



Carnegie Foundation for the Advancement of Teaching

Community College Pathways:

2012-2013 Descriptive Report

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Community College Pathways

The Community College Pathways (CCP) program had an outstanding second year. In 2012-2013, the program reproduced the positive outcomes realized in the first year of implementation, including successful course completion rates of over 50 percent for both Pathways. Simultaneously, the administration of the Pathways has continued to develop and improve in varied instructional settings across the United States.

This report provides descriptive statistics on 2012-2013 student outcomes as well as insights into the challenges and improvements in the second year's implementation of the Pathways. Altogether, the information presented in this report adds to the growing evidence of the Community College Pathways program's ability to reliably generate positive results at scale.

Community College Pathways Program

The academic success rate of developmental mathematics students at community colleges is alarmingly low. Over 60 percent of the nation's 14 million community college students are required to take at least one developmental mathematics class before they are eligible to enroll in college-credit courses (Achieving the Dream, 2006; Bailey, Jeong, and Cho 2010). However, 80 percent of the students who place into developmental math do not successfully complete any college-level mathematics courses within three years (Bailey, Jeong, and Cho, 2010). Instead, many students spend long periods of time repeating courses and leave college without a credential. This means that millions of students each year fail to acquire essential mathematics skills and are unable to progress toward their career and life goals.

To address this national problem, the Carnegie Foundation for the Advancement of Teaching joined with the Bill and Melinda Gates Foundation, William and Flora Hewlett Foundation, Kresge Foundation, Carnegie Corporation of New York, and Lumina Foundation in 2009 to create an innovative and transformative approach to developmental mathematics education, the Community College Pathways (CCP) program.

The CCP program is organized around two mathematics pathways, Statway® and Quantway®, that aim to accelerate students' progress through their developmental mathematics sequence and a college-level course for credit. The Pathways reduce the time required to earn college credit while improving the content and pedagogy of developmental mathematics.

Statway is a two-semester pathway that replaces the traditional algebra sequence and allows developmental math students to earn college-level credit for statistics in a single academic year. Statway integrates developmental mathematics skills and college-level statistics into a collaborative, problem-focused class.

Quantway is designed as two separate semester-long courses. The first semester, Quantway 1, fulfills the requirements for students' entire developmental mathematics sequence. The next semester¹, Quantway 2, is a college credit-bearing quantitative reasoning course. Each semester of Quantway is designed to promote success in community college mathematics and cultivate quantitatively literate citizens.

¹ Colleges can use Quantway 1 in isolation to help students progress more efficiently through developmental mathematics, or they may offer Quantway 2 along with Quantway 1 as an option for students to earn college-level math credit.

The Pathways' instructional system includes:

- 1 *Ambitious learning goals* leading to deep and long lasting understanding;
- 2 *Lessons and out-of-class materials* to advance these goals;
- 3 *Formative and summative assessments*, including end-of-module and common end-of-course assessments;
- 4 *Productive persistence*—an evidence-based package of practical student activities and faculty actions integrated throughout the instructional system to increase student motivation, tenacity, and skills for success;
- 5 *Language and literacy* component which interweaves necessary supports in instructional materials and classroom activities so that learning is accessible to all;
- 6 *Dynamic online environment* for network engagement and collaboration;
- 7 *Advancing quality teaching* component to provide instructors with the knowledge, skills, and habits necessary to experience efficacy in initial use and develop increasing expertise over time; and
- 8 *Rapid analytics* to support the continuous improvement of teaching and of the materials.

Changes to Statway and Quantway are tested and applied using the methodology of *improvement science*. Improvement science consists of rapid iterations of system changes to quickly identify and scale what works. For the CCP program, improvement science is applied by synthesizing best practices, rapidly developing and testing prospective improvements, and deploying successful changes in the classroom. Each step adds to the body of knowledge used to continuously improve Pathways' effectiveness.

To facilitate the application of improvement science in mathematics teaching and learning, Statway and Quantway are organized as a Networked Improvement Community (NIC) (Bryk, Gomez, and Grunow, 2011; Dolle, Gomez, Russell, and Bryk, 2012). The NIC is a scientific learning community distinguished by four essential characteristics: (1) *focused* on a well specified common aim, (2) *guided* by a deep understanding of the problem and the system that produces it, (3) *disciplined* by the rigor of improvement science, and (4) *networked* to accelerate the development, testing, and refinement of interventions and their effective integration into varied educational contexts.

