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# Mapping the Road to College: First-Generation Students' Math Track, Planning Strategies, and Context of Support

**By: Laura Horn and Anne-Marie Nuñez**

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College students whose parents have attained no more than a high school education are often referred to as "first-generation students." That is, they are the first generation in their immediate family to enroll in college. Increasing attention has been paid to this group of students as a means of increasing the diversity of college student populations. Because first-generation students cannot benefit from their parents' experiences in preparing for and applying to college, they may be at a distinct disadvantage in gaining access to postsecondary education. Thus, obtaining a better understanding of how to increase first-generation students' opportunities in preparing for college may help equalize their chances of benefiting from a college education.

This report compares the high school academic experiences of first-generation students with their peers from families where one or both parents either have some college education or are college graduates. Given the strong link between mathematics curricula and college enrollment (Riley 1997), the analysis of first-generation students' academic preparation focuses on mathematics coursetaking, beginning in the eighth grade. In addition, students' college planning activities and the extent to which parents and other key individuals are involved are examined.

The results of the study offer both negative and positive findings concerning the experiences of first-generation students. On the negative side, even after controlling for measures of academic achievement, family income, family structure (single vs. two parents), and other related characteristics, first-generation students were less likely than their peers to participate in academic programs leading to college enrollment. Consequently, they were much less likely to enroll in college within 2 years of graduating from high school. The disparity between first-generation students and their peers from families where at least one parent had attained a bachelor's degree was especially notable.

On the positive side, regardless of parents' educational attainment, students' achievement, and other related factors, students who completed mathematics programs beyond the level of algebra 2 substantially increased their chances of enrolling in a 4-year college. In addition, other factors, such as parents' participation in college preparation activities and students' receiving help from their high school in the application process, also increased students' chances of enrolling in college (at any level).

## First-Generation Students

Just over one-quarter (27 percent) of 1992 high school graduates were first-generation students (figure A). Half of the first-generation students were from low-income families, in contrast to less than one-third of the students whose parents had some postsecondary education and less than 1 in 10 students whose parents were college graduates.1 Compared to students whose parents had bachelor's degrees or higher, first-generation students were more likely to be Hispanic or black (non-Hispanic).

## Algebra in the Eighth Grade

Taking algebra in middle school is considered the "gateway" to completing advanced mathematics courses in high school (Oakes 1990). Yet just 14 percent of first-generation students took high school-level algebra in the eighth grade, compared with 34 percent of students whose parents were college graduates (figure B). Even among eighth-graders who were proficient at the highest mathematics level tested,2 a lower proportion of first-generation students (34 percent) than of students whose parents were college graduates (55 percent) took algebra in the eighth grade.

## High School Mathematics

At the high school level, first-generation students were far less likely to complete any advanced-level mathematics courses3 (figure C). Even among those who were proficient at the highest level tested in the eighth grade, 63 percent of first-generation students completed at least one advanced mathematics course in high school, compared with 83 percent of students whose parents were college graduates.

However, if students took algebra in the eighth grade, they were more likely to complete advanced-level mathematics courses in high school. This was true

regardless of parents' education and students' mathematics proficiency. For example, while nearly two-thirds (63 percent) of first-generation students who were proficient at the highest level of mathematics tested in the eighth grade had completed advanced high school mathematics courses, 83 percent who took algebra in the eighth grade had done so. Comparable percentages for students whose parents were college graduates were 83 and 95 percent, respectively. In other words, taking algebra in the eighth grade was associated with substantially higher rates of participation in advanced mathematics courses, even while controlling for mathematics proficiency and parents' education.

## College Enrollment

The rate at which students completed advanced-level high school mathematics courses had a direct bearing on whether or not they enrolled in a 4-year college within 2 years of graduating from high school. The relationship was especially evident for first-generation students: nearly two-thirds (64 percent) who completed any advanced courses enrolled, compared with about one-third (34 percent) who completed courses through algebra 2. Comparable percentages for students whose parents graduated from college were 85 and 63 percent, respectively.

Strong academic preparation, however, did not necessarily lead to college enrollment for all first-generation students. Two years after high school graduation, roughly one-quarter of first-generation students who were considered "highly qualified"4 for admission to a 4-year college had not enrolled at the 4-year level, and 13 percent had not enrolled in any postsecondary education. In contrast, just 1 percent of highly qualified students who had at least one parent with a bachelor's degree did not enroll in any postsecondary education. Thus, even for the most academically prepared students, first-generation students were less likely to enroll in postsecondary education. The remainder of the analysis examined factors that might help explain such discrepancies in enrollment outcomes.

## Who Encourages Students

The involvement of parents and other key individuals such as teachers, counselors, school principals, close relatives, and friends in students' curricular choices was explored as a factor that might help explain differences in curricular involvement and college enrollment patterns between first-generation and other students.

