Early Outcomes of Texas Community College Students Enrolled in Dana Center Mathematics Pathways Prerequisite Developmental Courses

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Every year, colleges refer more than a million students they deem underprepared for college-level mathematics coursework to sequences of one or more developmental math courses. Some of these students quickly complete these sequences and continue on to introductory college-level math courses, which are typically required for credential completion. However, most students linger in developmental math courses for years, either because they are placed into longer sequences of courses, struggle to pass these courses, or both. Developmental and college-level math requirements are both significant barriers for many students, regardless of major (Bailey, Jeong, & Cho, 2010; Chen, 2016).

Given the challenges students face in completing developmental and entry-level college math courses, educators and researchers recognize the need for improvement in how students remediate their math skills and satisfy their math requirements. One strategy, sometimes called the math pathways approach, encourages students to enroll in a college-level math course that is best suited to their field of interest, which could be a non-algebra based course, as soon as possible after starting college. Studies of reforms that adopt this approach illuminate two main ways of accelerating students' progress into college-level courses: developmental course compression and developmental corequisite coursework (Zachry Rutschow, 2019).

The compression approach condenses sequences of two or more developmental courses into a shorter, accelerated (also referred to as "streamlined") prerequisite course that covers the same content in a single semester. The corequisite approach allows students to enroll in introductory college-level math at the same time as developmental math, where the developmental content is often reviewed "just in time" to support the related college-level content. Both approaches are supported by a growing body of research (on course compression, see Schudde & Keisler, 2019; Yamada & Bryk, 2016; Zachry Rutschow, 2018; on corequisites, see Logue, Watanabe, & Douglas, 2016; Logue, Douglas, Watanabe-Rose, 2019).

> **We find evidence of greater enrollment and pass rates in introductory college-level math courses among students who enrolled in DCMP developmental math courses.**

In this brief, we use state administrative data to examine outcomes of Texas community college students enrolled in compressed prerequisite developmental math courses as part of the Dana Center Mathematics Pathways (DCMP) program. Among two cohorts of students who enrolled in developmental math courses in fall 2015 and fall 2016, we compare key early outcomes of those enrolled in DCMP developmental courses with peers enrolled primarily in traditional developmental math courses. We find evidence of greater enrollment and pass rates in introductory college-level math courses among the DCMP enrollees as early as one semester after developmental enrollment.

This study contributes to a growing body of research on the math pathways approach (Ganga & Mazzariello, 2018) and to evidence about the DCMP model more specifically (Schudde & Keisler, 2019; Zachry Rutschow, 2018). Schudde and Keisler similarly used state administrative data in Texas to examine the outcomes of a fall 2014 cohort of students who enrolled in DCMP developmental courses. In the current study, we follow more recent cohorts, as more colleges in the state have implemented the DCMP model, and we assume that implementation has changed compared to when that first large cohort participated in DCMP in fall 2014. Our results also bolster support for preliminary findings from CAPR's randomized controlled trial (RCT) of the DCMP model, which measures the effects of DCMP at four colleges in Texas and shows that students assigned to DCMP developmental courses more than doubled their enrollment and pass rates in college-level math by the subsequent semester compared to students assigned to traditional developmental math courses (Zachry Rutschow, 2018). The advantage of our study is that we use state administrative data from all implementing community colleges in Texas. Although our approach does not allow us to capture causal effects, as in the RCT, using these statewide data allows us to examine differences in the backgrounds of students and to compare outcomes of greater numbers of students after controlling for student characteristics.

Dana Center Mathematics Pathways

At the time of our study, many colleges in Texas were implementing the DCMP model by offering students a compressed prerequisite developmental math course as well as non-algebra introductory college-level math courses based on students' field of interest (e.g., a quantitative reasoning and a statistical reasoning introductory course). This multiple math pathways approach moves

away from the algebra-for-all approach, still common in many colleges across the country, in which students take algebra as an introductory college math course regardless of their major or career interests. The Dana Center's recommendation to colleges at the time of implementation was that the DCMP developmental course would work best for students interested in non-STEM majors who would otherwise need to take at least two semesters of traditional developmental math coursework. Thus, under this model, students would take only one compressed developmental course in order to accelerate their progress.