The NICs join community college faculty and administrators with Carnegie's improvement specialists and national educational researchers. Together they engage in disciplined inquiry using common conceptual frameworks, measures, and protocols to advance measureable improvements in teaching and learning (Berwick, 2008; Langley et al., 2009). Network members test hypotheses, analyze local adaptations to ensure their effectiveness, and contribute to the continued modification of Pathways.

Launch of Statway and Quantway

Statway was first launched during the 2011-2012 academic year. The first cohort of 1,133 students spanned 19 community colleges and two state universities across five states. In total, there were 50 faculty teaching 55 sections of Statway. Fifty-one percent of the initial cohort successfully completed Statway and earned college-level math credit in a single year. A detailed discussion of this initial cohort

was presented in *Community College Pathways: 2011-2012 Descriptive Report* (Strother, Van Campen and Grunow, 2013).

Quantway 1 was first launched in the spring of 2012. The first cohort of 418 students spanned eight community colleges across three states. In total, there were 23 faculty teaching 24 sections of Quantway. Fifty-six percent of the initial cohort successfully completed Quantway 1, thus fulfilling their developmental math requirements in a single semester. Refer to *Community College Pathways: 2011-2012 Descriptive Report* for further details on this first cohort (Strother et al, 2013).

Year Two of Statway

In 2012-2013, a total of 19 community colleges and four state universities offered Statway across five states (see Appendix A for the complete list). All 18 community colleges that offered Statway in Year 1 continued to offer it, and one college joined the program. A total of 1,553 students enrolled in 77 sections of Statway taught by 67 faculty. This is a marked increase from Year 1, in which 1,133 students were enrolled in Statway.

Because Statway was designed with community college students in mind, results from the community colleges and the state universities who offer Statway will be reported separately. For community colleges, this report describes the rate of successful completion for students enrolled in Statway during fall 2012. This fall cohort serves as the analytic sample and consists of 853 students and 41 faculty in 45 sections of Statway at 18 community colleges.² Successful Statway completion is defined as receiving a grade of C or higher in the final Statway term.

Though it was designed to serve community college students, Statway has been employed successfully for students at four-year universities as well. In particular, students who place into developmental math and do not plan to pursue a major that requires calculus can save time and gain useful math skills by completing Statway.

In 2012-2013, a substantial portion of Statway's growth occurred at California State University (CSU) campuses. Four campuses in the CSU system taught Statway in Year 2, an increase of two schools from Year 1. A total of 204 students were enrolled in nine sections of Statway taught by eight faculty across the four CSU campuses.

Year Two of Quantway

Quantway expanded substantially in Year 2. All eight community colleges continued to teach Quantway 1 and the number of sections offered and students enrolled tripled from Year 1. There were 48 faculty teaching 74 sections of Quantway 1 with 1,402 students enrolled. Data was available from all eight colleges, so the analytic sample described in the current report consists of 1,402 students. Successful completion of Quantway 1 is defined as receiving a grade of C or higher.

²In addition to the 853 students in the fall 2012 cohort, 496 students enrolled in 23 Statway sections taught by 22 faculty at 19 community college campuses in spring or winter of 2013. These students were excluded from our analysis because full-year data was not available. One community college did not offer any Statway sections in the fall but offered 6 sections in the spring.

Additionally, Quantway 2 was rolled out at three community colleges³ in spring 2013. The first cohort consisted of 49 students and five faculty in six sections of Quantway 2. Student data were submitted from five of those six sections, so the analytic sample for this report is comprised of 44 students. Successful completion of Quantway 2 is defined as receiving a grade of C or higher.

Year Two Pathway Improvements

Improved Instructional Systems

New versions of the instructional systems for both Statway and Quantway were released prior to the start of the Fall 2012 term. Both included standard updates and improvements, which are part of our continuous improvement process. In addition Statway version 2.0 provided a significant enhancement of tighter alignment between in class lesson materials and online resources and a glossary.

Language and Literacy

Year 1 assessment data revealed that students with a language background other than English were less likely to successfully complete the Pathways. In 2012-2013, the Pathways' curriculum development team received in-depth training in language and literacy. They used this training to revise Pathways lessons to improve accessibility and better support the learning of all students. As the materials were revised, NIC faculty tested the new lessons in the classroom and offered immediate feedback on which elements worked and which did not.

