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A Synthesis of Two Experimental Evaluations

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For more information about CAPR, visit postsecondaryreadiness.org.

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Overview

Around 40 percent of students who enter community college are thought to be academically underprepared for college-level coursework. Many community colleges require these students to complete noncredit developmental courses before taking college-level courses. While developmental courses may prepare some students for college-level work, research suggests that many students are being referred to these courses unnecessarily, resulting in a loss of time and money that could have been put toward earning a college credential.

Historically, colleges have used standardized testing to determine whether a student is ready for college-level work or requires developmental courses first, but this method has been criticized as inaccurate. To obtain more accurate placements, nearly three-quarters of colleges now use multiple measures assessment (MMA) systems. These systems typically do consider students' scores on standardized tests, but they also incorporate additional measures of academic preparedness such as high school grade point average (GPA).

This report synthesizes findings from two studies that compare the effects of traditional test-only course placement to MMA course placement. These studies, conducted by the Center for the Analysis of Postsecondary Readiness (CAPR), involved 12 community colleges across three states (New York, Wisconsin, and Minnesota) and 29,999 students. Students were randomly assigned to either a test-only placement group or an MMA placement group, and their subsequent academic outcomes were compared.

The main findings from this analysis are:

- **For most students, the course placement systems "agreed," so their placement system assignment was inconsequential.** Although students were randomly assigned to either a test-only or an MMA placement group, and this assignment dictated their actual course placement, data were collected on how students would have been placed under each system. Using these data, this analysis found that for 81 percent of the total math sample and 68 percent of the total English sample, the test-only and MMA placement systems "agreed"—that is, they referred students to the same level of coursework. Faculty generally set the thresholds for the MMA measures high enough to avoid dramatically increasing the number of students placed into college-level courses. It can be concluded that these students were not affected by the placement system used; they would have had the same experience under either system.
- **MMA improved academic performance when it allowed students to bypass a developmental course they otherwise would have been required to take.** Students who benefited from MMA met the following criteria: (1) The systems disagreed on how they should be placed, with the MMA system recommending college-level courses and the test-only system recommending developmental courses, and (2) They were randomly assigned to the MMA group. Typically, such students had relatively low test

scores but relatively high GPAs, compared with students placed directly into college coursework in test-only placement systems. This group of students—designated the "bump-up" group—was approximately 8 percentage points more likely to pass a college-level course in the tested subject and earned, on average, 2.0 more credits than counterparts who met the first criterion above but were assigned to the test-only group. MMA placement also appeared to increase the likelihood of earning a degree or transferring to a four-year school by 1.5 percentage points—a promising though not statistically significant effect.

- **MMA had a negative impact on academic performance when it imposed a developmental course requirement on students who would otherwise have been placed directly into a college-level course.** In an inverse of the situation in which students benefited from MMA, students whose academic performance was negatively impacted by MMA met the following criteria: (1) The two systems "disagreed" about placement, with the MMA system recommending developmental courses and the test-only system recommending college-level courses, and (2) The students were randomly assigned to the MMA group. Typically, such students had relatively high test scores and relatively low GPAs, compared with students placed directly into college coursework in test-only placement systems. This group of students—designated the "bump-down" group—had negative academic outcomes compared with their counterparts who met the first criterion above but were assigned to the test-only group. Bumping-down occurred only in the New York colleges study. At the Wisconsin and Minnesota schools, students who qualified for college-level courses in the test-only system were placed in those courses, regardless of MMA system results. The same is true for most colleges today that use MMA placement systems.

- **The evidence shows that referring more students directly to college-level courses is more important than a placement system that better predicts success in college-level courses.** In the studies in this analysis, MMA predicted success in college-level courses better than test-only placement systems did. However, this analysis indicates that MMA led to better outcomes not because of improved predictions but because it allowed more students to proceed directly to college-level courses. This conclusion arises from the fact that only students who bypassed a developmental requirement due to MMA—and not those who had a requirement added due to MMA—experienced better outcomes. This trend was even true for the least prepared students in the sample (students with high school GPAs below 3.0). Therefore, the evidence from this analysis is that colleges can improve student outcomes by increasing the number of students they place directly into college-level courses.

- **The cost to a college of implementing MMA is small. For students and society, MMA saves money because students take fewer courses but end up with more college-level credits.** Both students and society as a whole (the sum of student, government, and college perspectives) save money when MMA is implemented at a college. Under an MMA system, students take fewer developmental courses and earn more college-level credits. For colleges, implementing MMA comes at a cost. This cost includes the direct

cost of implementing the MMA system (60 dollars per student) but no savings from reduced developmental course offerings, because of the corresponding loss of tuition.

When used to place more students directly into college-level courses, MMA is a cost-effective strategy for improving college progress, worthy of consideration for state and college policymakers. More generally, this research finds evidence that colleges should consider increasing the total number of students referred directly to college-level courses, whether by lowering their requirements for direct placement into college-level courses or by implementing other policies with the same effect.

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Introduction

Across the United States, almost all community colleges are open access, meaning they accept nearly anyone who applies, without consideration of the student's prior academic achievement. An estimated 40 percent of students who enter community college are deemed academically underprepared.[1] In many community colleges, students whom colleges identify as underprepared are required to complete noncredit developmental courses (also called remedial courses) before taking college-level courses.

At their best, developmental courses prepare students to succeed in college-level courses that they would have failed without the additional preparation. However, critics of developmental courses argue that these courses often have limited benefits, and that many students are unnecessarily required to take them, resulting in a loss of time and money.[2] Thus, the decision to require students to take developmental courses before they can access college-level coursework is consequential. But what is the best way for colleges to make this decision?

Historically, most colleges have made course placement decisions based on a student's scores on a standardized test taken immediately before the student's first semester in college.[3] However, such "test-only" referral systems have been criticized. Research indicates that these standardized tests are not very accurate at predicting which students will pass college-level courses if referred to them.[4] It follows that test-only referral systems may not be very accurate at determining which students would benefit from taking developmental courses and which do not need them.

To address these concerns, nearly three-quarters of community colleges now use more than one measure of academic preparation in their referral systems, an approach known as multiple measures assessment (MMA).[5] MMA systems typically do consider students' scores on standardized tests, but they also incorporate additional measures of academic preparedness such as students' high school grade point averages (GPAs). The theory behind MMA systems is that by factoring in additional information beyond a test score, they place students more accurately than test-only systems do, allowing more students who are capable of passing college-level courses to proceed directly to those. Importantly, most MMA placement systems used in community colleges today expand the number of students eligible for college-level courses, compared with test-only systems, by providing multiple ways for students to qualify for the college-level coursework.

This report presents a final impact analysis of combined data from two previous experimental studies comparing the effects of test-only referral systems and MMA referral systems on academic outcomes. The two studies took place across three states and 12 participating

1. Institute of Education Sciences (2022).
2. Melguizo, Bos, and Prather (2011).
3. Bailey, Jaggars, and Jenkins (2015); Rutschow, Cormier, Dukes, and Cruz Zamora (2019).
4. Belfield and Crosta (2012); Scott-Clayton (2012).
5. Litschwartz, Cullinan, and Plancarte (2023).

colleges, and included 29,999 students.[6] By synthesizing the findings from these prior evaluations, this report expands on previously published results in three ways. First, combining data from the two evaluations enlarges the analysis sample, yielding more precise estimates of the overall average effect of MMA on student outcomes. Second, combining data across multiple states and contexts enhances the general representativeness of the results, increasing their usefulness to policymakers. Third, this report extends the follow-up period for one of the two studies, yielding reported results for both evaluations through nine semesters after each study began—long enough to consider effects on degree completion and transfer to a four-year college.[7]

This analysis also examines what drives better outcomes from a placement system, considering two hypotheses. One hypothesis is that the most accurate placement system—in terms of identifying which students are most likely to pass a college-level course—leads to the best academic outcomes. The other hypothesis is that simply maximizing the number of students who are placed directly into college-level courses is what is important for having the best academic outcomes.

This analysis and the studies on which it is based were conducted by the Center for the Analysis of Postsecondary Readiness (CAPR), a partnership of the Community College Research Center and MDRC.

Background: The SUNY and Great Lakes CAPR Studies

One of the studies used in this analysis, the SUNY MMA study, was launched in 2016 and focused on seven community colleges in the State University of New York (SUNY) system. The other study, the Great Lakes MMA study, was launched in 2018 and focused on four community colleges in Minnesota and one in Wisconsin.[8]

Both studies used a randomized controlled trial research design to estimate the effects of MMA referral compared with test-only referral. In each study, all incoming students who took a placement test were randomly assigned to one of two groups: a "test-only" placement group, for whom course placement was based on test scores per the college's existing test-only referral system, or an MMA placement group, for whom course placement was based on an MMA placement system collaboratively designed by the CAPR research team and college faculty and staff.[9] Differences in subsequent outcomes between the two groups represent an estimate of the effect of MMA placement versus test-only placement.

6. Kopko, Daniels, and Cullinan (2023); Cullinan and Biedzio Rizik (2021).

7. See Cullinan and Biedzio Rizik (2021). The 2021 publication includes follow-up data through three semesters after enrollment. The current report collects additional follow-up data to extend the analysis to nine semesters after enrollment across all colleges in the sample.

8. Kopko, Daniels, and Cullinan (2023); Cullinan and Biedzio Rizik (2021).

9. Random assignment was done separately for math and English. Most students took a placement exam in both subjects and were randomly assigned to a referral system separately for each subject. Students were not informed which method they had been assigned to, but in some cases students may have inferred their assignment by comparing test scores with placement criteria or through conversations with advisors or other students.

In both studies, a portion of students assigned to the MMA group were "bumped up"—that is, the MMA system placed them in a college-level course, even though the status-quo, test-only system would have placed them in a developmental course. In the SUNY study, a smaller portion were "bumped down"; MMA placed them in a developmental prerequisite course, even though the status-quo system would have placed them into a college-level course.[10]

Box 1 describes the placement decision process in more detail and identifies the measures considered for MMA in the two studies. Faculty generally set the thresholds for these new measures high enough to avoid dramatically increasing the number of students placed into college-level courses.

The findings from each study are summarized below. Unless otherwise noted, all results are statistically significant at the 0.05 level, which means that there is a less than 5 percent chance that the true effect is zero.

Summary of SUNY MMA Findings

- More students were bumped up due to MMA than were bumped down. For course placement in English, 44 percent of students randomly assigned to the MMA group were bumped up (placed in a college-level course, even though the status-quo, test-only system would have placed them in a developmental course). In contrast, 7 percent of students randomly assigned to the MMA group were bumped down (placed in a developmental prerequisite even though the status-quo system would have placed them into a college-level course). For course placement in math, 16 percent of students were bumped up into a college-level course, and 10 percent were bumped down into a developmental prerequisite.
- After nine semesters, MMA bump-up had a positive impact of 7 percentage points on a student's likelihood of completing a college-level English course and of 8 percentage points on a student's likelihood of completing a college-level math course.
- MMA bump-up increased the total number of college-level credits students completed in English and math by approximately three credits after nine semesters.
- After nine semesters, MMA bump-up caused students in the English sample to be 2.4 percentage points more likely to have obtained a credential or transfer to a four-year college than their peers in the test-only group. No statistically significant effect was found on these outcomes in the math sample.
- Bumped-down students in English and math experienced the reverse of the effects described above. After nine semesters, they were less likely to have passed college-level courses in English and math, and they had earned fewer college-level credits in any subject compared with their counterparts in the test-only group. This finding suggests that the benefit of MMA systems compared with test-only systems in these studies is that they increased the overall number of students assigned to college-level courses, not that they placed students more accurately.

10. In the SUNY study, bump-down was found to have a negative impact on students, as discussed in the SUNY MMA findings subsection below. Consequently, in the Great Lakes study, the study design did not permit students to be bumped down.

BOX 1
WHAT IS PLACEMENT, AND WHAT PLACEMENT MEASURES WERE CONSIDERED ACROSS COLLEGES?

What is course placement? A course placement recommendation communicated to students entering community college is based on tests or other measures of college readiness in English and math. In the studies discussed in this analysis, placement results were communicated to students in a printout provided by testing staff, on screen after students had finished answering questions online, or verbally. Within a given subject area, denial of registration into college-level courses for students placed in a developmental prerequisite is enforced by a registration block, which is removed when the prerequisite is completed. Students may override this block only by a special appeals process. However, enrollment in the course a student is placed into is not so easily enforced, and in fact many students do not enroll in either math or English courses after receiving their placement results.