Advisors and faculty at each implementing college had autonomy in determining placement into DCMP, and there was some variation in advising and recruitment procedures across colleges (see Schudde & Keisler, 2019). At many colleges implementing DCMP, the compressed developmental course was taught using a curriculum developed by the Dana Center called *Foundations of Mathematical Reasoning*, which emphasizes application of math concepts to the real world, though some colleges created their own comparable curriculum to achieve similar goals. Students were advised to enroll in college-level math immediately after passing the compressed prerequisite developmental math course in order to build momentum to complete their required introductory college-level math course within the year.

In fall 2013, nine colleges in Texas piloted the DCMP model. The scale of the program grew in fall 2014, when 20 of Texas's 50 public two-year colleges implemented the model (Schudde & Keisler, 2019), though DCMP developmental enrollees still comprised only about 4 percent of the participating community colleges' developmental math students. In fall 2015 and fall 2016, 24 and 27 Texas community colleges implemented the DCMP model, respectively, and DCMP students comprised 20 and 26 percent of developmental math students at the participating colleges. The majority of the implementing colleges continued to offer DCMP compressed prerequisite developmental courses, but six colleges—whose DCMP developmental enrollees made up fewer than 5 percent of all DCMP developmental enrollees in the state—used a corequisite approach.[1] More recently, colleges across the country, including those in Texas, continue to shift from offering a compressed prerequisite developmental math course to offering corequisite coursework in which students take college-level and developmental math in the same term. Because this shift has primarily occurred after the follow-up window in our administrative data, we focus on selection into and outcomes associated with participation in the compressed prerequisite implementation of DCMP in this brief.

Data and Methods

To examine the relationship between DCMP participation and early college outcomes, we use state administrative data to provide descriptive statistics and conduct regression analyses. The data were obtained through a restricted-use agreement with the Texas Education Research Center (ERC), a research center and data clearinghouse at the University of Texas at Austin. The ERC holds longitudinal, student-level data for the entire population of secondary and postsecondary students in the state. We use student data collected by the Texas Higher Education Coordinating Board (THECB), including demographic information, enrollment records, placement test scores and exemptions, credits, grades, and degree outcomes, along with financial aid application (FAFSA) information. Using a list of course and section numbers provided by

the Dana Center, we identify students enrolled in DCMP developmental courses at each of the implementing colleges in fall 2015 and 2016. The comparison group is primarily composed of students in traditional developmental math sequences (identified based on course number), but at least some colleges were experimenting with alternative developmental math reforms. We cannot easily delineate which non-DCMP courses were not traditional developmental courses from the administrative data. For that reason, our results may represent conservative estimates of the relationship between DCMP developmental math courses and student outcomes, as the inclusion of students in alternative treatments in the comparison group might dampen our estimates if those alternative treatments also improve outcomes for developmental math students.

Student Characteristics

To examine differences between students in DCMP courses and other developmental math courses, we present summary statistics for all students who enrolled in developmental math at Texas community colleges offering DCMP in fall 2015 (see Table 1 below). We focus on the fall 2015 cohort because we have more long-term data for those students, but we also present preliminary results for the fall 2016 cohort. The first three columns of Table 1 include all students enrolled in developmental math in fall 2015, broken into those enrolled in DCMP developmental courses and those enrolled in non-DCMP developmental courses at colleges that offered DCMP, and the differences between these two groups. The second three columns include only students in their first semester of college (referred to as first-time-in-college or FTIC students), broken into the same categories. FTIC students comprised about 45 percent of the developmental enrollees.