Strengthened Student Surveys and Assessments

In the spirit of continuous improvement, the Carnegie Foundation sought to optimize Pathways' student surveys and assessments after Year 1. Researchers at Carnegie performed Rasch analyses⁴ on survey/assessment questions and student responses in order to determine which questions were most applicable to desired student outcomes. The Carnegie Foundation used this information to revise, delete, and add questions to increase their clarity and usefulness.

Improved Reporting

In Year 2, the Carnegie Foundation leveraged the power of data to increase faculty engagement and improve instruction. Improved reporting processes were launched to provide Pathways instructors with valuable insight about their students.

Incoming Pathways students complete a background survey that measures their knowledge of and attitudes toward math. After finishing activities and discussions designed to challenge negative beliefs such as "I am not a math person," students complete a shorter version of this survey designed to assess changes in their attitudes toward math. In 2012-2013, the Carnegie Foundation improved these surveys through Rasch analysis and provided instructors with individualized reports summarizing student responses after each survey closed. This helped faculty to better understand their students, tailor their instructional practices to meet students' needs, and appreciate the benefits of data collection in

³ Cuyahoga Community College, Sinclair Community College, and Onondaga Community College all offered Quantway 2 in spring 2013.

⁴ Rasch analysis is an Item Response Theory (IRT) technique that models the probability of a specific assessment response as a function of item and person parameters.

Pathways. College administrators were also provided with institution-wide reports on student enrollment, success, and at-risk indicators.

Who Are the Students in Statway and Quantway?

Table 1 provides demographic information on the students in Statway and Quantway. The demographic characteristics of Pathways students were very similar to Year 1, with the exception of an increase in the number of students who placed three or more levels below college math (Strother et al, 2013).⁵ Additionally, 71 percent of Statway students placed at least two levels below a college-level mathematics course and almost half would be required to take at least one developmental reading course as well. About 60 percent of the students are female and 69 percent were raised in families where the mother did not hold a college degree. Two-thirds of the Statway students are minorities and 40 percent grew up in an environment where a language other than English was spoken.

Similarly, over two-thirds (70 percent) of Quantway students placed into mathematics courses two levels or more below college-level mathematics and 41 percent placed into developmental reading. Sixty-four percent of Quantway students are female and two-thirds came from families where the mother did not obtain a college degree. Quantway students are predominantly Caucasian (48 percent) and African-American (33 percent), with smaller percentages of other ethnic minorities. Thirty percent grew up in an environment where a language other than English was spoken. Overall, both Pathways enroll traditionally underserved populations but vary slightly in their ethnic compositions. This likely reflects the differing ethnic compositions of the states in which Statway and Quantway are taught.

⁵ In Year 2, 34.9 percent of Statway community college students with valid placement level data placed three levels below college math, versus 26.3 percent in Year 1. Twenty-six percent of Quantway students with valid placement level data placed three levels below in Year 2, versus 12.8 percent in Year 1. It is important to note that placement level data were missing for 38.2 percent of Statway community college students in Year 2, versus 18.5 percent in Year 1. For Quantway, placement level data were missing for 45.6 percent of students in Year 2, versus 1.7 percent in Year 1. The role of placement level data merits further exploration and will be considered as the CCP program continues to grow.

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Table 1

Demographic Data of Students Enrolled in the Second Cohort of Statway and Quantway

	Statway	Quantway
<i>Mathematics Placement Level</i>		
College Level	4.6%	0%
1 level below college level	14.4%	29.5%
2 levels below college level	46.1%	44.6%
3 or more levels below college level	34.9%	26.0%
<i>Reading Placement Level</i>		
College Level	51.5%	59.2%
1 level below college level	33.2%	25.9%
2 levels below college level	10.3%	14.7%
3 levels below college level	5.0%	0.2%
<i>Gender</i>		
Female	59.8%	63.6%
Male	40.2%	36.4%
<i>Race</i>		
Hispanic	32.5%	12.1%
Caucasian	33.3%	48.0%
African American	24.0%	33.0%
Asian	4.5%	2.6%
American Indian/Alaskan Native	0.4%	0.1%
Pacific Islander	1.3%	0%
Other	0.8%	2.4%
Multiple	3.2%	1.8%
<i>Home Language Growing Up</i>		
English only	60.3%	69.6%
English and another language	28.5%	19.8%
A non-English language only	11.2%	10.6%
<i>Maternal Education</i>		
Less than high school	14.2%	11.9%
High school graduate or GED	27.1%	29.6%
Some college but no degree	27.4%	25.3%
2-year college degree	12.0%	12.4%
4-year college degree	14.0%	13.4%
Graduate or professional degree	5.3%	7.4%

Successful Completion for Statway Students

Fifty-two percent of Statway community college students successfully completed the full Pathway (had a grade of C or higher in the final term) and earned college credit in 2012-2013 (see Table 2). This is a promising reproduction of Year 1 outcomes, in which 51 percent of all Statway students and 49 percent of Statway community college students successfully completed the final term.

