What's Happening

Using high school data to understand college readiness in the Northern Mariana Islands

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Key findings

The study used both high school and college data to examine the college readiness of public high school graduates in the Northern Mariana Islands. Students were considered to be college ready if they were placed in only credit-bearing English or math courses.
Key findings include:

- Few students were placed in credit-bearing college courses in English or math: about 20 percent in English and about 8 percent in math.
- Female students were more likely to be placed in credit-bearing English courses; students with relatively less economic need were more likely to be placed in credit-bearing math courses.
- Students were more likely to be placed in credit-bearing English and math courses if they had better high school academic preparation, as indicated by enrollment in Advanced Placement courses, cumulative grade point averages, standardized test scores, and, for math placement, Algebra 2 grades and highest level of high school math courses taken.
- Many students who had a high cumulative grade point average and high test scores in high school were placed in developmental courses.
- Students who had better high school academic preparation were more likely than their less prepared peers to be placed in higher levels of developmental courses.

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Summary

Over the period 2010–14 more than 80 percent of public high school graduates in the Commonwealth of the Northern Mariana Islands were placed in non-credit-bearing developmental English courses and more than 92 percent were placed in developmental math courses when they enrolled at Northern Marianas College, the commonwealth's only public institution of higher education. This study responds to a request from the Northern Mariana Islands Alliance for College and Career Readiness, which includes stakeholders from the K–12, college, and government sectors, to better understand the characteristics of students who are ready for college and those who are not. In addition, the alliance wanted to understand what can be done to better prepare students for college.

Little is known about the characteristics of students who are more college ready and those who are less college ready when they enter Northern Marianas College. This study describes the high school academic preparation and demographic characteristics of public high school graduates attending Northern Marianas College. It compares these characteristics for students who are placed in credit-bearing English or math courses, which is one key indicator of college readiness (Conley, 2011), with students who are placed in developmental English or math courses. The study uses both high school and college data.

Key findings include:
- Few students were placed in credit-bearing courses: about 20 percent in English and about 8 percent in math.
- Female students were more likely to be placed in credit-bearing English courses; students with less economic need were more likely to be placed in credit-bearing math courses.
- Students' placement in credit-bearing courses and in different levels of developmental English and math courses was related to their enrollment in Advanced Placement courses, cumulative grade point average, scores on the SAT-10, and, for math placement, grades in Algebra 2 and highest high school math course taken.
- Students who had enrolled in Advanced Placement courses in English and math were more likely to be placed in credit-bearing courses in those subjects.
- Students who had a higher cumulative grade point average and higher Stanford Achievement Test, 10th edition, (SAT-10) scores were more likely to be placed in credit-bearing English and math courses.
- Students who had earned a grade of A or B in Algebra 2 or had taken math courses beyond Algebra 2, such as precalculus, calculus, or statistics, were more likely to be placed in credit-bearing math courses.
- Many students who had a high cumulative grade point average and high standardized test scores were placed in developmental courses. About 45 percent of students with a cumulative grade point average of 3.75 or higher were placed in developmental English courses, and about 73 percent of students with a SAT-10 math score at or above the 75th percentile rank were placed in developmental math courses.
- Students who had better high school academic preparation were more likely than their less prepared peers to be placed in higher levels of developmental courses.

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Why this study?

Over the period 2010–14 more than 80 percent of public high school graduates in the Northern Mariana Islands were placed in developmental English courses and more than 92 percent were placed in developmental math courses when they enrolled at Northern Marianas College, the commonwealth's only public institution of higher education (see box 1 for definitions of key terms). Students' enrollment in developmental courses means that despite having graduated from high school, they are seen as needing more preparation before they can undertake credit-bearing college work; enrollment in only credit-bearing courses is one key indicator of being considered college ready (Conley, 2011).

Little is known about the characteristics of students who are more college ready and those who are less college ready when they enter Northern Marianas College. This study describes the demographic characteristics and high school academic preparation of public high school graduates who are placed in credit-bearing or developmental English and math courses at Northern Marianas College.

Enrollment in only credit-bearing courses is one key indicator of being considered college ready

Nationally, as many as 60–70 percent of students in community colleges and 30–40 percent of students in four-year colleges and universities are placed in developmental courses (Attewell, Lavin, Domina, & Levey, 2006; Bailey, 2009b; Porter & Polikoff, 2012; Radford, Pearson, Ho, Chambers, & Ferlazzo, 2012). Students who are placed in developmental courses have worse academic outcomes than students who are placed in credit-bearing courses: they take longer to graduate (Bettinger & Long, 2005) and have lower graduation rates (Bailey, 2009a; Jaggars & Stacey, 2014).

Improving the college readiness of public high school graduates is an important objective of education leaders and other stakeholders in the Northern Mariana Islands. The commissioner of education and the board of regents at Northern Marianas College signed a memorandum of understanding in 2014 to strengthen collaboration between the K–12 school system and the college. The strategic plans of both the public school system and the college emphasize college and career readiness and success and call for better collaboration across the two education systems (Northern Marianas College, 2015; Commonwealth of the Northern Mariana Islands Public School System, 2015). The school system and college's strategic plans also stress the need to generate data to inform and evaluate efforts to improve college and career readiness and success.

Regional Educational Laboratory (REL) Pacific supported the formation of the Northern Mariana Islands Research Alliance for College and Career Readiness and Success to assist

Box 1. Key terms

College ready. Students in this study were considered to be college ready if they placed in credit-bearing English or math courses upon entry to Northern Marianas College.

Credit-bearing courses. College-level English or math courses for which students who receive a passing grade earn credits toward a degree.

Developmental courses. Reading, writing, and math courses designed to prepare students for college-level English or math courses. Students do not earn credits toward a degree by passing these courses.

stakeholders in the Northern Mariana Islands who are concerned about the number of students who were placed in developmental education. Alliance members include administrators and faculty from the Northern Mariana Islands Public School System, Northern Marianas College, and the Northern Mariana Islands Department of Labor. During discussions with REL Pacific, the alliance expressed an interest in gaining a better understanding of the characteristics of students who are ready for college and those who are not. In addition, the alliance wanted to understand what can be done to better prepare students for college. This study responds to requests from the research alliance to explore the college readiness of entering students at Northern Marianas College.

What the study examined

The study examined whether the demographic characteristics and academic preparation of public high school graduates were associated with their placement in credit-bearing English and math courses. (For a discussion of the literature on measures of academic preparation that are related to college readiness, see appendix A.) The study examined the high school records of recent graduates of the public school system who entered Northern Marianas College from the fall semester of 2010 through the spring semester of 2014. In 2014 about 55 percent of public high school graduates in the Northern Mariana Islands enrolled at Northern Marianas College. (For a brief description of the data and methods, see box 2; for more detail, see appendix B.)

The study examined whether the demographic characteristics and academic preparation of public high school graduates were associated with their placement in credit-bearing English and math courses

Box 2. Data and methods

Data

The Northern Mariana Islands Alliance for College and Career Readiness—whose members include stakeholders from Northern Marianas College and the Northern Mariana Islands Public School System—provided data for the study. Whether students were placed in credit-bearing or developmental courses was determined by students' scores on the college's placement exams for English and math. In rare cases, students may have been placed in credit-bearing courses based on their performance on a high school Advanced Placement exam, or in other cases college advisors or faculty may have influenced initial course placement and moved some students from developmental to credit-bearing courses. (For more about placement exams and developmental courses, see box 3. For more about the data and methods, see appendix B.)

