COLLEGE OF THE CANYONS

Research Brief #134
June 2018

Math Disjunctive Placement Success 2016-17

Preeta Saxena, Ph.D., Daylene Meuschke, Ed.D. & Barry Gribbons, Ph.D.

This report presents the success rates related to the new Math placement changes which included disjunctive methods of placing students using self-reported information on high school GPA, last Math course and grade in last Math course. These changes were implemented in spring of 2016 for students who were placing into courses for the subsequent year (2016 fall, 2017 winter, and 2017 spring).

The impact of these changes were substantial.
- Disjunctive transfer-level placement was 407% times higher for the statistics pathway (14% to 71%) and 107% higher for the STEM pathway (14% to 29%) compared to the traditional (Accuplacer-based) placement model.
- The disjunctive model completely eliminated racial/ethnic disproportionate impact for statistics transfer placement and reduces it for STEM transfer placement. For the statistics pathway, compared to the traditional model, Latinx students' transfer placement increased from 9 to 66%, and from 9 to 60% for African-American/Black students. For placement into transfer-level on the STEM pathway, there was an increase of 160% for Latinx students and an increase of 70% for African-American/Black students.

For a detailed description of the changes to, and the impact of the placement model, refer to RB#120.

The following research questions guided this analysis:
1. How do course success rates in fall 2016 compare to rates prior to when the new disjunctive placement model was implemented?
2. What are the success rates for students who are 'newly' placed into Math courses using the disjunctive placement method?
3. What are success rates for Introductory Statistics in which students were directly placed based on GPA, prior coursework, and grade in prior course?
4. How does recency affect success in Math courses?
5. How did the changes affect 1-year transfer-level Math completion by race/ethnicity and financial aid status?

Method

Placement reports from Informer for students who assessed between March 7th 2016 and Feb 29th 2017, were merged with the grades report in Informer for Math courses. These records were for those students who were placed through the new model of Math placement and subsequently enrolled in their first Math course either in fall 2016, winter 2017 or spring 2017.

Results

Math placement and course enrollment records for 2,624 students were assessed for the 1-year period.

Success Rates

The first analysis examined overall success rates per course for the fall 2016 term compared to prior fall terms going as far back as fall 2012 in order to assess whether overall success rates were affected by performance of students who were placed through the disjunctive model. Figure 1 provides the comparison

for course success rates between fall terms prior to changes (2012-2015) and the fall term after changes (2016). The 'before' rates are a combined weighted average of course success rates in fall 2012, 2013, 2014 and 2015.