MMA Placement at the SUNY Colleges: In the SUNY colleges, placement decisions were made using a multiple measures assessment (MMA) approach based on a predictive algorithm. Each college developed a statistical model for predicting success in college-level English and math courses using multiple measures of college preparation including scores on placement tests (such as ACCUPLACER), high school GPA, and other measures (such as time since graduation). Faculty at each college then created placement rules by choosing cut points based on a predicted probability of success or predicted enrollment rates, which were used to place students into coursework. In general, colleges chose placement cutoffs that either maintained current enrollment rates or pass rates, although cutoff values varied by college.

The following measures were weighed in the algorithm to determine college readiness in English and math:

- High school GPA
- Years since high school graduation
- High school diploma/GED status
- Subject-specific Accuplacer test score results

One college also considered New York State Regents scores or SAT scores in math placements, and another college considered high school rank in English placements.

MMA Placement at the Minnesota and Wisconsin (Great Lakes) Colleges: In the Minnesota and Wisconsin colleges, college administrators also used an MMA placement approach. They decided not to use a weighted algorithm because it proved costly to design and implement, and also allowed for "bumping students down" to developmental courses based on MMA—a practice found by the SUNY study to be detrimental to academic outcomes. Instead, at the Great Lakes colleges, qualification thresholds were set by faculty for each measure, and under the MMA placement rules, students who met any of those thresholds were directly placed in college-level coursework.

At these colleges, the following measures were used in decision rules to determine college readiness in English and math:

- High school GPA
- Noncognitive assessments: the LASSI motivation scale in Minnesota and the GRIT scale in Wisconsin
- Standardized tests such as the ACT, SAT, or the Minnesota Comprehensive Assessments
- Subject-specific Accuplacer test score results

For any of the above measures, meeting the cutoff set by faculty qualified a student for a college-level course in that subject. The high school GPA cutoff scores used in the decision rules fell between 2.3 and 3.0.

Summary of Great Lakes MMA Findings

- Among students randomly assigned to MMA, 15 percent in English and 14 percent in math were bumped up. As explained in Box 1, the placement method used in this study did not include the bump-down option.
- After three semesters, MMA bump-up caused students to be 16 percentage points more likely to have completed a college-level English course and 11 percentage points more likely to have completed a college-level math course than their test-only placement group peers.
- MMA bump-up increased the total number of college-level credits students accumulated in English and math by approximately 1.5 credits after three semesters.

Predictive Utility of High School Grade Point Average

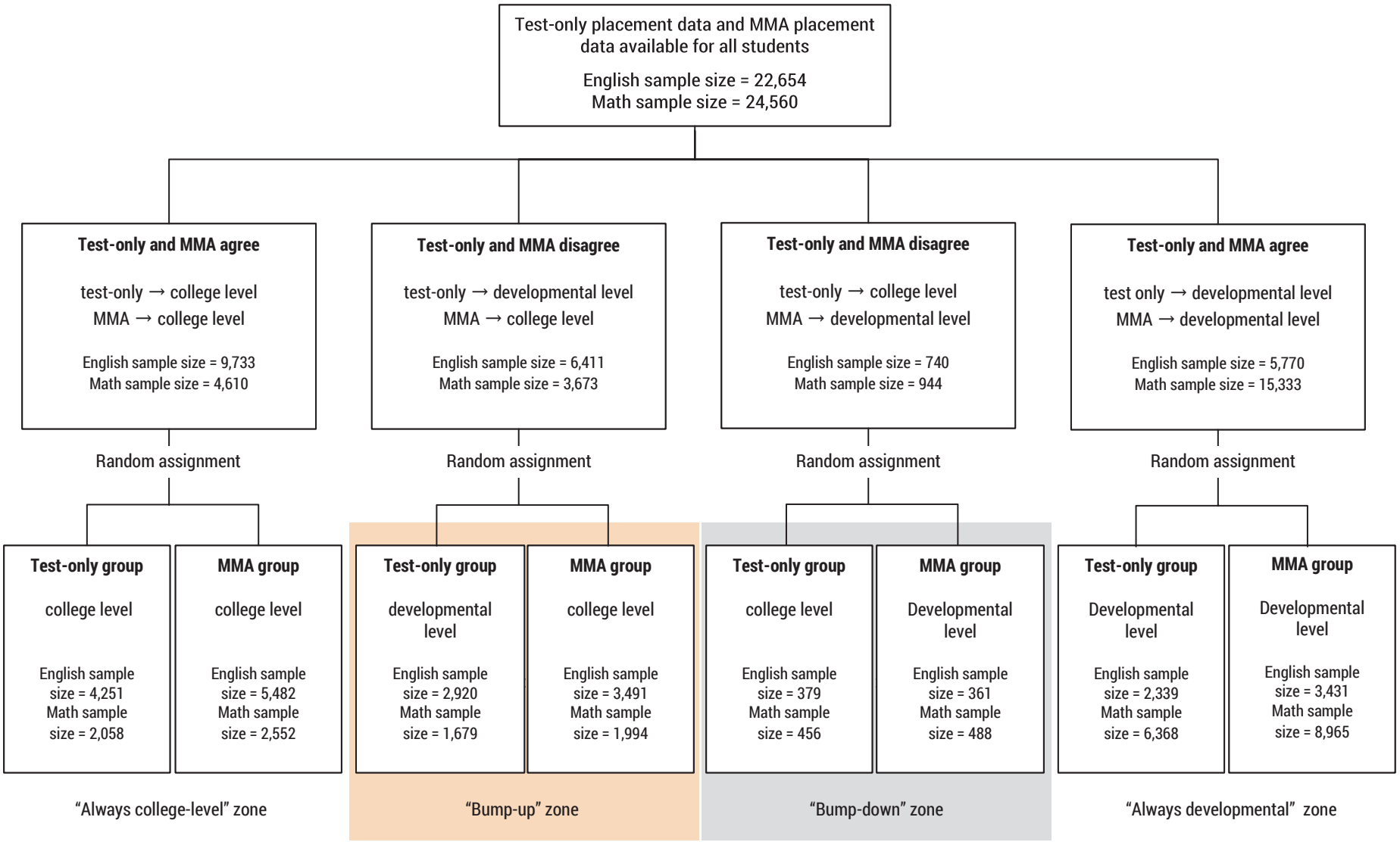
Data from the SUNY and Great Lakes MMA studies were also used to perform predictive analyses to estimate the relationship between various measures of academic preparation and the likelihood a student successfully completed a college-level course in English or math, among students placed directly in those courses without a developmental prerequisite. The findings were consistent across both studies: High school GPA explained more of the variation in outcomes than any other measure or combination of measures (including standardized test scores, placement test scores, time since graduation, high school attended, and English and math course grades). However, the unexplained variation remained much larger than that explained by any individual measure or combination of measures, even when high school GPA was included.

Analysis Methods

This analysis placed students into one of four categories, or "zones," based on which course level or levels they had been assigned to by the placement systems in the two earlier studies. These four zones are described below and shown in Figure 1.

- **Always college-level:** This zone includes students for whom the status-quo, test-only placement system and MMA placement system agreed—specifically, both referred them directly to a college-level course. Regardless of whether students in this zone were randomly assigned to the test-only placement group or the MMA group, they were placed in a college-level course.
- **Bump-up:** The bump-up zone includes students whom the test-only system referred to a developmental prerequisite course, and whom the MMA system referred to a college-level course. The outcome of random assignment to either the test-only or MMA group determined where each student in this zone was placed.
- **Bump-down:** The bump-down zone contains students whom the test-only placement system referred to a college-level course, and whom the MMA system referred to a developmental prerequisite course. As with students in the bump-up zone, the outcome of random assignment determined where they were actually placed. This sample group contains only students from the SUNY study.

Figure 1. Analysis Zones Resulting from Random Assignment Outcomes



- **Always developmental:** This zone contains students referred by both the test-only placement system and the MMA placement system to a developmental prerequisite course. Regardless of whether they were assigned to the test-only group or the MMA group, they were placed in a developmental prerequisite course.

The prespecified main analysis sample for this study is students in the bump-up zone.[11] Students in the "always developmental" zone and students in the "always college-level" zone are excluded from the main analysis sample because adoption of MMA had no impact on their course placement and thus there is no reason to expect their academic outcomes to have been impacted.[12] Students in the bump-down zone were also excluded from the main analysis sample. As noted above, students were bumped down only in the SUNY study. That study showed that bumping down produced a negative outcome, and later MMA research and technical assistance by CAPR, including the Great Lakes study, no longer allowed for this possibility.[13] Therefore, the bump-down zone is no longer considered policy-relevant.

The primary research question for this analysis is as follows: For students whom MMA bumped up—that is, for students placed directly into college-level courses contrary to the recommendation of the status-quo system—what is the average effect of MMA after nine semesters on (1) the probability of completing a first college-level course, (2) total college credits earned, and (3) the probability of receiving a degree or transferring to a four-year college? These three outcomes were chosen to balance capturing important college milestones with limiting the total number of confirmatory outcomes to minimize the risk of spurious statistically significant results.[14]

Summary of Analysis Findings

The evidence indicates that when MMA placement allowed students to bypass a developmental prerequisite and be placed directly in a college-level course, it improved student academic outcomes. MMA increased cumulative credits earned by two credits for students who were bumped up, a statistically significant effect. This positive effect on credits translated to an estimated 1.5 percentage point increase in degree completion or transfer to a four-year school.

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11. An analysis plan for this study was preregistered on September 12, 2023, and can be found here: https://sreereg.icpsr.umich.edu/sreereg/subEntry/20582/pdf?section=all&action=download. The original analysis plan for the Minnesota and Wisconsin MMA study also prespecified the bump-up zone as the primary analysis sample in 2019 and can be found here: https://sreereg.icpsr.umich.edu/sreereg/subEntry/2264/pdf?section=all&action=download.
12. There is also a statistical reason for this exclusion. Assuming MMA had no effect on students whose placement was unchanged by MMA, the likelihood of detecting an effect, if one exists, is better in the bump-up population than in the sample that includes "always college-level" and "always developmental."
13. Kopko, Daniels, and Cullinan (2023).
14. In an impact evaluation, confirmatory outcomes are used to assess how strongly the study's *prespecified* central hypotheses are supported by the data. Exploratory or secondary outcomes are used to identify hypotheses that could be subject to future rigorous testing or to examine factors that may help explain effects on confirmatory outcomes. See Schochet (2009).

While the direction of this effect aligns with the intervention theory, the estimated effect is not statistically significant, so it cannot conclusively be distinguished from no effect.

MMA was successful because it increased the number of students placed into college-level courses, not because it was better at targeting which students should be in college-level courses. MMA had a positive impact on students when it placed them in college-level courses despite the test-only system recommending developmental courses. Conversely, it had a negative impact when it placed students in developmental prerequisites despite the test-only system recommending college-level courses.

This analysis also found that MMA lowered costs to students and society (the sum of student, government, and college perspectives) because MMA placement reduced the number of developmental courses taken. Overall, this report concludes that MMA, when it allows more students to be directly placed in college-level coursework, is a cost-effective way to increase student educational achievement.

Sample Characteristics

The sample for this analysis comprises 29,999 students from 12 community colleges in New York, Minnesota, and Wisconsin who had participated in either the CAPR SUNY MMA study or the CAPR Great Lakes MMA study.[15] As part of their participation in those studies, all students had taken at least one placement exam either in math or English and had been randomly assigned to one of two groups: Control group students were placed in courses (either developmental or college-level courses) using the results of the status-quo, test-only placement system at their college, and program group students were placed in courses using the results of an MMA placement system.[16] Of the 29,999 students in this sample, 22,654 had taken an English placement exam and 24,560 had taken a math placement exam. (The total number of tests taken was greater than the total number of students involved in the study because some students took both tests.)

Data from the New York colleges were drawn from three randomly assigned cohorts of students who underwent placement testing: a fall 2016 semester cohort, a spring 2017 cohort, and a fall 2017 cohort. Excluded from the sample were students who opted out of the study, those who took their first placement test outside of the study intake period, and students whose placement exam scores placed them into a course for English-language learners. The final randomized sample from the New York colleges included 12,796 students, with an overall English sample of 10,608 and an overall math sample of 9,558.

15. Kopko, Daniels, and Cullinan (2023); Cullinan and Biedzio Rizik (2021).

16. An additional 621 students were randomized in the SUNY sample (for a total of 30,620 students in the full randomized sample) but are excluded from all analyses. These 621 students did not take the placement test but were randomized because in some of the SUNY colleges all incoming students were randomized, including those who did not take the placement exam.