Table 1 illustrates that students enrolled in DCMP courses were more likely to be White and female than students enrolled in non-DCMP courses. Although DCMP courses included more Black students than non-DCMP courses, the disparities in White and Hispanic student enrollments—in which White students appear to be strongly overrepresented and Hispanic students strongly underrepresented in DCMP courses—are striking. Students enrolled in DCMP courses were also somewhat more likely to have test score records from the Texas Success Initiative (TSI) assessment (the mandated placement test in Texas),[2] and conditional on having scores, their scores tended to be significantly higher. There also appear to be some differences in financial measures across students enrolled in DCMP and non-DCMP courses, though the differences are only statistically significant for the average family contribution and unmet financial need measures. However, most students did not have financial aid records containing this information—among all the students, under a third filed for financial aid.

Table 2 presents qualitatively similar summary statistics for the fall 2016 cohort of developmental math students. Supplementary tables available as a separate document show that developmental math enrollees at colleges that offered DCMP appear similar to developmental math enrollees at colleges that did not offer DCMP (see Tables S1 and S2). In additional analyses (available upon request), we find that the variation in DCMP enrollment does not appear to be driven by student compositional differences between colleges that offered more or fewer spots in DCMP developmental courses.

Our main takeaway from the descriptive patterns in both cohorts is that there appear to be systematic differences between students enrolled in DCMP and non-DCMP developmental math courses.

TABLE 1. Summary Statistics for Students Enrolled in Developmental Math at DCMP Colleges in Fall 2015

	All Students			FTIC Students Only		
	DCMP Courses [1]	Non-DCMP Courses [2]	Difference [3]	DCMP Courses [4]	Non-DCMP Courses [5]	Difference [6]
Campuses	24	23		23	22	
Students	4,857	23,837		2,372	10,566	
Developmental math course enrollments	4,974	26,714		2,426	11,981	
Pass rate	66.6%	61.3%	5.3%***	69.1%	63.9%	5.3%***
Demographics						
Female	64.1%	60.5%	3.6%***	60.4%	57.6%	2.8%**
Race/ethnicity						
White	43.5%	25.3%	18.2%***	42.9%	22.6%	20.3%***
Asian	1.1%	1.4%	-0.3%*	1.2%	1.3%	-0.2%
Black	20.6%	16.1%	4.5%***	18.2%	14.0%	4.2%***
Hispanic	31.7%	54.1%	-22.4%***	34.7%	59.4%	-24.7%***
Other	3.1%	3.1%	0.0%	3.1%	2.7%	0.4%
Age						
0-19	52.2%	47.6%	4.5%***	81.8%	80.4%	1.4%
20-24	20.7%	23.1%	-2.4%***	10.1%	11.2%	-1.0%
25+	25.5%	25.0%	0.6%	8.1%	8.5%	-0.4%
Placement Test						
Has TSI score record	67.1%	52.5%	14.6%***	85.9%	65.5%	20.4%***
Mean TSI score	334.1	331.2	2.9***	336.3	332.7	3.6***
Has any test score record	69.0%	56.5%	12.5%***	86.5%	66.3%	20.2%***
Mean Z-score (any test)	-0.55	-0.74	0.19***	-0.47	-0.70	0.23***
Financial Aid						
Has FADS record	30.3%	29.7%	0.6%	3.2%	2.9%	0.3%
Average student income	$10,843	$10,092	$751	$860	$2,151	-$1,291
Average family income	$17,652	$16,778	$874	$11,690	$15,839	-$4,149
Average family contribution	$2,658	$2,157	$500**	$1,435	$2,043	-$608
Average unmet need	$8,200	$9,252	-$1,052***	$14,620	$34,188	-$19,568***

NOTES: We count a student enrolled in both a DCMP and non-DCMP developmental math course at the same college as a DCMP student. The row "Developmental math course enrollments" counts the number of course enrollments in the given category of developmental math, which may be more than one per student. Other than in that row, students are counted only once per column. The Placement Test section is based on Texas Success Initiative (TSI) Report records from the THECB. Such records do not always include test scores. A student is counted as having a TSI score record if, within five years previous to fall 2015 (the window of validity for placement test scores), the student has a TSI Report record with a score from the math TSI test. Similarly, a student is counted as having any test score record if the student has a record with a score from any math placement test within five years.