Methods

Students were included in the study sample if they both:
- Graduated from one of the five public high schools in the Northern Mariana Islands.
- Enrolled at Northern Marianas College within one academic year of high school graduation from the fall semester of 2010 through the spring semester of 2014.

There were 846 students who met these criteria. The study included separate analytic samples for English and math because stakeholders in the Northern Mariana Islands indicated a desire to explore readiness for English and math separately, in part to understand whether variables associated with readiness varied by subject. For students to be included in the analytic samples, their records had to include information about placement in credit-bearing or developmental English or math courses. Of the 846 students who met the inclusion criteria, 77 did not have math placement data. Therefore, placement data were available for 846 students in English and 769 in math.

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To address the research question on how many students were placed in credit-bearing and developmental courses, the study group classified students by their performance on the placement exams and by data about what English or math course they were placed in first (see appendix B for details).

To address the question on the demographic characteristics and academic preparation of students who were placed in each type of course, the study group generated and analyzed descriptive statistics. Chi-square tests were used to compare categorical variables such as gender, and independent sample *t*-tests were used to compare the means of continuous variables such as cumulative grade point average. Descriptive statistics were also generated for the academic preparation of students who were placed at different levels of credit-bearing or developmental English and math courses—for example, the average cumulative grade point average of students who were placed in college algebra. These data relate academic preparation not only to placement in credit-bearing or developmental courses but also to placement in different levels of credit-bearing and developmental courses.

Scaled scores and national percentile ranks were provided to the study team, and both are used in this study. This study reports national percentile ranks, which range from 1 to 99, with 50 being the national average. A percentile rank compares test takers' performance to a nationally representative sample of test takers in 2007.

The study examined the following research questions:
- How many high school graduates of the public school system in the Northern Mariana Islands were placed in credit-bearing English or math courses, and how many were placed in developmental English or math courses?
- What were the demographic characteristics and academic preparation of students who were placed in credit-bearing English or math courses compared with those who were placed in developmental English or math courses?

Box 3 provides information about placement in credit-bearing and developmental courses at Northern Marianas College.

Box 3. Placement in credit-bearing and developmental courses at Northern Marianas College

Northern Marianas College uses two exams to place students in either credit-bearing or developmental English or math courses: the ACCUPLACER exam in English and the COMPASS exam in math. ACCUPLACER has been in use since spring 2011 and COMPASS since spring 2013. Before adopting the ACCUPLACER and COMPASS exams, the college used exams developed by its faculty for placement decisions. (For more about the placement exams, see appendix B.)

According to representatives from Northern Marianas College, a few students who received a score of 4 or 5 (out of a possible 5) on an Advanced Placement English or math exam during high school were not required to take a college placement exam and enrolled directly in credit-bearing courses. The exact numbers of students who followed this path were not available to the study team. Also, Northern Marianas College representatives reported that in rare cases college advisors or faculty may have influenced the initial course placement. So in the English

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sample and the math sample, a small number of students whose placement exam scores would have placed them in developmental English or math courses were enrolled in credit-bearing courses. The study treats those students as having been placed in credit-bearing courses.

In developmental courses in math, students were placed in one of three courses of ascending difficulty: basic math, pre-algebra, and beginning algebra. A student placed in the lowest level development course was required to pass all three courses before advancing to credit-bearing math courses. Students may enroll in only one developmental math course per semester.

In English, students were placed in developmental reading and developmental writing courses. Depending on initial English placement, a student could be required to complete from one to seven developmental courses (up to three in reading and four in writing) before advancing to credit-bearing English courses. In a given semester a student may take up to two developmental English courses—one in reading and one in writing. Developmental speaking/listening courses are also offered but are not required to advance to credit-bearing courses and are therefore not included in this study. For a list of developmental English and math courses offered at Northern Marianas College, see appendix B.

Few students in this study were ready for college-level English and math courses; a higher percentage of students were placed in credit-bearing courses in English than in math

What the study found

This section compares the high school academic preparation of students who were placed in credit-bearing English and math courses at Northern Marianas College with the preparation of students who were placed in developmental courses.

Few students were placed in college-level English or math

Few students in this study were ready for college-level English and math courses. A higher percentage of students were placed in credit-bearing courses in English (19.6 percent) than in math (7.8 percent; tables 1 and 2).

Gender was associated with placement in credit-bearing English courses, and economic need with placement in credit-bearing math courses

The study examined differences in the demographic characteristics of students who were placed in credit-bearing courses and those placed in developmental courses. Four student background characteristics were examined: gender, race/ethnicity, primary language spoken at home, and receipt of a Pell grant (an indicator of economic need). In English, only a student's gender was found to be significantly associated with college readiness: about 23 percent of female students, compared with about 16 percent of male students, were placed in credit-bearing courses (see table 1). Interestingly, students who spoke primarily English at home were not more likely to be placed in credit-bearing English courses than students who spoke primarily another language at home.

In math, students who did not receive Pell grants were more likely to be placed in credit-bearing math courses than students who received Pell grants (the study's indicator of

Table 1. Demographic characteristics and academic preparation of students placed in credit-bearing or developmental English courses, 2010/11–2013/14

Student characteristic	Overall	Placed in credit-bearing courses	Placed in developmental courses
All students (*n* = 846; percent)	100	19.6	80.4
Demographic characteristic			
Gender			
Male (*n* = 383; percent)	45.3	15.7**	84.3**
Female (*n* = 463; percent)	54.7	22.9**	77.1**
Race/ethnicity			
Chamorro (*n* = 339; percent)	40.1	22.1	77.9
Filipino (*n* = 279; percent)	33.0	19.7	80.3
Other (*n* = 228; percent)	27.0	15.8	84.2
Pell grant status			
Received (*n* = 737; percent)	87.1	18.6	81.4
Did not receive (*n* = 109; percent)	12.9	26.6	73.4
Primary language spoken at home			
English (*n* = 609; percent)	72.0	20.7	79.3
Other (*n* = 237; percent)	28.0	16.9	83.1
Academic preparation			
Advanced Placement English courses			
Enrolled in one or more (*n* = 174; percent)	20.6	39.1***	60.9***
Did not enroll in any (*n* = 672; percent)	79.4	14.6***	85.4***
Cumulative grade point average[a] (*n* = 773; mean)	2.7	3.2***	2.6***
Stanford Achievement Test, 10th edition, reading[b] (*n* = 755; percentile rank for the average student)	39	66***	32***

**Significant at *p* <.01; ***significant at *p* <.001.

Note: Percentages may not sum to 100 because of rounding.

a. Data were missing for 73 students and available for 152 students in credit-bearing courses and 621 students in developmental courses.

b. Data were missing for 91 students and available for 156 students in credit-bearing courses and 599 students in developmental courses.

Source: Authors' analysis of 2010/11–2013/14 data from Northern Marianas College and 2007/08–2013/14 data from the Northern Mariana Islands Public School System.

Students were more likely to be placed in credit-bearing English and math courses if they had better high school academic preparation: enrollment in Advanced Placement courses, cumulative high school grade point average, and standardized test scores

economic need; see table 2). There were no other statistically significant demographic predictors of students' placement in a credit-bearing math course.

Academic preparation was associated with placement in credit-bearing English and math courses

Students were more likely to be placed in credit-bearing English and math courses if they had better high school academic preparation, as indicated by enrollment in Advanced Placement courses, cumulative high school grade point average, and standardized test scores. Placement in a credit-bearing math course was additionally predicted by enrollment in higher-level high school math courses and by grades in Algebra 2 courses in high school. More detailed discussion of these findings appears below.

