do is identify those students who may be at risk of dropping out after their first year of college, and to follow up with early and effective interventions. These signs include:

- low SAT/ACT scores or low standardized test scores
- low standardized math scores
- low GPA
- parents who have high school or less as their highest level of education

School boards play a large part in making sure that college success is a goal for their districts. There are several things they can do:

- **Data collection:** The first thing is to make sure that data is being collected on how well their graduates perform in college. It is not sufficient to just get a student into college, they need the skills to continue and obtain a degree. Schools should also monitor middle- and high-school data to identify students who may be falling off the tracks toward high school graduation and college success so that effective interventions can be provided.
- **Rigorous curriculum:** Schools need the resources to provide a curriculum like AP/IB courses to all students, but it doesn't necessarily need to be through AP/IB. Many schools districts have augmented their curriculum to make sure that their courses mirror the type of challenging content that AP/IB provide. School boards and school districts should consider the success of the AP/IB programs when designing their curriculum. What is it about the AP/IB courses that help students persist? Is there something that can be used in other courses?
- **Academic counseling:** Possibly the most surprising finding was the strength of academic advising as a predictor of persistence. College students who reported visiting with advisors frequently had a much greater likelihood of staying on track than their peers who never did. The lesson to colleges here is clear: policies to encourage these relationships can go a long way toward making sure students are on pace to earn a degree. But we also believe that academic advising can be a great benefit when it starts earlier. Middle and high schools need enough counselors to monitor student progress so they can make sure all students are taking the rigorous courses and have the support they need to be successful in them. Counselors also fill an important role in helping students plan for their futures after high school, including help choosing a post-secondary institution that best matches their goals, and navigating the college application and financial aid processes.

*This study was conducted by Kasey Klepfer, an Archer Graduate Fellow at the University of Texas at Austin, with the guidance of Jim Hull, senior policy analyst for the Center for Public Education, an initiative of the National School Boards Association. The authors thank Michael Hurwitz, associate policy research scientist for the College Board, for his very thoughtful review of this paper.*

## Appendix: Persistence rates by individual student characteristics

### **10<sup>th</sup> Grade Standardized Scores**

In this report we use 10th grade standardized test scores so we can compare the results for students with similar achievement levels. These standardized tests were designed for the ELS 2002 assessment, and measure reading and math abilities. These standardized tests are taken before many students take advanced subject courses and allow us to see the effect of the final two years of high school when controlling for prior academic performance. This report has found that that sophomore academic performance is also predictive of persistence.

*Four-year Institutions:* In four-year institutions only 4.7 percent of students are in the bottom quintile of 10<sup>th</sup> grade standardized scores. This is a small demographic with low persistence (72 percent persist), but we can also see the effect of academic performance when just looking at top performers vs. below average performers. Only 80 percent of students scoring below average scores (21<sup>st</sup> to 40<sup>th</sup> percentile) persist to their second year compared to 93 percent of top performing students (top quintile).

*Two-year institutions:* While students in four-year institutions have a small amount of students with low 10<sup>th</sup> grade test scores, the reverse is true of two-year institutions. Only 10 percent of students in a two-year institution have scores in the top quintile. 55 percent of students in the bottom quintile of scores persisted compared with 71 percent of students with above average scores (61<sup>st</sup> to 80<sup>th</sup> percentile).

These results show that academic achievement as early as sophomore year can be an indicator for success after high schools. As we will see later in the report, a rigorous curriculum can provide students with low sophomore academic achievement with a better chance of success in their first year of college. It can be a way for high schools to identify those that may need more attention, or more encouragement to take harder courses than other students.

### **Socio-economic Status<sup>10</sup>**

Socio-economic status (SES) is another highly predictive factor when looking at persistence. The SES variable in this report is created by the ELS study with using a common federal definition and broken down into quintiles. SES in this report is based on five weighted variables including mother and father's education, mother and father's occupation and family income. When it comes to persistence students from lower SES backgrounds are less likely to persistent than those students from higher SES backgrounds.

