
# Developmental Education Placement Policies and Student Success in the Connecticut Community Colleges

Research Report to the
Connecticut Community Colleges System

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# Table of Contents

## Overview

The Connecticut Community College System (CCCS) is examining its policies on college remedial, or what is often referred to as "developmental," instruction in the state's community colleges. Currently all colleges in the system use the ACCUPLACER placement test developed by the College Board to determine whether or not entering students should be placed in developmental courses. Beyond that, the colleges differ in their policies on which students are required to take a placement test and on the "cut scores" that determine whether students are recommended to take developmental instruction. Colleges also differ on whether students must complete developmental courses before they enroll in college-level courses and on the curriculum and approaches to instruction used in developmental courses. With respect to curriculum and instruction, in some cases there may be substantial variation *within* colleges as well.

The Connecticut legislature has asked CCCS to develop a plan for establishing common placement standards across the colleges in the system. More generally, CCCS is exploring what other policies might help improve outcomes for the many students who enter Connecticut's community colleges unprepared for college-level academic work.

CCCS asked the Community College Research Center (CCRC) to conduct an analysis examining the relationship between ACCUPLACER test scores and student success. CCCS is particularly interested in two related questions:

(1) Can CCRC make a recommendation regarding a common set of ACCUPLACER cut scores for all 12 colleges that will maximize student success in college-level courses?

(2) Given existing developmental education structures, is there a score on the ACCUPLACER below which students are not likely to succeed?

CCCS also asked CCRC to track the educational outcomes of students who take developmental courses compared to those who do not.

This report presents the findings from CCRC's research on these questions. The next section briefly describes the data CCRC used to conduct the analysis. The third section presents our main findings. In the concluding section we make recommendations for actions that CCCS and its member colleges might consider taking to improve student success. All the tables and figures discussed in this report appear in appendices.

## The Data

CCCS shared with CCRC longitudinal data on a cohort of 8,874 first-time college students who entered a Connecticut community college in the fall of 2001. The dataset contained information on individual students including demographics, ACCUPLACER test scores, transcript data on courses attempted and grades received, and information on certificates and associate degrees earned. The data enabled CCRC to track this cohort for a total of 19 terms (fall, winter, spring, and summer), or just under five years.

The analysis was complicated by the ACCUPLACER testing procedure. Connecticut community colleges use nine ACCUPLACER tests to decide whether students should be recommended for developmental instruction: three English (Reading, Sentence Skills, and Essay), three math (Arithmetic, Elementary Algebra, and College Math), and three English as a Second Language (ESL) tests. (Since so few students take the ESL tests, CCCS directed CCRC to exclude them from our analysis.)

The ACCUPLACER mathematics test is a computerized adaptive test; questions are presented to students based on their mathematical ability level. Depending on the student's ability level he or she may be presented with questions at one or more of three levels: Arithmetic, Elementary Algebra, or College Math. Students only receive scores for the math test levels for which a sufficient number of questions is presented for the student to answer. Thus, students who take the math test may receive from one to three math scores. The English tests are not computer-adaptive, so students receive a separate score for each test they take (Reading, Sentence Skills, and Essay).

For the cohort examined in this study, scores on all three language tests were available for only 15 percent of the cohort; 35 percent of the cohort had no scores. Over sixty percent (62 percent) of the cohort took the Reading test; 45 percent took the Sentence Skills test; and 29 percent, the Essay test. A third of the cohort had no math scores. There were scores on all three math tests for less than 4 percent of the cohort. We had Elementary Algebra scores for a little more than half (53 percent) of the students in the cohort; Arithmetic scores for just under half (47 percent), and College Math scores for only 10 percent. As will be discussed in more detail below, we did not have any English or math scores for nearly a third of students in the cohort.

Table 1 shows the scores available for each of the 12 colleges in the system and for the system as a whole. It also shows the percentages of students taking individual tests and various relevant combinations of tests. Note the wide variation among the colleges in the number of students in the cohort for whom test scores were reported. Further investigation is needed to determine the extent to which this variation reflects inconsistencies in the reporting of test scores to the state or differences in placement test policies among the colleges, or some combination of these.

Because some colleges use their own instrument to test writing, CCCS asked CCRC to focus on only two of the English tests – Reading and Sentence Skills – as well as the three math tests – Arithmetic, Elementary Algebra and College Math. We had at least one math score and one Reading or Sentence Skills score for 62 percent of the cohort. Of the

cohort, 63 percent took one of the three math tests and at least one of the Reading or Sentence Skills tests. Among students for whom we had test scores, 92 percent took at least one math and one English test. Thus it was an unusual case where a student took only a math test or only an English test.

Given the variation in the tests that students took, it is not possible to make claims about a single cut score or range of cut scores for English or math as a whole. Therefore, we had to examine the relationship between ACCUPLACER scores and student outcomes separately for each test. (Of course, we confined these analyses to students for whom we had scores for at least one placement test.)

## Findings

Placement Test Taking

***Finding:*** **Neither English nor math test scores were reported for nearly a third of students in the first-time student cohort examined here.**

CCCS should work with the colleges to determine why scores were not reported for a substantial percentage of students in the cohort. We did not have a full set of test scores – that is, reading, sentence skills, and at least one math test – for a majority (56.4 percent) of students.

It is possible that scores were not reported for some students because they did not take a test. One reason that students might not take a placement test is that they were not seeking a degree, and, therefore, did not have to take college English or math. Indeed, 3,224 students, or about 36 percent of the cohort tracked in this study, indicated upon enrollment that they were not seeking a credential.[1]

Table 2 shows test-taking patterns of students by their stated purpose for enrolling, by college and system-wide. While students with the intent to earn a degree were more likely to take a placement test, over a third of students (37 percent) who indicated that they were not pursuing a credential nevertheless ended up taking a placement test. The table also shows the numbers and percentages of students, by college and system-wide, who took the minimum combination of reading, sentence skills, and one math test.

In general, students' initial stated intent did not have a strong correlation with their subsequent behavior. Of the 8,874 students in the cohort, 1,149 earned a credential by the end of the 19-term period; this represents about 13 percent of the entering cohort.[2] Nearly

[1] About half of the cohort (4,496 students, or 51 percent) said that they were pursuing an AS degree. Of the others, 707 said they were pursuing an AA degree; 403, a certificate; and a small number, 45, an AAS degree.

[2] The total number of credentials earned by these students was 1,291, since some students earned multiple credentials.

a quarter (22 percent) of these graduates had indicated upon enrollment that they were not seeking a credential.[3] Table 3 shows the outcomes of students by their initial intent for CCCS as a whole and by college.

Therefore, colleges should not assume that students who indicate that they are not seeking a credential should not take a placement test. Similarly, colleges should also ensure that students who do arrive with the intent of earning a degree take placement exams. In the cohort examined here, test scores were not reported for nearly a quarter of those who indicated that they were seeking an associate of arts degree.

## Test Scores and Student Success[4]

***Finding:*** **While there is some correlation between students' test scores and their success on various measures, generally this correlation is weak. Moreover, for any of the five ACCUPLACER tests we are unable to identify potential "cut scores" for which there is a sharp difference in the probability of success for students scoring above or below the cut score.**

We examined the relationship between ACCUPLACER scores and student success on various measures for the entire cohort of students, that is, for students from all 12 colleges together. The results for each measure are summarized below.

### *Developmental and Gatekeeper Course Grades*[5]

Generally, students with lower scores earned lower grades in developmental courses, while students with higher scores got higher grades, but the effect is not strong. For instance, the mean grade in developmental English for students in the bottom quintile for the Reading ACCUPLACER test was 2.0 (a C); for students in the top quintile, it was 2.8, or slightly below a B. Similarly, the mean grade in developmental math for students in the bottom quintile of the Elementary Algebra ACCUPLACER test was 2.0, and the mean for those in the top quintile was 2.8.

The pattern for gatekeeper course grades is similar. The mean grade in gatekeeper English for students in the lowest quintile in Reading was 2.2; the grade for those in the highest quintile was 2.9. The mean grade in gatekeeper math for those in the lowest quintile in Elementary Algebra was 1.8, and for those in the highest quintile, 2.5.

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[3] Of the credentials earned, 898 were AS degrees;135, AA degrees; 10, AAS degrees; and 248, certificates. This means that around 20 percent of those who said that they were seeking a credential, for each of the three credentials, earned one. However, 61 percent of those who said that they were seeking a certificate obtained one.

[4] Our analysis of the ACCUPLACER scores is confined to the students in the cohort who took at least one of the five math or English placement tests.

[5] In this report, "gatekeeper courses" refer to the first-level, degree-credit courses in English and math. Students generally must pass these courses to earn an associate or bachelor's degree, but many students have a hard time doing so, particularly courses in math.

Notably, students scoring in similar ranges on the placement test did worse on average in gatekeeper math than they did in developmental math, and slightly better in college-level English than they did in developmental English.

As is evident from Table 4, ACCUPLACER test scores and developmental course grades are positively correlated, but the correlation is small. In fact, for the College Math test, the correlation between developmental grades and test scores was close to zero. The correlation between grades and the Reading and Sentence Skills test scores was 0.18, while the correlations between grades and the Arithmetic and Elementary Algebra scores were 0.19 and 0.15, respectively. In their December 2006 memo to CCCS on the validity of the ACCUPLACER, Erica Walker and Julie Patterson of Teachers College reported that, in the College Board's main study of the validity of the ACCUPLACER (conducted in 1990-92), the average correlation between ACCUPLACER scores and developmental reading grades was 0.18 (Walker & Patterson, 2006, p. 2). The highest correlation between ACCUPLACER scores and developmental reading grades was 0.38, even though the College Board reported that it considers a "high correlation" to be above 0.60. The ACCUPLACER technical manual does cite other ACCUPLACER validation studies with much higher correlations – ranging from 0.33 to as high as 0.90 – though it provides few details on these studies.