Data from the Minnesota and Wisconsin colleges were drawn from three randomized cohorts of students who took placement tests for enrollment between the fall of 2018 and the fall of 2019. Dual enrollment students (students enrolled in both high school and community college) were excluded from the sample. English language learners were also excluded in all colleges except one (Normandale). The final randomized sample from these colleges included 17,203 students, with 12,046 students testing for English placement and 15,002 testing for math.

Identifying the Main Analysis Sample: Students in the Bump-Up Zone

For most students, the outcome of random assignment to either the program group or the control group had no impact on their course placement. As Table 1 shows, approximately 68 percent of students in the English sample and approximately 81 percent of students in the math sample were in either the "always college" or "always developmental" zone; they would have received the same course placement regardless of whether they were placed using the test-only or MMA system. For these students, the choice of placement system was not expected to and did not have an impact on their college outcomes because the choice of placement system did not have an observable policy impact.[17]

Table 1. Students in Zones, by Subject Area

Zone (%)	Program	Control	All	Sample Size
English				
Always college-level	42.9	43.0	43.0	9,733
Bump-up	27.3	29.5	28.3	6,411
Bump-down	2.8	3.8	3.3	740
Always developmental	26.9	23.7	25.5	5,770
Math				
Always college-level	18.2	19.5	18.8	4,610
Bump-up	14.2	15.9	15.0	3,673
Bump-down	3.5	4.3	3.8	944
Always developmental	64.0	60.3	62.4	15,333

SOURCE: Placement data provided by study colleges.

NOTES: Rounding may cause slight discrepancies in sums and differences.

As noted earlier, the main analysis sample for this report is students in the bump-up zone—that is, students who qualified for a college-level course according to the MMA system even though they met the criteria for a developmental course using the status-quo, test-only system. Students in the bump-up zone represented 28 percent of the full sample of students who took

17. See Appendix Table A.2.

placement exams in English and 15 percent of the full sample who took placement exams in math, generating a main analysis sample of 6,411 in English and 3,673 in math.

In the SUNY colleges, the MMA placement policy allowed for some students to be placed in developmental courses based on the recommendation of the MMA system, even though these students would have been placed directly in college-level courses by the test-only system. This group—the individuals in the bump-down zone—contained 740 students in English and 944 students in math. The bump-down zone represents a small proportion (3 percent to 4 percent) of the full sample but yields insight into how an MMA system operates. Analysis of the bump-down zone helps distinguish between two potential mechanisms by which MMA could have a positive effect: (1) by improving the ability of colleges to successfully identify which level of coursework will be best for each student, or (2) by sending more students directly to college-level courses.

Characteristics of the Main Analysis Sample

The students in the main analysis sample, the bump-up zone, were demographically and socioeconomically diverse, as Table 2 shows. Over one-fourth of students were aged 22 or over, about half were students of color, and close to half were eligible for federal Pell Grants, an indicator of financial need.[18]

Within the main analysis sample, the students in the MMA and test-only groups had similar baseline characteristics. This is expected because students were randomized between the MMA group and the test-only group, and the bump-up zone analysis sample was defined on the measures used for placement, which were collected before the study randomization occurred. Overall, there were no statistically significant differences between the MMA group and the test-only group with regard to baseline characteristics; therefore, any differences in outcomes between the MMA group and the test-only group can be attributed to the effect of MMA.[19]

Generally, students in the bump-up zone had baseline characteristics similar to those of students in the overall randomized sample. However, students who were traditionally aged (21 or younger when they started taking classes), Black, or Pell eligible were overrepresented in the bump-up zone compared with the full randomized sample. The substantial proportion of students of color in the sample makes this analysis especially relevant because achievement barriers resulting from societal racism lead students of color to be overrepresented in developmental courses compared with college-level courses when placement is based on traditional test-only systems.[20] The demographic makeup of the analysis sample is advantageous for investigating the potential of MMA to provide a more equitable placement

18. Students of color include Black, Hispanic, Asian, and Native American students. Race information comes from college administrative data and therefore represents students' self-reported information.

19. See Appendix Tables A.3 through A.6 for full baseline characteristics for all analytic samples in this report.

20. Bahr, Peter Riley (2010); Castillo, Wendy, and David Gillborn (2022); Following Castillo and Gillborn, language used in this report is intended to emphasize that race is not an objective category but one that is societally constructed.

Table 2. Baseline Characteristics of Bump-Up Zone and Full Sample Students

Characteristic (%)	Bump-Up Zone			Full Sample
	All	Program	Control	
Age				
21 and under	74.4	74.3	74.6	69.6
22-29	13.1	13.1	13.1	14.3
30 and over	12.5	12.6	12.3	16.1
Age missing	0.0	0.0	0.0	0.0
Gender				
Male	44.1	43.8	44.6	44.1
Female	52.5	52.6	52.2	48.8
Gender missing	3.4	3.6	3.1	7.1
Race/Ethnicity				
Asian	5.0	5.4	4.5	5.4
Black	19.9	20.5	19.2	16.9
Hispanic	16.5	16.7	16.2	15.0
White	44.2	43.4	45.1	45.7
Other	8.7	8.7	8.8	13.0
Race/Ethnicity missing	5.7	5.2	6.3	4.0
Pell eligible	43.5	43.9	43.0	39.7
Pell eligibility missing	6.9	7.5	6.1	12.8
Sample size	9,006	4,872	4,134	29,999

SOURCE: Demographic data provided by the study colleges.

NOTES: Italicized variables were collected after randomization and were likely affected by the intervention itself.
Rounding may cause slight discrepancies in sums and differences.
Distributions may not add to 100 percent because categories are not mutually exclusive.
To analyze whether program and control group students differed from each other on average with respect to the pre-randomization baseline characteristics above, an omnibus F-test was performed, which yielded a p-value of 0.389 for the bump-up zone and 0.653 for the whole sample. This finding suggests that relative to these characteristics, program and control group students in either sample do not significantly differ from one another.

method for these students. Even if MMA bump-up works equally well across different racial and socioeconomic groups, the demographic makeup of the bump-up zone suggests that a switch from test-only placement systems to MMA placement systems has the potential to reduce societal inequality by affecting higher numbers of individuals in these groups.

Data Sources

All data used in the prior studies and in this analysis were provided by the 12 colleges. These data comprise admissions and demographic data, placement test data, noncognitive

assessment data, college transcript records, and transfer and completion records. Admissions and demographic data were used to describe the study sample and define subgroups. Placement test scores and noncognitive assessments, in conjunction with a random assignment process, were used to determine students' placement in developmental or college-level courses. Data for confirmatory outcomes for this study were derived from the colleges' transcript, transfer, and completion records. The five colleges in Minnesota and Wisconsin provided National Student Clearinghouse data, which captures enrollments and credential completions at nearly any college in the United States; the data provided by the SUNY colleges captures this information at any college within the SUNY system.[21]

The Effects of MMA Placement: Findings from Analysis of Two Studies Across Three States

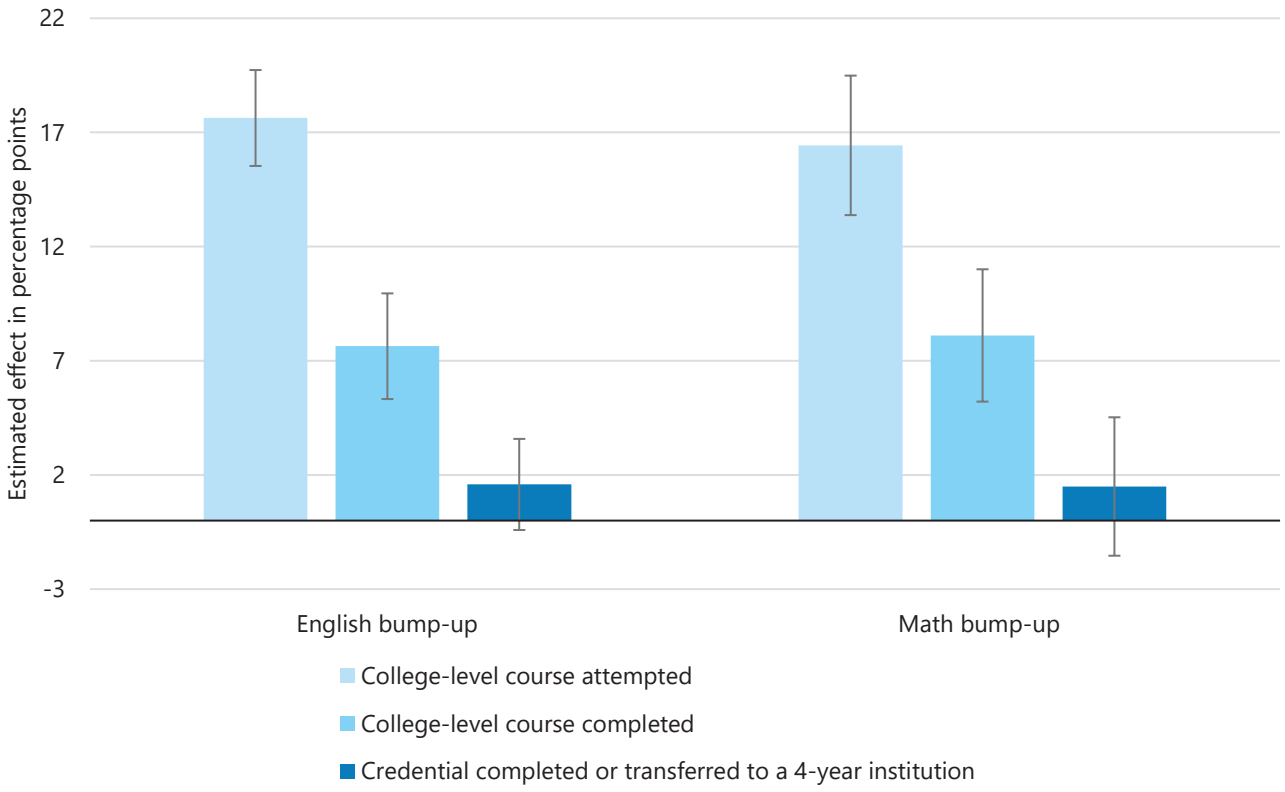
Overall, MMA bump-up had a positive effect on the likelihood that a student completed early college milestones, as Figure 2 shows. This analysis found statistically significant increases in the probabilities that a student attempted a college-level course and completed a college-level course, and in the total number of cumulative college credits earned. However, the effects of these milestones translated into only a small and ultimately not statistically significant effect on final credential attainment and transfer.[22] This pattern of effects was seen across students regardless of race, gender, or Pell eligibility. Importantly, MMA bump-up saves society about 30 dollars per student placed using MMA. Therefore, this study finds that MMA is a cost-saving policy that boosts student achievement.

This section of the report first presents a detailed look at findings broken down by outcomes; these findings are also summarized in Table 3. Findings are then presented by subgroup and site, and are followed by an analysis of the mechanism underlying the effectiveness of MMA systems in these studies.[23]

As explained above, this analysis includes data for all students across nine semesters, extending the follow-up time for the Minnesota and Wisconsin colleges to match that used in the SUNY study.[24] Obtaining an associate's degree requires four semesters of full-time study; therefore, nine semesters is considered enough time to allow students to earn a college credential or transfer to a four-year college.

21. See Appendix B for a detailed description of data processing decisions for this report.
22. In this report college credentials include certificates, associate's degrees, and bachelor's degrees granted by the colleges.
23. It is relevant to note that not all students complied with their assigned placement. In a minimal number of cases, students who were placed in college-level coursework took developmental courses and vice versa, while many more did not register for any class in the subject in the semester they were assigned a placement. This means the effects of MMA placement in this study should be interpreted as the effect of being *placed* into a college-level course, not the direct effect of taking the course.
24. Kopko, Daniels, and Cullinan (2023); Cullinan and Biedzio Rizik (2021).

Figure 2. MMA Bump-Up Effect by College Milestones Nine Semesters After Randomization



SOURCES: Transcript and credential data provided by study colleges.

NOTES: Sample represents 6,411 students in the English bump-up zone and 3,673 students in the math bump-up zone.
The vertical lines (or error bars) at the top of each program bar represent the 95 percent confidence interval around the impact estimates.
Estimates are adjusted by college, cohort, race/ethnicity, gender, age, high school GPA, ACT English and math subscores, and Accuplacer test scores.

Unless otherwise noted all results are statistically significant at the 0.05 level.