To place these completion rates in context, we worked with institutional researchers from 18 of the Year 1 Statway colleges⁶ to establish baseline course completion rates among developmental math students. These data revealed that only 5.9 percent of non-Statway developmental mathematics students received credit for college-level mathematics in one year. Additionally, only 15.1 percent had achieved this goal after two years, 20.4 percent after three years, and 23.5 percent after four years. Judged against this baseline data, the results from both years of implementation are extremely encouraging. Essentially, Statway students experienced over triple the success rate of students in traditional courses (52 percent versus 15.1 percent) in half the time (one versus two years).

Table 2
Community College Student Success in Statway (Fall 2012 Cohort)

	Number of Colleges	Initial Student Enrollment	Number of Students Completing* Pathway	Number of Students Successfully** Completing Pathway
2011-2012	18	974	562 (58%)	475 (49%)
2012-2013	18	853	501 (59%)	445 (52%)

*Completion is defined as persisting through the final term and receiving any grade (did not withdraw).

**Successful completion is defined as receiving a grade of C or higher in the final term.

Completion rates are also high at CSU campuses. In 2012-2013, over 80 percent of students completed the Pathway and 75 percent earned a C or better. This is a promising reproduction of Year 1 outcomes at CSU schools, where 74 percent of students successfully completed Statway. Because students at community versus traditional colleges tend to differ in some important ways, these results indicate that Statway can be usefully applied in a variety of contexts.

Table 3
CSU Student Success in Statway (Fall 2012 Cohort)

	Number of Colleges	Initial Student Enrollment	Number of Students Completing* Pathway	Number of Students Successfully** Completing Pathway
2011-2012	2	109	92 (84%)	81 (74%)
2012-2013	4	204	167 (82%)	153 (75%)

*Completion is defined as persisting through the final term and receiving any grade (did not withdraw).

**Successful completion is defined as receiving a grade of C or higher in the final term.

⁶ Eighteen of the Year 1 Statway institutions provided baseline data for all developmental mathematics students who enrolled in 2008.

In traditional developmental mathematics sequences, there are several “critical junctures” where students tend to drop out. Each of these junctures signifies a crucial milestone in progressing toward successful developmental math completion. For example, even if students do successfully pass their first developmental math course, many students fail to reenroll in the subsequent required course. Understanding these junctures provides valuable information that can be used to further increase successful completion rates.

Statway’s streamlined design reduces the number of critical junctures, but some still remain. These include: completion of each term, successful completion of each term (having a grade of C or higher), and enrollment into the subsequent term.

Table 4 and Figure 1 show the percentage of students who remain in Statway at each critical juncture. Rates were calculated by institution to better understand the institutional variation in how students persisted across each juncture. These progress rates were used to divide the institutions into a top quartile, median, and bottom quartile at each juncture.

The median completion rate for the first term of Statway was 92 percent and the median rate of successful completion was 72 percent. Also promising is the high percentage of students that enrolled in the second term of Statway after successfully completing the first term. The median rate of successful completion for the full Pathway was over half (52 percent). The most noticeable drop is the percent of students who completed the first term of Statway but did not do so successfully.

Table 4 and Figure 1 also show examples of the variation among colleges. For example, schools in the top quartile had 81 percent successful completion in the first term while schools in the bottom quartile had 65 percent of students successfully complete. This variation persists through the end of the second term, where schools in the top quartile had over 60 percent of students successfully complete Statway but schools in the bottom quartile had successful completion rates of 42 percent or less. Carnegie’s continuing goal is to drive improvement efforts within and across institutions to better understand the sources that cause institutional variation.