*Developmental and Gatekeeper Course Success*

In Figures 1a-e we plotted the rates of success (course completed with a grade of C or higher) in developmental English and math courses against the scores on each of the two English and three math ACCUPLACER tests. We also overlaid a plot of the distribution of scores on the given test.[6]

In each figure, the success rate plot line becomes "chaotic" in the lowest and highest ranges of the score. This is most likely due to the small number of students in our sample who scored in these lowest and highest ranges. For the two developmental English course plots, the general trend of the success rates in the middle test score ranges is upward, though not steeply so. The trend for the Arithmetic test is also upward, while the plot for Elementary Algebra and especially the plot for College Math show a substantial amount of noise, again due to small sample sizes. In none of the cases – at least in the middle test score ranges where there are sufficient numbers of test scores – is there a sharp change in the probability of success between students scoring lower and those scoring higher on the given test. A similar pattern is evident in Figures 2a-e, which show the relationship

[6] All of these tests are on a scale of 120. The median score on the ACCUPLACER Reading test for the cohort tracked here was 75. On the Sentence Skills test, it was 80. On the Arithmetic test, it was 36, on Elementary Algebra, 36 (also), and on College Math, 27. The respective means of the five tests (with standard deviations in parentheses) were: 73 (s.d. 22), 77 (s.d. 24), 46 (s.d. 25), 45 (s.d. 23), and 32 (s.d. 16). Note that the distributions of scores on the two English tests are skewed to the right, with relatively high medians, and with something of a tail on the left, especially in the case of the Sentence Skills test. In contrast, the distributions of the three math tests are skewed to the left, with relatively low medians, and long tails to the right. The percentages of students scoring at any particular value on the tests is low; the distributions are scaled so that the most frequently-appearing score is set to a value of one, so as to provide maximal visual contrast.

between ACCUPLACER test scores and rates of success in gatekeeper math and English courses.

To examine the relationship between test scores and developmental and gatekeeper outcomes in more depth, we constructed logit models (not presented here) to estimate the effect of scores on the various ACCUPLACER tests on successful (grade of C or better) developmental and gatekeeper course completion. In every case, the coefficient for the test score variable was statistically significant and in the expected direction. The effects were not large, however: in all cases our estimates indicated that a one point increase in test scores was associated with a less than one percent increase in the probability of course completion.[7] Thus, only scores fairly far away from the mean would correspond to (on average) a substantial difference in the chances of success in these courses.

To further illustrate this relationship across all test scores, we developed a second set of logit models to estimate rates of success in developmental and gatekeeper courses (C or better) controlling for students' characteristics o*ther than* their test scores. These characteristics included race/ethnicity, age, gender, U.S. citizenship, enrollment status (full-time, half-time or part-time), program of enrollment (non-degree, occupational, or one of three associate-level academic transfer programs), and which college they were attending.[8] Based on these characteristics, we estimated the chances that each student would successfully complete a developmental or a gatekeeper course. We then plotted the mean projected chances of success across the range of placement scores for each of the two outcomes (development and gatekeeper course completion) and for each of the two English and three math tests. This is another way of examining the relationship between test scores and outcomes that we also explored with the uses of score quintiles. This method has the advantage of controlling for differences in student outcomes that are related to factors other than students' test scores.

As is shown in Figures 3a-e, there appears to be an increase in the estimated chances of success in developmental courses at higher scores for all five tests. Thus, there seems to be a slight upward tendency in the chances of success as Reading test scores increase. The Sentence Skills score also seems to have a stronger positive relationship with success, but the pattern is more chaotic. The Arithmetic score appears to have a positive relationship with success. The Elementary Algebra score seems to have a stronger, but looser, positive relationship with success than does the Arithmetic score. College Math also appears to have a positive relation with success, although the plot is noisy, most likely due to the relatively small number of test takers.

A similar pattern is evident with the gatekeeper course analysis (see Figures 4a-e): there is a slight upward trend in estimated success rates in gatekeeper courses with increasing placement scores for each of the five tests; but again, the relationship does not appear particularly strong. Interestingly, the chances of gatekeeper success are in roughly similar

[7] The coefficients for success were all positive, as expected, and ranged between 0.002 and 0.007, indicating that in all cases a one point increase in the test score is associated with less than a 1 percent increase in the chances of success.

[8] All of these models had highly-significant chi-square statistics.

ranges for students with Arithmetic scores compared with those having Elementary Algebra and College Math scores; this finding seems to indicate that those students with low ability (as measured by the placement test) who nevertheless place into gatekeeper math are doing as well as those with higher measured ability, as there are other factors beyond test scores that also affect success. It is the case, however, as one would expect due to the adaptive nature of the ACCUPLACER, that a lower percentage of students (23 percent) who took the Arithmetic test went on to take gatekeeper math than did those who took Elementary Algebra (37 percent) or College Math (45 percent).

*Course Completion, Credit Accumulation, Credential Completion, and Retention*

Students with lower scores on the ACCUPLACER tests tended to complete courses at a lower rate than did students with higher scores. For example, students scoring in the lowest quintile of Reading successfully completed 61 percent of the credits that they attempted, while those in the highest quintile completed 84 percent of credits attempted. For Elementary Algebra, the figures were 64 and 87 percent, respectively.

There is also a positive relationship between ACCUPLACER test scores and the number of credits that students accumulated on average. The mean number of credits completed by students in the lowest quintile on the Reading test was 20, while the corresponding number for those in the highest quintile was 28. For the Elementary Algebra test, the respective figures were 18 and 33. It appears that scoring higher on the math tests in particular is associated with a greater likelihood that students will earn credits.

Perhaps related to this relationship is the finding that students with higher placement scores were also more likely to earn a credential. For instance, 11 percent of students scoring in the lowest quintile of Reading earned a certificate or associate degree by the end of our nearly five-year period, compared with 20 percent of students in the highest quintile. The spread was a bit larger for math; 10 percent of those in the lowest quintile in Elementary Algebra earned a credential, as opposed to 26 percent in the highest quintile.

The relationship between test scores and the rates at which students earned a credential is also shown in Figures 5a-e. The figures show an increase in the rates of credential completion as test scores increase, although there is no sharp discontinuity at any particular test score, other than those that appear to be caused by noise in the data. The figures show that the rates at which students earned credentials overall are not very high, even for the highest-scoring groups. Of course, some students may transfer to a baccalaureate program or achieve some other successful result without earning a community college credential; unfortunately, we did not have the data to measure these other outcomes.

While, on average, higher scoring students were more likely than students scoring lower to attain key milestones and ultimately earn a credential, this is not to say that there were no low-scoring students who succeeded. At least a quarter of the students who scored in the lowest quintile on any of the five ACCUPLACER tests examined here either completed a credential or were still enrolled at the end of the tracking period. Moreover, as with the other measures of success examined, there is not a clear score or range of

scores on any test where the probability of success changes markedly for students who received lower scores compared with those who scored higher.

***Finding:*** **An analysis of the gatekeeper success rates of students who did not take a developmental course regardless of their test scores also failed to show clear "cut points" in the success rates between higher and lower scorers.**

Not all students who got low scores took developmental courses. In fact, some students with low scores ended up taking a gatekeeper course without first taking a developmental course. We would expect that students who scored in the lower ranges on a given placement test and who did not take a developmental course would be less likely to pass the college-level courses than higher scoring students.

Figures 6a-e show the success rates in gatekeeper math and English across the range of test scores for students who did not take a developmental course. Looking at the Figure 6 graphs and ignoring the "noise" at the lowest test score ranges (which is due to small sample sizes), we see that the expected pattern whereby higher-scoring students did better than students scoring lower is most clearly evident in the relation between gatekeeper math success rates and the Elementary Algebra scores (6d); to a lesser extent the pattern is evident between gatekeeper English completion and Reading scores (6a). In both cases, the success rates range from between 0.4 and 0.6 at the lower end and over 0.8 at the higher end. Even so, in none of these figures is there a clear point above and below which students were substantially more or less likely to succeed.

Enrollment in Developmental Education

***Finding:*** **Not surprisingly, students who scored higher on placement tests were less likely to enroll in developmental courses. However, with the possible exception of the College Math test, there was no clear "cut point" above which students were very unlikely to enroll in developmental education. Indeed, a substantial number of higher scoring students enrolled in developmental courses – voluntarily, it seems. More problematic is the fact that many low-scoring students did not enroll in such courses.**

Figures 7a-e show the rates at which students enrolled in developmental English or math across the range of test scores for each of the five tests examined here. These figures also show the distribution of test scores received by students who took the given test.

As expected, there is a fairly strong relationship between placement scores and rates of enrollment in developmental courses. Eighty-one percent of students scoring in the lowest quintile in Reading enrolled in developmental English, as opposed to 22 percent of those scoring in the highest quintile. For Elementary Algebra and developmental math, the figures were 76 and 6 percent, respectively.

Even so, with the possible exception of the College Math test, there is no clear score range beyond which students were very unlikely to enroll in developmental courses. On

the Reading test, the rate at which students scoring below 60 enrolled in developmental courses is high: between 70 and 80 percent. Above 60, the rate of enrollment begins to decline, but it does so gradually. Only at 100 and above does the rate of enrollment fall below 20 percent. A similar pattern is evident with the Sentence Skills test, except that the transition point is around 75.

For the ACCUPLACER Arithmetic test, developmental math enrollment rates were reasonably high even for relatively high scores, although they did decline more or less monotonically for scores above about 40, and a relatively sharp decline occurred above 80. For the Elementary Algebra test, enrollment rates fell off sharply after a score of about 45, although even at scores of around 80, the changes of enrollment were approximately 20 percent. Few students who scored above 40 on the College Math test took a developmental math course, although at the median score of just over 20, the rate of enrollment was still over 25 percent.

That there are generally no clear "cut points" on these tests is perhaps not surprising because these figures are based on analysis of data system-wide, and we know that each college in the system has its own placement rules for each developmental subject based on individual tests or combinations of tests. It is also clear that a substantial number of higher scoring students enrolled in developmental courses – voluntarily, it seems (or perhaps as a result of counseling).

In addition, and possibly a cause for concern, is the fact that many low-scoring students nevertheless did not enroll in developmental courses. Nearly 20 percent of students scoring in the lowest quintile on the Reading test and nearly 25 percent of the lowest scorers on the Elementary Algebra test did not enroll in a developmental course in the corresponding subject area.

***Finding:*** **Although students who enrolled in developmental education were more likely to have indicated that they were seeking a college credential upon enrollment, a substantial percentage of developmental enrollees indicated that they were not seeking a credential and yet enrolled anyway.**

One reason why students with low placement test scores might not enroll in developmental courses is that they are not seeking a degree and therefore do not need to take college-level math and English. As mentioned, about 36 percent of the cohort tracked in this study indicated upon enrollment that they were not seeking to earn a credential.

Over three-quarters of students in the cohort who indicated that they were pursuing a credential enrolled in at least one developmental course. Still, well over a third (38 percent) of those who indicated that they were not credential seeking nevertheless enrolled in developmental education. Table 5 shows the number and percentages of student who enrolled in remediation system-wide and by college, by credential-seeking status and overall.

Colleges cannot assume, therefore, that students who indicate that they are not credential seeking will be unlikely to enroll in developmental courses.

***Finding:*** **Most students who took developmental courses did so early on.**

Table 6 shows the semester in which students who enrolled in a developmental course first did so. Ninety percent of students in the fall 2001 first-time cohort who took developmental English first enrolled in the course in fall 2001 or spring 2002. The comparable figure for math is 84 percent. Since most students enrolled in a developmental subject early on, they did not previously accumulate a substantial number of college credits. The median number of credits earned prior to enrollment in either developmental math or English is zero; the means are only slightly higher; 2 and 1 credits, respectively. Connecticut community colleges are therefore evidently effective in encouraging students to take developmental courses early on, before they attempt too many college-level courses.