Effects on Gateway Course Completion

Gateway courses are the first college-level courses in math or English that students take; completion is often required for enrollment in other college-level courses. As shown in Table 3, MMA bump-up had a positive effect on whether students completed a gateway course within nine semesters. The analysis found that MMA placement improved the probability that a student in the English bump-up zone completed a gateway English course by 7.6 percentage points, and improved the probability that a student in the math bump-up zone completed a gateway math course by 8.1 percentage points.

Table 3. Confirmatory Results for Students in the Bump-Up Zone After Nine Semesters

Outcome	Control Group	Impact Estimate	P-Value	SE	Sample Size
English bump-up zone					
Completed gateway English course (%)	37.1	7.6	0.000 ***	1.2	6,411
Cumulative college-level credit accumulation in English	2.5	0.4	0.000 ***	0.1	6,411
Cumulative college-level credit accumulation in math	1.9	0.2	0.035 **	0.1	6,411
Cumulative college-level credit accumulation, any subject	22.1	1.9	0.004 ***	0.7	6,411
Credential completion or transfer to a 4-year institution (%)	21.4	1.6	0.120	1.0	6,411
Math bump-up zone					
Completed gateway math course (%)	24.6	8.1	0.000 ***	1.5	3,673
Cumulative college-level credit accumulation in math	2.2	0.6	0.000 ***	0.1	3,673
Cumulative college-level credit accumulation in English	3.1	0.3	0.014 **	0.1	3,673
Cumulative college-level credit accumulation, any subject	27.9	1.9	0.027 **	0.9	3,673
Credential completion or transfer to a 4-year institution (%)	33.5	1.5	0.334	1.5	3,673
English or math bump-up zone					
Cumulative college-level credit accumulation, any subject	24.3	1.6	0.004 ***	0.6	9,006
Credential completion or transfer to a 4-year institution (%)	25.7	1.2	0.196	0.9	9,006

SOURCES: Transcript and credential data provided by study colleges.

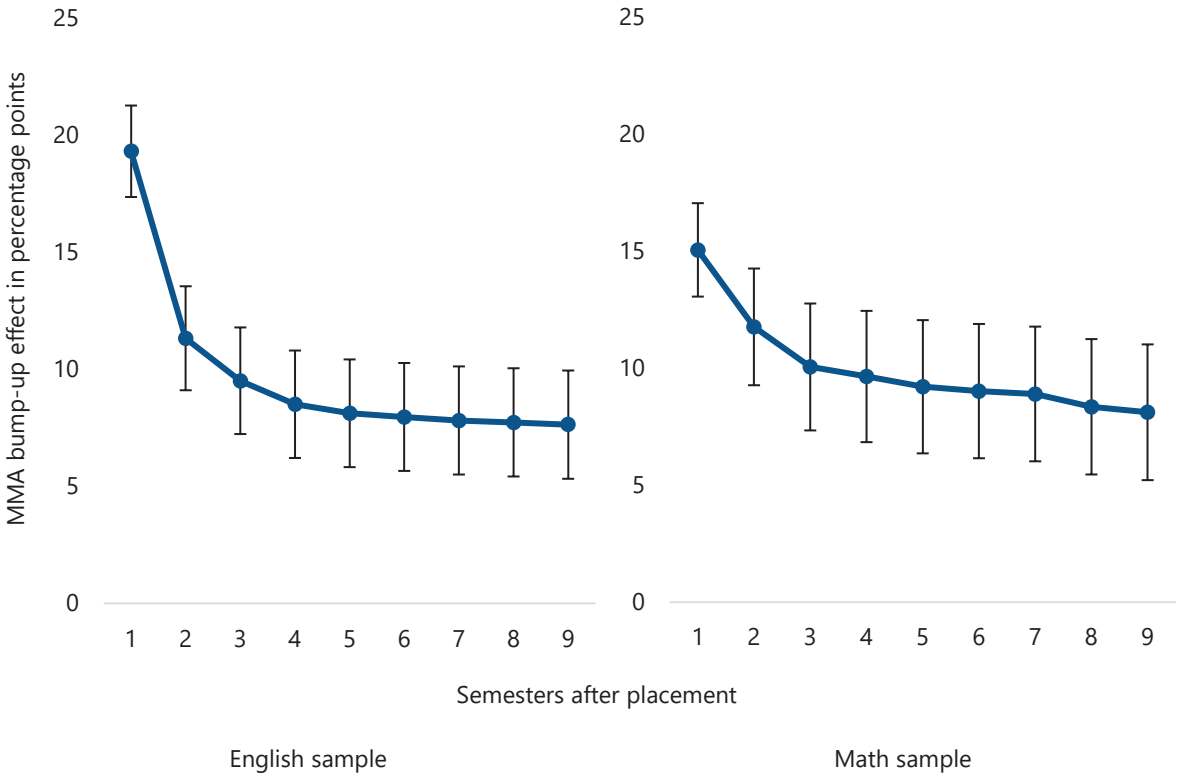
NOTES: Rounding may cause slight discrepancies in sums and differences.
Distributions may not add to 100 percent because categories are not mutually exclusive.
*Statistical significance levels are indicated as: *** = 1 percent, ** = 5 percent, * = 10 percent.*
The p-value indicates the likelihood that the estimated impact (or larger) would have been generated by an intervention with zero true effect.
SE = standard error.

The previous CAPR studies had shown there was a large effect on gateway course completion after one semester. However, it was unknown whether this effect would persist over time as control group students assigned to developmental courses completed those courses and subsequently moved on to college-level work. The current analysis shows that while this effect diminished slightly after the first semester, it eventually stabilized and persisted through nine semesters, as Figure 3 indicates.

Effects on Cumulative College-Level Credits

MMA bump-up also had a positive effect on the total number of college-level credits a student earned in any subject over nine semesters (Figure A.1). Across the different subject groups, MMA bump-up increased college-level credit accumulation by approximately two credits. Most college-level courses are worth three credits. Therefore, this effect can be considered equivalent to an increase of one college-level course completed for two-thirds of students. Because some students in the CAPR studies were bumped up in both math and English, it is

Figure 3. Effect of MMA Bump-Up on Probability of Completing a Gateway Course



SOURCE: Transcript data provided by study colleges.

NOTES: Sample represents 6,411 students in the English bump-up zone and 3,673 students placed in the math bump-up zone.
The vertical lines (or error bars) at each point represent the 95% confidence interval around the impact estimates.
Estimates are adjusted by college, cohort, race/ethnicity, gender, age, high school GPA, ACT English and math subscores, and Accuplacer test scores.

not possible to disaggregate effects of bump-up in one subject area—either math or English—on accumulated credits in the other subject area.[25]

MMA led to increases in credit earned in all subject areas, not just in English and math (Figure A.2). After one semester, students in the MMA group had earned about a half-credit more in their bumped-up subject and a half-credit more in courses outside of math and English, compared to students in the test-only placement group. The effect on the bumped-up subject stayed approximately constant after the first semester, but the effect on credits outside of

25. The study randomized students into either MMA placement policies or the control placement policies overall and not into a placement policy by subject. As a result, the English bump-up sample contains many students who were bumped up in math and vice versa. Specifically, 17 percent of students bumped up in English were also bumped up in math and 29 percent of students bumped up in math were also bumped up in English.

math and English jumped another half-credit around the second or third semester before leveling off. After nine semesters, over 50 percent of the additional credits came from subjects that were neither math nor English.

These results may reflect the fact that at many colleges, there are restrictions on which college-level courses students can take when they have yet to complete developmental course requirements. For example, a sociology course may require students to have completed or been placed out of developmental English. However, there are other possible explanations. For example, removing developmental course requirements may have opened space in students' schedules for more college-level courses outside of the bumped-up subject, or removing coursework barriers may have simplified course selection and enrollment. In any case, these results show the effects of MMA outside of the subjects directly covered by the required developmental courses.

Effects on Credential Attainment or Transfer to a Four-Year College

As Table 3 shows, MMA bump-up had a positive—but not statistically significant—effect of approximately 1.5 percentage points on the likelihood a student earned a credential or transferred to a four-year college. The magnitude of the effect, while small, is large enough to be policy-relevant; given MMA's low cost, policymakers should interpret this result as pointing to a promising area for further investigation.[26]

Effects on Educational Outcomes by Subgroup

Thus far, the findings in this analysis pertain to the effects of MMA bump-up across all students in both studies. The research team also conducted analyses by student population subgroup to help policymakers better understand the likely effect of MMA placement in specific contexts. These analyses are also presented to help policymakers and program designers understand the implications of MMA for mitigating inequality in student outcomes.

The main outcomes were explored for subgroups based on the following characteristics:

- Gender (male, female)[27]
- Race and ethnicity (Black, Hispanic, White)
- Pell eligibility (eligible for Pell Grant, not eligible for Pell Grant)[28]

26. In this study, the minimum detectable effect on earning a credential or transferring to a four-year college was 2.6 percentage points. However, a 1.5 percentage point effect on credential attainment or transfer to a four-year college is the expected effect, conditional on a positive effect of 2.0 cumulative college credits.
27. The college administrative data systems did not include additional gender options, and therefore additional gender identities such as nonbinary were not included in this study.
28. Pell Grants are the main form of federal financial aid for college provided based on financial need.

The analysis did not find any statistically discernable differences in the effects of MMA bump-up on any of the subgroups.[29] There was also no subgroup for whom MMA bump-up had a statistically significant negative effect.

In general, estimating differences in program effects between groups requires very large sample sizes. The subgroup analyses in this report would have been able to detect differences in intervention effects of at least 6 percentage points to 15 percentage points or at least three to five credits, depending on the sample sizes of the groups being compared. Smaller differences in impacts may exist without being detected in this analysis.

Effects on Educational Outcomes by Study

As explained in Box 1 above, MMA was implemented differently in the two experimental studies, with the SUNY colleges using an MMA placement algorithm and the Minnesota and Wisconsin colleges using explicit decision rules. Additionally, while each sample contained a similar percentage of students in the bump-up zone for math (16 percent in the SUNY sample and 14 percent in the Minnesota and Wisconsin sample), the percentages in the bump-up zone for English were substantially different (44 percent in the SUNY sample and 15 percent in the Great Lakes sample). Therefore, to determine how applicable the results from this study are to other colleges, it is important to ask how much these implementation differences affected student outcomes.

As Table 4 shows, the only statistically significant difference between the groups involved gateway course completion: MMA bump-up had a larger effect in the Minnesota and Wisconsin sample than in the SUNY sample on the probability of completing a first college-level course in English.[30] There were no statistically significant differences across the samples in any of the longer-run outcomes and no statistically significant negative outcomes.

This report also contains the first analysis of nine semesters of follow-up data for the Minnesota and Wisconsin sample. After nine semesters, the effects of MMA bump-up in the Minnesota and Wisconsin colleges were not statistically significant for either cumulative college credits or degree completion or transfer to a four-year college.

Effects on Educational Outcomes for the Whole Sample

For most students in the study, course placement was not affected by the adoption of MMA. Use of an MMA system caused a shift in placement from a developmental to a college-level course for only 10 percent to 40 percent of students, depending on the subject and college. Because the main analysis sample for this report contains only students in the bump-up zone,

29. As measured using the H-statistic (Hedges, 1984), which is used to assess whether differences in impacts across subgroups are statistically significant. The p-value associated with the H-statistic reflects the probability that observed differences in impacts across subgroups could have been generated if the true impacts were identical across subgroups. See Appendix Tables A.7 through A.9 for full subgroup results.

30. Appendix Table A.10 contains estimates of cross-college effects. The results also show no statistically significant variance among colleges.

Table 4. Exploratory Results for Subgroups of Students in the Bump-Up Zone, by Study

Outcome	SUNY					WI-MN					H-Statistic P-value
	Control	Impact Estimate	P-Value	SE	Sample Size	Control	Impact Estimate	P-Value	SE	Sample Size	
English bump-up zone											
Completed gateway English course (%)	38.9	5.0	0.001 ***	1.5	4,596	32.0	14.9	0.000 ***	2.4	1,815	0.000 †††
Cumulative college credits earned, any subject	21.9	2.5	0.003 ***	0.9	4,596	22.6	0.5	0.655	1.2	1,815	0.168
Credential completion or transfer to a 4-year institution (%)	18.0	2.2	0.056 *	1.2	4,596	30.0	-0.1	0.959	2.3	1,815	0.365
Math bump-up zone											
Completed gateway math course (%)	31.0	5.3	0.026 **	2.4	1,591	19.8	10.0	0.000 ***	1.9	2,082	0.126
Cumulative college credits earned, any subject	29.8	2.8	0.074 *	1.6	1,591	26.4	1.2	0.237	1.0	2,082	0.394
Credential completion or transfer to a 4-year institution (%)	27.2	2.5	0.276	2.3	1,591	38.7	0.0	0.988	2.2	2,082	0.428
English or math bump-up zone											
Cumulative college credits earned, any subject	24.0	2.3	0.005 ***	0.8	5,594	25.0	0.1	0.874	0.8	3,412	0.061 †
Credential completion or transfer to a 4-year institution (%)	20.4	2.0	0.069 *	1.1	5,594	34.9	-0.9	0.604	1.7	3,412	0.155

(continued)

Table 4 (continued)

SOURCES: Transcript and credential data provided by study colleges.