With regard to below-transfer courses, MATH-075 (Interm. Alg. for Statistics), had either higher or similar success rates in fall 2016 as compared to the prior terms. There was a substantial dip in success rates for MATH-058/059 (Alg. Prep) (62% vs. 50%) and for MATH-070 (Interm. Alg.) (56% vs. 38%) and these fall 2016 rates were the **lowest** in the last 4 years. Transfer-level course success rates were similar or higher for MATH-102 (Trigonometry), MATH-104 (Pre-calculus) and MATH-140 (Intro. Statistics). Drops in success rates were seen for MATH-103 (College Algebra) (60% vs. 55%) and MATH-211 (63% vs. 61%); however, transfer-level fall 2016 rates were not below the lowest rate in the 4 years prior.
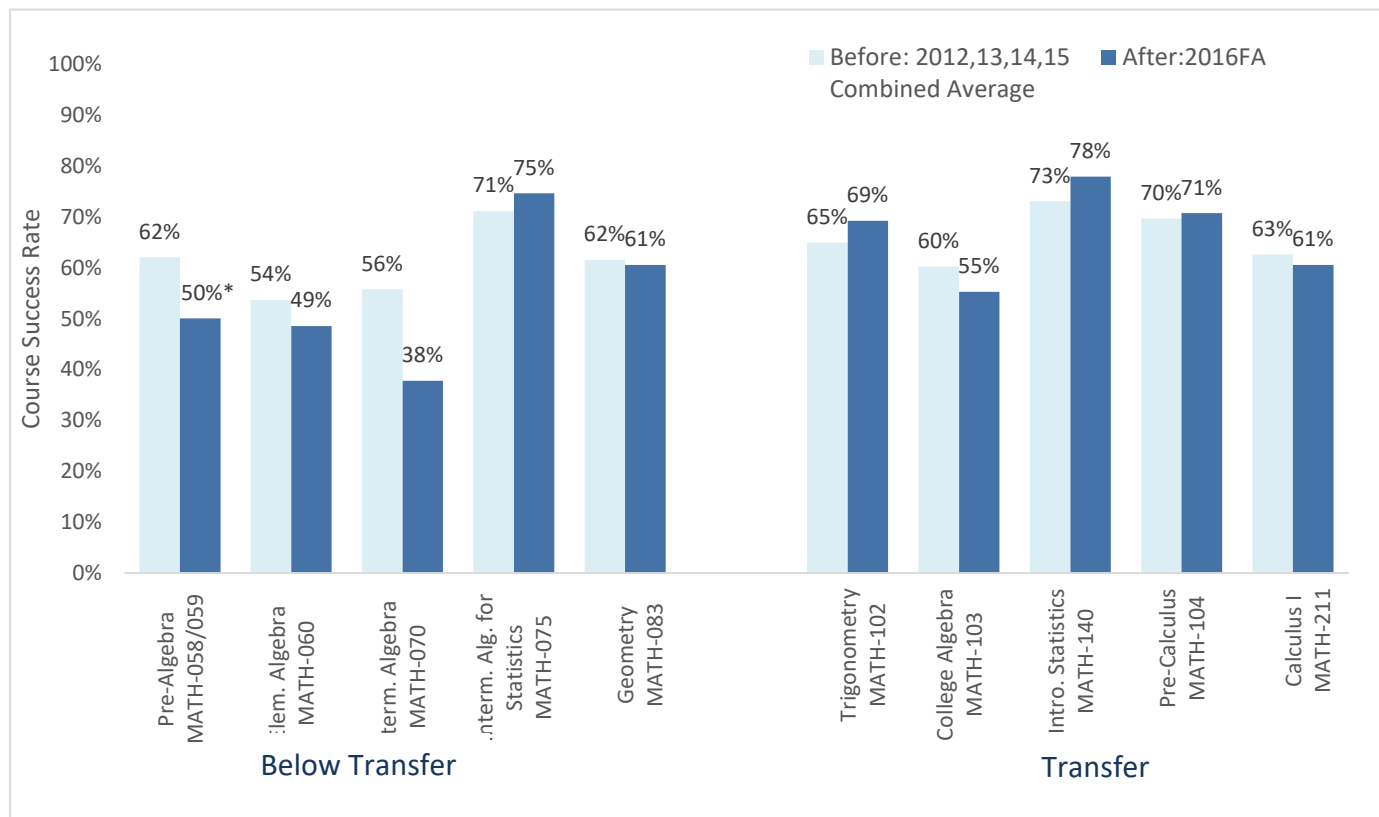

*Figure 1 Success Rates for fall term math courses before changes (2012-13-14-15) vs. After 2016. *This decrease in the success rate for MATH-058/059 can be attributed to the change in the Math sequence in fall 2015 where Arithmetic was removed and Pre-Algebra became the lowest level.*