Developmental Education Course Outcomes

Using course descriptions provided by the colleges, analysts at CCCS assigned a level to each developmental course based on how far the course is below college level. For both developmental math and English, courses can be one, two, or three levels below college level.

Table 7 presents statistics on the outcomes of credential-seeking students[9] in the cohort examined here by the level of the first developmental English course they took; it also includes students who did not take any developmental English. Table 8 is the corresponding table for math. The outcomes examined in the two tables are: attempted the corresponding gatekeeper course, passed the gatekeeper course, and completed a certificate or associate degree. The tables also show the median ACCUPLACER test scores for students starting at each developmental level.

Forty-five percent of credential seekers took no developmental English course. A little more than a quarter (28 percent) enrolled in developmental English one level below college, while about one-fifth (21 percent) enrolled two levels below. Only a small fraction – about 3 percent – enrolled in developmental English three levels below college level. The comparable figures for math were: no developmental, 38 percent; one level below college, 24 percent; two levels below, 35 percent; and three levels below, 4 percent.

[9] We confined this analysis to students who indicated upon enrollment that they were seeking to earn a certificate or degree.

***Finding:*** **A substantial proportion of students who took developmental courses did not take the initial college-level or "gatekeeper" courses in English and math, which are usually required for degrees. The rates of gatekeeper course-taking were even lower for math than for English.**

Two-thirds (67 percent) of credential-seeking students who enrolled in developmental English starting one level below college took college-level or gatekeeper English. The gatekeeper course-taking rates for developmental English students who started two and three levels below college were 56 percent and 44 percent, respectively. Only a third (33 percent) of the students who enrolled in developmental math one level below college attempted college-level or gatekeeper math. Slightly more than one-fifth (22 percent) of developmental math students who started two levels below college, and only 3 percent of those who started three levels below college, attempted college-level math.

***Finding:*** **The rates at which students who took developmental English passed gatekeeper English were roughly similar to those of students who did not take any developmental English. In contrast, the gatekeeper pass rates for students who started in developmental math were lower than those for students who did not enroll in developmental math.**

Of credential-seeking developmental English students who started one level below college and who attempted gatekeeper English, 72 percent successfully completed the gatekeeper course, about the same percentage as students who took gatekeeper English but did not take a developmental course. The gatekeeper pass rates for students who started developmental English two and three levels below college were somewhat lower – 67 percent and 62 percent, respectively – but still reasonably close to the rates for students who took no developmental English.

In math, 58 percent of students who started one level below college level and who attempted gatekeeper math passed the gatekeeper course, compared with 68 percent of students who did not take any developmental math. Math developmental students who started two and three levels below college passed developmental at even lower rates: 57 percent and 33 percent, respectively. The math gatekeeper course milestone appears to be a higher hurdle for students than gatekeeper English, especially for those who start at the lower developmental levels.

***Finding:*** **The credential completion rates for credential-seeking students who started developmental English one level below college was somewhat lower than that for students who did not take any developmental courses. Those who started developmental math one level below college actually graduated at a higher rate than did students who took no developmental math. Students who started developmental English or math two levels below college graduated at somewhat lower rates. Very few students who started in developmental education three levels below college completed a credential within five years.**

Among credential-seeking students who started in developmental English one level below college, the completion rate was 15 percent, which is somewhat lower than the 18 percent rate for students who took no developmental courses. The completion rate for those who started in developmental English two levels below college was 13 percent. Only 6 percent of those who started three levels below college in English completed a credential. Students who start this far behind clearly face an uphill battle to complete a program. The comparable rates for math were: no developmental math, 17 percent; one level below college, 20 percent; two levels below, 13 percent; three levels below, 5 percent.

Note that the median Reading test score for those who started three levels below college level in English was considerably lower even than those who started two levels below: 40 and 58, respectively. The differences between the ACCUPLACER math scores of those who started two levels and three levels below college in math were not as stark.

The overall completion rate for students who started in developmental math was comparable to that for students who started in developmental English. This is the case even though a far smaller proportion of developmental math students take and pass the gatekeeper course than do students who start in developmental English. This suggests that taking and passing gatekeeper math may be a key milestone or "momentum point" associated with a substantial increase in students' chances of completing a credential. CCRC has found this to be the case in other research on community college student milestones (Calcagno, Crosta, Bailey, & Jenkins, 2007).

## Conclusions and Recommendations

CCRC found that ACCUPLACER test scores and various measures of student success are correlated; the correlations are not particularly strong, however. While higher scoring students were generally more likely to pass developmental and gatekeeper courses, accumulate credits, and earn degrees, the rates of success on these measures for higher scoring students were generally not substantially higher than those for lower scoring students. As a result, in the pooled sample of students from all 12 colleges, we could identify no clear "cut scores" – scores where there was a clear difference in the probability of success for students scoring below and above a given score – for the two English tests and the three math tests that were the focus of this study. This outcome is perhaps most evident in the analysis where we estimated rates of success in developmental and gatekeeper courses and controlled for students' characteristics other than their test scores. In Figures 3a-e, where we plotted the estimated chances of success across the range of scores on each test, a positive correlation between test scores and student success is evident for most of the five tests, although the relationship is weak, and there is no clear range of scores where there is a sharp change in the probability of completion. Moreover, while lower scoring students did have lower success rates, there was not a score on any of the ACCUPLACER tests below which students were extremely unlikely to succeed.

***Recommendation 1:*** **Because we were unable statistically to derive a set of cut scores that can be used to identify students with substantially higher chances of success, CCCS should reach a consensus among its member colleges on a common set of scores based on the existing policies of the colleges – perhaps using as system-wide cut scores averages of colleges' existing cut scores.**

Such system-wide consistency would satisfy the legislature's desire for common placement standards and create a system in which no college can unfairly attract students by setting lower requirements for entry into college-level gatekeeper courses. It would also create an environment in which the system can more effectively study its outcomes.

While the system and the colleges are coming to agreement on a set of common placement rules, it might also be a good opportunity to examine placement policies more generally and, where appropriate, to standardize such policies across the system. One obvious candidate comprises the policies governing which students are required to take placement tests. No test scores were reported for nearly one-third of the students in the cohort we tracked. This includes one-fourth of students who indicated upon enrollment that they were seeking an associate degree. CCCS should work with individual colleges to find out why test score data were not available for so many students, and, moreover, to ensure that students who should take placement tests are taking them.

***Recommendation 2:*** **CCCS should consider establishing common system-wide policies governing which students should take placement tests.**

Our analysis indicates that the reasons that students give upon enrollment for coming to college do not correlate strongly with whether they earn a credential or even take steps to earn one. For example, nearly a quarter of students in the cohort we tracked who earned a certificate or degree indicated that they were not seeking a credential when they first enrolled.

Rather than rely on indicators of student intent to determine which students should take a placement test, we recommend that the CCCS colleges consider testing all students who enter with no postsecondary credentials or fewer than some agreed-upon number of college credits (perhaps 12). Whether or not these students intend to earn a credential when they enter college, research suggests that they *need* to earn one to secure employment paying family-supporting wages (Carnevale & Desrochers, 2003; Marcotte, Bailey, Borkoski, & Kienzl, 2005; see also Bailey, Jenkins, & Leinbach, 2006). All such students should be tested in both English (ideally on all three tests) and math.

We recognize that requiring more students to be tested potentially increases costs for colleges and may discourage some applicants from actually enrolling in classes. However, without this information, neither colleges nor students can make informed decisions about course placement or selection. Colleges should also assess and compare their procedures for advising new students on which courses to take, since without high-

quality advising, many students are unlikely to be able to make good course decisions, especially with regard to developmental courses.

We found that a substantial number of students who got low ACCUPLACER test scores did not take a developmental course. Nearly 20 percent of students scoring in the lowest quintile on the Reading test, and nearly 25 percent of the lowest scorers on the Elementary Algebra test, did not enroll in a developmental course in the corresponding subject area. Some of these students nevertheless enrolled in gatekeeper English or math courses. Our analysis showed that, as one might expect, among students who enrolled in a gatekeeper English or math course without taking a developmental course in the given subject area, lower scoring students were less likely to pass the gatekeeper course than were higher scoring ones.

***Recommendation 3:*** **CCCS should also consider establishing common system-wide policies requiring students who receive low placement test scores to enroll in developmental instruction.**

The success rates for students who started in developmental English or math three levels below the college level were very low, although these students only represented about 4 percent of the cohort. The median Reading score of those starting three levels below in English was considerably lower than the score for those who started two levels below college, but the differences in median scores in Sentence Skills, Arithmetic, and Elementary Algebra between those starting two and three levels below college were not as great.

***Recommendation 4:*** **Colleges should consider strategies other than developmental education for serving students with very low Reading scores, as well as for those who are placed in developmental courses three levels below college, because these students have a very low chance of success.**

Colleges do seem to be doing a good job of ensuring that most students who take developmental courses do so in the first semester or two.

Our findings suggest, however, that colleges could be doing more to encourage and support students in developmental courses to enroll in gatekeeper courses, particularly in math. Among developmental math students who started one level below college, only a third went on to enroll in gatekeeper math. The gatekeeper course-taking rates for students who started in developmental math two and tree levels below college were even lower (22 percent and 3 percent, respectively).

We also found that, while developmental English students who enrolled in gatekeeper English passed such courses at rates similar to those of students who did not take developmental English, the gatekeeper math pass rates for developmental math students were lower than those of students who did not take developmental math.

***Recommendation 5:*** **CCCS colleges should consider what can be done to ensure that more developmental students go on to enroll in gatekeeper courses and that there is clear alignment between developmental and gatekeeper courses in curriculum and standards of student performance, particularly in math, so that developmental students are well prepared to succeed in college-level courses.**

Tracking the progress and outcomes of cohorts of first-time students over time as we have done in this study can help identify both "leakage points" where students tend to struggle and gaps in achievement among different groups of students. With the longitudinal dataset that CCRC has constructed to conduct this study, CCCS and its member colleges can conduct their own analyses of this sort. While longitudinal student cohort data can be useful in identifying problems in student achievement, such information generally is of limited use in diagnosing the problems and devising ways to solve them. To do this, it is necessary to understand what is happening with students. This can best be accomplished through qualitative as well as additional quantitative data collection and analysis at the level of practice. Those in the best position to use such information to figure out how to change practices and policies to improve student outcomes are faculty and student support staff. By continuing to track new cohorts of entering students over time, CCCS and its member colleges can examine changes in student outcomes over time and thereby assess the effectiveness of efforts by colleges to improve performance.