NOTES: Rounding may cause slight discrepancies in sums and differences.
Distributions may not add to 100 percent because categories are not mutually exclusive.
*Statistical significance levels are indicated as: *** = 1 percent, ** = 5 percent, * = 10 percent; ††† = 1 percent, †† = 5 percent, † = 10 percent.*
The p-value indicates the likelihood that the estimated impact (or larger) would have been generated by an intervention with zero true effect.
SE = standard error.
For each outcome, the impacts and standard errors from the subgroup regressions were used to generate an H-statistic in order to compare impacts across subgroups. The H-statistic is used to assess whether the difference in impacts across subgroups is statistically significant. The p-value associated with the H-statistic reflects the probability that observed differences in impacts across subgroups could have been generated if the true impacts were identical across subgroups.
The construction of the H-statistic is described in Lowenstein et al. (2014), Appendix D.

many of the findings presented thus far are not the overall impact a college would expect from adopting an MMA placement system.

Table 5 contains the estimated effects of MMA on the full randomized sample, not just the bump-up-zone students. These data are the estimated overall effects that a college implementing MMA can expect. For the sample as a whole, MMA had no statistically significant effects on any of the primary outcomes looked at in this study. This result—specifically, the attenuation of the positive effect on bumped-up students when considering the full sample—can be attributed to the negative effect of MMA on students in the bump-down zone and to the fact that students in the "always college" and "always developmental" zones experienced no effect. The positive effects of MMA are detectable only for students bumped up by MMA, not for the student population as a whole.

Table 5. Exploratory Results for Students in the Full Sample

Outcome	Control	Impact Estimate	P-Value	SE
Completed gateway English course (%)	37.9	0.9	0.093 *	0.5
Completed gateway math course (%)	20.6	0.2	0.698	0.4
Cumulative college credits earned, any subject	22.9	0.0	0.960	0.3
Credential completion or transfer to a 4-year institution (%)	26.5	-0.6	0.235	0.5
Sample size (total = 29,999)	13,046			

SOURCES: Transcript and credential data provided by study colleges.

NOTES: Rounding may cause slight discrepancies in sums and differences.
Distributions may not add to 100 percent because categories are not mutually exclusive.
*Statistical significance levels are indicated as: *** = 1 percent, ** = 5 percent, * = 10 percent.*
The p-value indicates the likelihood that the estimated impact (or larger) would have been generated by an intervention with zero true effect.
SE = standard error.

Effects of Direct Placement into College-Level Courses on Educational Outcomes

This analysis also made it possible to address a new question pertinent to, but distinct from, the original research question: Why did MMA placement improve outcomes? Was it because MMA more accurately matched students to the courses most suited to their academic needs, or because it allowed students to bypass developmental education and enroll directly in college-level classes?

One way the research team explored this question was through the analysis of bump-down-zone data from the SUNY study. While MMA had a positive effect on the main analysis sample, MMA had a negative effect on students in the bump-down zone (Table 6). Specifically, for students in the English bump-down zone, MMA had a large, statistically significant, negative effect on academic outcomes (a decrease of 7.0 percentage points on passing a gateway course in English and a decrease of 5.1 percentage points on completing a degree or transferring to a four-year college). For students in the math bump-down zone, the effects were also negative but not statistically significant (a decrease of 3.4 percentage points on passing a gateway course in math and a decrease of 0.9 percentage points on completing a degree or transferring to a four-year college).

Table 6. Effects of MMA on Academic Outcomes for Students in the Bump-Down Zone

Outcome	Control	Impact Estimate	P-Value	SE	Sample Size
English bump-down zone					
Completed gateway English course (%)	37.2	-7.0	0.041 **	3.4	740
Cumulative college credits earned, any subject	19.1	-3.2	0.092 *	1.9	740
Credential completion or transfer to a 4-year institution (%)	15.9	-5.1	0.039 **	2.5	740
Math bump-down zone					
Completed gateway math course (%)	30.3	-3.4	0.246	2.9	944
Cumulative college credits earned, any subject	27.3	-2.2	0.262	1.9	944
Credential completion or transfer to a 4-year institution (%)	22.2	-0.9	0.726	2.7	944

SOURCES: Transcript and credential data provided by study colleges.

NOTES: Rounding may cause slight discrepancies in sums and differences.
Distributions may not add to 100 percent because categories are not mutually exclusive.
*Statistical significance levels are indicated as: *** = 1 percent, ** = 5 percent, * = 10 percent.*
The p-value indicates the likelihood that the estimated impact (or larger) would have been generated by an intervention with zero true effect.
SE = standard error.

The negative effect of MMA on students who were bumped down suggests that the main reason MMA has a positive impact is that it refers more students directly to college-level courses, rather than that it predicts outcomes more accurately. This conclusion arises from the fact that both bumped-down and bumped-up students in the group randomly assigned to MMA were placed using the "improved" approach of MMA; however, students in the bump-down zone who were in the MMA program group had to take developmental coursework that would not have been required under the test-only system. This result provides rigorous evidence that those students would have had better academic outcomes going directly into college-level courses.

Another way this analysis evaluated the impact of being directly placed into college-level coursework is by looking at effects on students with different high school GPAs. The premise of developmental coursework is that some students come into college underprepared for college-level courses and need extra preparation for college-level coursework. Therefore, a potential concern is that MMA would be detrimental to the population potentially most in need of developmental coursework—that is, students with low high school GPAs.

However, as Table 7 shows, when the sample is split by high school GPA, there is generally no statistically distinguishable differential effect of MMA bump-up. To the extent there are differences, the estimated benefits of MMA are greater for students with lower high school GPAs. In addition, the one outcome for which there was a statistically significant difference when grouping students by GPA—probability of completing the gateway course for the English bump-up zone—had a larger effect of 8.4 percentage points for students with a high school GPA below 3.0 compared with students who had higher GPAs. This implies that students with lower high school GPAs were at a minimum not harmed from direct placement into college-level coursework.

Taken together, these findings suggest that for the populations examined—students in the bump-up and bump-down zones—placing students directly into college-level courses rather than developmental prerequisite courses yields either the same or better results on the outcomes examined. These students were generally those with a combination of relatively high test scores and low GPAs (in the case of students in the bump-down zone) or of relatively low test scores and high GPAs (in the case of students in the bump-up zone), although the finding also holds for bumped-up students with GPAs lower than 3.0.

The only remaining population who might experience better outcomes if placed directly into developmental courses rather than college-level courses are those in the "always developmental" zone. With both low test scores and low high school GPAs, these students are the least likely to complete college-level courses if placed directly into them. However, it is not clear that placing them into developmental courses first yields results that are any better than directly placing them into college-level courses; this study lacks the data to answer this question.

Table 7. Exploratory Results for Subgroups of Students in the Bump-Up Zone, by High School GPA

Outcome	HS GPA Above 3.0					HS GPA Below 3.0					H-Statistic P-value
	Control	Impact Estimate	P-Value	SE	Sample Size	Control	Impact Estimate	P-Value	SE	Sample Size	
English bump-up zone											
Completed gateway English course (%)	29.5	5.5	0.081 *	3.2	970	43.6	13.9	0.000 ***	2.4	1,842	0.013 ††
Cumulative college credits earned, any subject	17.9	-0.6	0.695	1.5	970	29.2	3.5	0.009 ***	1.3	1,842	0.114
Credential completion or transfer to a 4-year institution (%)	21.1	-1.0	0.732	2.8	970	28.7	4.4	0.049 **	2.2	1,842	0.279
Math bump-up zone											
Completed gateway math course (%)	18.7	5.0	0.199	3.9	469	26.9	7.8	0.000 ***	2.2	1,882	0.668
Cumulative college credits earned, any subject	21.7	3.2	0.157	2.3	469	32.1	0.2	0.899	1.2	1,882	0.129
Credential completion or transfer to a 4-year institution (%)	32.0	2.8	0.526	4.5	469	37.4	-0.5	0.836	2.3	1,882	0.605
English or math bump-up zone											
Cumulative college credits earned, any subject	19.1	-0.1	0.919	1.3	1,263	31.0	1.4	0.136	1.0	3,259	0.328
Credential completion or transfer to a 4-year institution (%)	23.9	-0.1	0.965	2.5	1,263	33.4	1.3	0.432	1.7	3,259	0.883

(continued)

Table 7 (continued)

SOURCES: Transcript and credential data provided by study colleges.

NOTES: Rounding may cause slight discrepancies in sums and differences.
Distributions may not add to 100 percent because categories are not mutually exclusive.
*Statistical significance levels are indicated as: *** = 1 percent, ** = 5 percent, * = 10 percent.*
The p-value indicates the likelihood that the estimated impact (or larger) would have been generated by an intervention with zero true effect.
SE = standard error.
For each outcome, the impacts and standard errors from the subgroup regressions were used to generate an H-statistic in order to compare impacts across subgroups. The H-statistic is used to assess whether the difference in impacts across subgroups is statistically significant. The p-value associated with the H-statistic reflects the probability that observed differences in impacts across subgroups could have been generated if the true impacts were identical across subgroups.
The construction of the H-statistic is described in Lowenstein et al. (2014), Appendix D.

Cost Considerations

Table 8 shows the costs and savings associated with MMA, broken down into categories: the direct costs to the college of MMA implementation, as well as the indirect costs and savings to students and financial aid due to changes in course-taking behavior. Societal costs are the sum of all costs borne by all perspectives: the colleges, the students, and the government (via financial aid).

Table 8. MMA Costs per Student Undergoing Placement

	Cost to Student or Financial Aid	Cost to College	Total Cost to Society
Direct cost of MMA placement system	0	60	60
Indirect cost of 0.40 additional college-level courses attempted	230	0	230
Indirect cost of 0.55 fewer developmental courses attempted	-320	0	-320
Net cost of MMA	-90	60	-30

SOURCES: Direct and per-course cost estimates from previous studies' cost analyses, averaged across sites. Estimates of the impact of taking college-level and developmental courses are from the follow-up analysis of the full sample after nine semesters.

NOTES: All costs shown in 2023 dollars rounded to the nearest 10. Indirect costs are presented assuming the marginal cost of course offerings equals average cost. It is also assumed from the college perspective that the marginal cost of course offerings equals marginal revenue from offering those courses (that decreased credits offered means decreased costs equal to the lost tuition or funding).

The direct cost to a college of implementing MMA placement systems averaged 70 dollars per student in the SUNY colleges and 40 dollars per student in the participating Minnesota State and Wisconsin Technical colleges, averaging about 60 dollars per student across all

29,999 randomized students.[31] However, the changes in course-taking patterns induced by MMA resulted in students achieving the same or better outcomes, with approximately 0.6 fewer developmental courses taken per student and only 0.4 more college-level courses taken per student. The resulting decrease of 0.2 courses taken translates into societal savings (freeing up resources such as faculty time and facility space used on developmental prerequisites for other uses, such as offering other courses).[32] Combining direct and indirect costs across colleges results in an average cost per student in the MMA group of approximately 30 dollars less than in the control group. Table 8 shows that the savings from decreased developmental course taking (row 3) are greater than the costs of implementing MMA combined with the costs of additional college-level course taking (rows 1 and 2).[33]

From the student perspective, the savings are even greater—about 90 dollars per student (row 3 minus row 2)—because students do not pay the direct costs of MMA but do benefit from taking fewer developmental courses. From the college perspective, MMA has a positive net cost instead of a savings, about 60 dollars per student (row 1), because colleges pay the direct costs but do not save money from offering fewer developmental courses because they lose the tuition associated with those courses.

Even when successful, policies and programs for improving student outcomes typically represent a cost to society in exchange for improved student outcomes. However, because MMA saves money compared with the status quo by decreasing developmental course taking, the per-credit cost to students and society when MMA is used is less than the cost without it. Therefore, MMA bump-up as implemented at these colleges both produced better outcomes and was less costly for society than the status quo.