Further analyses of success rates consisted of comparisons between those who placed through the new disjunctive model and those students who were in the course otherwise (i.e. through the sequence, through transfer eligibility etc.). Figures 2 and 3 provide the success rates of the "newly placed"- dark-shade bars, and "other", light-shade bars for the full year of 2016-17 (fall, winter and spring terms). In below transfer-level courses, those who placed had lower success rates in Interm. Alg. (32% vs. 47%), Interm. Alg. for statistics (68% vs. 80%) and Geometry (57% vs. 62%), compared to other students in these courses. The most striking difference was for Interm. Alg. (-070) where those who placed had a success rate that was 15 percentage points lower.
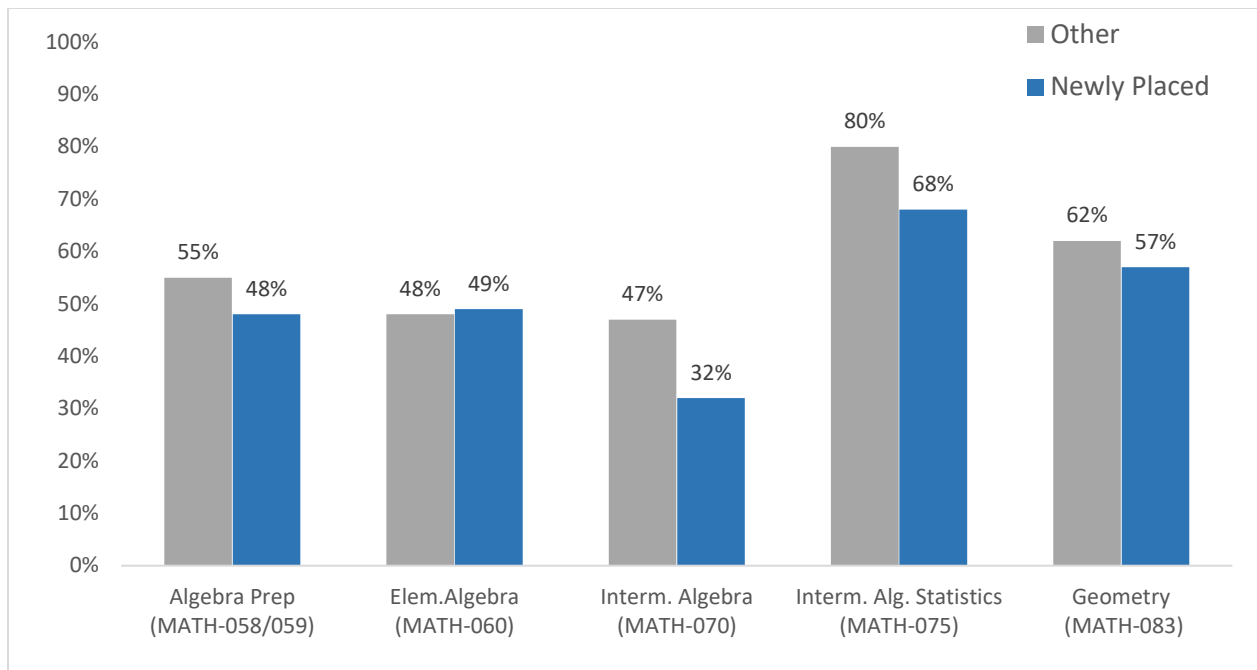
Figure 2 Below Transfer-level Course Success Rates 2016-17