Students who enrolled in Advanced Placement English and math courses in high school were more likely to be placed in credit-bearing courses in college. Although only

Table 2. Demographic characteristics and academic preparation of students placed in credit-bearing or developmental math courses, 2010/11–2013/14

Student characteristic	Overall	Placed in credit-bearing courses	Placed in developmental courses
All students (n = 769; percent)	100	7.8	92.2
Demographic characteristic			
Gender			
Male (*n* = 344; percent)	44.7	9.6	90.4
Female (*n* = 425; percent)	55.3	6.4	93.6
Race/ethnicity			
Chamorro (*n* = 301; percent)	39.1	5.0	95.0
Filipino (*n* = 266; percent)	34.6	9.4	90.6
Other (*n* = 202; percent)	26.3	9.9	90.1
Pell grant status			
Received (*n* = 665; percent)	86.5	5.4***	94.6***
Did not receive (*n* = 104; percent)	13.5	23.1***	76.9***
Primary language spoken at home			
English (*n* = 557; percent)	72.4	6.8	93.2
Other (*n* = 212; percent)	27.6	10.4	89.6
Academic preparation			
Advanced Placement math courses			
Enrolled in one or more Advanced Placement math courses (*n* = 53; percent)	6.9	45.3***	54.7***
Did not enroll in any Advanced Placement math courses (*n* = 716; percent)	93.1	5.0***	95.0***
Cumulative grade point average[a] ((n = 704; mean)	2.7	3.4***	2.7***
Stanford Achievement Test, 10th edition, math[b] (n = 684; percentile rank for the average student)	52	86***	46***
Grades in Algebra 2[c]			
B or better (A or B) (*n* = 268; percent)	35.4	19.0***	81.0***
C or below (C, D, or F) (*n* = 489; percent)	63.6	1.6***	98.4***
Highest math course[d]			
Algebra 2 (*n* = 636; percent)	83.8	4.2***	95.8***
Math course beyond Algebra 2[e] (*n* = 123; percent)	16.0	26.0***	74.0***

***Significant at p < .001.

Note: Percentages may not sum to 100 because of rounding.

a. Data were missing for 65 students and available for 60 students in credit-bearing courses and 644 students in developmental courses.

b. Data were missing for 85 and available for 52 students in credit-bearing courses and 632 students in developmental courses.

c. The number of students does not sum to 769 because it excludes 12 students who did not enroll in Algebra 2.

d. The number of students does not sum to 769 because it excludes 10 students who had Algebra 1 or Geometry as their highest math course.

e. Precalculus, statistics. or calculus.

Source: Authors' analysis of 2010/11–2013/14 data from Northern Marianas College and 2007/08–2013/14 data from the Northern Mariana Islands Public School System.

a minority of students enrolled in Advanced Placement English (21 percent) or math courses (7 percent) in high school, students who did so were more likely to be college ready. Of students who enrolled in one or more Advanced Placement English courses in high school, about 39 percent were placed in credit-bearing English courses, compared with only about 15 percent of students who did not take an Advanced Placement English course (see table 1). Similarly, of students who enrolled in one or more Advanced Placement math courses, about 45 percent were placed in credit-bearing math courses, compared with 5 percent of those who did not take an Advanced Placement math course (see table 2).

Students with a higher cumulative grade point average and higher grade 11 reading and math test scores were more likely to be placed in credit-bearing English and math courses. Students with better academic preparation in high school, including a higher cumulative grade point average and higher grade 11 Stanford Achievement Test, 10th edition, (SAT-10) exam scores, were more likely to be placed in credit-bearing courses in both English and math. For example, the mean cumulative grade point average of students who were placed in credit-bearing English courses was 3.2, compared with a mean of 2.6 for students who were placed in developmental English courses (see table 1). In math, students who were placed in credit-bearing courses had a mean cumulative grade point average of 3.4, compared with 2.7 for students who were placed in developmental math courses (see table 2).

Students who had high grades in Algebra 2 or had enrolled in higher-level math courses were more likely to be placed in credit-bearing math courses. Nineteen percent of students who had earned a grade of B or higher in Algebra 2 were placed in credit-bearing math courses, compared with 2 percent of students who had earned a C or lower (see table 2). Students who had enrolled in higher-level math courses beyond the required Algebra 2 course, such as precalculus, calculus, and statistics, were more likely to be placed in credit-bearing math courses. Of the 123 students who took a math course beyond Algebra 2, 26 percent were placed in credit-bearing math courses, compared with 4 percent of students whose highest course had been Algebra 2.

Students with a lower cumulative grade point average were less likely to be placed in credit-bearing English and math courses. In English 60 percent of students with a cumulative high school grade point average of 3.75–4.0 were placed in credit-bearing courses, compared with only about 15 percent of students with a cumulative grade point average of 2.50–2.99 (table 3). This means that 40 percent of students with a cumulative grade point average of 3.75–4.0 were nonetheless placed in developmental English courses. In math about 33 percent of students who had a cumulative high school grade point average of 3.75–4.0 were placed in credit-bearing courses (table 4). About 5 percent of students with a cumulative grade point average of 2.5–2.99 were placed in credit-bearing math courses.

Students with high reading and math scores were less likely to be placed in developmental English and math courses. About 95 percent of students with SAT-10 reading scores at or above the 90th national percentile rank were placed in credit-bearing English courses (table 5), and about 46 percent of students with SAT-10 math scores at or above the 90th national percentile rank were placed in credit-bearing math courses (table 6). For math students, this means that nearly 54 percent of students with SAT-10 math scores at or above the 90th national percentile were nonetheless placed in developmental math courses.

Table 3. Placement of students in credit-bearing English courses, by cumulative high school grade point average, 2010/11–2013/14

Students placed in credit bearing English courses	Grade point average					
	0–2.49 (*n* = 314)	2.50–2.99 (*n* = 185)	3.0–3.49 (*n* = 150)	3.50–3.74 (*n* = 57)	3.75–4.0 (*n* = 35)	4.01–4.31 (*n* = 32)
Percent	8.3	15.1	28.0	33.3	60.0	50.0
Number	26	28	42	19	21	16

Note: Cumulative grade point averages were available for 773 students. The range of grade point averages was 0.96–4.31. The mean was 2.69, and the standard deviation was 0.74. Students could have grade point averages above 4.0 if they took Advanced Placement or honors courses.

Source: Authors' analysis of 2010/11–2013/14 data from Northern Marianas College and 2007–14 data from the Northern Mariana Islands Public School System.

Table 4. Placement of students in credit-bearing math courses, by cumulative high school grade point average, 2010/11–2013/14

Students placed in credit bearing math courses	Grade point average					
	0–2.49 (*n* = 264)	2.50–2.99 (*n* = 171)	3.0–3.49 (*n* = 144)	3.50–3.74 (*n* = 57)	3.75–4.0 (*n* = 36)	4.01–4.31 (*n* = 32)
Percent	1.5	4.7	12.5	19.3	33.3	21.9
Number	4	8	18	11	12	7

Note: Cumulative grade point averages were available for 704 students. The range of grade point averages was 0.96–4.31. The mean was 2.75, and the standard deviation was 0.73. Students could have grade point averages above 4.0 if they took Advanced Placement or honors courses.

Source: Authors' analysis of 2010/11–2013/14 data from Northern Marianas College and 2007/08–2013/14 data from the Northern Mariana Islands Public School System.