Conclusion

This study synthesized research from two experimental evaluations of MMA—one in community colleges within the SUNY system and one in community colleges in the Great Lakes region. Consistent with prior reports, this analysis finds that MMA placement improved academic

31. Kopko, Daniels, and Cullinan (2023); Cullinan and Biedzio Rizik (2021).

32. The Integrated Postsecondary Education Data System (IPEDS) of the National Center for Education Statistics provides data on college expenditures and instructional activity credit hours. Costs per credit were calculated by taking the IPEDS total expenses for the participating colleges and dividing by the IPEDS instructional activity credit hours.

33. The finding that MMA societal cost is lower than business as usual is dependent on two assumptions. First, it assumes that the estimates of effects on credits attempted accurately represent the true effects and are consistent across sites. Second, in keeping with the previous SUNY cost analysis, the marginal cost of course offerings is assumed to equal the average cost as calculated by IPEDS data on institutional expenditures and instructional hours. MMA's societal cost would still be negative (a savings) as long as the marginal cost of instructional credits is at least two-thirds of that average cost. From the student perspective, there is a savings regardless of the marginal cost assumption because students do not pay the direct cost of MMA implementation but do benefit from taking fewer courses to achieve the same or better college course outcomes. Accounting for the value of students' time would increase these savings.

outcomes when it allowed students to bypass a requirement to take a developmental course and proceed directly to a college-level course.[34] As expected, use of MMA placement had no effect when the placement recommendation agreed with the recommendation of the status-quo, test-only referral system. Use of MMA placement had a negative effect when it added a developmental course requirement.

Specifically, MMA bump-up (when MMA allowed a student to bypass a developmental prerequisite) improved cumulative credit completion by approximately 2.0 credits across the samples and subgroups examined in this report. This increase in cumulative credit completion translated to an estimated increase of 1.5 percentage points in degree completion or transfer to a four-year school, which, while directionally consistent with the intervention theory, was not statistically significant and therefore cannot conclusively be distinguished from no effect. In addition, while MMA did cost colleges money to set up and administer, it did not cost students or society at large anything once developmental course-taking effects were accounted for, and in fact yielded a cost savings per student.

Policy Recommendations

Two important policy recommendations that emerge from this analysis are described below.

- **Colleges should strongly consider MMA placement as a low-cost means of improving academic outcomes.**

As stated above, students saved money due to MMA moving students from developmental courses to college-level courses, thus reducing the number of developmental courses taken while also improving overall academic outcomes. While these improvements in academic outcomes did not lead to statistically significant effects in college completion, they also came at no net cost to society. Therefore, MMA placement can be thought of as one of several changes that, when combined like pieces of a puzzle, can improve student outcomes.

- **Colleges should strongly consider lowering their requirements for direct placement into college-level courses.**

This analysis strongly suggests that students would benefit from lower requirements for direct placement into college-level coursework, whether that change stems from implementation of MMA or simply lowering cut scores in existing placement systems. Faculty implementing such changes would require sufficient information about research in this area to make informed decisions about where to set placement thresholds, specifically so that they do not set them too high.

34. Kopko, Daniels, and Cullinan (2023); Cullinan and Biedzio Rizik (2021).

Future Research

Based on this analysis, the following topics are promising areas for future research.

- **Applicability to students with very low GPAs**

As stated above, this analysis indicates that colleges would benefit from loosening their requirements for placement into college-level courses, even for students with GPAs below 3.0. In this study, the sample was split by students with GPAs below and above 3.0, the approximate average GPA for students in the bump-up zone. Further research should examine whether students with very low GPAs benefit from direct placement into college-level courses and whether all students, regardless of academic preparation, are in fact better off being directly placed into college-level courses.

- **The use of MMA in the context of corequisite courses**

During the study, placement decisions were between college-level courses and developmental prerequisite courses, which students had to complete before they could enroll in college-level ones. However, a growing number of colleges have transitioned from using developmental prerequisite courses to corequisite courses—developmental support courses that students enroll in at the same time as college-level courses. If the impact of MMA is derived largely from allowing students to enroll in college-level courses, and corequisite remediation allows them to do so while potentially also boosting their likelihood of success, it is worth understanding the effects of MMA in a corequisite context. For this reason, CAPR is launching a new round of randomized trials that will explore the effects of altering placement systems using MMA in a corequisite context.

Appendix

Supplemental Tables and Figures

Appendix Table A.1. Sample Size, by College

College	Full Sample	English and Math Bump-Up Zones
Anoka Ramsey Community College	4,196	1,186
Cayuga Community College	688	164
Century College	2,982	367
Jefferson Community College	1,226	352
Madison Area Technical College	3,593	353
Minneapolis Community and Technical College	788	191
Niagara County Community College	1,874	966
Normandale Community College	5,644	1,315
Onondaga Community College	1,995	1,131
Rockland Community College	1,797	1,101
SUNY Schenectady County Community College	497	313
SUNY Westchester Community College	4,719	1,567
Total sample size	29,999	9,006

SOURCE: Enrollment data provided by study colleges.

Appendix Table A.2. Exploratory Results for Students in the "Always College-Level" or "Always Developmental" Zone for Either Subject

Outcome	Control	Impact Estimate	P-value	SE
Completed gateway English course (%)	36.7	-0.2	0.822	0.9
Completed gateway math course (%)	17.2	-0.9	0.177	0.7
Cumulative college credits earned, any subject	21.0	-0.1	0.801	0.4
Credential completion or transfer to a 4-year institution (%)	23.5	-0.4	0.586	0.8
Sample size (total = 10,978)	4,528			

SOURCES: Transcript and credential data provided by study colleges.

NOTES: Rounding may cause slight discrepancies in sums and differences.
Distributions may not add to 100 percent because categories are not mutually exclusive.
*Statistical significance levels are indicated as: *** = 1 percent, ** = 5 percent, * = 10 percent.*
The p-value indicates the likelihood that the estimated impact (or larger) would have been generated by an intervention with zero true effect.
SE = standard error.

Appendix Table A.3. Baseline Characteristics of Students in the English Bump-Up Zone

Characteristic (%)	Program Group	SD	Control Group	SD	Difference	SE	P-value
Age							
20 and under	75.79	42.83	76.61	42.33	-0.81	1.07	0.445
21-30	12.20	32.73	11.68	32.12	0.52	0.81	0.519
31 and over	12.00	32.50	11.71	32.16	0.29	0.81	0.721
Age missing	0.00	0.00	0.00	0.00	0.00	0.00	
Gender							
Male	46.98	49.91	49.76	50.00	-2.78 **	1.25	0.026
Female	50.10	50.00	47.91	49.96	2.19 *	1.25	0.081
Gender missing	2.92	16.84	2.33	15.08	0.59	0.40	0.137
Race/Ethnicity							
Asian	5.13	22.06	3.84	19.21	1.29 **	0.52	0.012
Black	23.37	42.32	22.19	41.55	1.18	1.05	0.261
Hispanic	18.59	38.90	17.98	38.40	0.61	0.97	0.528
White	38.24	48.60	40.34	49.06	-2.10 *	1.23	0.086
Other	8.19	27.43	7.91	26.99	0.28	0.68	0.680
Race/Ethnicity missing	6.47	24.61	7.74	26.72	-1.27 *	0.65	0.050
Pell eligible	47.35	49.93	45.99	49.84	1.36	1.25	0.278
Pell eligibility missing	5.96	23.67	4.49	20.70	1.47 ***	0.55	0.008
Sample size	3,491		2,920				

SOURCE: Demographic data provided by the study colleges.

NOTES: Rounding may cause slight discrepancies in sums and differences.
Distributions may not add to 100 percent because categories are not mutually exclusive.
*Statistical significance levels are indicated as: *** = 1 percent, ** = 5 percent, * = 10 percent.*
The p-value indicates the likelihood that the estimated impact (or larger) would have been generated by an intervention with zero true effect.
SD = standard deviation.
SE = standard error.

Appendix Table A.4. Baseline Characteristics of Students in the Math Bump-Up Zone

Characteristic (%)	Program Group	SD	Control Group	SD	Difference	SE	P-value
Age							
20 and under	71.46	45.16	70.22	45.73	1.24	1.51	0.409
21-30	14.89	35.60	15.25	35.95	-0.35	1.19	0.766
31 and over	13.64	34.32	14.53	35.24	-0.89	1.15	0.440
Age missing	0.00	0.00	0.00	0.00	0.00	0.00	
Gender							
Male	36.66	48.19	35.20	47.76	1.46	1.59	0.358
Female	58.27	49.31	59.80	49.03	-1.52	1.63	0.350
Gender missing	5.07	21.93	5.00	21.80	0.06	0.72	0.932
Race/Ethnicity							
Asian	6.07	23.87	5.60	22.99	0.47	0.78	0.545
Black	17.70	38.17	14.95	35.66	2.75 **	1.22	0.024
Hispanic	14.09	34.79	13.10	33.74	0.99	1.13	0.383
White	49.75	50.00	51.88	49.96	-2.13	1.66	0.199
Other	9.73	29.64	10.60	30.79	-0.87	1.00	0.385
Race/Ethnicity missing	2.66	16.09	3.87	19.29	-1.21 **	0.59	0.041
Pell eligible	38.67	48.70	36.81	48.23	1.86	1.61	0.247
Pell eligibility missing	11.23	31.58	9.95	29.93	1.29	1.02	0.206
Sample size	1,994		1,679				

SOURCE: Demographic data provided by the study colleges.

NOTES: Rounding may cause slight discrepancies in sums and differences.
Distributions may not add to 100 percent because categories are not mutually exclusive.
*Statistical significance levels are indicated as: *** = 1 percent, ** = 5 percent, * = 10 percent.*
The p-value indicates the likelihood that the estimated impact (or larger) would have been generated by an intervention with zero true effect.
SD = standard deviation.
SE = standard error.

Appendix Table A.5. Baseline Characteristics of Students in Either the English or Math Bump-Up Zone

Characteristic (%)	Program Group	SD	Control Group	SD	Difference	SE	P-value
Age							
20 and under	74.30	43.70	74.58	43.54	-0.27	0.92	0.766
21-30	13.05	33.69	13.11	33.75	-0.06	0.71	0.937
31 and over	12.64	33.23	12.31	32.86	0.33	0.70	0.636
Age missing	0.00	0.00	0.00	0.00	0.00	0.00	
Gender							
Male	43.76	49.61	44.61	49.71	-0.85	1.05	0.421
Female	52.63	49.93	52.25	49.95	0.38	1.06	0.721
Gender missing	3.61	18.66	3.14	17.45	0.47	0.38	0.220
Race/Ethnicity							
Asian	5.44	22.68	4.50	20.73	0.94 **	0.46	0.040
Black	20.53	40.39	19.16	39.35	1.37	0.84	0.105
Hispanic	16.73	37.32	16.18	36.83	0.55	0.78	0.487
White	43.41	49.56	45.07	49.76	-1.65	1.05	0.115
Other	8.70	28.19	8.81	28.34	-0.10	0.60	0.864
Race/Ethnicity missing	5.19	22.19	6.29	24.28	-1.10 **	0.49	0.026
Pell eligible	43.88	49.62	43.01	49.51	0.87	1.05	0.404
Pell eligibility missing	7.51	26.36	6.14	24.01	1.37 **	0.53	0.010
Sample size	4,872		4,134				

SOURCE: Demographic data provided by the study colleges.

NOTES: Rounding may cause slight discrepancies in sums and differences.
Distributions may not add to 100 percent because categories are not mutually exclusive.
*Statistical significance levels are indicated as: *** = 1 percent, ** = 5 percent, * = 10 percent.*
The p-value indicates the likelihood that the estimated impact (or larger) would have been generated by an intervention with zero true effect.
SD = standard deviation.
SE = standard error.