*Four-year institutions:* For those students with low SES backgrounds (bottom quintile), 79 percent persist in four-year institutions. When compared to the 94 percent of students that persist with high SES backgrounds (top quintile), we can see the large 15 percentage-point persistence gap that shows the dramatic effect that low SES can have for students. Each level of SES a student moves up in, there is consistent improvement in persistence.

*Two-year institutions:* In two-year institutions, 56 percent of students with low SES backgrounds persisted to their second year. For those with high SES, 78 percent of students persist. This is a 22 percentage-point gap between low and high SES, far larger than students in four-year institutions.

### Race/Ethnicity

This report does not explicitly control for race in any of the analysis, but instead chooses to control for SES since it is highly correlated with race (Coleman 1966). However, this report does include several variables in which underrepresented races are disproportionately represented (parent's highest education, income, etc.).

*Four-year institutions:* Of high school students in this study, 60 percent are White, 14 percent are Black or African-American, and 16 percent are Hispanic. Of all students in four-year institutions, 69 percent are White, 11 percent are Black or African-American, and 8.4 percent are Hispanic. Of those students:

- 90 percent of White students persist
- 81 percent of Black or African Americans persist
- 87 percent of Hispanic students persist
- The persistence gap between White students and Black/Hispanic students is 6.6 percentage points

*Two-year institutions:* Of all students beginning at two-year institutions, 61 percent are White, 12 percent are Black or African American, and 18 percent are Hispanic. Of those students:

- 67 percent of White students persist
- 53 percent of Black or African American students persist
- 57 percent of Hispanics persist
- The persistence gap between White students and Black/Hispanic students is 11 percentage points

## **Gender**

Gender plays a huge role in the persistence of students in both four and two-year institutions. Consistently when researching for this report, females have had greater probabilities of persisting no matter their SES or prior achievement. While females have a greater probability of persisting than men in general, this difference decreases as prior academic achievement goes up. For example, males and females with a high 9<sup>th</sup>-12<sup>th</sup> Grade Point Average (GPA) have a smaller difference in their chances to persist than males and females with a low GPA. We can also see this phenomena with 10th grade standardized test scores. A male and female with low standardized test scores have a larger difference in the likelihood of persistence than male and females with high test scores. More research is needed to understand what factors contribute to why females persist more than men.

*Four-year institutions:* Females account for 54 percent of four-year students and 91 percent of them persist in comparison to the 86 percent of males who persist. While this 5 percentage-point gap is important, it becomes larger when you look at students that took lower levels of core subjects, students with low SES, and those with low prior academic performance. For example, when looking at students with all three of these characteristics there is a 10 percentage-point gap in persistence between male and females.<sup>11</sup>

*Two-year institutions:* In two-year institutions females make up 53 percent of the population. There is a 6 percentage-point gap in male/female persistence that is similar to four-year students. We see the same gap growth when you look at low SES, low previous academic performance, and low core subject levels. In the case of two-year students, there is an 8.5 percentage-point gap between male and female students with all three of these characteristics.

## **Parent's Highest Education**

In this report we primarily use SES as a proxy for lots of student characteristics including the parent's highest education. Still, it is helpful to see the percentage of students that persist who have parents with a college degree.

*Four-year institution:* Of students from four-year institutions that have fathers who have only completed high school or less, 83 percent persist. If the student has a father with a four-year degree or above, 94 percent persist. If we look at the same education level for the mother of the student, 85 percent persist if their mother had a high school degree or less while 93 percent persist if the mother has a four-year degree or higher. This gap between the parents' education level is 11 percentage-points for the fathers' education and 8 percentage points for the mothers'.

*Two-year institution:* 61 percent of students whose father had a high school degree or below persisted compared to 71 percent for those whose father had a four-year degree or higher for a 10 percentage-point gap. This gap is higher for the mothers' highest education with a 12 percentage-point gap. Additional support and information may be helpful to students whose parents are unfamiliar with college. These students may benefit from additional information about what it takes to be successful in college that their parent may not be able to provide. For example, one of the findings of this report is that meeting with a college academic advisor dramatically improves the chance a student will persist to their second year of college. A parent who graduated from a two or four-year institution might understand this better than one with high school as their highest level of education, and they might communicate this better to their child since they have gone through this experience themselves.

