

Education Brief

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Participation in Math Corps Increases College Enrollment

Nearly 30 years ago, Dr. Steven Kahn and Professor Leonard Boehm at Wayne State University (WSU) started Math Corps, a summer camp for middle school students in Detroit who could benefit from mentoring and positive influences. The camp is an intensive six-week summer program that provides not only high-quality math instruction but also social and emotional support.

In 2015, the National Science Foundation awarded an Advancing Informal Science, Technology, Education, and Mathematics (STEM) Learning grant to WSU. As part of the grant, Mathematica conducted an independent study of Math Corps using a quasi-experimental retrospective analysis focusing on long-term outcomes for students who attended Math Corps from 2004 to 2009. This brief presents the results of those analyses, which provide rigorous evidence of the impact of the Math Corps summer program on college enrollment, degree completion, and encounters with the criminal justice system.

Research questions. Two research questions guided the study:

- / What is the impact of Math Corps on postsecondary education and criminal justice outcomes?
- / Does the impact of Math Corps differ among student subgroups characterized by the following:
 - GPA at the time of program application
 - Participation in a Saturday program during the school year
 - Participation in summer camp for three or more years
 - Participation in middle school and high school



Math Corps Philosophy and Main Principles

The Math Corps philosophy is based on the belief that all children have greatness within them and that the surest road to realizing that greatness lies along the path of simply being yourself. Math Corps upholds the following two basic principles:

- High standards and expectations should be held at all times for every student in the program with regard to both academics and character, and without regard to either past performance or background.
- A sense of family should exist, whereby every student in the program is cared for as an individual, is supported non-academically as well as academically, finds friendships and mentoring relationships that are both meaningful and long-lasting, and is made to feel that they belong to something very special.

From the Math Corps website, www.mathcorps.org.

Math Corps

WSU's Math Corps summer camp is a math enrichment and mentoring program that seeks to provide Detroit children from disadvantaged backgrounds with a high-quality learning environment and a safe place. It has four core components:



Community. Math Corps is a place where students can build family and community connections and learn to strive to achieve more than they might otherwise accomplish. Math Corps develops cultural norms for interacting with one another and uses the Socratic approach to help build community. The curriculum is also designed to strengthen connections through teams and mentors. High school students mentor middle school students, and college students and professors mentor high school and middle school students. Camp participants are divided into teams, each of which includes 10 middle school students, 5 high school teaching assistants, and a college student mentor who leads the team. Math Corps strongly encourages students to return to the program year after year, and many of the middle school participants ultimately become high school and college mentors.



Schedule. The camp runs Monday through Thursday from 9:30 a.m. to 2:30 p.m. Camp begins with an assembly at 9:30 a.m. All students attend the assembly together to learn the Math Corps philosophy and cultural norms, have fun, and celebrate middle school student successes. After assembly, middle school students have 1.5 hours of "Team Time," which includes their basic math course and a practice session during which teaching assistants and college student instructors help students with their work. After the morning Team Time, students have a lunch break, take their advanced math course, and have time to write in journals. Each day ends with special math activities and projects or computer activities, such as playing chess, making tessellations, studying astronomy, or learning about probability. On Friday, the camp offers special activities from 9:30 a.m. to 12:30 p.m., such as Movie Day, Craft Day, Volunteer Day, Game Day (board and video), Karaoke Day, or a field trip (for example, to a planetarium). Attendance is mandatory Monday through Thursday and optional on Fridays. Students are encouraged to arrive early for breakfast and stay late for tutoring, daily.



Curriculum. Students receive instruction in both basic and advanced math topics. The basic math courses offered each morning include "The Real Numbers" for 7th graders, "The Operations on Real Numbers" for 8th graders, and "The Foundations of Algebra" for 9th graders. University professors teach the afternoon advanced math course using the Socratic method. These courses include a variety of hands-on activities that encourage students to use multiple approaches to problem solving.



Values. Math Corps' values of kindness, integrity, and student greatness are promoted throughout each day. All participants are expected to attend, arrive on time, and complete their homework daily. In addition, students are held to strict standards of behavior. Having fun is considered a daily requirement and violence is strictly prohibited. ▲

Methods. Because Math Corps historically received about twice as many applicants as the program can accommodate (Figure 1), we first used propensity score matching to construct a comparison group from the applicant pool. Then, to estimate impacts, we used regression models that show how outcomes differed for Math Corps participants and matched comparison applicants who did not participate in Math Corps. The matched sample we analyzed included 1,207 students (608 in the Math Corps group and 599 in the comparison group).¹

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Data sources

The study focuses on six cohorts of middle school students who applied to the program from 2004 to 2009. These years were selected because they gave us time to observe college enrollment outcomes by mid-2019, when we collected data for the study.