Table 5. Placement of students in credit-bearing English courses, by Stanford Achievement Test, 10th edition, reading percentile rank, 2010/11–2013/14

Students placed in credit-bearing English courses	Percentile rank				
	1–24 (*n* = 213)	25–49 (*n* = 309)	50–74 (*n* = 177)	75–89 (*n* = 37)	90–99 (*n* = 19)
Percent	1.4	13.9	39.0	62.2	94.7
Number	3	43	69	23	18

Note: Stanford Achievement Test, 10th edition, reading percentile rank scores were available for 755 students. Percentile rank scores are reported in quartiles. The highest quartile, 75–99, was divided into two categories to examine the placement of high performing students.

Source: Authors' analysis of 2010/11–2013/14 data from Northern Marianas College and 2007/08–2013/14 data from the Northern Mariana Islands Public School System.

Table 6. Placement of students in credit-bearing math courses, by Stanford Achievement Test, 10th edition, math percentile rank, 2010/11–2013/14

Students placed in credit-bearing math courses	Percentile rank				
	1–24 (*n* = 174)	25–49 (*n* = 181)	50–74 (*n* = 185)	75–89 (*n* = 105)	90–99 (*n* = 39)
Percent	0.0	1.7	5.4	20.0	46.2
Number	0	3	10	21	18

Note: Stanford Achievement Test, 10th edition, math percentile rank scores were available for 684 students. The percentile rank scores are reported in quartiles. The highest quartile, 75–99, was divided into two categories to examine the placement of high performing students.

Source: Authors' analysis of 2010/11–2013/14 data from Northern Marianas College and 2007/08–2013/14 data from the Northern Mariana Islands Public School System.

High school academic preparation was related to placement in different levels of credit-bearing and developmental English and math courses. Students who were placed in credit-bearing English courses had cumulative grade point averages that were, on average, about 0.5 points higher than their peers who were placed in the highest levels of developmental reading and writing courses (table 7). The percentage of students who had taken one or more Advanced Placement English courses in high school was lowest among those placed in the lowest level of developmental courses and increased across the developmental sequence and into the credit-bearing courses. For example, of students assigned to Reading & Vocabulary Development II, only about 14 percent had enrolled in Advanced Placement English; that percentage rose to about 20 percent of students placed in Reading & Vocabulary Development III and about 40 percent of students placed in the first credit-bearing English course, English Composition. Students in each successive developmental course had incrementally higher SAT-10 reading scores. The SAT-10 reading scores of students placed in the credit-bearing English Composition course were considerably higher than the scores of those placed in the highest level of developmental reading and writing courses.

Students who were placed in the lowest credit-bearing math course, Intermediate Algebra, had cumulative grade point averages in high school that were about 0.2 point higher, on average, than those of students who were placed in the highest developmental math course, Beginning Algebra (table 8). The SAT-10 math scores of students placed in each

Table 7. Student academic preparation by level of initial placement in credit-bearing or developmental English courses, 2010/11–2013/14

Academic preparation	Enrolled in one or more Advanced Placement English courses (percent)	Cumulative grade point average[a]	Stanford Achievement Test, 10th edition, reading[b] (percentile rank for the average student)
Credit-bearing English courses			
English Composition I (n = 162)	40.1	3.2	66
Developmental reading courses			
Reading & Vocabulary Development III (n = 242)	19.8	2.8	41
Reading & Vocabulary Development II (n = 171)	13.5	2.5	27
Reading & Vocabulary Development I (n = 77)	3.9	2.2	17
Developmental writing courses			
Writing & Grammar Study III (n = 283)	14.1	2.6	35
Writing & Grammar Study II (n = 136)	10.3	2.3	23
Writing & Grammar Study I (n = 10)	0	1.8	11

Note: Students could be placed in both a developmental writing course and a development reading course, so some students may be counted twice. Course names reflect the course content rather than the names used by Northern Marianas College. The table does not include academic preparation information for the credit-bearing creative writing course and the beginning developmental writing course because the cells for each course contained fewer than five students.

a. Cumulative grade point average data were missing for 73 students. Of those with available cumulative grade point average data, 148 were placed in English Composition; 218 were placed in Reading III; 156 were placed in Reading II; 75 were placed in Reading I; 257 were placed in Writing III; 127 were placed in Writing II; and 9 were placed in Writing I.

b. Stanford Achievement Test, 10th edition, Reading data were missing for 91 students. Of those with available data, 153 were placed in English Composition; 216 were placed in Reading III; 159 were placed in Reading II; 60 were placed in Reading I; 250 were placed in Writing III; 120 were placed in Writing II; and 8 were placed in Writing I.

Source: Authors' analysis of 2010/11–2013/14 data from Northern Marianas College and 2007/08–2013/14 data from the Northern Mariana Islands Public School System.

Table 8. Student academic preparation by level of initial placement in credit-bearing or developmental math courses, 2010/11–2013/14

Academic preparation	Enrolled in one or more Advanced Placement math courses (percent)	Cumulative grade point average[a]	Stanford Achievement Test, 10th edition, math[b] (percentile rank for the average student)	Grades in Algebra 2[c] (percent)		Highest math course[d]	
				B or higher (A or B)	C or below (C, D, or F)	Algebra 2	Math beyond Algebra 2 (precalculus, calculus, or statistics)
Credit-bearing math courses							
College Algebra (n = 21)	52.4	3.4	88	95.2	4.8	23.8	76.2
Intermediate Algebra (n = 39)	33.3	3.4	85	81.6	18.4	57.9	41.0
Developmental math courses							
Beginning Algebra (n = 153)	9.2	3.2	74	63.8	36.2	78.7	20.9
Pre-algebra (n = 310)	3.9	2.8	46	30.2	69.8	84.6	15.2
Basic Math (n = 246)	1.2	2.3	15	12.3	87.7	95.1	4.9

a. Cumulative grade point average data were missing for 65 students. Of those with available cumulative grade point average data, 21 were placed in College Algebra; 39 were placed in Intermediate Algebra; 133 were placed in Beginning Algebra; 286 were placed in Pre-algebra; and 225 were placed in Basic Math.

b. Stanford Achievement Test, 10th edition, math data were missing for 85 students. Of those with available Stanford Achievement Test, 10th edition, math data, 17 were placed in College Algebra; 35 were placed in Intermediate Algebra; 138 were placed in Beginning Algebra; 281 were placed in Pre-algebra; and 213 were placed in Basic Math.

c. Data on grades in Algebra 2 were missing for 12 students. Of those with available data on grades, 21 were placed in College Algebra; 38 were placed in Intermediate Algebra; 149 were placed in Beginning Algebra; 305 were placed in Pre-algebra; and 244 were placed in Basic Math.

d. Data on highest math course were missing for 10 students. Of those with available data on highest math course, 21 were placed in College Algebra; 38 were placed in Intermediate Algebra; 150 were placed in Beginning Algebra; 306 were placed in Pre-algebra; and 244 were placed in Basic Math.

Source: Authors' analysis of 2010/11–2013/14 data from Northern Marianas College and 2007/08–2013/14 data from the Northern Mariana Islands Public School System.

higher level of developmental and credit-bearing courses were incrementally higher. Detailed results for students receiving grades A–F in Algebra 2 and for students' highest math course (Algebra 2, precalculus, calculus, or statistics) are presented in tables C1 and C2 in appendix C.