### In eighth grade

Differences in parent involvement were apparent beginning in the eighth grade. As the level of parents' education increased, so did the proportion of eighth-graders who reported that their parents encouraged them to take algebra in the eighth

grade. Just under one-third (31 percent) of first-generation students reported that their parents wanted them to take algebra, compared with 39 percent of those whose parents had some college and 53 percent of those whose parents were college graduates. Even when controlling for proficiency in mathematics, differences by parents' education levels prevailed.

On the other hand, whether or not eighth-graders reported being encouraged by teachers or school counselors to take algebra varied with their mathematics proficiency, not with their parents' education. For example, among first-generation students, 29 percent who performed below level 1 in mathematics proficiency5 reported being encouraged by a teacher or counselor to take algebra in the eighth grade, compared with 47 percent who were proficient at the highest level of mathematics tested. Comparable percentages for students whose parents were college graduates were 33 percent and 54 percent, respectively.

In planning for their high school curriculum, eighth-graders relied heavily on their mothers for guidance. Students were much more likely to report frequently discussing (i.e., three or more times) their future high school programs with their mothers than with their fathers (60 vs. 43 percent). However, while frequent discussions with mothers varied little with parents' education, discussions with fathers increased as parents' highest education rose. About 34 percent of first-generation students, 41 percent of students whose parents had some college, and 50 percent of students whose parents were college graduates reported having frequent discussions with their fathers about their high school programs.

Perhaps because they were more likely to come from single-parent homes, first-generation students reported frequently discussing their high school programs more often with their friends (49 percent) than with their fathers (34 percent). The same was not observed for students whose parents were college graduates; among these students, roughly half reported frequently discussing their high school programs with either their friends or fathers.

## In high school

Confirming the results found in the eighth grade, when 1992 high school graduates were asked in the 12th grade how they chose their high school programs, first-generation students were less likely than students whose parents were college graduates to report choosing their programs with their parents (34 vs. 48 percent). At the same time, first-generation students were no more likely to report choosing their high school programs with a teacher or counselor, or with friends.

## Planning for college

In understanding what is required for college admission and navigating the application process, first-generation students may receive little assistance from their parents, who have had no direct experience in the process. Consequently, it might be expected that first-generation students would rely more on teachers, counselors, and other "knowledgeable agents" for guidance in applying to college. Yet, with two exceptions—getting school assistance in applying for financial aid and obtaining counselors' assistance in choosing a 12th-grade mathematics class—there was little evidence that first-generation students received help from the school more often than did students whose parents were college graduates. Moreover, the two instances in which first-generation students were more likely to receive school help came very late in their high school programs.

## Conclusions

The findings from this analysis indicate that first-generation students consistently trailed their counterparts whose parents were college graduates—and, to some degree, those whose parents had some college but less than a bachelor's degree—in participating in curricular activities linked to college enrollment. This remained true when controlling for academic preparation and other family background characteristics. That is, even high-achieving first-generation students were less likely to take algebra in the eighth grade and less likely to complete advanced high school mathematics courses. Correspondingly, college-qualified first-generation students with academic credentials similar to those whose parents graduated from college enrolled in 4-year colleges and other types of postsecondary education at lower rates than their counterparts.

However, when controlling for mathematics proficiency and parents' education, first-generation students increased their likelihood of completing advanced high school mathematics courses by taking algebra in the eighth grade (figure B). Taking advanced mathematics courses in high school, in turn, more than doubled their chances of enrolling in a 4-year college.

The data also indicated that parent involvement was strongly associated with students' taking algebra in eighth grade, taking advanced-level mathematics courses in high school, and subsequent enrollment in postsecondary education. This remained true after controlling for parents' education, mathematics proficiency, and family background characteristics. Therefore, it is possible that providing first-generation students and their parents with more information about choosing courses to better prepare students for college might help these students better navigate the path to higher education.

## Footnotes

1 In this report "parents were college graduates" means that at least one parent had attained a bachelor's degree.

2Could perform simple problem solving requiring conceptual understanding or the development of a solution strategy.

3 Any course beyond algebra 2, such as precalculus, calculus, trigonometry, probability, statistics, or algebra 3.

4 They were in the top 10 percent of 1992 high school graduates who enrolled in 4-year colleges, according to a college qualification index based on five academic performance criteria (class rank, GPA, NELS 1992 test scores, ACT score, and SAT score), with some adjustments made depending on whether students took programs of rigorous academic coursework.

5 Could not perform simple mathematical operations on whole numbers.

References

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Data source: The NCES National Education Longitudinal Study of 1988 Eighth-Graders (NELS:1988/1994).

For technical information, see the complete report:

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Author affiliations: L. Horn and A. Nuñez, MPR Associates, Inc.

For questions about content, contact Aurora D'Amico (aurora.d'amico@ed.gov).

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back to top

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