## References

- Adelman, C. (2006). The Toolbox Revisited: Paths to Degree Completion From High School Through College. *Office of Vocational and Adult Education. U.S. Department of Education* Retrieved on June 20, 2012, from <http://www2.ed.gov/rschstat/research/pubs/toolboxrevisit/toolbox.pdf>
- Carnevale, A. P., Smith, N. and Strohl, J. (2010). Help Wanted: Projections of jobs and education requirements through 2018. *Georgetown University Center on Education and the Workforce* Retrieved on October 4, 2012, from <http://cew.georgetown.edu/jobs2018/>
- Coleman, J. S. (1966). Equality of Education Opportunity. *Johns Hopkins University* Retrieved on from
- Conley, D. T. (2007). Redefining College Readiness. *Education Policy Improvement Center* Retrieved on June 20, 2012, from <http://www.aypf.org/documents/RedefiningCollegeReadiness.pdf>
- CPE. (2012). Is High School Tough Enough:.. *Center for Public Education* Retrieved on July 11, 2012, from <http://www.centerforpubliceducation.org/Main-Menu/Instruction/Is-high-school-tough-enough-At-a-glance>
- Knapp, L. G., Kelly-Reid, J. E. and Ginder, S. A. (2012). Enrollment in Postsecondary Institutions, Fall 2011; Financial Statistics, Financial Year 2011; Graduation Rates, Selected Cohorts 2003 - 2008 (NCES 2012-174). *National Center for Education Statistics, U.S. Department of Education* Retrieved on from <http://nces.ed.gov/pubs2012/2012174.pdf>
- National Center for Higher Education Management Systems (NCHEMS). Retention Rates - First-Time College Freshmen Returning Their Second Year. Retrieved on October 4, 2012, from <http://www.higheredinfo.org/dbrowser/index.php?submeasure=228&year=2010&level=&mode=policy&state=0>
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- <sup>1</sup> In 2010, there were 3.2 million first-time freshmen enrolled in 2- and 4-yr colleges. 90% would be 2.88 million for each of the next 8 years or 23 million graduates, 4.2 million shy of the president's goal.
- <sup>2</sup> Calculated based on data from Education Longitudinal Study (ELS) 2002-2006
- <sup>3</sup> ELS Variable Description: Socio-economic status composite, v.2, BYSES2 was previously named SES2 on the BY ECB. 1989 GSS occupational prestige scores used instead of 1961 Duncan SEI-version.
- <sup>4</sup> Variable Name: F1SES2, F1 socio-economic status composite, v.2
- <sup>5</sup> Variable Name: BYTXCSTD, Standardized test composite score math/reading
- <sup>6</sup> Variable Name: F1SES2, F1 socio-economic status composite, v.2

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<sup>7</sup> This variable (F1RMAPIP) is from ELS2002 and grouped to represent a level below the standard Algebra II level that is required by many schools, one level above, and a Pre-Cal/Calculus level. There are a sufficient number of students in each level for both two and four-year institutions.

<sup>8</sup> Used SAT/ACT math test scores that are standardized into ACT scores: ELS2002 variable

<sup>9</sup> High score is defined as scoring a 28 or higher. A low score is defined as scoring an 18 or lower. These numbers correspond to 1 standard deviation from the ACT mean score of 23 of all 4-year college going students.

<sup>10</sup> ELS Variable Description: Socio-economic status composite, v.2, BYSES2 was previously named SES2 on the BY ECB. 1989 GSS occupational prestige scores used instead of 1961

Duncan SEI-version.

<sup>11</sup> Bottom quintile of SES, bottom quintile of 10<sup>th</sup> grade standardized scores, and Algebra II as the highest level of math