Implications of the study findings

This is the first study of the college readiness of public high school graduates in the Northern Mariana Islands who went on to attend Northern Marianas College. It found that many recent high school graduates were not ready for college courses in English and math, as indicated by their performance on college placement tests, and that academic preparation in high school was associated with placement in credit-bearing courses. These findings suggest that Northern Marianas College and the Northern Mariana Islands Public School System may want to consider ways to better align students' experiences in high school English and math with college-level coursework.

All of the students in the sample graduated from public high schools in the Northern Mariana Islands and completed all high school English and math requirements, including four years of English and three years of math. But few graduates were considered college ready when they first enrolled at Northern Marianas College. These findings suggest that the two education systems are misaligned in ways that may be affecting the college

This is the first study of the college readiness of public high school graduates in the Northern Mariana Islands who went on to attend Northern Marianas College

readiness of students. Misalignment between high school graduation requirements and the skills and knowledge needed to succeed in college has been identified as one reason for high levels of enrollment in developmental education (Conley, 2007; Grubb, 2013; Hodara, 2015). There are several strategies, including the ones listed below, that education leaders could use that might better align the systems so that more high school graduates are college ready.

Fourth year of high school math

The study found that students who did not take math beyond Algebra 2 were less likely to be placed in credit-bearing math courses. Education leaders may want to consider whether requiring students to take four years of math, which would require many students to enroll in math courses beyond Algebra 2, would better prepare more students for college. However, research cautions that requiring more math without developing more effective supports for students in more advanced math courses might not increase students' college readiness (Buddin & Croft, 2014). Understanding the kinds of supports students would need to succeed in math classes beyond Algebra 2 and designing those supports would thus be a critical accompaniment to policies to increase math requirements for high school graduation.

Education leaders could use several strategies to better align high school graduation requirements and the skills and knowledge needed to succeed in college

Alignment of the rigor and content of high school English and math courses with college requirements

High school students who enrolled in more rigorous courses, such as Advanced Placement courses in English and math, were more likely to be college ready. Similarly, students who enrolled in other higher level math courses, such as precalculus and general education calculus, were more likely to be college ready in math. Again, not all of the students who enrolled in higher-level math courses were college ready. The rigor of even the Advanced Placement English and math courses in high school may need to be increased to help more students place into credit-bearing courses.

The content of the high school English and math courses may also need to be better aligned with college placement exams and college English and math courses. So that the English and math content that students learn in high school is aligned with what they need to successfully transition to college, some states, including Hawaii, have put in place transitional English and math courses for high school students. These courses have been co-designed by colleges and K–12 systems to support better alignment of content. Northern Marianas College and the Northern Mariana Islands Public School System may consider co-designing transition courses to match the content and the rigor of high school English and math courses with what the college requires.

Additional information about students for placement in credit-bearing and developmental courses

Northern Marianas College relies almost exclusively on placement exams to determine students' college readiness. Research indicates that using other data about students, such as high school grade point average, whether alone or in combination with placement exams, can improve college placement decisions (Westrick & Allen, 2014; Wiley et al., 2010). As of 2014 the Northern Mariana Islands Public School System discontinued the SAT-10 exam and replaced it with the ACT Aspire. The Northern Mariana Islands Research Alliance for College and Career Readiness and Success, which includes education leaders from the

K–12 public school system, college, and government sectors, may want to sponsor a study to determine how well scores on the ACT Aspire indicate the likely college readiness of students who are still in high school, and Northern Marianas College may consider using ACT Aspire scores as part of its placement process. Future research might focus on developing a multidimensional metric (for example, a combination of measures of coursework and achievement) for more accurately assessing the college readiness of students while they are in high school and as they make the transition to college.

The validity of the ACCUPLACER (English) and COMPASS (math) placement exams used at Northern Marianas College is unclear

Many students who had strong high school records, including students who took Advanced Placement courses, had high cumulative grade point averages, and had high SAT-10 scores, were placed in developmental courses. It is unclear why so few students are placed in credit-bearing college courses, particularly in math. It is likely that both insufficient preparation in high school and misaligned criteria for placement in credit-bearing courses are contributing to these outcomes. Validity studies have not been conducted at Northern Marianas College to determine whether student scores on the placement exams predict academic outcomes at the college. Research indicates that students who start college in developmental courses are likely to have worse academic outcomes than their peers who start in credit-bearing courses (Bailey, 2009a). Because the placement exams are high stakes exams, education leaders need to be sure that the placement process is effective and that scores on the placement exams are associated with students' academic outcomes at Northern Marianas College.

Northern Marianas College continues to explore how well the use of placement exam scores serves the needs of students in the Northern Mariana Islands

Research also indicates that relying on the COMPASS exam scores for math placement may result in some students being placed in developmental courses who might have been able to pass their first credit-bearing courses if given a chance to take them (Scott-Clayton, 2012). This concern is one reason why the COMPASS exam was discontinued at the end of fall 2016. Stakeholders at Northern Marianas College are beginning to discuss whether college algebra is the appropriate required math course for all degree students at the college, even those whose degree is in a subject that is not math-intensive. Some colleges are asking whether statistics might be a more appropriate requirement for learning quantitative analysis. A recent randomized controlled trial found that students who were placed in college-level statistics rather than in developmental algebra had more positive academic outcomes (Logue, Watanabe-Rose, & Douglas, 2016). Northern Marianas College continues to explore how well the use of placement exam scores serves the needs of students in the Northern Mariana Islands.

Limitations of the study

This study had three main limitations. First, the study was descriptive, so causal inferences cannot be made. Thus although the study found that students who were placed in credit-bearing courses at Northern Marianas College were more likely to have enrolled in Advanced Placement English and math courses, it cannot be inferred that enrolling in more Advanced Placement courses would increase students' likelihood of being placed in credit-bearing courses in college.

Second, the generalizability of the study may be limited. The results may not be applicable to all graduates of the public high school system in the Northern Mariana Islands who pursue postsecondary education. Alliance members have indicated that approximately 20 percent of these graduates may attend college outside the Northern Mariana Islands. Currently, the public high school system does not use the National Student Clearinghouse to track graduates who attend college outside of the Northern Mariana Islands.

Finally, the study was limited to the available data on the demographic characteristics and academic preparation of students, and the only measure of college readiness was placement in credit-bearing courses. Other data might be important in gauging whether high school students are on track to succeed in college. Student motivation, commitment to career goals, high school attendance records, and other features of students' lives might be relevant to the consideration of college readiness.

Appendix A. Literature review

Previous research has used high school data to predict college readiness, college enrollment, and college success. Research has identified measures of high school academic preparation and achievement, including standardized test scores, grade point average, completion of rigorous coursework such as Advanced Placement courses and upper-level math courses, and non-academic factors such as student motivation that are correlated with college enrollment, readiness, and success (Achieve, 2011; Adelman, 2006; Atkinson & Geiser, 2009; Conley, 2011; Wiley, Wyatt, & Camara, 2010).

Individual features, such as high school grade point average, may predict variance in college outcomes. But most research suggests that multidimensional metrics capturing more of a student's characteristics, including demographic, academic, and nonacademic factors, lead to more accurate prediction of college enrollment, readiness, and success than performance on college placement exams, achievement of threshold ACT scores, and other individual measures (Allen & Sconing, 2005; Conley, 2011; Consortium on Chicago School Research, 2008; Geiser & Santelices, 2007; Maruyama, 2012; Porter & Polikoff, 2012; Stephan, Davis, Lindsay, & Miller, 2015).