In Transfer-level courses, those who are "newly placed" had similar or higher success rates compared to other students in the same courses with the exception of Statistics (MATH-140). New placements in Statistics (-140) had a success rate that was 10 percentage points lower than 'other' students (70% vs. 83%). This group of students included those who would have formerly placed below transfer-level (i.e. Arithmetic, Pre-Algebra and Elementary Algebra and Intermediate Algebra).
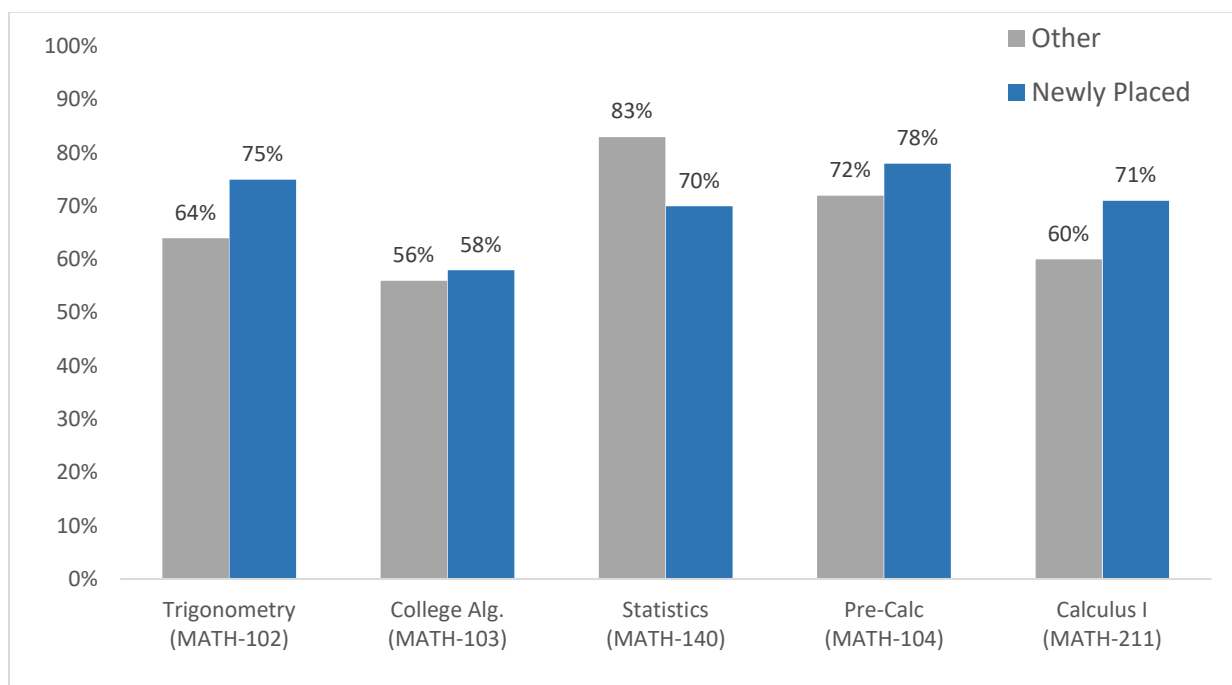

Figure 3 Transfer-level Course Success Rates

Direct Placement Success

One substantive change to the placement process was direct placement into Statistics for students who met any *one* of the following criteria:

- High School GPA ≥ 3.0
- GPA ≥ 2.7 and Algebra II or higher with C or better
- GPA ≥ 2.7 and Algebra 1B or Geometry with B- or better
- Trigonometry or Statistics or PreCalc/Calc with C or better
- Algebra II with B- or better

Students received up to two placements which are referred to as a) Statistics Direct placement and b) STEM placement. The STEM placement is based on *either* Accuplacer score and Multiple Measure weights, *or* high school GPA, prior Math course and grade in prior Math course as part of placement floors. Students meeting certain criteria are not placed in a level of Math lower than the last one they successfully completed.

Of the 2,624 students who placed and enrolled in Math, 1,855 received direct placement into Statistics, and of these, 501 students enrolled in it as their first course. Success rates for these students who self-reported one of the above-stated criteria and were given eligibility to enroll in Statistics (MATH-140) were examined. Figure 6 provides these success rates categorized by the students' STEM placement.