***Recommendation 6:*** **CCCS and its colleges should continue to track students over time and use this information to identify and evaluate efforts to improve student success. CCCS should also support the regular convening of faculty and student services staff within and across colleges to examine longitudinal data on student outcomes and to work together to devise and test ways to address gaps in student achievement.**

We believe that by regularly convening administrators, faculty, and staff to systematically examine and discuss data on student progression, and by working to standardize policies and practices that prove effective across the system, CCCS and its member colleges can bring about substantial improvements in student success over time.

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## Appendix A: Tables

**Table 1.**
**Percentage of Students in the Cohort with Reported ACCUPLACER Scores by Test: by College and System-Wide**

| Name of Institution | Reading Only | Sentence Skills Only | Both Reading and SS | No English Test | Arithmetic Only | Elementary Algebra Only | College Math Only | More than 1 math test | No Math Test | Reading and SS and at least one Math | No English or Math |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Asnuntuck | 0.3 | 0.0 | 35.1 | 64.6 | 14.2 | 0.3 | 0.0 | 22.5 | 63.1 | 35.1 | 63.1 |
| Capital | 2.7 | 0.0 | 6.9 | 90.4 | 3.7 | 1.8 | 0.0 | 4.5 | 90.0 | 6.9 | 90.0 |
| Gateway | 0.7 | 0.0 | 69.0 | 30.3 | 55.7 | 0.2 | 0.0 | 18.1 | 26.0 | 68.6 | 25.5 |
| Housatonic | 22.6 | 3.3 | 39.0 | 35.1 | 1.3 | 13.7 | 0.1 | 62.3 | 22.6 | 39.0 | 22.4 |
| Manchester | 60.2 | 0.0 | 0.7 | 39.2 | 5.9 | 38.9 | 0.0 | 26.9 | 28.3 | 0.7 | 28.2 |
| Middlesex | 1.1 | 0.0 | 56.0 | 42.9 | 1.3 | 13.7 | 0.1 | 43.1 | 41.8 | 54.2 | 40.0 |
| Norwalk | 0.2 | 0.1 | 56.5 | 43.2 | 27.7 | 0.3 | 0.0 | 30.9 | 41.1 | 55.6 | 40.2 |
| Naugatuck Valley | 63.7 | 0.1 | 2.4 | 33.9 | 1.2 | 32.3 | 0.1 | 36.1 | 30.4 | 2.4 | 30.1 |
| Northwestern Connecticut | 1.1 | 0.0 | 90.1 | 8.9 | 39.8 | 0.0 | 0.0 | 50.8 | 9.4 | 89.5 | 8.4 |
| Quinebaug Valley | 0.0 | 0.3 | 79.8 | 19.9 | 21.5 | 0.0 | 0.3 | 60.5 | 17.8 | 79.1 | 17.0 |
| Three Rivers | 0.9 | 0.0 | 91.9 | 7.2 | 1.8 | 9.7 | 5.3 | 76.3 | 7.0 | 91.6 | 6.7 |
| Tunxis | 0.1 | 0.0 | 70.8 | 29.0 | 0.4 | 19.4 | 0.0 | 51.2 | 29.0 | 68.3 | 26.5 |
| **System-Wide** | **18.1** | **0.5** | **44.2** | **37.3** | **14.0** | **13.6** | **0.4** | **38.9** | **33.1** | **43.6** | **32.4** |

**Table 2.**
**Whether Students Indicated That They Were Credential-Seeking by Test-Taking Behavior, by College, and System-Wide**

| | Credential Seeking | | | | Not Credential Seeking | | | | Credential Seeking | | | Not Credential Seeking | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Took at Least One Test of Six | | | | Took at Least One Test of Six | | | | Took Reading, Sent Skills, and One Math | | | Took Reading, Sent Skills, and One Math | | | |
| | No | Yes | | Total | No | Yes | | Total | No | Yes | | No | Yes | | |
| Name of Institution | n | n | % | | n | n | % | | n | n | % | n | n | % | Grand Total |
| Asnuntuck | 32 | 78 | 70.9% | 110 | 211 | 66 | 23.8% | 277 | 35 | 75 | 68.2% | 216 | 61 | 22.0% | 387 |
| Capital | 215 | 37 | 14.7% | 252 | 244 | 15 | 5.8% | 259 | 226 | 26 | 10.3% | 250 | 9 | 3.5% | 511 |
| Gateway | 58 | 734 | 92.7% | 792 | 229 | 111 | 32.6% | 340 | 104 | 688 | 86.9% | 251 | 89 | 26.2% | 1,132 |
| Housatonic | 98 | 839 | 89.5% | 937 | 136 | 45 | 24.9% | 181 | 520 | 417 | 44.5% | 162 | 19 | 10.5% | 1,118 |
| Manchester | 133 | 462 | 77.6% | 595 | 127 | 199 | 61.0% | 326 | 592 | 3 | 0.5% | 323 | 3 | 0.9% | 921 |
| Middlesex | 24 | 284 | 92.2% | 308 | 286 | 201 | 41.3% | 487 | 46 | 262 | 85.1% | 318 | 169 | 34.7% | 795 |
| Norwalk | 133 | 349 | 72.4% | 482 | 259 | 240 | 48.1% | 499 | 153 | 329 | 68.3% | 283 | 216 | 43.3% | 981 |
| Naugatuck Valley | 17 | 759 | 97.8% | 776 | 333 | 75 | 18.4% | 408 | 759 | 17 | 2.2% | 397 | 11 | 2.7% | 1,184 |
| Northwestern Connecticut | 8 | 137 | 94.5% | 145 | 8 | 38 | 82.6% | 46 | 10 | 135 | 93.1% | 10 | 36 | 78.3% | 191 |
| Quinebaug Valley | 18 | 297 | 94.3% | 315 | 47 | 20 | 29.9% | 67 | 27 | 288 | 91.4% | 53 | 14 | 20.9% | 382 |
| Three Rivers | 16 | 452 | 96.6% | 468 | 22 | 79 | 78.2% | 101 | 24 | 444 | 94.9% | 24 | 77 | 76.2% | 569 |
| Tunxis | 62 | 408 | 86.8% | 470 | 123 | 110 | 47.2% | 233 | 83 | 387 | 82.3% | 140 | 93 | 39.9% | 703 |
| **System-Wide** | **814** | **4,836** | **85.6%** | **5,650** | **2,025** | **1,199** | **37.2%** | **3,224** | **2,579** | **3,071** | **54.4%** | **2,427** | **797** | **24.7%** | **8,874** |

**Table 3.**
**Numbers of Students in the Cohort Who Graduated, and Graduation Rates, by College and System-Wide, and by Credential-Seeking Status**

| | Credential Seeking Graduated? | | | | Not Credential Seeking Graduated? | | | | All Students Graduated? | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Name of Institution** | **No** | **Yes** | **% Yes** | **Total** | **No** | **Yes** | **% Yes** | **Total** | **No** | **Yes** | **% Yes** | **Total** |
| Asnuntuck | 78 | 32 | 41.0% | 110 | 252 | 25 | 9.9% | 277 | 330 | 57 | 14.7% | 387 |
| Capital | 205 | 47 | 22.9% | 252 | 240 | 19 | 7.9% | 259 | 445 | 66 | 12.9% | 511 |
| Gateway | 670 | 122 | 18.2% | 792 | 328 | 12 | 3.7% | 340 | 998 | 134 | 11.8% | 1,132 |
| Housatonic | 830 | 107 | 12.9% | 937 | 174 | 7 | 4.0% | 181 | 1,004 | 114 | 10.2% | 1,118 |
| Manchester | 482 | 113 | 23.4% | 595 | 291 | 35 | 12.0% | 326 | 773 | 148 | 16.1% | 921 |
| Middlesex | 254 | 54 | 21.3% | 308 | 437 | 50 | 11.4% | 487 | 691 | 104 | 13.1% | 795 |
| Norwalk | 413 | 69 | 16.7% | 482 | 448 | 51 | 11.4% | 499 | 861 | 120 | 12.2% | 981 |
| Naugatuck Valley | 664 | 112 | 16.9% | 776 | 383 | 25 | 6.5% | 408 | 1,047 | 137 | 11.6% | 1,184 |
| Northwestern Connecticut | 111 | 34 | 30.6% | 145 | 39 | 7 | 17.9% | 46 | 150 | 41 | 21.5% | 191 |
| Quinebaug Valley | 259 | 56 | 21.6% | 315 | 66 | 1 | 1.5% | 67 | 325 | 57 | 14.9% | 382 |
| Three Rivers | 399 | 69 | 17.3% | 468 | 93 | 8 | 8.6% | 101 | 492 | 77 | 13.5% | 569 |
| Tunxis | 391 | 79 | 20.2% | 470 | 218 | 15 | 6.9% | 233 | 609 | 94 | 13.4% | 703 |
| **System-Wide** | **4,756** | **894** | **18.8%** | **5,650** | **2,969** | **255** | **8.6%** | **3,224** | **7,725** | **1,149** | **12.9%** | **8,874** |

**Table 4.**
**Correlations Between Developmental Grades (A-F) and ACCUPLACER Scores**

| Correlation between: | Correlation Coefficient |
|---|---|
| English Grades and | |
| Reading | 0.18 |
| Sentence Skills | 0.18 |
| Essay | 0.02 |
| Math Grades and | |
| Arithmetic | 0.19 |
| Elementary Algebra | 0.15 |
| College Math | 0.00 |

**Table 5.**
**Number and Percentage Enrolling in Developmental Education, by College and System-Wide, and by Credential-Seeking Status**

| | Credential Seeking In Developmental | | | | Not Credential Seeking In Developmental | | | | All Students In Developmental | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Name of Institution** | **No** | **Yes** | **% Yes** | **Total** | **No** | **Yes** | **% Yes** | **Total** | **No** | **Yes** | **% Yes** | **Total** |
| Asnuntuck | 53 | 57 | 51.8% | 110 | 228 | 49 | 17.7% | 277 | 281 | 106 | 27.4% | 387 |
| Capital | 67 | 185 | 73.4% | 252 | 148 | 111 | 42.9% | 259 | 215 | 296 | 57.9% | 511 |
| Gateway | 160 | 632 | 79.8% | 792 | 246 | 94 | 27.6% | 340 | 406 | 726 | 64.1% | 1,132 |
| Housatonic | 204 | 733 | 78.2% | 937 | 132 | 49 | 27.1% | 181 | 336 | 782 | 69.9% | 1,118 |
| Manchester | 166 | 429 | 72.1% | 595 | 143 | 183 | 56.1% | 326 | 309 | 612 | 66.4% | 921 |
| Middlesex | 119 | 189 | 61.4% | 308 | 322 | 165 | 33.9% | 487 | 441 | 354 | 44.5% | 795 |
| Norwalk | 92 | 390 | 80.9% | 482 | 193 | 306 | 61.3% | 499 | 285 | 696 | 70.9% | 981 |
| Naugatuck Valley | 129 | 647 | 83.4% | 776 | 340 | 68 | 16.7% | 408 | 469 | 715 | 60.4% | 1,184 |
| Northwestern Connecticut | 30 | 115 | 79.3% | 145 | 13 | 33 | 71.7% | 46 | 43 | 148 | 77.5% | 191 |
| Quinebaug Valley | 69 | 246 | 78.1% | 315 | 51 | 16 | 23.9% | 67 | 120 | 262 | 68.6% | 382 |
| Three Rivers | 127 | 341 | 72.9% | 468 | 54 | 47 | 46.5% | 101 | 181 | 388 | 68.2% | 569 |
| Tunxis | 81 | 389 | 82.8% | 470 | 125 | 108 | 46.4% | 233 | 206 | 497 | 70.7% | 703 |
| **System-Wide** | **1,297** | **4,353** | **77.0%** | **5,650** | **1,995** | **1229** | **38.1%** | **3,224** | **3,292** | **5,582** | **62.9%** | **8,874** |