This rest of this literature review describes the evidence for measures used to predict college readiness.

Standardized tests

In recent years researchers have used high school assessments to measure how well students meet college and career readiness standards (Achieve, 2011; Atkinson & Geiser, 2009; Cohen, 2008; Porter & Polikoff, 2012; Wiley et al., 2010). Some states have developed high school achievement tests to serve as indicators of college readiness (Atkinson & Geiser, 2009; Porter & Polikoff, 2012; Wiley et al., 2010). Seven states use state-developed standardized high school tests capable of measuring students' college and career readiness, and another 11 states require national college admissions exams as part of high school assessments (Achieve, 2012). Additionally, national standardized tests, such as the SAT and ACT, can be predictors of success in college (Stephan et al., 2015).

The Stanford Achievement Test, 10th edition, (SAT-10) exam is administered to high school students in the Northern Mariana Islands in grades 9 and 11. The study team was unable to identify research that connects scores on the SAT-10 with common indicators of college readiness and success, such as performance on English and math placement exams, grades in gateway college courses, or college grade point average. The exam developers note, however, that 100 percent of SAT-10 reading and 98.5 percent of SAT-10 math items align with Common Core State Standards, which align with expectations for college and career readiness (Pearson, Inc., 2011).

High school grade point average

Researchers have explored how high school grade point average predicts college readiness. Grade point averages, even though they may reflect different grading standards across districts, schools, or courses, can be a reliable predictor of college readiness (Belfield & Crosta, 2012), particularly when considered in conjunction with SAT scores (Atkinson & Geiser, 2009;

Kobrin, Patterson, Shaw, Mattern, & Barbuti, 2008). Grade point average can also effectively predict both initial success, such as freshman grades, and overall college success, such as graduating from college in four years and cumulative college grade point average (Geiser & Santelices, 2007). The predictive power of high school grade point average improves after the first year of college and explains more variance in later college grades than first-year college grades, according to one study (Geiser & Santelices, 2007). The same study also suggested that using high school grade point averages in college admissions, compared to using only standardized test scores, may increase the number of minority or disadvantaged students who are accepted. Grade point average has been found to be as strong a predictor of many outcomes as standardized exams (Hiss & Franks, 2014; Porter and Polikoff, 2012). Many studies fail, however, to identify a threshold for high school grade point averages that most accurately predicts whether students are likely to be ready for college or successful there (Conley, 2011).

High school coursework

The completion of rigorous high school coursework is correlated with future college enrollment, college readiness, and college success (Adelman, 2006; Atkinson & Geiser, 2009; Burton & Ramist, 2001; Porter & Polikoff, 2012). Completion of specific courses, including Advanced Placement courses and higher level math courses such as precalculus, calculus, trigonometry, and statistics has been linked to college readiness. Advanced Placement exam scores predict college grades and graduation rates (Ackerman, Kanfer, & Beier, 2013). Completion of at least one higher level math course beyond Algebra 2 was associated with more than twice as great a chance of completing a bachelor's degree, in a review of large data sets from high school graduating classes in 1982 and 1992 (Adelman 2006). Another study confirms the link between advanced courses and early college success, but cautions that causation—whether participating in advanced courses directly contributes to early college success—is not clear (Stephan et al., 2015).

Attendance

Attendance, though more directly related to high school graduation rates, has also been identified as an indicator of postsecondary readiness and success (Achieve, 2013; Cromwell, McClarty, & Larson, 2013; Hein, Smerdon, & Sambolt, 2013; Stephan et al., 2015). Chronic absenteeism in middle school and high school is correlated with lower college graduation rates (Cromwell et al., 2013). Missing no more than 10 percent of school days per grade level is associated with on-track high school graduation, and graduating high school on time is associated with college readiness (Allensworth & Easton, 2007). Additionally, low attendance rates could negatively affect coursework and grade point averages, which are predictors of college readiness and success.

Attendance data was unavailable for the current study. Attendance data are collected and stored at each high school in the Northern Mariana Islands Public School System, but stakeholders, including principals, indicated that the attendance data were not reliable, so they were not included in this study.

Noncognitive factors

Although standardized tests, grades, and high school coursework are among the main factors that have been correlated with college readiness, models that include only these

factors do not account for all variance in predicting college readiness. Noncognitive factors, such as engagement, social support, motivation, and resilience, among others, may also contribute to college readiness and success (Conley, 2011; Lippman, Atienza, Rivers, & Keith, 2008; Wiley, Wyatt, & Camara, 2010).

Appendix B. Data and methodology

This appendix describes the study data and data sources, the steps used to link the data, and the steps taken to ensure accuracy of the data.

Data sources

All data were provided by Northern Marianas College and the Northern Mariana Islands Public School System. The Office of Institutional Effectiveness and the Office of Admissions and Records at Northern Marianas College provided registration and enrollment information, demographic data, college coursework records, placement data, and financial aid data, which included an indicator of socioeconomic status (received/did not receive Pell grant), for graduates of the public school system who entered Northern Marianas College between the fall semester of 2010 and the spring semester of 2014.

Northern Marianas College also provided paper copies of high school transcripts for all students who enrolled during this timeframe. Transcripts were examined only for students who enrolled at Northern Marianas College within one academic year of high school graduation from fall semester 2010 through the spring semester of 2014. High school data were examined for students who graduated from public high schools in the Northern Mariana Islands from 2007 to 2014. These transcripts included information on coursework, course grades, grade point average, high school graduation date, and credits earned. Since the transcripts did not include student identification numbers that were assigned by the college, the Office of Admissions and Records hand-wrote student identification numbers on each paper transcript so that the study team could more reliably match the high school transcript data with the college data.

The Office of Accountability, Research, and Evaluation at Northern Mariana Islands Public School System provided data about students' demographic characteristics, including gender, race/ethnicity, and primary language spoken at home, and academic preparation, including scores on the Stanford Achievement Test, 10th edition, (SAT-10) reading and math exam, cumulative grade point average, highest math course taken, Algebra 2 grades, and Advanced Placement English and math course enrollment.

Data linking and merging

Students were included in the study sample if they both:
- Graduated from one of the five public high schools in the Northern Mariana Islands.
- Enrolled at Northern Marianas College within one academic year of high school graduation from the fall semester of 2010 through the spring semester of 2014.

There were 846 students who met these criteria in English and 769 in math. The study includes two analytic samples, one for English and one for math, because members of the Northern Mariana Islands Research Alliance for College and Career Readiness and Success, which includes the K–12 public school system, college, and government sectors in the Northern Mariana Islands, indicated a desire to explore readiness for English and math separately, in part to understand whether variables associated with readiness varied by subject. Therefore, to be included in the analytic samples, a student's records needed to

include information on initial placement in credit-bearing versus developmental English and math courses.

Linking and merging data required several steps. First, paper transcripts were processed to construct electronic files that summarized the transcript data.

Where there was no linkable student identification number, Link Plus[1] software was used to merge student's high school transcript information, SAT-10 data, high school demographic data, and college data. Link Plus used students' last and first names, the only common variables among the datasets, to create a probability of likely matches. Linking then required extensive and time-consuming visual inspection to ensure that data were linked correctly and that no students who were likely matches were missed by the Link Plus probability-matching approach. In some cases, a visual inspection revealed that names had been misspelled or garbled that otherwise would be likely matches; in those cases two researchers determined case by case the matching across data files. Although the chances were minimal, it is possible that this visual matching also introduced some error.