The lower the STEM placement was, the lower the success rate was in Statistics. Students who received a STEM placement in the lowest level Math course had a success rate of 44% in Statistics. (Students who had a Pre-Algebra, MATH-058 placement and enrolled in Pre-Algebra, had a success rate of 48% as indicated in Figure 2.) Students who would have placed in the second to lowest level (Elementary Alg.), completed Statistics at a rate of 59% in their first-semester.
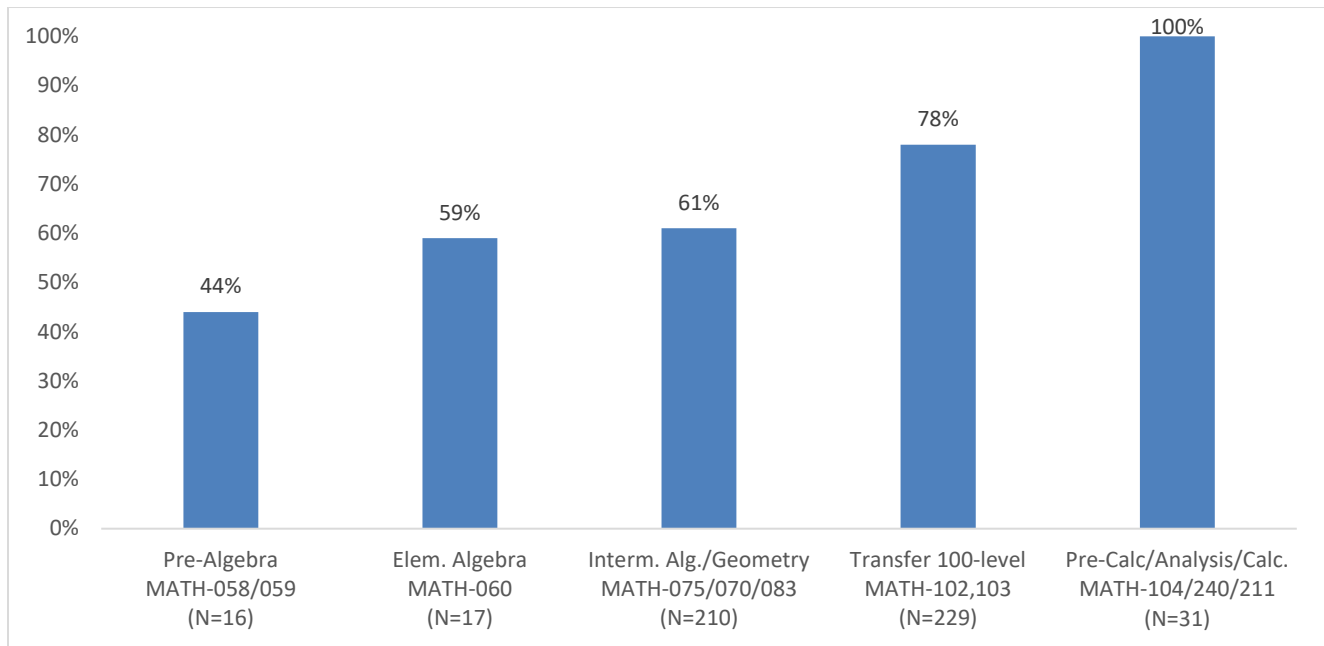

Figure 4 Success rate in Intro. Statistics (MATH-140) for those who received Direct Placement BY STEM placement

Recency
Since this data is reflective of the first time these changes to Math placement were implemented, the background questions that students answered during the placement assessment included an item on the *recency* of prior coursework and GPA. Particularly, the question asked, "How long has it been since you last participated in formal education in high school or college?" Among those who place and enrolled in their first math course, the most frequent response was 'less than 2 years' (86%). The other three categories were indicated as follows: 2 to 5 years (7%), 5 to 7 years (3%), and more than 7 years (4%).

The measure of recency was further examined for association with success in Math course. Success in Math course did not vary significantly with regard to how recently students indicated having participated in formal education ($\chi^2(3)= 4.81$; $p =.186$). Figure 6 presents success in first Math course by the level of recency indicated. Success rates by recency were also disaggregated by specific Math course and did not yield consistent differences within each course level.