**Table 6.**
**Term of First Developmental Enrollment, for Students Who Took a Developmental Course**

| | | First Took Developmental Math | | First Took Developmental English | |
|---|---|---|---|---|---|
| **Year** | **Term** | **n** | **%** | **n** | **%** |
| 2001 | Fall | 3,022 | 72 | 3,026 | 82 |
| | Winter | 2 | 0 | 0 | 0 |
| 2002 | Spring | 519 | 12 | 284 | 8 |
| | Summer | 37 | 1 | 19 | 1 |
| | Fall | 246 | 6 | 125 | 3 |
| | Winter | 2 | 0 | 0 | 0 |
| 2003 | Spring | 111 | 3 | 68 | 2 |
| | Summer | 10 | 0 | 4 | 0 |
| | Fall | 84 | 2 | 59 | 2 |
| | Winter | 0 | 0 | 0 | 0 |
| 2004 | Spring | 48 | 1 | 28 | 1 |
| | Summer | 6 | 0 | 1 | 0 |
| | Fall | 51 | 1 | 27 | 1 |
| | Winter | 0 | 0 | 0 | 0 |
| 2005 | Spring | 23 | 1 | 17 | 0 |
| | Summer | 2 | 0 | 0 | 0 |
| | Fall | 28 | 1 | 11 | 0 |
| | Winter | 0 | 0 | 0 | 0 |
| 2006 | Spring | 20 | 0 | 9 | 0 |

**Table 7.**
**Gatekeeper English and Outcomes by First Developmental Level:**
**Declared Degree or Certificate Seekers Only**

| First Developmental Course Taken | | Attempted Gatekeeper English | | Passed Gatekeeper English | | Median Credits Accumulated | Earned Certificate or Associate Degree | | Highest Award: Certificate | | Highest Award: Associate Degree | | ACCUPLACER Reading Test | | ACCUPLACER Sentence Skills Test | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | n | n | % | n | % | | n | % | n | % | n | % | n | median | n | median |
| None | 2,539 | 1,689 | 67% | 1,184 | 47% | 14.5 | 465 | 18% | 79 | 3% | 386 | 15% | 1,855 | 86 | 1,402 | 93 |
| 1 level below college | 1,567 | 1,021 | 65% | 734 | 47% | 18.0 | 238 | 15% | 44 | 3% | 194 | 12% | 1,374 | 73 | 911 | 76 |
| 2 levels below college | 1,339 | 752 | 56% | 503 | 38% | 15.0 | 178 | 13% | 37 | 3% | 141 | 11% | 1,075 | 58 | 714 | 54 |
| 3 levels below college | 205 | 90 | 44% | 56 | 27% | 9.0 | 13 | 6% | 2 | 1% | 11 | 5% | 162 | 40 | 102 | 50 |
| **Total** | **5,650** | **3,552** | **63%** | **2,477** | **44%** | **15.0** | **894** | **16%** | **162** | **3%** | **732** | **13%** | **4,466** | **74** | **3,129** | **79** |

**Table 8.**
**Gatekeeper Math and Outcomes by First Developmental Level:**
**Declared Degree or Certificate Seekers Only**

| First Developmental Course Taken | | Attempted Gatekeeper Math | | Passed Gatekeeper Math | | Median Credits Accumulated | Earned Certificate or Associate Degree | | Highest Award: Certificate | | Highest Award: Associate Degree | | ACCUPLACER Arithmetic Test | | ACCUPLACER Elementary Algebra Test | | ACCUPLACER College Math Test | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | n | n | % | n | % | | n | % | n | % | n | % | n | median | n | median | n | median |
| None | 2,117 | 614 | 29% | 405 | 19% | 12 | 366 | 17% | 76 | 4% | 290 | 14% | 834 | 47 | 1,402 | 57 | 523 | 30 |
| 1 level below college | 1,328 | 440 | 33% | 254 | 19% | 24 | 267 | 20% | 27 | 2% | 240 | 18% | 578 | 68 | 1144 | 38 | 125 | 22 |
| 2 levels below college | 1,992 | 446 | 22% | 252 | 13% | 15 | 251 | 13% | 57 | 3% | 194 | 10% | 1,716 | 31 | 1023 | 28 | 101 | 18 |
| 3 levels below college | 213 | 6 | 3% | 2 | 1% | 10 | 10 | 5% | 2 | 1% | 8 | 4% | 203 | 29 | 206 | 24 | 0 | NA |
| **Total** | **5,650** | **1,506** | **27%** | **913** | **16%** | **10** | **894** | **16%** | **162** | **3%** | **732** | **13%** | **3,331** | **35** | **3,775** | **36** | **749** | **26** |

# Appendix B: Figures

Fig. 1a. Developmental English Success & Score Distribution

Accuplacer Reading Test: Entire System (n=3084)

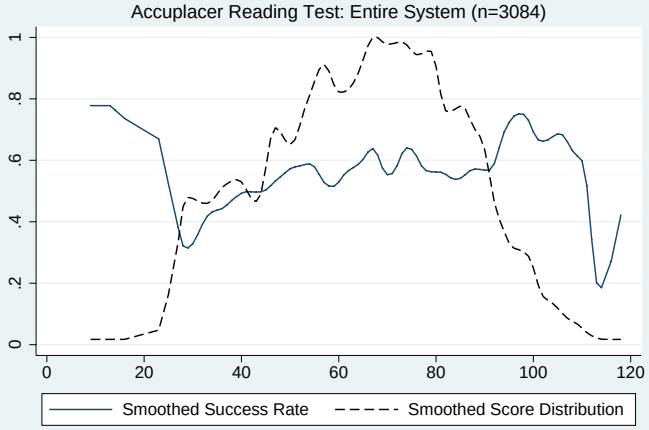



Fig. 1b. Developmental English Success & Score Distribution

Accuplacer Sentence Skills Test: Entire System (n=2077)

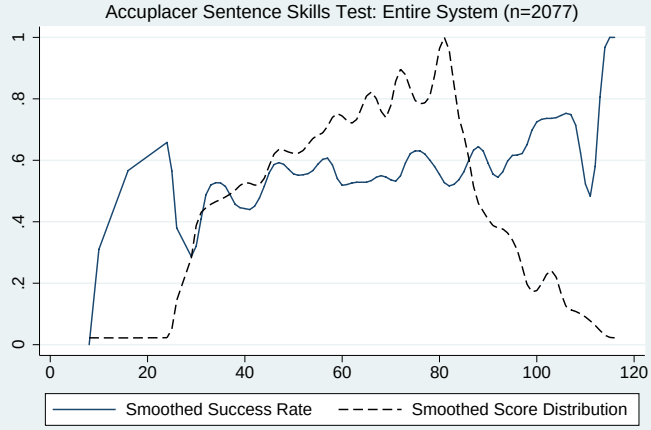



Fig. 1c. Developmental Math Success & Score Distribution

Accuplacer Arithmetic Test: Entire System (n=2963)

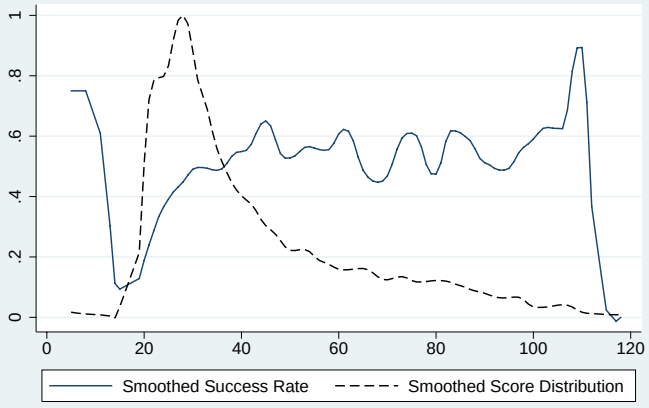



Fig. 1d. Developmental Math Success & Score Distribution

Accuplacer Elementary Algebra Test: Entire System (n=2781)

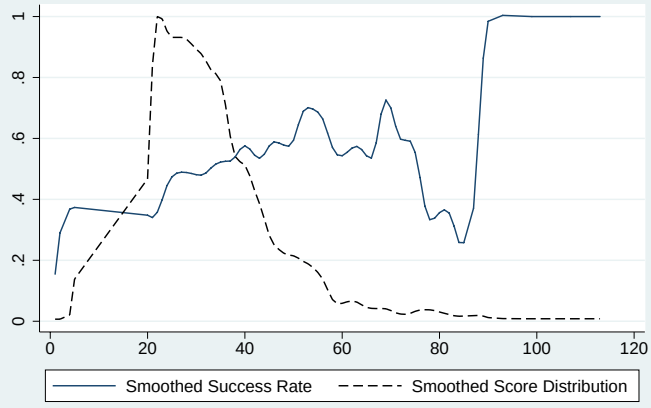



Fig. 1e. Developmental Math Success & Score Distribution

Accuplacer College Math Test: Entire System (n=248)

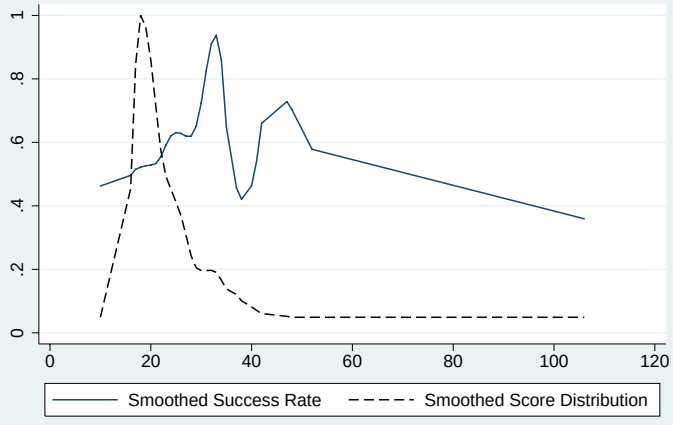


Fig. 2a. Gatekeeper English Success & Score Distribution

Accuplacer Reading Test: Entire System (n=3594)


