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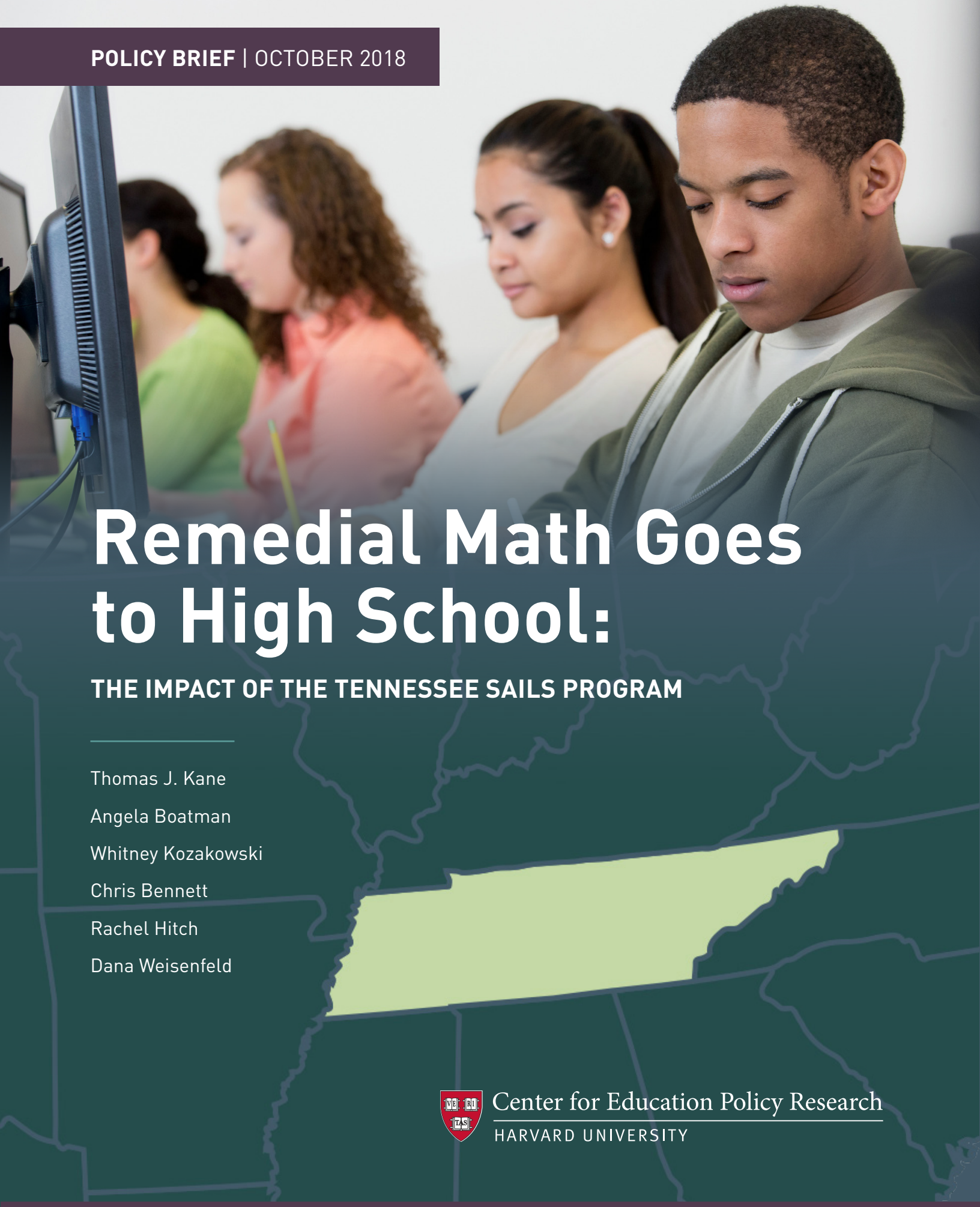

Remedial Math Goes to High School:

THE IMPACT OF THE TENNESSEE SAILS PROGRAM

Thomas J. Kane
Angela Boatman
Whitney Kozakowski
Chris Bennett
Rachel Hitch
Dana Weisenfeld

Center for Education Policy Research
HARVARD UNIVERSITY

As college enrollment rates have risen, many students are arriving on college campuses without the math and literacy skills traditionally expected for college-level work. Colleges typically require such students to complete remedial courses before proceeding to college coursework. Among first- and second-year students at public two-year institutions nationally in 2011-12, 41% took at least one remedial course (Skomsvold, 2014).

Yet, with only 34% of community college students in remediation completing a credential within six years, many have questioned whether remediation does more harm than good, needlessly delaying students and costing taxpayers money[1] (NCES, 2012). In fact, the advocacy organization Complete College America has decried pre-requisite college remediation as a "bridge to nowhere" (Complete College America, 2012).

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Tennessee has been a national leader in the effort to rethink college remediation, launching the Seamless Alignment and Integrated Learning Support (SAILS) program in 2012. The goal of the SAILS program has been to shift the timing of remediation from college back to high school and, thereby, to allow students to enroll in college math directly upon enrolling in a community college.