Appendix Table A.6. Baseline Characteristics of Students in the Full Randomized Sample

Characteristic (%)	Program Group	SD	Control Group	SD	Difference	SE	P-value
Age							
20 and under	69.26	46.14	70.10	45.78	-0.84	0.54	0.118
21-30	14.18	34.88	14.35	35.06	-0.17	0.41	0.679
31 and over	16.56	37.17	15.55	36.24	1.00 **	0.43	0.019
Age missing	0.00	0.00	0.00	0.00	0.00	0.00	
Gender							
Male	43.36	49.56	45.12	49.76	-1.77 ***	0.58	0.002
Female	49.05	49.99	48.47	49.98	0.59	0.58	0.314
Gender missing	7.59	26.49	6.41	24.49	1.18 ***	0.30	0.000
Race/Ethnicity							
Asian	5.79	23.35	4.93	21.65	0.86 ***	0.26	0.001
Black	16.73	37.32	17.16	37.71	-0.43	0.44	0.321
Hispanic	14.99	35.70	15.06	35.77	-0.07	0.42	0.871
White	45.44	49.79	45.95	49.84	-0.51	0.58	0.382
Other	13.56	34.23	12.36	32.92	1.19 ***	0.39	0.002
Race/Ethnicity missing	3.50	18.37	4.54	20.81	-1.04 ***	0.23	0.000
Pell eligible	38.91	48.76	40.73	49.13	-1.82 ***	0.57	0.001
Pell eligibility missing	14.02	34.72	11.11	31.43	2.91 ***	0.38	0.000
Sample size	16,953		13,046				

SOURCE: Demographic data provided by the study colleges.

NOTES: Rounding may cause slight discrepancies in sums and differences.
Distributions may not add to 100 percent because categories are not mutually exclusive.
*Statistical significance levels are indicated as: *** = 1 percent, ** = 5 percent, * = 10 percent.*
The p-value indicates the likelihood that the estimated impact (or larger) would have been generated by an intervention with zero true effect.
SD = standard deviation.
SE = standard error.

Appendix Table A.7. Exploratory Results for Subgroups of Students in the Bump-Up Zone, by Gender

Outcome	Male					Female					H-Statistic P-value
	Control	Impact Estimate	P-value	SE	Sample Size	Control	Impact Estimate	P-value	SE	Sample Size	
English bump-up zone											
Completed gateway English course (%)	33.9	6.7	0.000 ***	1.8	3,093	41.5	8.5	0.000 ***	1.8	3,148	0.642
Cumulative college credits earned, any subject	21.5	1.2	0.246	1.0	3,093	23.6	2.5	0.014 **	1.0	3,148	0.639
Credential completion or transfer to a 4-year institution (%)	19.4	0.8	0.594	1.5	3,093	23.0	2.2	0.170	1.6	3,148	0.768
Math bump-up zone											
Completed gateway math course (%)	26.3	7.0	0.007 ***	2.6	1,322	25.3	8.1	0.000 ***	2.0	2,166	0.819
Cumulative college credits earned, any subject	26.4	1.7	0.267	1.5	1,322	30.4	2.0	0.094 *	1.2	2,166	0.986
Credential completion or transfer to a 4-year institution (%)	29.4	0.9	0.721	2.6	1,322	36.2	1.2	0.585	2.1	2,166	0.953
English or math bump-up zone											
Cumulative college credits earned, any subject	22.9	1.3	0.140	0.9	3,976	26.7	1.5	0.074 *	0.8	4,724	0.990
Credential completion or transfer to a 4-year institution (%)	21.9	1.1	0.402	1.3	3,976	29.0	0.5	0.686	1.4	4,724	0.761

SOURCES: Transcript and credential data provided by study colleges.

NOTES: Rounding may cause slight discrepancies in sums and differences.
Distributions may not add to 100 percent because categories are not mutually exclusive.
*Statistical significance levels are indicated as: *** = 1 percent, ** = 5 percent, * = 10 percent.*
The p-value indicates the likelihood that the estimated impact (or larger) would have been generated by an intervention with zero true effect.
SE = standard error.
For each outcome, the impacts and standard errors from the subgroup regressions were used to generate an H-statistic in order to compare impacts across subgroups. The H-statistic is used to assess whether the difference in impacts across subgroups is statistically significant. The p-value associated with the H-statistic reflects the probability that observed differences in impacts across subgroups could have been generated if the true impacts were identical across subgroups.
The construction of the H-statistic is described in Lowenstein et al. (2014), Appendix D.

Appendix Table A.8. Exploratory Results for Subgroups of Students in the Bump-Up Zone, by Race

Outcome	Black					Hispanic					White					H-Statistic P-value
	Control	Impact Estimate	P-value	SE	Sample Size	Control	Impact Estimate	P-value	SE	Sample Size	Control	Impact Estimate	P-value	SE	Sample Size	
English bump-up zone																
Completed gateway English course (%)	32.8	6.0	0.019 **	2.5	1,464	37.8	11.3	0.000 ***	2.9	1,174	45.5	5.8	0.004 ***	2.0	2,513	0.517
Cumulative college credits earned, any subject	18.1	2.9	0.030 **	1.3	1,464	21.1	3.8	0.014 **	1.6	1,174	27.9	0.1	0.938	1.2	2,513	0.229
Credential completion or transfer to a 4-year institution (%)	16.4	4.3	0.041 **	2.1	1,464	18.1	2.7	0.264	2.4	1,174	27.0	-0.3	0.860	1.8	2,513	0.475
Math bump-up zone																
Completed gateway math course (%)	21.3	9.2	0.011 **	3.6	604	29.4	1.1	0.789	4.2	501	27.3	8.5	0.000 ***	2.2	1,863	0.503
Cumulative college credits earned, any subject	24.4	4.8	0.035 **	2.3	604	24.3	5.4	0.030 **	2.5	501	32.5	0.4	0.772	1.3	1,863	0.350
Credential completion or transfer to a 4-year institution (%)	28.6	5.5	0.157	3.9	604	24.2	3.7	0.355	4.0	501	38.7	-0.5	0.834	2.3	1,863	0.738

(continued)

Appendix Table A.8 (continued)

Outcome	Black					Hispanic					White					H-Statistic P-value
	Control	Impact Estimate	P-value	SE	Sample Size	Control	Impact Estimate	P-value	SE	Sample Size	Control	Impact Estimate	P-value	SE	Sample Size	
English or math bump-up zone																
Cumulative college credits earned, any subject	19.9	2.8	0.022 **	1.2	1,792	22.5	3.6	0.011 **	1.4	1,484	29.8	-0.1	0.929	0.9	3,978	0.162
Credential completion or transfer to a 4-year institution (%)	19.9	3.2	0.110	2.0	1,792	19.8	3.6	0.099 *	2.2	1,484	31.9	-0.8	0.584	1.5	3,978	0.379

SOURCES: Transcript and credential data provided by study colleges.

NOTES: Rounding may cause slight discrepancies in sums and differences.
Distributions may not add to 100 percent because categories are not mutually exclusive.
*Statistical significance levels are indicated as: *** = 1 percent, ** = 5 percent, * = 10 percent.*
The p-value indicates the likelihood that the estimated impact (or larger) would have been generated by an intervention with zero true effect.
SE = standard error.
For each outcome, the impacts and standard errors from the subgroup regressions were used to generate an H-statistic in order to compare impacts across subgroups. The H-statistic is used to assess whether the difference in impacts across subgroups is statistically significant. The p-value associated with the H-statistic reflects the probability that observed differences in impacts across subgroups could have been generated if the true impacts were identical across subgroups.
The construction of the H-statistic is described in Lowenstein et al. (2014), Appendix D.

Appendix Table A.9. Exploratory Results for Subgroups of Students in the Bump-Up Zone, by Pell Eligibility

Outcome	Pell-eligible					Not Pell-eligible					H-Statistic P-value
	Control	Impact Estimate	P-value	SE	Sample Size	Control	Impact Estimate	P-value	SE	Sample Size	
English bump-up zone											
Completed gateway English course (%)	41.7	7.5	0.000 ***	1.9	2,996	34.1	7.5	0.000 ***	1.8	3,076	0.929
Cumulative college credits earned, any subject	23.2	2.8	0.006 ***	1.0	2,996	22.1	1.0	0.318	1.0	3,076	0.436
Credential completion or transfer to a 4-year institution (%)	22.1	2.7	0.089 *	1.6	2,996	19.4	0.9	0.536	1.5	3,076	0.623
Math bump-up zone											
Completed gateway math course (%)	26.6	5.3	0.033 **	2.5	1,389	25.2	10.0	0.000 ***	2.1	1,893	0.360
Cumulative college credits earned, any subject	31.2	0.8	0.586	1.5	1,389	27.4	3.2	0.013 **	1.3	1,893	0.190
Credential completion or transfer to a 4-year institution (%)	37.5	0.7	0.784	2.7	1,389	29.7	0.9	0.664	2.2	1,893	0.980
English or math bump-up zone											
Cumulative college credits earned, any subject	25.7	1.5	0.083 *	0.9	3,916	24.5	1.4	0.105	0.9	4,470	0.869
Credential completion or transfer to a 4-year institution (%)	27.0	1.1	0.435	1.5	3,916	23.6	0.5	0.673	1.3	4,470	0.898

SOURCES: Transcript and credential data provided by study colleges.

NOTES: Rounding may cause slight discrepancies in sums and differences.
Distributions may not add to 100 percent because categories are not mutually exclusive.
*Statistical significance levels are indicated as: *** = 1 percent, ** = 5 percent, * = 10 percent.*
The p-value indicates the likelihood that the estimated impact (or larger) would have been generated by an intervention with zero true effect.
SE = standard error.
For each outcome, the impacts and standard errors from the subgroup regressions were used to generate an H-statistic in order to compare impacts across subgroups. The H-statistic is used to assess whether the difference in impacts across subgroups is statistically significant. The p-value associated with the H-statistic reflects the probability that observed differences in impacts across subgroups could have been generated if the true impacts were identical across subgroups.
The construction of the H-statistic is described in Lowenstein et al. (2014), Appendix D.

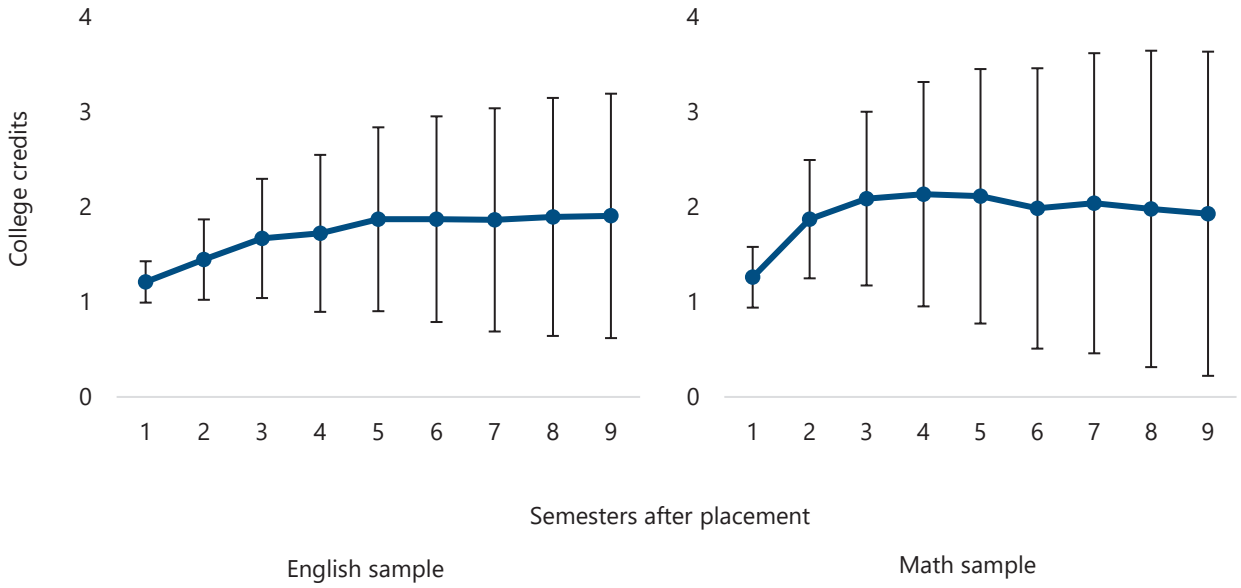
Appendix Table A.10. Cross-College Variation in MMA Placement Effects

Outcome	MMA Placement Effect SD	95% Confidence Interval	Sample Size
English bump-up zone			
Completed gateway English course (%)	7.7	(0, 14.3)	6,411
Cumulative college credits earned, any subject	0.9	(0, 7.0)	6,411
Credential completion or transfer to 4-year institution (%)	0.0	(0, 10.3)	6,411
Math bump-up zone			
Completed gateway math course (%)	4.5	(0, 11.3)	3,673
Cumulative college credits earned, any subject	1.3	(0, 4.5)	3,673
Credential completion or transfer to 4-year institution (%)	0.0	(0, 2.0)	3,673
English or math bump-up zone			
Cumulative college credits earned, any subject	0.0	(0, 3.7)	9,006
Credential completion or transfer to 4-year institution (%)	0.0	(0, 5.8)	9,006
Full sample			
Completed gateway English course (%)	2.3	(0, 5.0)	29,999
Completed gateway math course (%)	1.9	(0, 3.1)	29,999
Cumulative college credits earned, any subject	0.9	(0, 2.3)	29,999
Credential completion or transfer to 4-year institution (%)	0.0	(0, 0.3)	29,999

SOURCES: Transcript and credential data provided by study colleges.