WSU program records

- Provided student-level data on background characteristics, Math Corps participation, and application information

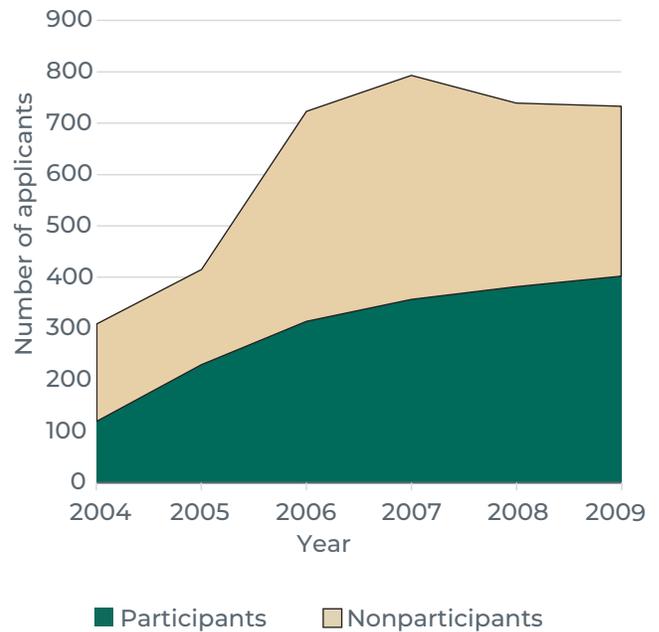
National Student Clearinghouse

- Provided student-level information on college enrollment and graduation

Michigan State Police

- Provided student-level criminal history records on arrests and convictions ▲
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Figure 1. Number of middle school applicants to Math Corps by year, 2004–2009



Source: Math Corps administrative data from Wayne State University.



Key findings

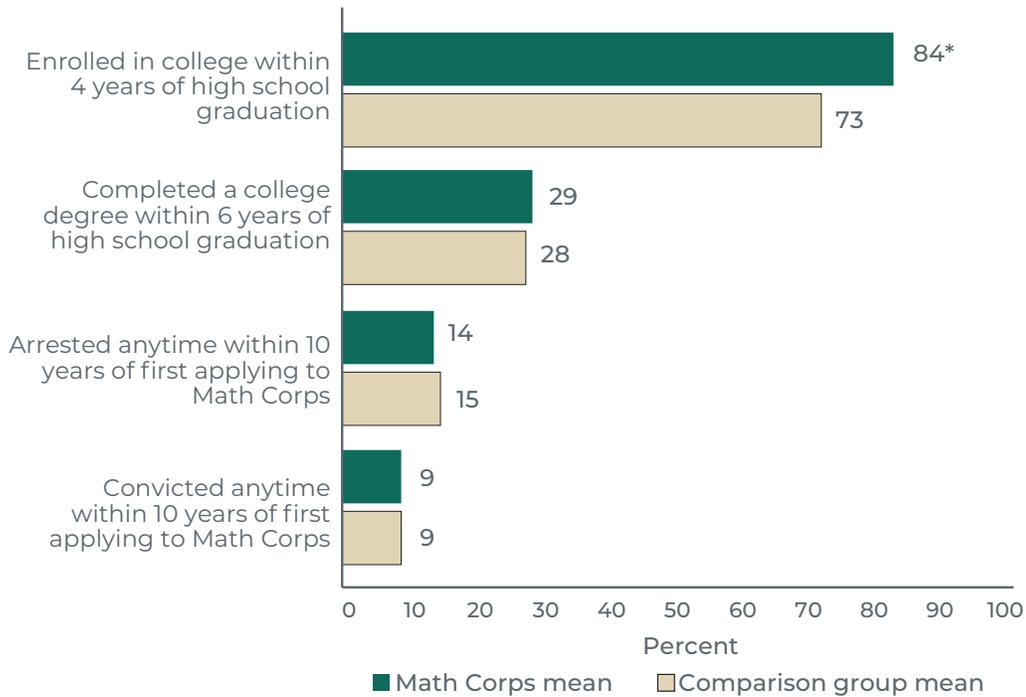
Math Corps students had much higher graduation rates than Detroit Public Schools. We did not measure high school graduation directly, but we did examine college enrollment (which indicates a student graduated or received a high school equivalent certificate). Eighty-four percent of Math Corps participants enrolled in college, suggesting at least that many students graduated from high school or received a high school equivalent certificate. This graduation rate far exceeded the approximately 60 percent average graduation rate within Detroit Public Schools during the same years (2004–2009).² Math Corp leaders estimate that during those years, approximately 95 percent of participants graduated from high school.