Unlike most states where students learn of their remediation status only after taking a placement test upon arrival at college, Tennessee notifies students of their remediation requirements in high school (based on their junior year ACT score), while they still have time to fill any gaps in their skills. Students in SAILS-participating high schools who score below the remediation threshold of 19 on the ACT math test can fulfill their math remediation by completing an online math course during their senior year. Overseen by the Tennessee Board of Regents, the SAILS program provides support and training to high school teachers implementing the SAILS course. Students proceed at their own pace, asking help from a teacher when necessary. Students who complete the course's five modules (about 90% of recent cohorts) are exempted from math remediation if they enroll at any Tennessee community college.

A joint team of researchers from Harvard and Vanderbilt have been evaluating the impact of SAILS by tracking outcomes of those who were public high school seniors in Tennessee from 2010-11 through 2015-16.

TWO RESEARCH DESIGNS

The design of the SAILS program, and the way it was rolled out across the state, provide a unique opportunity to evaluate its effectiveness, not just on postsecondary course enrollment and credit accumulation, but also on student achievement in math as well. Accordingly, we evaluate the program using two different research designs:

First, because high schools adopted the program in different years, we study the changes in student outcomes based on the year in which schools began implementing SAILS. By focusing on changes in outcomes, we control for differences in schools' starting points on these outcome measures. By comparing the same-year changes for SAILS-participating and non-participating schools, we also control for other policy reforms that may have affected all Tennessee high schools in any given year.

Second, we compare outcomes for students with ACT math scores just above and below the cutoff for remediation (a score of 19). Because students on either side of the cutoff have similar achievement and characteristics, such comparisons are akin to random assignment. Students on one side (below 19) were recommended for remediation while students on the other side (19 and above) were not. By comparing outcomes for the two groups of students, we can measure the impact of being recommended for remediation. Moreover, by measuring the differences at the threshold in SAILS-participating and non-

participating high schools, we can compare the consequences of SAILS remediation to those of students whose only option was pre-requisite or co-requisite remediation. We administered a math assessment and survey to Tennessee high school seniors with ACT math scores above and below 19 to measure impacts of remediation.

Both approaches, though relying on different statistical methods and comparison groups, tell a similar story.

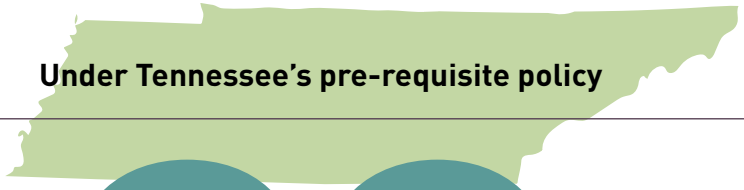
SUMMARY OF FINDINGS

We summarize our four primary findings below:

1. **Under the pre-requisite policy, the SAILS program allowed students to enroll in college-level math at higher rates.** During the first year in community college, SAILS participants were 29 percentage points more likely to enroll in college math. Roughly half of those students passed the course, yielding a 13-percentage point increase in the percentage of students having passed college math by the end of their first year. However, the impacts on college math enrollment and completion were smaller by the second year, as students from non-participating high schools completed their remediation and caught up.[2] By the end of their second year in college, SAILS participants completed a modest number of additional college credits (4.5 credits or 1.5 courses) compared to their counterparts in high schools without SAILS.

2. **The SAILS program improved students' perceptions of the usefulness and enjoyment of math.** Students just below the ACT math cutoff of 19 (a group much more likely to enroll in SAILS) were 6.5 percentage points more likely to perceive that their math course content would be useful in their careers, 10 percentage points more likely to indicate they were better prepared for college math, and 6 percentage points more likely to say that they were interested in math than those immediately above the remediation threshold, who took a different high school math course. The impacts were particularly large for Black students.

Under Tennessee's pre-requisite policy



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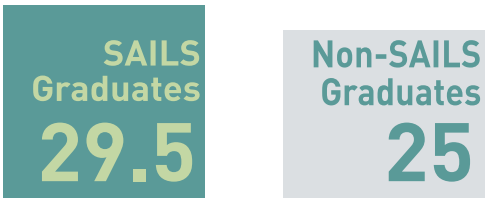
During the first year in community college, SAILS participants were **29 percentage points more likely to enroll in college math.**

Roughly **half of those students passed the course**. However, the passing rates for SAILS graduates were not higher than for students with similar ACT scores who were just above the remediation threshold.

Credits by 2nd year



By the end of their second year in college, SAILS participants **completed 4.5 additional credits (or 1.5 courses)** compared to their counterparts in non-SAILS high schools.

3. **Despite the positive impacts on students' perceptions of math, the SAILS program did not improve students' math achievement nor boost their likelihood of passing college math upon taking the course.** We did not find that SAILS participation improved performance on any of the subsets of items identified by SAILS program staff as aligned with the SAILS curriculum. About half of the new students who enrolled in college math as a result of SAILS passed the course during their first year in college. The passing rates for SAILS graduates were not higher than for students with similar ACT scores who were just above the remediation threshold.