NOTES: Rounding may cause slight discrepancies in sums and differences.
Distributions may not add to 100 percent because categories are not mutually exclusive.
SD = standard deviation.

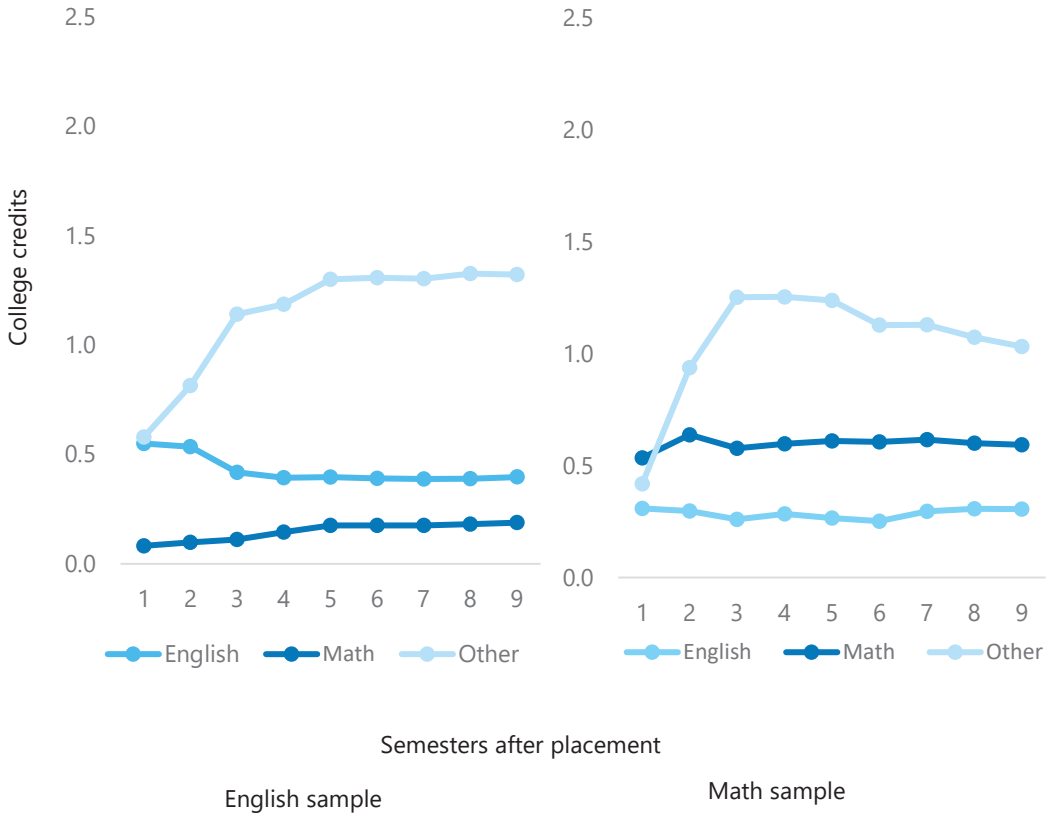
Appendix Figure A.1. Effect of MMA Bump-Up on Cumulative College Credits



SOURCE: Transcript data provided by study colleges.

NOTES: Sample represents 6,411 students in the English bump-up zone and 3,673 students placed in the math bump-up zone. The vertical lines (or error bars) at each point represent the 95 percent confidence interval around the impact estimates. Estimates are adjusted by college, cohort, race/ethnicity, gender, age, high school GPA, ACT English and math subscores, and Accuplacer test scores.

Appendix Figure A.2. Effect of MMA Bump-Up on Cumulative College Credits, by Subject



SOURCE: Transcript data provided by study colleges.

NOTES: Sample represents 6,411 students in the English bump-up zone and 3,673 students placed in the math bump-up zone.

Estimates are adjusted by college, cohort, race/ethnicity, gender, age, high school GPA, ACT English and math subscores, and Accuplacer test scores.

B

Appendix

Detailed Description of Data Processing Decisions

A Note on Previously Published Impacts at SUNY Colleges

Throughout this report, impacts are sometimes shown separately for the seven SUNY colleges, which were part of a separate study. Data from this study have been analyzed in a previous report which presented impacts after nine semesters, just as this report does.[1] For a variety of reasons, the SUNY-specific nine semester impacts in this report do not exactly replicate the previously published findings. In the process of drafting this report, the authors compared the new impact estimates on confirmatory outcomes and samples to previously published impact estimates to ensure consistency, and in that process identified minor errors in the previously published report about impacts at SUNY. These errors do not meaningfully change the findings in that report. The original authors of that report have since published updated impact estimates that correct the identified errors.[2]

Additionally, the combined analysis in this report used a slightly different set of covariates than previous studies due to differences in the availability of covariates across the two studies as well as a need to align with the preregistered analysis plan for this study.[3] This may result in slight differences in the precision of impact estimates compared with previously reported figures. Table B.1 below summarizes the differences in data availability between the two studies and the final set of covariates used in this combined analysis. Note that information on Pell eligibility and receipt was collected postrandomization and therefore not used as covariates.

Lastly, the two studies varied in certain approaches to processing student outcome data, as they were conducted by research teams at two different organizations with slightly differing practices for dealing with common data issues such as missingness, imputation, and outliers. Out of a desire for consistency, the approaches used in the combined analysis are the same across all the data, which results in minor differences in outcome levels and impact estimates.

Limitations to Transfer Outcomes

Due to differences in the scope of data received from colleges, there are some cases where it was not possible to assess with complete accuracy whether a student transferred to a four-year college. At one college, the data contained information on when and to where a student transferred, but no information on how long they stayed enrolled at their new institution. While likely negligible, this would mean that a student who was accepted to another institution but never enrolled in classes would still be counted as a successful transfer. At another college, the data included only transfer students who earned a degree at their new institution, resulting in an underestimate of total transfers for that college. For the SUNY colleges, the data capture

1. Kopko, Daniels, and Cullinan (2023).
2. Kopko and Daniels (2023).
3. The analysis plan for this study was preregistered on September 12, 2023, and can be found here: https://sreereg.icpsr.umich.edu/sreereg/subEntry/20582/pdf?section=all&action=download.

transfers only within the SUNY system. All things considered, the estimates of transfer rates reported in this analysis are likely underestimates.

Appendix Table B.1. Data Availability and Covariate Usage

Covariate	SUNY	WI-MN	Combined
Demographic			
Race/ethnicity	x	x	x
Gender	x	x	x
Age	x	x	x
Pell eligibility	~	~	
Pell recipient	x		
Design			
College	x	x	x
Cohort	x	x	x
Multiple measures			
Math algorithm score	x		
English algorithm score	x		
HS GPA	~	x	x
LASSI		x	
Grit		x	
ACT English	~	x	x
ACT Reading		x	
ACT Math	~	x	x
Accuplacer			
Elementary algebra	~	x	x
Arithmetic	~	x	x
College-level math	~	x	x
Reading comprehension	~	x	x
Sentence skills	~	x	x
ESL combined		x	
Writeplacer	~	x	x

SOURCES: Demographic and placement data provided by study colleges.

NOTES: x = used as covariate in impact analysis.
~ = variable available in data.

References

Bahr, Peter Riley. 2010. Preparing the Underprepared: An Analysis of Racial Disparities in Postsecondary Mathematics Remediation. *The Journal of Higher Education* 81, 2: 209–237. https://doi.org/10.1080/00221546.2010.11779049.

Bailey, Thomas, Shanna S. Jaggars, and Davis Jenkins. 2015. "What We Know About Guided Pathways." New York: Columbia University, Teachers College, Community College Research Center. https://files.eric.ed.gov/fulltext/ED562052.pdf.

Belfield, Clive R., and Peter M. Crosta. 2012. "Predicting Success in College: The Importance of Placement Tests and High School Transcripts." CCRC Working Paper No. 42. New York: Columbia University, Teachers College, Community College Research Center. Website: https://ccrc.tc.columbia.edu/media/k2/attachments/predicting-success-placement-tests-transcripts.pdf.

Castillo, Wendy, and David Gillborn. 2023. "How to 'QuantCrit:' Practices and Questions for Education Data Researchers and Users." EdWorkingPaper: 22-546. Providence, RI: Annenberg Institute at Brown University: https://doi.org/10.26300/v5kh-dd65.

Cullinan, Dan, and Dorota Biedzio Rizik. 2021. *Increasing Gatekeeper Course Completion: Three-Semester Findings from an Experimental Study of Multiple Measures Assessment and Placement*. New York: MDRC. Website: https://www.mdrc.org/work/publications/increasing-gatekeeper-course-completion.

Hedges, Larry V. 1984. "Estimation of Effect Size Under Nonrandom Sampling: The Effects of Censoring Studies Yielding Statistically Insignificant Mean Differences." *Journal of Educational and Behavioral Statistics* 9,1: 61–85.

Institute of Education Sciences. 2022. "Percentage of First-Year Undergraduate Students Who Reported Taking Remedial Education Courses, by Selected Student and Institution Characteristics: Selected Academic Years, 2003-04 Through 2019-20." *Digest of Education Statistics*. Washington, DC: U.S. Department of Education, Institute of Education Sciences. Website: https://nces.ed.gov/programs/digest/d22/tables/dt22_311.40.asp.

Kopko, Elizabeth, and Hollie Daniels. 2023. "The Long-Term Effects of Multiple Measures Assessment at SUNY Community Colleges." New York: Center for the Analysis of Postsecondary Readiness. Website: https://ccrc.tc.columbia.edu/media/k2/attachments/long-term-effects-multiple-measures-assessment.pdf.

Kopko, Elizabeth, Hollie Daniels, and Dan Cullinan. 2023. "The Long-Term Effectiveness of Multiple Measures Assessment: Evidence from a Randomized Controlled Trial." A CAPR Working Paper. New York: Center for the Analysis of Postsecondary Readiness. Website: https://www.mdrc.org/sites/default/files/long-term-effectiveness-multiple-measures-assessment_0.pdf.

Litschwartz, Sophie, Dan Cullinan, and Vivianna Plancarte. 2023. "Multiple Measures Assessment and Corequisite Courses: Alternate Ways to Place and Prepare New College Students." New York: Center for the Analysis of Postsecondary Readiness. Website: https://www.mdrc.org/sites/default/files/Multiple_Measures_Assessment_and_Corequisite_Courses_0.pdf.

Lowenstein, Amy E., Noemi Altman, Patricia M. Chou, Kristen Faucetta, Adam Greeney, Daniel Gubits (Abt Associates), Jorgen Harris, JoAnn Hsueh, Erika Lundquist, Charles Michalopoulos, and Vinh Q. Nguyen. 2014. *A Family-Strengthening Program for Low-Income Families: Final Impacts from the Supporting Healthy Marriage Evaluation, Technical Supplement*. OPRE Report 2014-09B. Washington, DC: U.S. Department of Health and Human Services, Administration for Children and Families, Office of Planning, Research and Evaluation.

Melguizo, Tatiana, Johannes Bos, and George Prather. 2011. "Is Developmental Education Helping Community College Students Persist? A Critical Review of the Literature." *American Behavioral Scientist* 55, 2: 173–184. https://doi.org/10.1177/0002764210381873.

Rutschow, Elizabeth Z., Maria S. Cormier, Dominique Dukes, and Diana E. Cruz Zamora. 2019. *The Changing Landscape of Developmental Education Practices*. New York: Center for the Analysis of Postsecondary Readiness. Website: https://ccrc.tc.columbia.edu/media/k2/attachments/changing-landscape-developmental-education-practices.pdf.

Schochet, Peter. Z. 2009. "An Approach for Addressing the Multiple Testing Problem in Social Policy Impact Evaluations." *Evaluation Review* 33, 6: 539–567.

Scott-Clayton, Judith. 2012. "Do High-Stakes Placement Exams Predict College Success?" Community College Research Center Working Paper No. 41. New York: Columbia University, Teachers College, Community College Research Center. Website: https://ccrc.tc.columbia.edu/media/k2/attachments/high-stakes-predict-success.pdf.

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