Fig. 2b. Gatekeeper English Success & Score Distribution

Accuplacer Sentence Skills Test: Entire System (n=2620)

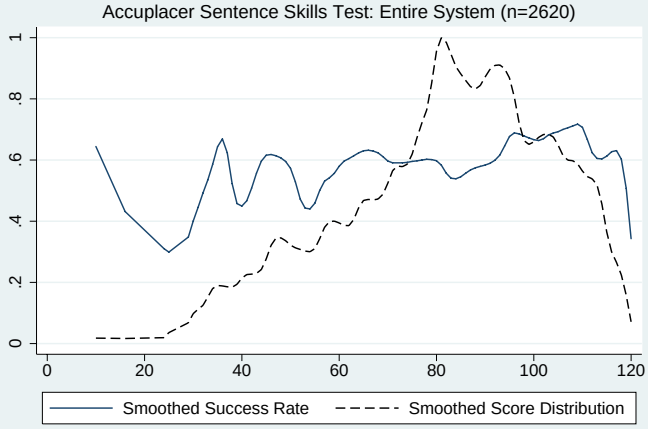



Fig. 2c. Gatekeeper Math Success & Score Distribution

Accuplacer Arithmetic Test: Entire System (n=863)

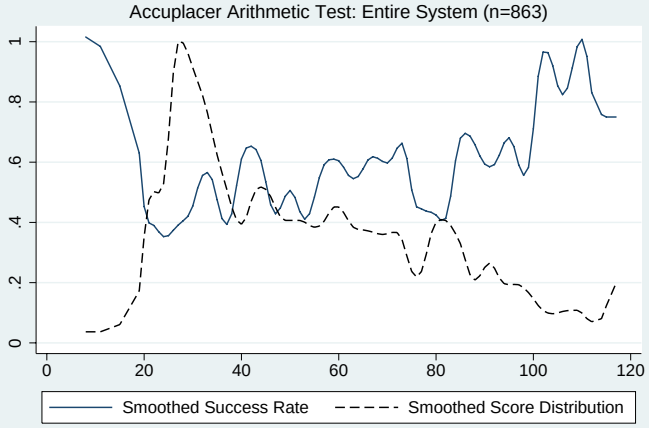



Fig. 2d. Gatekeeper Math Success & Score Distribution

Accuplacer Elementary Algebra Test: Entire System (n=1392)

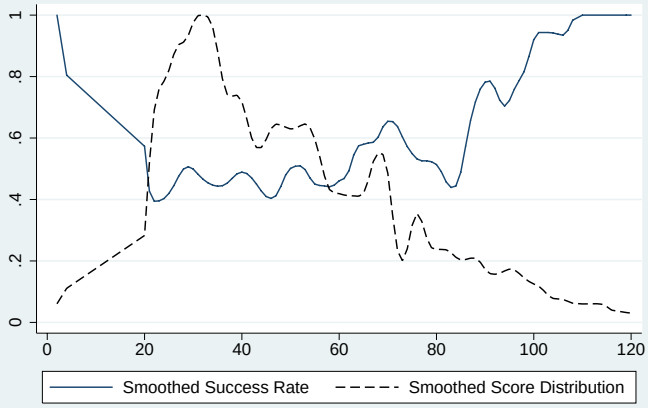
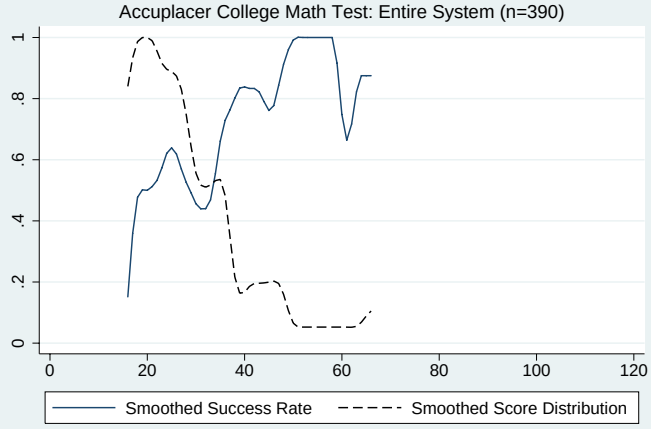



Fig. 2e. Gatekeeper Math Success & Score Distribution

Accuplacer College Math Test: Entire System (n=390)



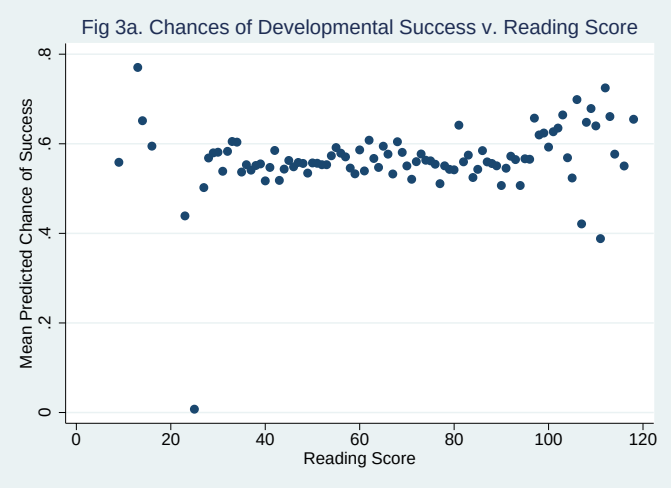


Fig 3a. Chances of Developmental Success v. Reading Score
Mean Predicted Chance of Success
0
.2
.4
.6
.8
0
20
40
60
80
100
120
Reading Score

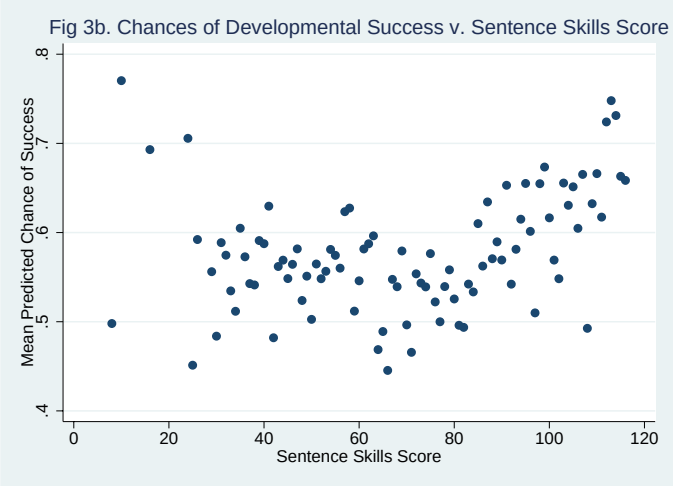


Fig 3b. Chances of Developmental Success v. Sentence Skills Score
Mean Predicted Chance of Success
.4
.5
.6
.7
.8
0
20
40
60
80
100
120
Sentence Skills Score

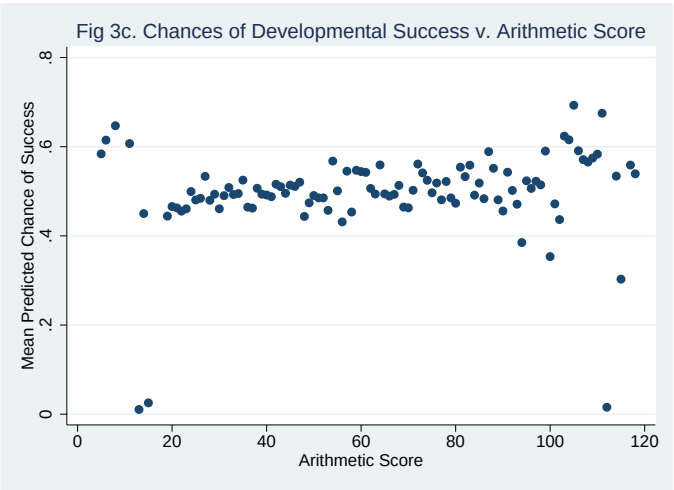


Fig 3c. Chances of Developmental Success v. Arithmetic Score
Mean Predicted Chance of Success
0
.2
.4
.6
.8
0
20
40
60
80
100
120
Arithmetic Score

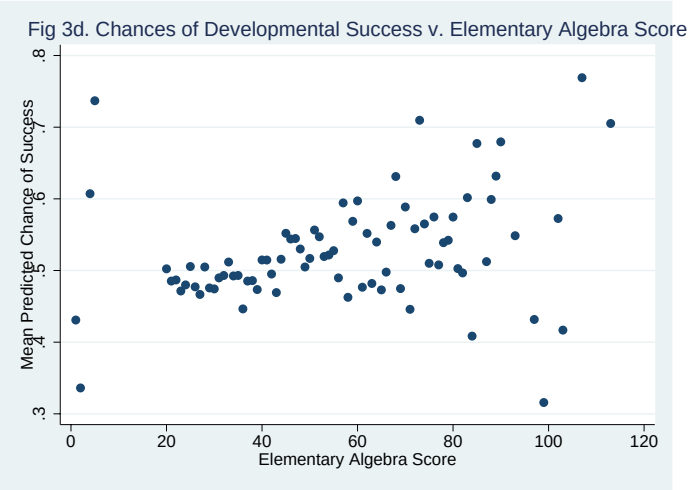


Fig 3d. Chances of Developmental Success v. Elementary Algebra Score
Mean Predicted Chance of Success
.3
.4
.5
.6
.7
.8
0
20
40
60
80
100
120
Elementary Algebra Score

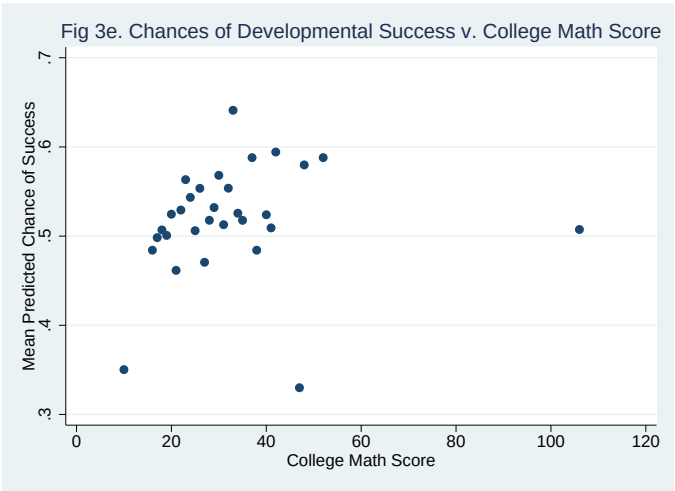


Fig 3e. Chances of Developmental Success v. College Math Score
Mean Predicted Chance of Success
.3
.4
.5
.6
.7
0
20
40
60
80
100
120
College Math Score