4. **After the co-requisite policy was introduced in the fall of 2015, SAILS no longer had an impact on students' taking or passing college math during their first year, nor on the total number of credits completed at the end of their second year.** In lifting the barrier to entry into college-level courses, the co-requisite policy largely superseded the SAILS program by allowing students to do their remediation alongside college-level courses, rather than before them. Even though SAILS allowed students to avoid having to take remedial classes concurrently with their college classes, we saw no impact of SAILS on the number of college credits students completed under the co-requisite policy.

DISCUSSION

In sum, the SAILS program eliminated the delay for community college students in entering college-level math. The adoption of co-requisite remediation in Tennessee's community colleges in 2015 had a similar effect. However, the SAILS program did not boost student's math knowledge nor increase their chance of passing college math upon taking the course. SAILS—like the co-requisite policy—gave 30% more remediation-recommended students the opportunity to take college math during their first year at community college. And about half of the new entrants passed.

In addition to the modest impacts on credit completion, taxpayers and students in Tennessee may still have benefited from the cost reduction SAILS provided. Shifting the timing of remediation from college back to high school reduced expenditures on college remediation. Because high school students in Tennessee are already required to take four years of math to graduate, SAILS enrollment did not add to instructional costs in high school. Therefore, any reduction in expenditures on remediation delivered in college represented a cost saving.

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For policymakers nationally, our results are both good news and bad news. Critics have pointed to pre-requisite remediation as a major cause of non-completion. The good news is that, in Tennessee at least, that is not the case. Removing the barrier of pre-requisite remediation—either with the SAILS program or with co-requisite remediation—allowed students to make faster progress during their first year in college, but those advantages were only 4.5 credits (or 1.5 courses) by the end of the second year as the students from non-participating high schools caught up.

The bad news is that the remedial math course—at least at the level of intensity required by the SAILS program—did not have a discernible impact on students' math knowledge or improve students' likelihood of passing college math upon taking the course.

Achieving significant improvements in the number of Tennesseans with a postsecondary credential will require identifying and clearing other barriers to college completion. For example, in a review of recent remedial education reform efforts, Bailey et al. (2016) found that programs with comprehensive, integrated, and long-lasting student supports produced the largest increases in college success outcomes. Programs like the City University of New York's Accelerated Study in Associate Programs (ASAP) that

offer students comprehensive advising, tutoring, and financial support have been shown to have impacts on degree completion (Scrivener et al., 2015). Other institutions, such as Georgia State University, have been reaching out to students during the summer, allowing students to choose "meta-majors" with common course requirements during their freshman year, redesigning their introductory math courses, and automating parts of their advising system.[3] Some of these approaches have been tested with comparison groups and have been shown to produce improvements in postsecondary access and persistence (Page & Gelbach, 2017), though others have not yet been evaluated (Kurzweil & Wu, 2015).

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Our findings also suggest a more thorough rethinking of the content and delivery of remediation. The first task must be finding a model of remediation that actually improves students' understanding of math. It could be that senior year in high school is too late to start. In a study of the effectiveness of a double-period algebra course in the 9th grade in the Chicago Public Schools, researchers found positive impacts on students' achievement in algebra (Nomi & Allensworth, 2009). Later work found positive impacts on credits earned in high school, test scores, high school graduation, and college enrollment rates (Cortes, Goodman, & Nomi, 2015).

It is also possible that other modes of instruction or additional layers of support might be more effective for students. A growing body of work from college and high school settings has found that students with lower levels of academic preparation perform less well in online courses than with traditional instruction (Xu & Jaggars, 2013; Bettinger, Fox, Loeb, & Taylor, 2017; Heppen, et al., 2016). Although SAILS is not purely online (there is a teacher in the room), it is possible that the self-paced format is less effective for the students who have struggled with the material in the past. If states cannot find a model of remediation that actually increases students' success in math, we should be evaluating the consequences of eliminating remediation requirements for more students.

Especially for those without the math and literacy skills traditionally expected for college-level work, we are unlikely to find a single policy to generate large increases in college completion. Rather, leaders in Tennessee and other states will need to continue to innovate—and test their ideas with data—in order to achieve substantial change. ■

▶ For more details, read the **full report**, "Remedial Math Goes to High School: An Evaluation of the Tennessee SAILS Program," available at **cepr.harvard.edu/sails**.

ENDNOTES

1 Estimate based on Beginning Postsecondary Students (BPS): 2009 transcript data (NCES 2012; tables accessed via QuickStats at https://nces.ed.gov/datalab/index.aspx).

2 It is also possible that the co-requisite policy implemented during their second year helped shrink the difference.

3 Other states have begun using high school grades in combination with test scores for making remediation decisions. A recent study in New York found that some of the students exempted from remediation based on a combined measure were able to pass college math (Barnett et al., 2018). These findings support earlier research with similar conclusions (Belfield & Crosta, 2012; Scott-Clayton & Rodriguez, 2012; Scott-Clayton, Crosta, & Belfield, 2014).

SUGGESTED CITATION

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