Next, after separate sources of data were linked, the data was formatted and recoded to standardize the variables. Some cases had to be reformatted from text to numeric. This step helps prevent data from being lost when it is exported. Finally, the data were restructured so that all the data for each student were in only one row.

Data processing and cleaning

This section documents the processes to convert students' high school transcript and student data from both the Northern Marianas College and the Northern Mariana Islands Public School System into an analyzable dataset.

Reviewing high school transcripts. The study team received over 1,500 high school PDF transcript files from Northern Marianas College for students who enrolled between fall 2010 and spring 2014. Each individual transcript was reviewed to identify students who had graduated from any of the five public high schools in the Northern Mariana Islands during the 1999/2000 school year and later. A total of 1,191 unique transcripts were identified for the next phase of data cleaning.

Developing data entry protocols for processing high school transcripts. The study team worked with high school principals and the public school system's central office staff to clarify elements on the transcripts. The study team created Excel templates and data entry protocols to ensure that data from the high school transcripts were entered consistently and accurately into an electronic dataset. The study team subcontracted data entry to two companies and hired temporary workers to help.

Performing quality assurance. To ensure the accuracy of the transcript data in the Excel files, the study team secured a subsample of data from the data entry subcontractors to perform a quality assurance review. The study team compared data from the paper transcripts with the data in the Excel files provided by the subcontractors. In some cases, the protocol needed to be further refined, and then new samples were secured for a further quality assurance review.

Identifying missing data. SAT-10 and cumulative grade point average data were missing for some students. In math 769 students met all the inclusion criteria for the study. A total of 85 students were missing SAT-10 math scores and 65 were missing cumulative grade point averages. In English 846 students met all the inclusion criteria. Of these, 91 were missing SAT-10 reading scores and 73 were missing cumulative grade point averages.

Description of the variables in the study

This section describes the variables constructed from the data provided by Northern Marianas College and the Northern Mariana Islands Public School System. Variables that did not require significant recoding, such as gender, are not described below.

Race/ethnicity. The original race/ethnicity variable was collapsed into three categories, Chamorro, Filipino, and other, to capture two of the most common racial/ethnic groups in the Northern Mariana Islands. The other category included Carolinian, Caucasian, Chinese, Chuukese, Hawaiian, Indian, Japanese, Korean, Marshallese, Palauan, Pohnpeian, Samoan, and Yapese. Each of these groups represented a very small percentage of the total sample.

Primary language spoken at home. The original-language variable was collapsed into two categories: English and other. This decision was based on the frequency distribution of all the languages and the need to create meaningful comparison groups for the analyses. The other category included Palauan, Carolinian, Chamorro, Chinese, Chuukese, Fijian, Japanese, Korean, Kosraean, Marshallese, Nepalese, Pingelapese, Pohnpeian, Tagalog, and Yapese.

Pell grant. In the original spreadsheet file from Northern Marianas College, the Pell grant status variable cell either contained the letter "Y," indicating that a student had received a Pell grant, or was empty. In consultation with Northern Marianas College officials, the study team determined that empty cells indicated that students had not received a Pell grant, although it was unclear whether students with empty cells had applied for one and whether their eligibility had been determined. For this study the variable was coded 1 for students who received Pell grants and 0 for students whose data were missing. For students whose data were coded 0, it was assumed that they did not receive Pell grants, without establishing whether they were eligible or had applied.

Cumulative grade point average. Cumulative grade point average is reported on a four-point scale. In some cases, honors and Advanced Placement courses had a different scale, so that student cumulative GPAs could be above 4.0. Data were transcribed directly from the hard-copy transcripts provided by Northern Marianas College. Cumulative grade point average ranged from .96 to 4.31

Highest math course. This variable identifies the highest math course in which a student enrolled in high school. Math course names often varied by school, year, semester, and quarter. The study team consulted with high school principals to clarify which courses should be categorized as algebra I, geometry, Algebra 2, precalculus, statistics, and calculus. Through emails, the exchange of lists of courses, and in-person consultations, the study team classified all math courses. Some of the resulting six categories had relatively few students, so they were collapsed into two categories, Algebra 2 and beyond

Algebra 2. Beyond Algebra 2 included students who enrolled in precalculus, statistics, or calculus. Ten students whose highest math was either Algebra 1 or Geometry—lower than Algebra 2—were excluded from the highest math course variable.

Algebra 2 grades. Students' Algebra 2 grades were calculated using data extracted from the paper transcripts. The transcripts did not provide summative grades for all courses students attempted in high school, but reported a numeric grade at the end of every quarter or semester across all four years of high school enrollment. The study team calculated the Algebra 2 final grades by computing the mean of all numeric grades for each quarter or semester a student attempted. The average numeric grade was converted to a final letter grade using the appropriate grade scale at each high school. The final letter grades are A, B, C, D and F.

Enrolled in Advanced Placement English and math courses. Separate Advanced Placement variables for English and math were based on whether a student enrolled in at least one quarter of an Advanced Placement English or math course. Thus the respective variables equal 1 if a student enrolled in any Advanced Placement math or English course and 0 if a student did not. Although Advanced Placement exam scores are often used as a predictor of college readiness, those scores were not available in the dataset for this study.

Stanford Achievement Test, 10th edition, reading and math scores. Grade 11 SAT-10 reading and math scores were provided to the study team in two formats: scaled scores and national percentile ranks. The national percentile ranks ranged from 1 to 99; SAT-10 reading scaled scores ranged from 626 to 795; and SAT-10 math scaled scores ranged from 634 to 790. The study team used SAT-10 scaled scores to calculate all means in the report and then determined the national percentile ranks of those means

Identifying first-time freshmen

Only first-time freshmen who had graduated from public high schools less than one academic year prior to entry at the college were included in the sample. To determine if a student was a first-time freshman, the study team used information from several variables in the Northern Marianas College datasets: college attended, class level, semester grade point average, and cumulative grade point average. It was necessary to use multiple variables because stakeholders at Northern Marianas College indicated that college attended and class level alone would not provide a reliable classification. The college attended variable classified students as continuing, readmitted, transfer, or first-time freshmen. Northern Marianas College representatives indicated that in some cases, students might be misclassified as first-time freshmen even though they had earned some credits at the college because they had not earned enough to be classified as sophomores. Therefore, the study team also compared students' semester grade point average and cumulative grade point average—differences between these grade point averages could suggest that students had taken prior courses in a prior semester. Thus, by using multiple variables, the study team was able to determine whether students were first-time freshmen.

Placement exams at Northern Marianas College

Northern Marianas College uses two exams to place students in either credit-bearing or developmental English or math courses: the COMPASS exam in math and the ACCUPLACER exam in English. The COMPASS has been in use since the spring

semester of 2013, and the ACCUPLACER has been in use since the spring semester of 2011. Before adopting the COMPASS and ACCUPLACER, the college used exams developed by its own faculty for placement decisions.

Placement decisions are based almost entirely on exam performance except in the case of students who are exempt from the exam because they had scores of 4 or 5 out of 5 on an Advanced Placement exam in high school. In rare cases, placement decisions may be revisited, and students may be placed in higher-level developmental or credit-bearing courses if a faculty member strongly believes that a student was misplaced. Students are required to complete all developmental courses in the assigned sequence before advancing to credit-bearing English or math courses. Representatives from the Office of Institutional Effectiveness at Northern Marianas College indicated that the new and old English and math placement tests were "functioning similarly" in placing students in credit-bearing and developmental courses. However, to explore whether there were differences in placement associated with the new and old placement exams, both of which were used during the study timeframe, the study team generated descriptive statistics related to the placement of students based on the two different English and math placement exams. According to the Chi-square analyses, the English and math placement tests varied significantly in terms of the patterns of placing students into credit-bearing and developmental courses, but the effect sizes were very small (tables B1 and B2).