Specific Math course grades were statistically associated with recency ($\chi^2(12)= 23.21$; $p < .05$). Being further away from formal education (5 years of more) is associated with higher rates of A/Bs in the first Math course compared to students who were away for 2 years or less. Proportions for each course grade within each *recency* level are presented in Figure 5.
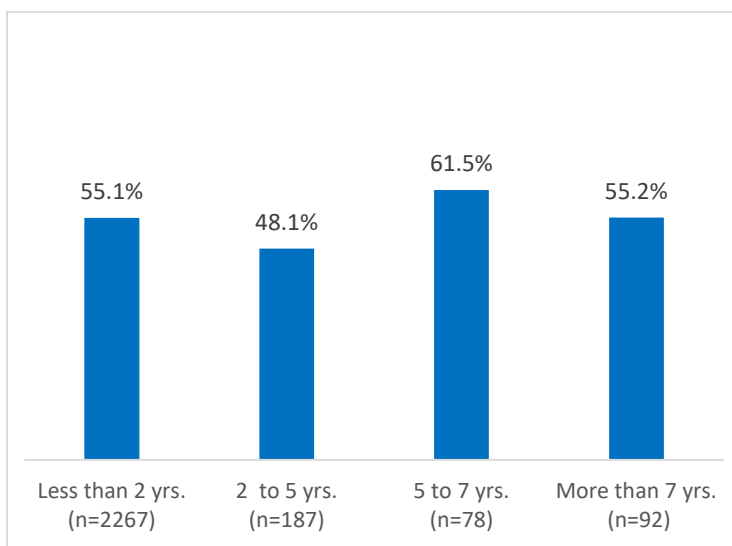

Figure 5 Success Rate* in first Math course by Recency Level. *denominator includes grades of F, FW, D, W, NP, P, I
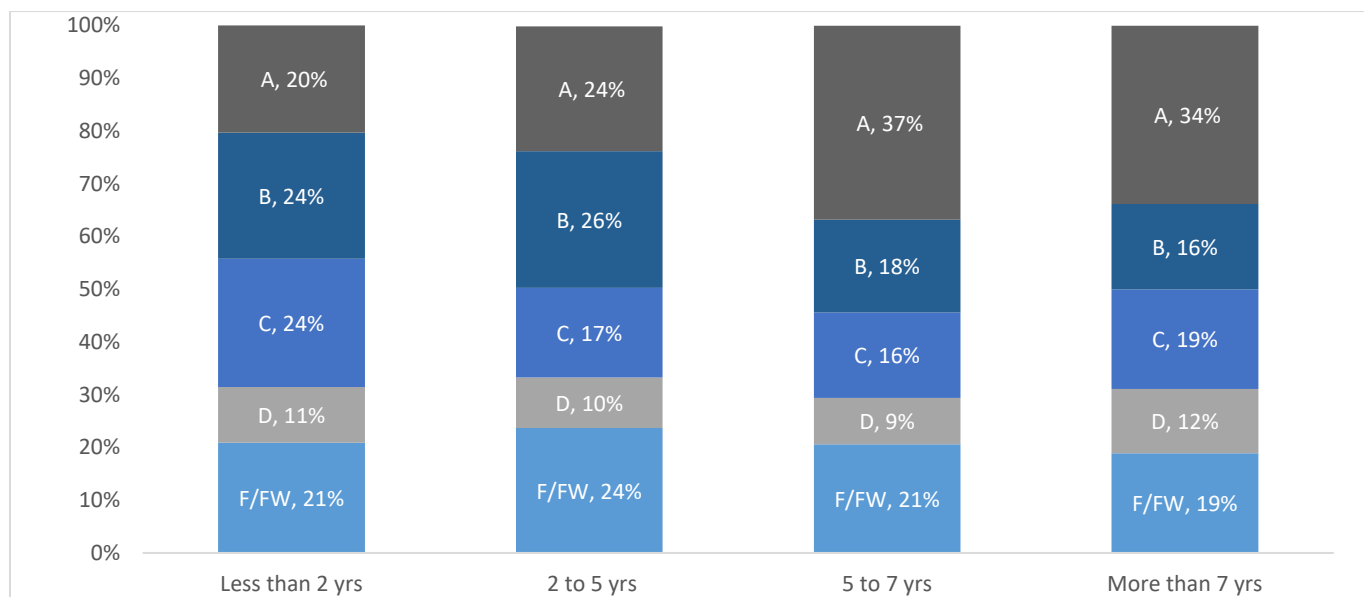

Figure 6 Math Course Grade by Recency Level* *Excludes grades of I, NP, P

Transfer Math Completion

As a metric for assessing student progress toward completion, transfer math course completion was examined for students in the cohort preceding the placement changes (2015 fall incoming) compared to those who placed with the new disjunctive model.