***p < .01, **p < .05, *p < .1.

TABLE 2. Summary Statistics for Students Enrolled in Developmental Math at DCMP Colleges in Fall 2016

	All Students			FTIC Students Only		
	DCMP Courses [1]	Non-DCMP Courses [2]	Difference [3]	DCMP Courses [4]	Non-DCMP Courses [5]	Difference [6]
Campuses	27	27		27	27	
Students	6,653	25,206		3,266	11,134	
Developmental math course enrollments	8,107	27,915		4,143	12,729	
Pass rate	66.8%	59.9%	6.9%***	69.6%	63.7%	5.8%***
Demographics						
Female	65.0%	58.9%	6.0%***	63.0%	56.9%	6.0%***
Race/ethnicity						
White	40.1%	28.7%	11.5%***	39.2%	27.0%	12.3%***
Asian	1.5%	2.9%	-1.4%***	1.5%	2.5%	-1.0%***
Black	15.3%	15.6%	-0.3%	13.3%	13.2%	0.1%
Hispanic	39.6%	50.6%	-11.0%***	42.3%	55.1%	-12.8%***
Other	3.4%	2.3%	1.2%***	3.6%	2.2%	1.5%***
Age						
0-19	53.8%	50.2%	3.6%***	80.5%	79.8%	0.7%
20-24	20.0%	22.6%	-2.6%***	10.4%	10.5%	-0.1%
25+	21.9%	23.2%	-1.2%**	9.1%	9.7%	-0.6%
Placement Test						
Has TSI score record	67.1%	63.4%	3.7%***	79.1%	74.7%	4.4%***
Mean TSI score	334.0	332.8	1.2***	335.6	334.2	1.4***
Has any test score record	68.9%	65.3%	3.6%***	79.4%	74.9%	4.4%***
Mean Z-score (any test)	-0.64	-0.71	0.08***	-0.58	-0.67	0.09***
Financial Aid						
Has FADS record	25.9%	28.0%	-2.1%***	3.9%	3.5%	0.4%
Average student income	$9,851	$9,355	$496	$7,345	$4,644	$2,701*
Average family income	$20,486	$21,538	-$1,051	$16,463	$15,653	$810
Average family contribution	$3,055	$2,863	$192	$2,575	$1,894	$681
Average unmet need	$7,176	$7,893	-$717***	$6,641	$6,301	$339

NOTE: See notes for Table 1.

Compared with non-DCMP courses, DCMP courses included more White students, fewer Hispanic students, and fewer male students than we would expect to see based on the distribution of students at the colleges. The observed selection—particularly the variation in participation across race/ethnicity—signals inequality in subgroup access to reformed developmental math pathways (we elaborate on this in the implications section). Without more information about how students were selected for enrollment in DCMP courses, we cannot ascertain the drivers of these patterns.

Findings on Outcomes

Next, we examine the outcomes of students who participated in DCMP courses using regression models. The systematic differences across DCMP and non-DCMP students at DCMP-offering colleges motivate our inclusion of various controls in the regression analysis. We use a linear probability model to estimate the relationship between enrollment in DCMP developmental math and several important milestones for student success, such as passing introductory college-level math within two years (or within one year, for specifications performed on students from the fall 2016 cohort). We control for demographics, including gender, race/ethnicity, age, and whether the student was FTIC, and in our preferred specification we also control for TSI score. (We also analyzed some specifications that included family and student income as controls [available upon request], but the sample proved to be too small to get precise estimates).[3]

In Table 3, we present coefficient estimates from our regressions. Column 1 shows that, prior to controlling for student background, compared with their non-DCMP peers, fall 2015 DCMP students were around 5 percentage points more likely to pass developmental math that term, 12 percentage