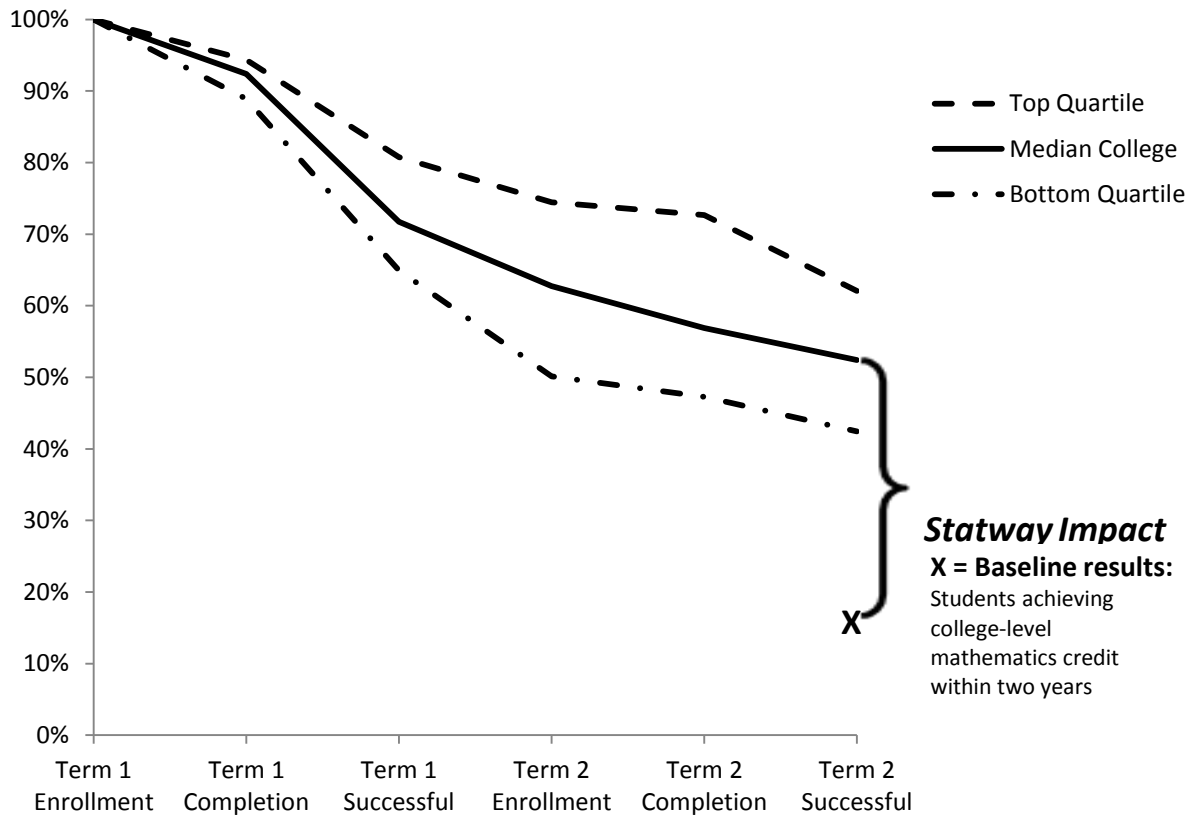
Table 4
Percentage of Students Remaining in Statway at Each Juncture during the 2012-2013 Academic Year

Quartile	Term 1 Enrollment	Term 1 Completion*	Term 1 Successful**	Term 2 Enrollment	Term 2 Completion	Term 2 Successful
Top	100%	94%	81%	74%	73%	62%
Median	100%	92%	72%	63%	57%	52%
Bottom	100%	89%	65%	50%	47%	42%

*Completion is defined as persisting through the final term and receiving any grade (did not withdraw).

**Successful completion is defined as receiving a grade of C or higher in the final term.

Completion Rate for the Statway Fall 2012 Cohort of Community College Students



*Completion is defined as persisting through the final term and receiving any grade (did not withdraw).

**Successful completion is defined as receiving a grade of C or higher in the final term.

Figure 1. Percentage of students remaining in Statway at each juncture in the 2012-2013 academic year.

Successful Completion in Quantway

In 2012-2013, 52 percent of all students enrolled in Quantway 1 successfully completed the semester with a grade of C or higher. This is a promising continuation of positive outcomes from the first semester of Quantway implementation, when 56 percent of students successfully completed Quantway 1.