Fall 2015 incoming students (those who placed and subsequently enrolled in their first math course) had 1-year transfer-level completion rate of 21%. Comparatively, incoming students in fall 2016, had a 1-year transfer-level completion rate of 33%. The largest increase was among Latinx students whose rate of 1-year transfer completion increase by 73%. For economically disadvantaged students (i.e. receiving PELL or BOGW), there was an 80% increase.

These rates include those who started in Transfer-level. Among students who started below-transfer level in 2015, transfer-completion was 10% (n=2,108) and in 2016 transfer completion rate was 16% (n=1,896).
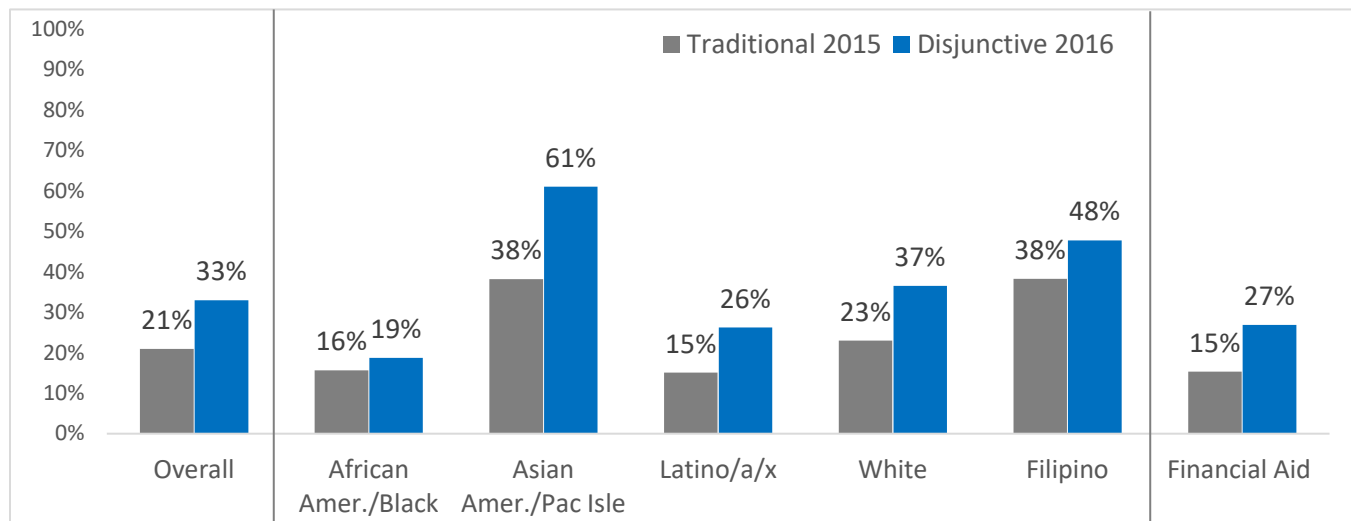

Figure 7 Transfer-Math completion in 1-year

*Table 1 Group sizes for Figure 7 *Total is not the sum of all ethnicity/race groups because some groups were excluded due to small sample sizes (e.g. Unknown, Native-American, Other)*

	2015 N	2016 N
African American	166	144
Asian American/Pac Isle	157	185
Latinx	1316	1319
White	918	782
Filipino	154	136
Financial Aid	1,492	1,430
Total*	2,768	2,624

Recommendations

- Consider making changes to placement with regard to low success rates in Intermediate Algebra (Math-070) among placers.
- Consider changes for improving success in Intermediate Algebra (Math-070).
- Track Statistics enrollment (Math-140) for students receiving direct placement.
- Conduct analyses on the predictive value of multiple measures on successful completion of Math courses (e.g. H.S. GPA, Math coursework).

For more detailed information on this research brief, stop by the Institutional Research, Planning, and Institutional Effectiveness office located in BONH-224, or contact Preeta Saxena, Senior Research Analyst at 661.362.3072, or Daylene Meuschke, Dean of Institutional Research, Planning and Institutional Effectiveness at 661.362.5329.