TABLE 3. Estimated Differences in Outcomes of Students Enrolled in DCMP and Non-DCMP Developmental Math

Outcome	Fall 2015 Cohort			Fall 2016 Cohort	Combined
	No Controls [1]	Only Demographic Controls [2]	Full Controls [3]	Full Controls [4]	Full Controls [5]
Passed developmental math	0.05*** (0.01)	0.06*** (0.01)	0.02** (0.01)	0.06*** (0.01)	0.04*** (0.01)
Next semester					
Enrolled in college	-0.02** (0.01)	-0.01* (0.01)	-0.02** (0.01)	0.02*** (0.01)	0.00 (0.01)
Enrolled in college-level math	0.18*** (0.01)	0.18*** (0.01)	0.17*** (0.01)	0.11*** (0.01)	0.13*** (0.01)
Passed college-level math	0.12*** (0.01)	0.12*** (0.01)	0.10*** (0.01)	0.07*** (0.01)	0.08*** (0.00)
College credits attempted	3.02*** (0.27)	2.93*** (0.25)	2.46*** (0.24)	1.11*** (0.21)	1.64*** (0.16)
College credits earned	2.07*** (0.23)	2.03*** (0.22)	1.47*** (0.22)	0.65*** (0.20)	0.95*** (0.15)
Subsequent years	Within 2 Years			Within 1 Year	
Enrolled in college	-0.01* (0.01)	-0.01 (0.01)	-0.03*** (0.01)	-0.01 (0.01)	-0.01** (0.01)
Enrolled in college-level math	0.11*** (0.01)	0.11*** (0.01)	0.09*** (0.01)	0.07*** (0.01)	0.09*** (0.01)
Passed college-level math	0.07*** (0.01)	0.07*** (0.01)	0.05*** (0.01)	0.05*** (0.01)	0.06*** (0.01)
College credits attempted	4.38*** (0.38)	3.89*** (0.37)	3.00*** (0.42)	1.41*** (0.26)	2.02*** (0.19)
College credits earned	3.02*** (0.34)	2.71*** (0.35)	1.64*** (0.40)	0.77*** (0.24)	1.13*** (0.18)
N	28,694	27,588	15,180	19,669	34,849

NOTES: In all columns, the treatment group is comprised of students enrolled in DCMP developmental math courses, while the comparison group is comprised of students enrolled in other developmental math courses at the same set of colleges (a student taking both a DCMP and a non-DCMP course at the same college is in the treatment group). Columns 2-5 include controls for gender, race/ethnicity, age, and FTIC status. Columns 3–5 include a control for TSI math placement test scores and exclude students without TSI score records.

Fall 2015 and fall 2016 control group means for each outcome, respectively, are shown in parentheses as follows: Passed developmental math (0.61, 0.60); [Next semester outcomes] Enrolled in college (0.78, 0.78), Enrolled in college-level math (0.24, 0.35), Passed college-level math (0.16, 0.22), College credits attempted (13.18, 27.18), College credits earned (9.84, 21.53); [Outcomes within 2 years or 1 year, respectively] Enrolled in college (0.39, 0.53), Enrolled in college-level math (0.74, 0.56), Passed college-level math (0.62, 0.39), College credits attempted (42.95, 36.15), College credits earned (35.98, 29.11).

***p < .01, **p < .05, *p < .1.

points more likely to pass college-level math in the next term, and 7 percentage points more likely to pass college-level math within two years. In column 2, we introduce demographic controls, which do not substantially change the estimates.