To place these results in context, Carnegie worked with institutional researchers from six of the first Quantway colleges⁷ to establish baseline course completion rates among developmental math students. This data revealed that only 20.6 percent of students were able to successfully complete their developmental math sequence within a full year. Additionally, 28.5 percent achieved this goal after two years, 31.6 percent after three years, and 33.3 percent after four years.

Judged against these baseline data, the results from all semesters of Quantway implementation appear quite significant. In essence, Quantway 1 students experienced more than double the success rate (52 percent versus 21 percent) in half the time (one versus two semesters).

Table 4 *Student Success in Quantway 1 (2012-2013 Academic Year)*

	Number of Colleges	Initial Student Enrollment	Number of Students Completing* Quantway 1	Number of Students Successfully** Completing Quantway 1
2011-2012	8	418	346 (83%)	234 (56%)
2012-2013	8	1402	1180 (84%)	732 (52%)

*Completion is defined as persisting through the final term and receiving any grade (did not withdraw).

**Successful completion is defined as receiving a grade of C or higher in the final term.

The first semester of Quantway 2 also displayed extremely encouraging results. In spring 2013, 95 percent of the students enrolled in Quantway 2 completed the course, and 68 percent successfully completed the course with a grade of C or higher.

Table 5 *Student Success in Quantway 2 (Spring 2013)*

	Number of Colleges	Initial Student Enrollment	Number of Students Completing* Quantway 1	Number of Students Successfully** Completing Quantway 1
2012-2013	3	44	42 (95%)	30 (68%)

*Completion is defined as persisting through the final term and receiving any grade (did not withdraw).

**Successful completion is defined as receiving a grade of C or higher in the final term.

⁷ Colleges provided baseline data for all developmental math students who enrolled in 2008. One community college in Quantway did not provide this baseline data and one could only provide data from 2010 onward, which was not included.

We analyzed the critical junctures of Quantway 1 as we did with Statway. Quantway 1 was designed as a one-term course, so the only critical junctures include: completion of term 1 and successful completion of term 1 (having a grade of C or higher). We did not perform this analysis for Quantway 2, as it was not yet offered by a large enough number of colleges.

Progress rates were calculated by institution to better understand the institutional variation in how students persisted across each juncture. Table 5 and Figure 2 display the median, bottom quartile, and top quartile of the colleges' progress rates for each juncture.

The median completion rate for Quantway 1 was 87 percent and the median rate of successful completion was over 50 percent. Also promising was the fact that the top quartile of colleges had a 65 percent or higher rate of successful completion.

Table 5 and Figure 2 also show examples of the variation between colleges. For example, schools in the top quartile had 95 percent of students complete Quantway 1, while schools in the bottom quartile had 21 percent of their students withdraw. Schools in the top quartile had 65 percent of students successfully complete Quantway 1 while schools in the bottom quartile had 42 percent or less of students successfully complete. Our goal is to advance further improvement efforts within and across institutions by better understanding the sources that cause this institutional variation.