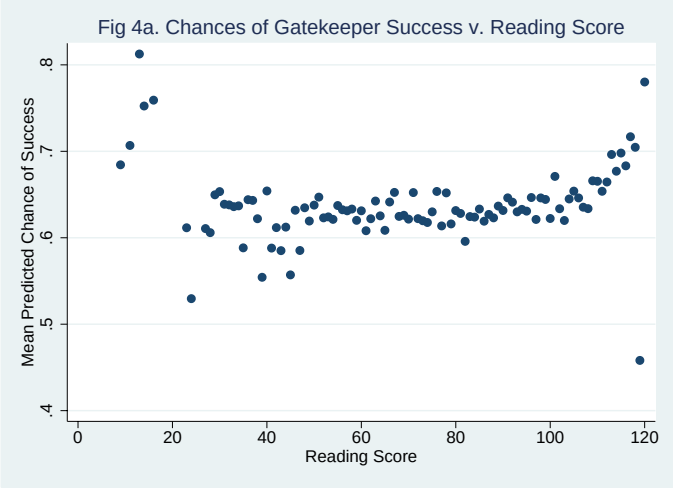


Fig 4a. Chances of Gatekeeper Success v. Reading Score
Mean Predicted Chance of Success
.4
.5
.6
.7
.8
0
20
40
60
80
100
120
Reading Score

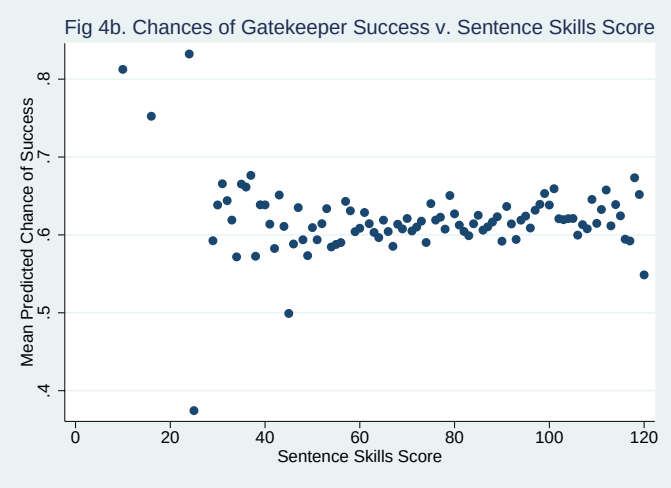


Fig 4b. Chances of Gatekeeper Success v. Sentence Skills Score
Mean Predicted Chance of Success
.4
.5
.6
.7
.8
0
20
40
60
80
100
120
Sentence Skills Score

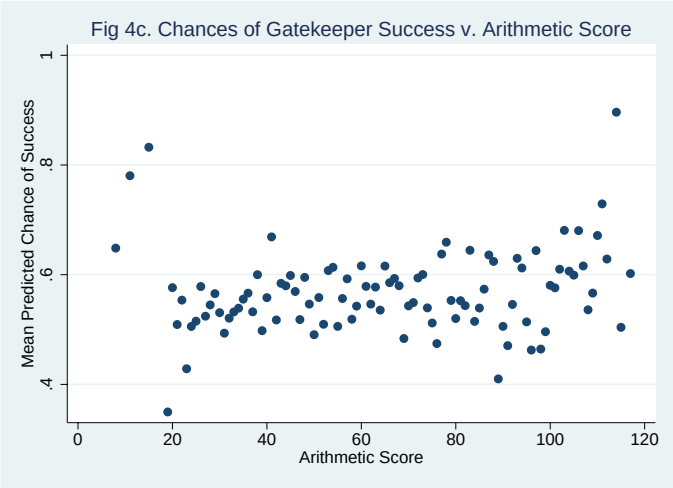


Fig 4c. Chances of Gatekeeper Success v. Arithmetic Score
Mean Predicted Chance of Success
.4
.6
.8
1
0
20
40
60
80
100
120
Arithmetic Score

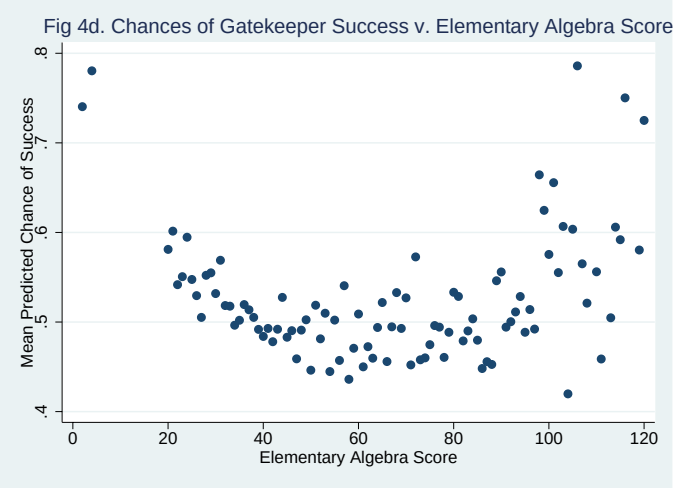


Fig 4d. Chances of Gatekeeper Success v. Elementary Algebra Score
Mean Predicted Chance of Success
.4
.5
.6
.7
.8
0
20
40
60
80
100
120
Elementary Algebra Score

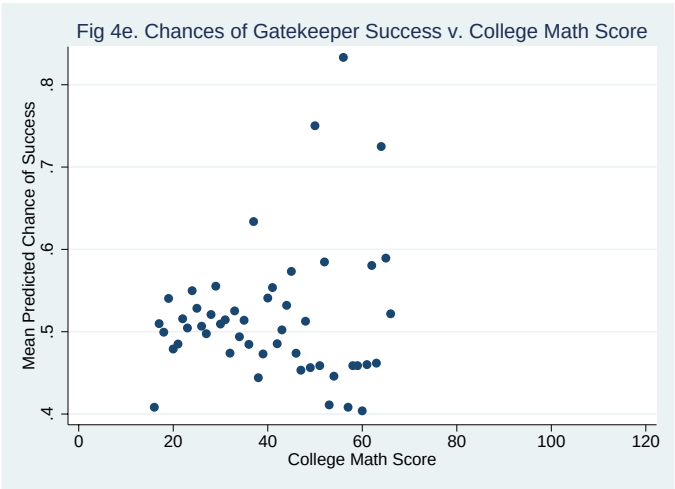


Fig 4e. Chances of Gatekeeper Success v. College Math Score
Mean Predicted Chance of Success
.4
.5
.6
.7
.8
0
20
40
60
80
100
120
College Math Score

Fig. 5a. Credential Completion Rate & Score Distribution

Reading Test: (n=5522)

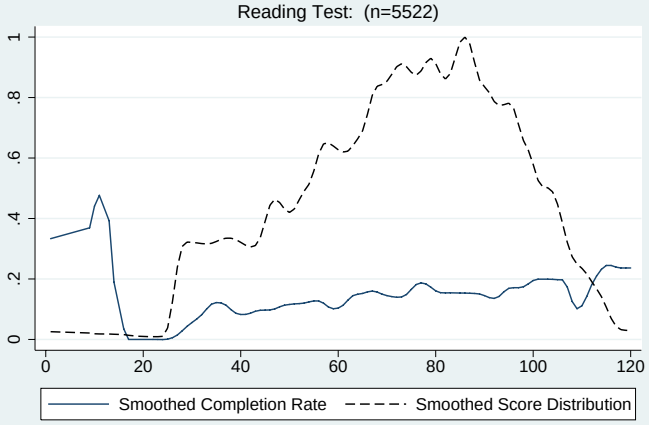



Fig. 5b. Credential Completion Rate & Score Distribution

Sentence Skills Test: (n=3959)

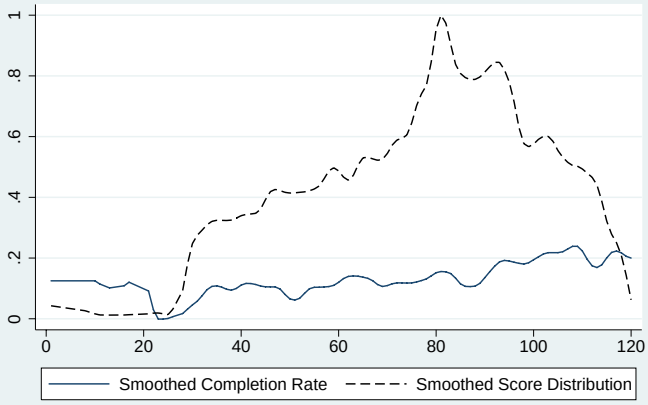



Fig. 5c. Credential Completion Rate & Score Distribution

Arithmetic Test: (n=4140)

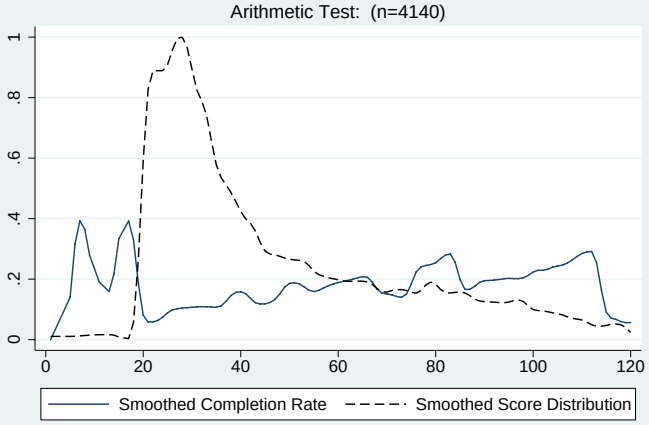



Fig. 5d. Credential Completion Rate & Score Distribution

Elementary Algebra Test: (n=4660)