Our preferred specification in column 3 also controls for TSI score, a potential predictor of passing college-level math. Using this specification, the increased likelihood of passing developmental math among DCMP enrollees shrinks to 2 percentage points. In this preferred model, DCMP students were slightly less likely to persist to the next semester than non-DCMP students, but they were much more likely to enroll in a college-level math course in that next term (driven by higher enrollment in college-level math among DCMP students who persisted). Participating in DCMP in fall 2015 is associated with a 17-percentage-point increase in the probability of enrolling in college-level math in the next term. Within two years, DCMP students were 9 percentage points more likely to enroll in college-level math and 5 percentage points more likely to pass college-level math than their peers who enrolled in non-DCMP courses. The positive relationship between DCMP developmental course enrollment and short-term outcomes is expected, as students in DCMP should take fewer developmental math courses overall and should enroll in college-level math earlier than students in traditional developmental math sequences.

Column 4 shows results for the fall 2016 cohort, but due to a shorter follow-up period, the longer term dependent variables capture the probability of each respective outcome within one year rather than two years. While there are some differences in short-term results across cohorts, the patterns generally hold across cohorts with one exception: next-semester persistence. The estimate for enrolling in college in the next semester is positive for DCMP students in the fall 2016 cohort but negative for those in the fall 2015 cohort. Other short-term estimates also differ, but less dramatically; for example, the estimate for passing developmental math is larger in magnitude and the estimates for the next-semester outcomes are smaller in magnitude among the fall 2016 than among the fall 2015 DCMP students. Column 5 pools the fall 2015 and fall 2016 cohorts to show the combined DCMP results within one year (we use these estimates in our final discussion below). The point estimates from the combined cohorts are a higher for the passing of developmental math (an increased likelihood of 4 versus 2 percentage points among DCMP students) and somewhat lower for most

FIGURE 1. Cumulative Proportion of Fall 2015 DCMP and Non-DCMP Students Who Passed College-Level Math Each Semester
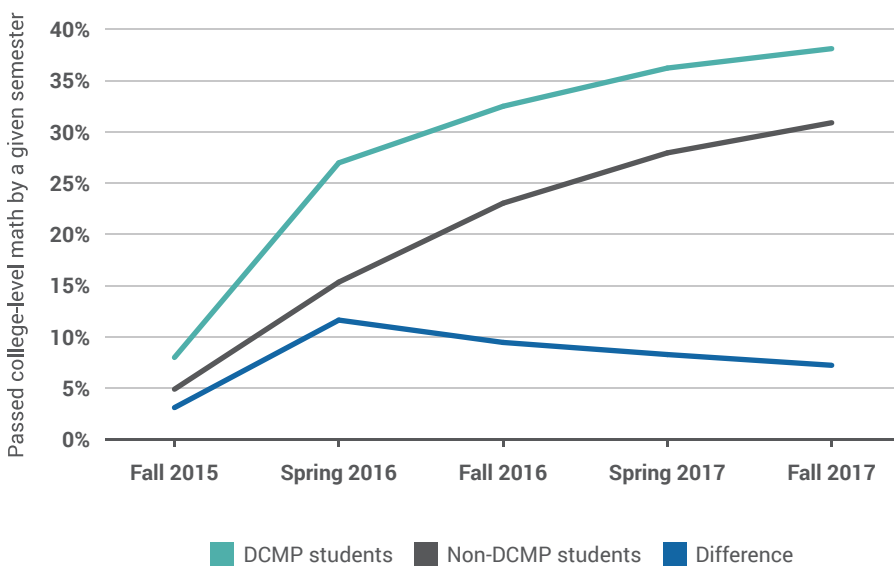

NOTE: A small number of students in the fall 2015 cohort passed a college-level math course prior to that term but had nevertheless been enrolled in developmental math in fall 2015.

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other outcomes than our preferred specification from the 2015 cohort.