Determining placement in credit-bearing versus developmental courses. Two sources of placement data were used to determine whether a student was placed in credit-bearing or developmental English or math courses. The primary source of data was whether a student initially enrolled in a credit-bearing English or math course. If course enrollment data were not available, then placement data (which indicated whether a student was assigned to a credit-bearing or developmental course) were used. This approach allowed for the largest possible sample size, because for some individual students one or the other data source was unavailable.

Developmental and credit-bearing courses at Northern Marianas College

Developmental and credit-bearing course sequences in English and math are listed below (tables B3 and B4).

Table B1. Assignment by old and new English placement exams into credit-bearing and developmental English courses, 2010/11–2013/14

| Placement exam | Total | | Credit bearing (percent) | Developmental (percent) |
	Number	Percent		
Northern Marianas College placement exam (fall 2010 to fall 2011)	175	20.7	25.7*	74.3*
ACCUPLACER (spring 2011 to spring 2014)	671	79.3	18.0*	82.0*
Total	846	100	19.6	80.4

*Significant at $p < .05$.

Note: Differences in the proportion of students assigned to credit-bearing versus developmental English courses by placement exams was statistically significant [χ^2 (1, N = 846) = 5.19; p < .05; ES = .078]. Effect size (ES) estimates the magnitude of differences between the two exam results and is reported here using the Phi statistic. A value of 0.10 was the recommended minimum effect size representing a significant effect for social science data.

Source: Authors' analysis of 2010/11–2013/14 data from Northern Marianas College.

Table B2. Assignment by old and new math placement exams into credit-bearing and developmental math courses, 2010/11–2013/14

Placement exam	Total		Credit-bearing (percent)	Developmental (percent)
	Number	Percent		
Northern Marianas College placement exam (fall 2010 to fall 2012)	527	68.5	9.3*	90.7*
COMPASS (spring 2013 to spring 2014)	242	31.5	4.5*	95.5*
Total	769	100	7.8	92.2

*Significant at $p < .05$.

Note: Differences in the proportion of students assigned to credit-bearing versus developmental math courses by placement exams was statistically significant [χ^2 (1, N = 769) = 5.21; p < .05; ES = .082]. Effect size (ES) estimates the magnitude of differences between the two exam results and is reported here using the Phi statistic. A value of 0.10 was the recommended minimum effect size representing a significant effect for social science data.

Source: Authors' analysis of 2010/11–2013/14 data from Northern Marianas College.

Table B3. Developmental and credit-bearing English courses at Northern Marianas College, 2010/11–2013/14

Subject and course number	Course name
Developmental English courses	
Reading	
English 73	Reading & Vocabulary Development I
English 83	Reading & Vocabulary Development II
English 93	Reading & Vocabulary Development III
Writing	
English 71	Beginning English: Reading & Writing
English 74	Writing & Grammar Study I
English 84	Writing & Grammar Study II
English 94	Writing & Grammar Study III
Credit-bearing English courses	
English 101	English Composition I
English 202	Creative Writing I

Note: Developmental courses are also offered in listening/speaking. However, these courses are generally not required to advance to credit-bearing English courses, and therefore information about listening/speaking courses was not reported in this study.

Source: Authors' analysis of 2010/11–2013/14 data from Northern Marianas College.

Table B4. Developmental and credit-bearing math courses at Northern Marianas College, 2010/11–2013/14

Subject and course number	Course name
Developmental math courses	
Math 87	Basic Math
Math 89	Pre-algebra
Math 91	Beginning Algebra
Credit-bearing math courses	
Math 132	Intermediate Algebra
Math 161	College Algebra

Source: Authors' analysis of 2010/11–2013/14 data from Northern Marianas College.

Appendix C. Detailed results for grades in Algebra 2 and highest math course

This appendix has detailed results for two academic preparation variables: grades in Algebra 2 and highest math course. In the main body of the report, these two variables were each aggregated into two levels—grades in Algebra 2 were grouped into B or higher and C or lower; highest math courses were grouped into Algebra 2 and beyond Algebra 2. Tables C1 and C2 report the placement in credit-bearing and developmental courses of students who earned A–F grades in Algebra 2 and of students whose highest math course was Algebra 2, precalculus, calculus, or statistics.

Table C1. Academic preparation by placement in credit-bearing or developmental math courses, 2010/11–2013/14

Student characteristic	Total		Credit bearing (percent)	Developmental (percent)
	Number	Percent		
All students	769	100	7.8	92.2
Grades in Algebra 2[a]				
A	111	14.7	32.4***	67.6***
B	157	20.7	9.6***	90.4***
C	216	28.5	2.8***	97.2***
D	188	24.8	0.5***	99.5***
F	85	11.2	1.2***	98.8***
Highest math course[b]				
Algebra 2	636	83.8	4.2***	95.8***
Precalculus	53	7.0	3.8 ***	96.2***
Calculus	44	5.8	47.7***	52.3***
Statistics	26	3.4	34.6***	65.4***

***Significant at $p < .001$.

Note: Percentages may not add to 100 percent because of rounding.

a. The number of students in this category does not sum to 769 because it excludes 12 students who did not enroll in Algebra 2. Ten of these students had either Algebra 1 or Geometry as their highest math course. Two of these students skipped Algebra 2 and enrolled directly in higher level math courses.

b. The number of students in this category does not sum to 769 because it excludes 10 students who had Algebra 1 or Geometry as their highest math course.

Source: Authors' analysis of 2010/11–2013/14 data from Northern Marianas College and 2007/08–2013/14 data from the Northern Mariana Islands Public School System.

Table C2. Distribution of placement in math courses by academic preparation, 2010/11–2013/14 (percent)

Academic preparation	Credit-bearing		Developmental		
	College Algebra (*n* = 21)	Intermediate Algebra (*n* = 39)	Beginning Algebra (*n* = 153)	Pre-algebra (*n* = 310)	Basic Math (*n* = 246)
Grades in Algebra 2[a]					
A	76.2	52.6	29.5	9.8	0.4
B	19.0	28.9	34.2	20.3	11.9
C	0	15.8	20.1	31.8	34.0
D	0	2.6	12.1	30.2	31.6
F	4.8	0	4.0	7.9	22.1
Highest math course[b]					
Algebra 2	23.8	57.9	78.7	84.6	95.1
Precalculus	4.8	2.6	8.0	9.8	3.7
Calculus	61.9	21.1	8.7	2.9	0.4
Statistics	9.5	18.4	4.7	2.6	0.8

a. The number of students in this category does not sum to 769 because it excludes 12 students who did not enroll in Algebra 2. Ten of these students had either Algebra 1 or Geometry as their highest math course. Two of these students skipped Algebra 2 and enrolled directly in higher level math courses.

b. The number of students in this category does not sum to 769 because it excludes 10 students who took Algebra 1 or Geometry as their highest math course.

Source: Authors' analysis of 2010/11–2013/14 data from Northern Marianas College and 2007/08–2013/14 data from the Northern Mariana Islands Public School System.

Note

1. LinkPlus is an open source software program developed by the Centers for Disease Control and Prevention that allows for accurate linking across disparate data sources (Centers for Disease Control, 2015).

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