Math Corps had a large and statistically significant impact on college enrollment. Eighty-four percent of Math Corps students enrolled in college compared

with 73 percent of the comparison group, a difference of about 11 percentage points (Figure 2). The magnitude of this effect size is 0.26, which is considered large in education settings. Although the study did not find an overall impact on college graduation rates, the results from the student subgroups suggest that participating in Math Corps for multiple years may increase college graduation rates.

Few Math Corps participants had encounters with the criminal justice system. About 14 percent of participants were arrested within 10 years of participating in Math Corps, compared to 17 percent of people younger than 21 in U.S. cities or 23 percent of people younger than 26 who responded to a national survey.³ Although there were no significant impacts on criminal justice system outcomes, the results consistently suggest Math Corps participants may have fewer encounters with the criminal justice system than nonparticipants.

Figure 2. Math Corps impacts on student outcomes



Source: Math Corps administrative data from Wayne State University; National Student Clearinghouse data; Michigan State Police criminal justice records.

Note: This figure shows the percentage of Math Corps participants with each outcome (green bars) and the comparison group rate (tan bars), which is equal to the Math Corps rate minus the impact estimate. An asterisk (*) means the estimate is statistically significant at the 5 percent level after adjusting for multiple comparisons. The sample size is 1,207 (608 Math Corps and 599 matched comparison) for enrollment, arrest, and conviction outcomes and 1,059 (528 Math Corps and 531 matched comparison) for degree completion outcomes.

Conclusion

Math Corps seeks to improve the lives of the students it serves by giving them a safe and high-quality instructional environment that encourages students to attain a college education and avoid interaction with the criminal justice system. These are lofty goals, particularly for a program that serves middle school students.

Much of the research on programs that seek to increase college enrollment and completion, or decrease criminal justice system encounters, involves high school students. Among such high school programs, evidence on the impact on college outcomes and criminal justice system encounters is mixed. Thus, to find a middle school summer program leads to statistically significant and large impacts on college enrollment is impressive. Although our study found no statistically significant impact of Math Corps on criminal activity, we did find small differences that consistently showed Math Corps participants were involved in less criminal activity than applicants, on average. Research on educational program impacts on criminal activity is limited, so we consider the potential for a middle school summer camp to decrease criminal activity exciting.

Together, these results suggest that Math Corps is a promising program that may increase high school graduation, increases college enrollment, and may decrease encounters with the criminal justice system. In addition, the results from the student subgroups suggest that students who participated in Math Corps for multiple years had increased college graduation rates, so longer participation in the program may lead to even better outcomes for Math Corps participants.

Contact us.

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Endnotes

¹ Data for this study came from 4,647 Math Corps applications from WSU. The applications were submitted by 3,165 unique students (965 in the Math Corps group and 2,200 in the potential comparison group). Of these, 1,909 were middle school students who were first-time applicants or participants in Math Corps who were eligible for the study. Before matching, the 664 Math Corps students and 1,245 potential comparison students differed significantly on many baseline characteristics. After matching, we successfully created two groups that looked similar on their observable baseline characteristics. The differences between the groups were small and none was statistically significant.

² MI School Data. (n.d.). *College enrollment by high school snapshot*. <https://www.mischooldata.org/college-enrollment-by-hs/>

³ Smith, J. P. (2019). The long-term economic impact of criminalization in American childhoods. *Crime & Delinquency*, 65(3), 422–444; Uniform Crime Reporting. (2018). *Arrests by cities, persons under 15, 18, 21, and 25 years of age*. Federal Bureau of Investigation. <https://www.fbi.gov/services/cjis/ucr/>