In Figure 1, we examine how DCMP's acceleration of student progress through developmental math and into introductory college-level math predicts the timing of completion of introductory college-level math. The figure shows the portion of students enrolled in DCMP and non-DCMP developmental math courses in fall 2015 who passed college-level math by each subsequent semester. There is a clear gap in passing college-level math between the two groups starting in the next term, spring 2016. The gap narrows modestly over

FIGURE 2. Cumulative Gap Between Fall 2015 DCMP and Non-DCMP Students In Passing College-Level Math Each Semester by Race/Ethnicity
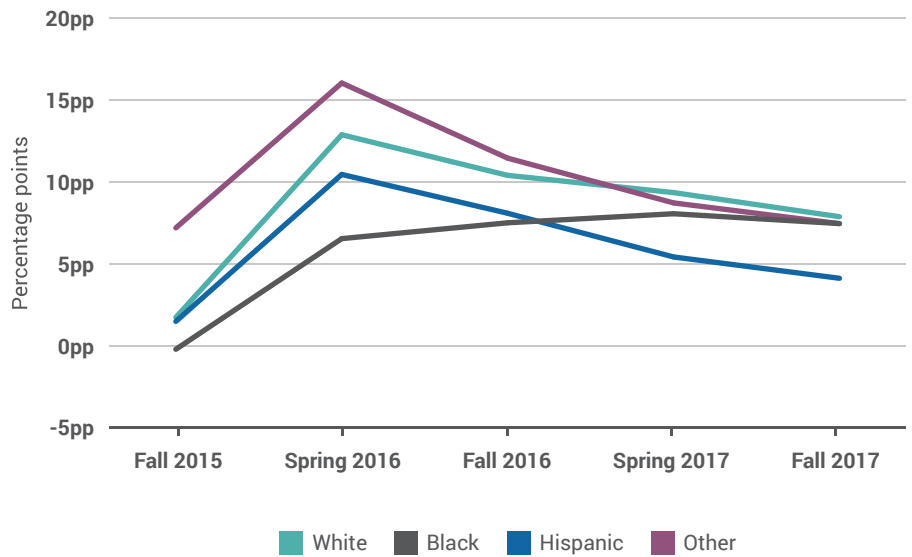
NOTE: In spring 2016 the college-level math course pass rates among non-DCMP students by racial/ethnic subgroup were: White, 14 percent; Black, 12 percent; Hispanic, 16 percent; Other, 16 percent.

time but remains substantial through fall 2017, two years after entry into the initial developmental course. The blue line represents the difference in passing college-level math between DCMP and non-DCMP developmental math students. It declines after the initial boost in the subsequent semester, but then declines more modestly as fewer additional students in the cohort continue to pass college-level math. Given the slowdown in additional course completions, it seems possible that the gap in passing college math after two years may be a close proxy for the gap in passing college math further out in time.

Given the differences in selection into DCMP developmental math courses across race/ethnicity in particular, it is useful to examine subgroup differences in passing college-level math courses by semester. We examine heterogeneity by race/ethnicity in Figure 2. Figure 2 shows, for each subgroup, the gap in cumulative pass rates between DCMP and non-DCMP students (similar to the blue line plotted in Figure 1, but provided for each racial/ethnic subgroup). For Black students, participating in DCMP did not initially increase their pass rate in college-level math as substantially as for other groups, but Black DCMP students showed a gradual increase in their pass rate over time. White students, Hispanic students, and students who identified as another racial/ethnic category (grouped as "Other" in our analysis due to low sample size) experienced an initial jump in passing college-level math that gradually diminished over time. For all racial/ethnic subgroups, students who participated in DCMP maintained an advantage over their non-DCMP peers in passing college-level math. Despite some differences in the patterns over time, the observed differences across racial/ethnic groups are not statistically significant.

Discussion and Implications

Overall, DCMP compressed prerequisite developmental courses appear to be effective at accelerating community college students through their math requirements. In our study, students enrolled in DCMP developmental math were about 13 percentage points more likely to enroll in college-level math in the subsequent semester and 8 percentage points more likely to pass college-level math in that term than their peers who enrolled in non-DCMP developmental math (pooled estimates across fall 2015 and fall 2016 cohorts). The next-term improvements we observe in the enrollment in and passing of college-level math occur earlier than those observed in the Schudde and Keisler (2019) study of the fall 2014 cohort—DCMP students in that cohort did not experience statistically significant improvements over non-DCMP students until after the subsequent semester. (Perhaps there was an implementation lag in encouraging 2014 cohort students enrolled in DCMP developmental math to enroll immediately in college-level math.) For students in the 2015 and 2016 cohorts, DCMP appears to have offered students an immediate boost in college-level math enrollment and completion. The results from our regression analysis suggest that the advantage gained in the first term after enrollment in developmental math was maintained over time—there was still a 5-percentage-point improvement in passing college-level math two years later among those in the fall 2015 cohort, which has a longer follow-up period than the 2016 cohort.