Table 5

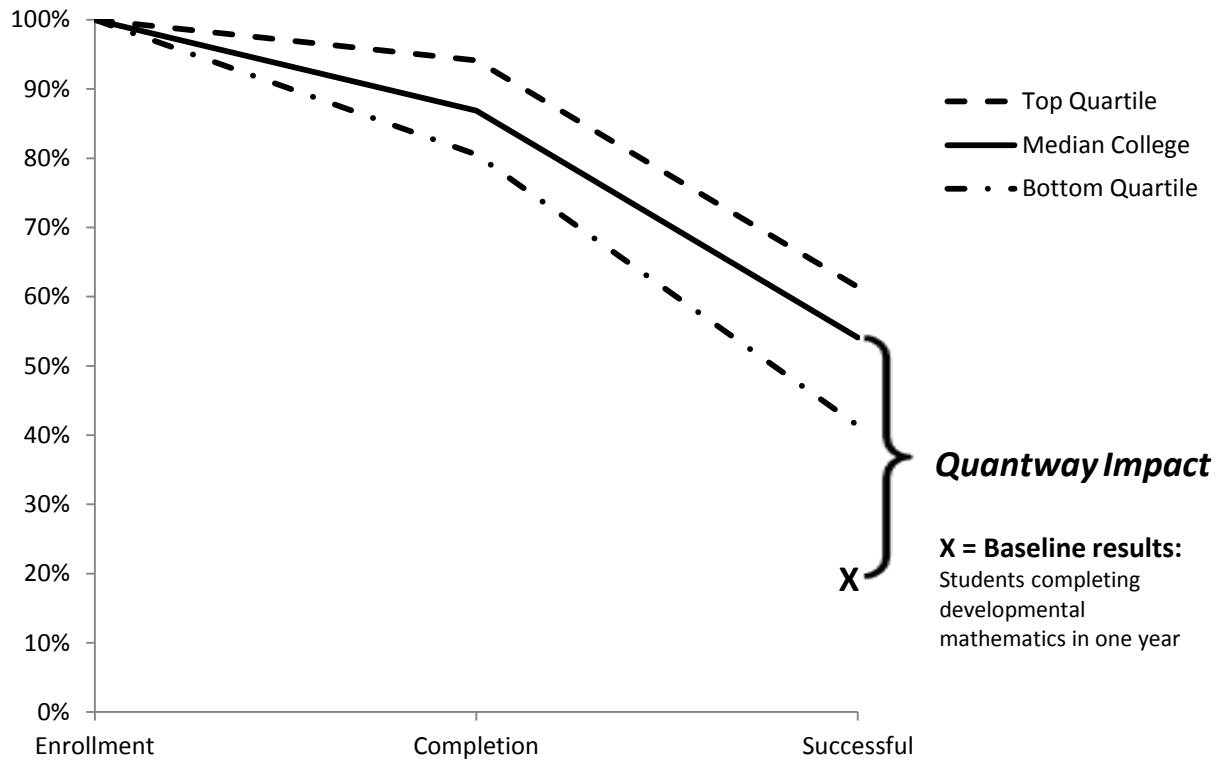
Percentage of Students Successfully Completing Quantway 1 in 2012-2013

Quartile	Quantway 1 Enrollment	Quantway 1 Completion*	Quantway 1 Successful** Completion
Top	100%	95%	65%
Median	100%	87%	53%
Bottom	100%	79%	42%

*Completion is defined as persisting through the final term and receiving any grade (did not withdraw).

**Successful completion is defined as receiving a grade of C or higher in the final term.

Completion Rate for Quantway 1 During 2012-2013



*Completion is defined as persisting through the final term and receiving any grade (did not withdraw).

**Successful completion is defined as receiving a grade of C or higher in the final term.

Figure 2. Percentage of students successfully completing Quantway 1 in 2012-2013.

Conclusions and Next Steps

In the 2012-2013 academic year, the Community College Pathways program sustained the positive outcomes realized in 2011-2012. Fifty-two percent of Statway community college students and 75 percent of Statway CSU students successfully completed the course, earning college credit within one year. Quantway 1 results were similarly encouraging, with 52 percent of students successfully completing the course and fulfilling their developmental math requirements. These rates are consistent with Year 1 results and dramatically higher than the typical completion rates of other developmental math students.

The fact that these results were achieved while the Community College Pathways program served a larger overall number of students, launched Quantway 2, and incorporated Pathways improvements is a testament to the program's effectiveness and stability. As more colleges offer the Pathways, it is increasingly important to reliably generate positive program outcomes. Year 2 data add to the evidence that Pathways can help large numbers of students in a variety of contexts gain essential mathematics skills and achieve their academic goals.

While this report provides a foundational descriptive picture of student performance, more sophisticated analyses of the Pathways data are currently underway. Analysts at Carnegie are working to improve Pathways student assessments and evaluate student academic success after they complete Statway or Quantway. These projects will increase understanding of the longer-term impact of Pathways as well as strengthen the Statway and Quantway courses.

For more information on the Carnegie Community College Pathways program and improvement research and to see the list of founding institutions, as well as the new institutions joining the Network, visit www.carnegiefoundation.org.

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Appendix A: Participating Institutions in the 2012-2013 Academic Year

STATWAY®

American River College
Austin Community College
Capital Community College
California State University, East Bay
California State University, Sacramento
El Paso Community College
Foothill College
Gateway Community College
Housatonic Community College
Houston Community College
Los Angeles Pierce College
Miami Dade College
Mt. San Antonio College
Naugatuck Valley Community College
Richland College
San Diego City College
San Diego Miramar College
San Francisco State University
San Jose State University
Seattle Central Community College
Tacoma Community College
Tallahassee Community College
Valencia College

QUANTWAY®

Cuyahoga Community College
Borough of Manhattan Community College
East Georgia State College
Gainesville State College
Onondaga Community College
Sinclair Community College
South Georgia State College
Westchester Community College

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