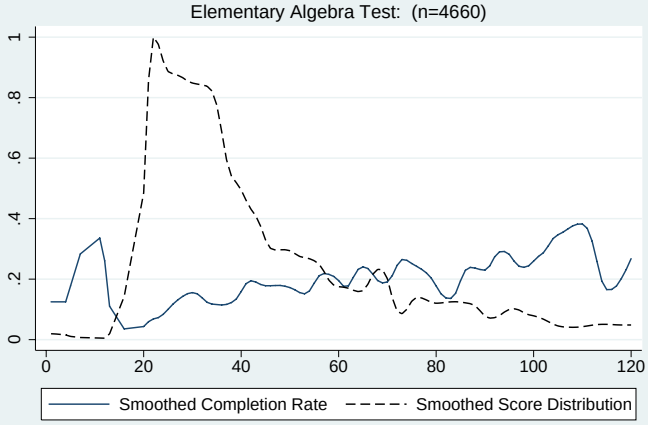



Fig. 5e. Credential Completion Rate & Score Distribution

College Math Test: (n=935)

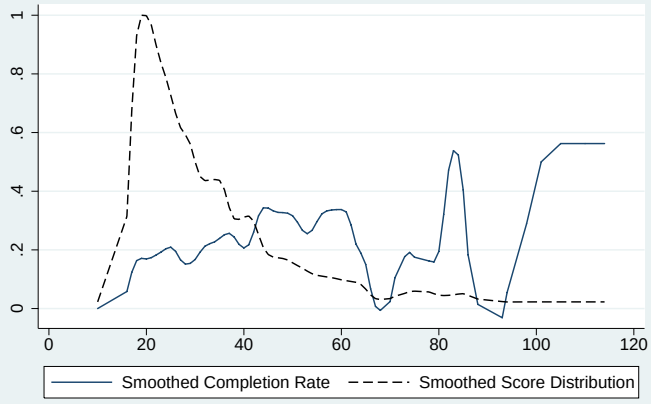


Fig. 6a. Gatekeeper English Success Rate & Score Distribution

No Developmental English; Reading Test: (n=1381)

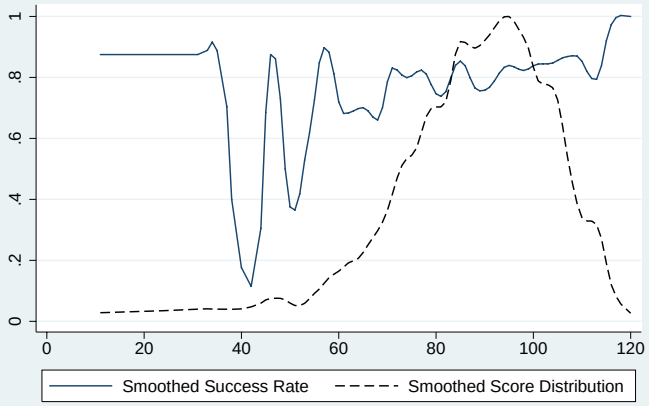



Fig. 6b. Gatekeeper English Success Rate & Score Distribution

No Developmental English; Sentence Skills Test: (n=1033)

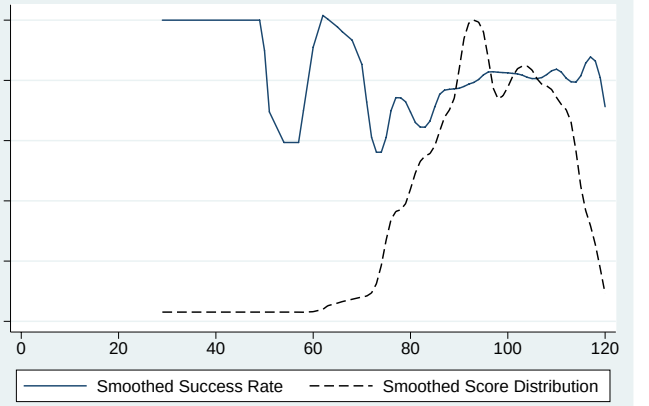



Fig. 6c. Gatekeeper Math Success Rate & Score Distribution

No Developmental Math; Arithmetic Test: (n=163)

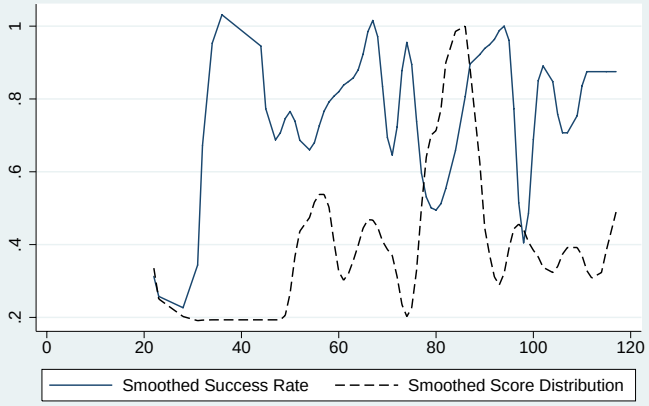



Fig. 6d. Gatekeeper Math Success Rate & Score Distribution

No Developmental Math; Elementary Algebra Test: (n=640)

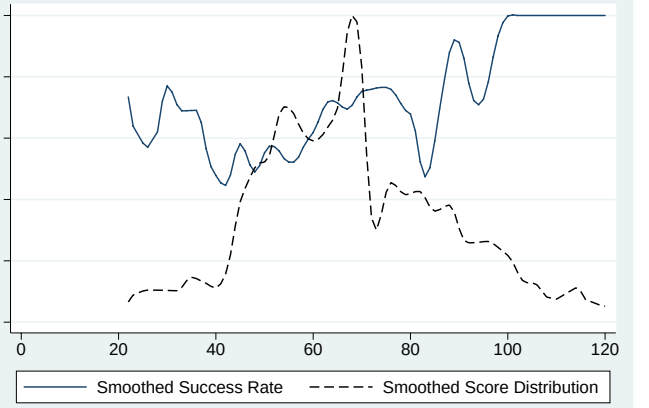



Fig. 6e. Gatekeeper Math Success Rate & Score Distribution

No Developmental Math; College Math Test: (n=290)

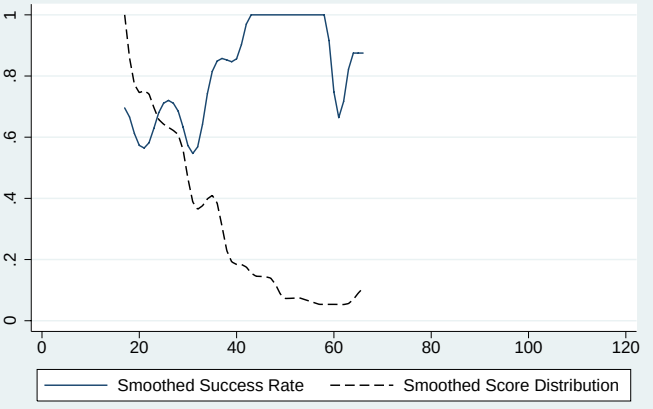


Fig. 7a. Developmental English Enrollment & Score Distribution

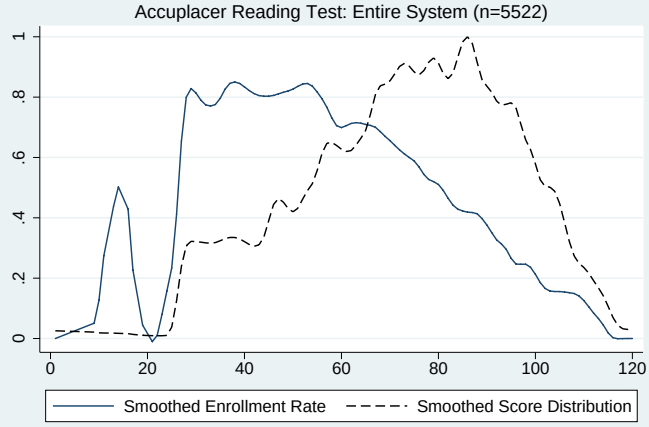



Fig. 7b. Developmental English Enrollment & Score Distribution

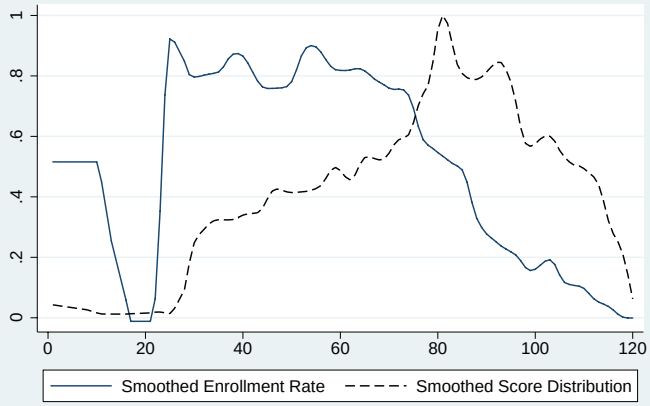



Fig. 7c. Developmental Math Enrollment & Score Distribution

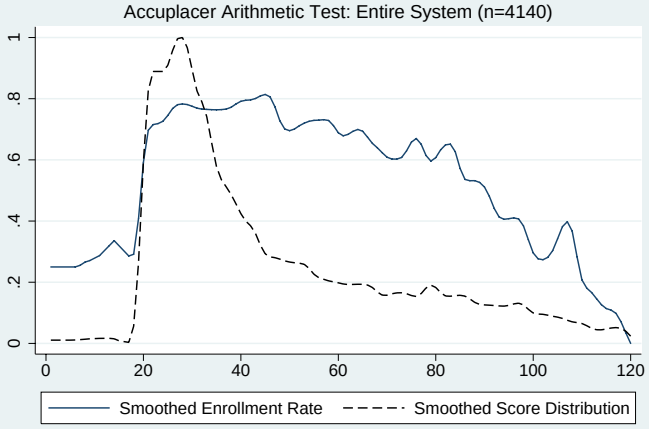



Fig. 7d. Developmental Math Enrollment & Score Distribution

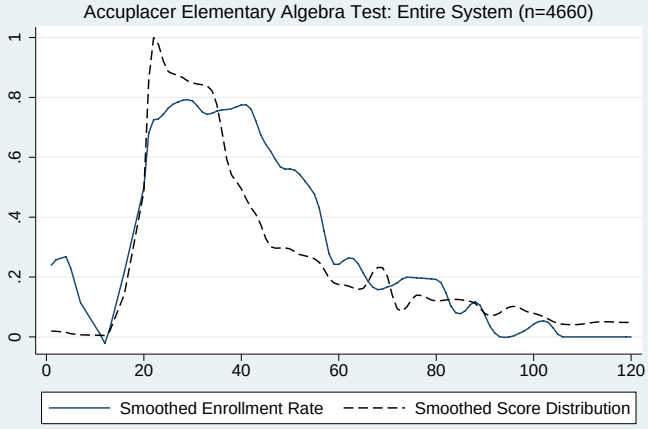



Fig. 7e. Developmental Math Enrollment & Score Distribution