The acceleration in meeting the milestone of college-level math completion represents time and effort saved for DCMP students. Conditional on eventually passing college-level math, completing the requirement a semester or two earlier may be a substantial benefit, as it could allow students to graduate earlier. Further, some DCMP students pass college-level math who may not pass otherwise.

Given the positive relationships between enrolling in DCMP developmental courses and important college outcomes, the systematic sorting of students into DCMP, and particularly the differences in participation across race/ethnicity, is a concern. DCMP-implementing colleges tend to enroll a disproportionately large number of White students in DCMP developmental courses relative to students from other racial/ethnic groups and especially relative to Hispanic students. Math reforms like compressed prerequisite and corequisite developmental coursework are opportunities for students to gain momentum through their college requirements. For that reason, colleges' placement practices have important implications for equity—decisions about placement by college personnel that serve to accelerate some students through developmental and college requirements and leave others with the status quo could exacerbate educational inequalities.

The patterns we observe in DCMP versus non-DCMP developmental course enrollment—based on decisions made at the college level—may be useful to educators across the country as they think about student access to innovations in developmental math. Understanding selection into reformed practices is crucial to improving equity and student success. College personnel make important decisions about which students have access to new opportunities in developmental math and which are left behind in traditional developmental pathways. We recommend additional inquiry into the placement procedures colleges use to determine who participates in not only DCMP coursework but other promising developmental reforms. Policymakers and college leaders seeking to improve on their reform efforts should work to ensure that students have equal

access to opportunities to advance to and through college-level coursework. And if reforms prove successful for large numbers of students, they should be scaled broadly.

Our research also has implications for future research in other areas of inquiry. In this study, we use a measure of passing college-level math that captures whether students pass any college-level math course. The observed increase in college-level math course enrollment and completion among DCMP students may partially stem from students taking non-algebra college-level math, a key component of the DCMP model (for more information, see Schudde & Keisler, 2019). At this point, we cannot examine the long-term consequences of offering field-specific math pathways, as very few students in our sample have graduated or trans- ferred. We expect that passing an introductory college-level math course—whether algebra or non-algebra—should spur an increase in associate degree attainment. But we also recognize that completing non-algebra college-level math may decrease students' likelihood of pursuing algebra-intensive majors.[4] Although this could be a concern, the benefit of increasing progress toward a credential likely outweighs the potential threat of having to take an additional math course for the few students interested in switching to an algebra-intensive major (Schudde & Keisler, 2019). As more colleges implement major-specific math pathways, future research should examine the implications of non-algebra math coursework on students' major selection and credential attainment.

Notes

1. We ran an additional analysis without the six DCMP colleges that offered corequisite math and found that the results were essentially the same. We present results from the full sample in this brief.

2. For an overview of the TSI placement test, see THECB (2017). Despite mandates for placement tests and reporting, there are high rates of missing test score data in the administrative data (see Schudde & Meiselman, 2019).

3. Ideally, we would capture a full set of controls, including financial measures, but the low rate of FAFSA filing among students contributed to high rates of missing data. Schudde and Keisler (2019) showed that results from the fall 2014 cohort were not sensitive to the inclusion of financial measures, but missing financial information made the results very imprecise.

4. At the time of this study, DCMP was targeted to students in majors that do not typically require algebra. DCMP now includes an algebra-intensive pathway that had not yet been developed in 2015.

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