



Demographic Factors Impacting College Admission, STEM Major Entry, and Graduation

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What We Studied

The demand for graduates with Science Technology Engineering and Mathematics (STEM) degrees continues to rapidly increase.¹ By 2018, the majority of positions that require a minimum of a bachelor degree will necessitate considerable mathematics and/or science training.² In order for students to access, persist, and complete STEM majors, they must have a sufficient academic background to meet the demands of college STEM courses. The National Mathematics Advisory Panel recommends that students complete an authentic algebra course by grade 8 and have an understanding of Algebra II concepts by high school graduation.³

This investigation explored characteristics (e.g. grade Algebra 1 completed, gender, ethnicity, disability status, socio-economic status, district locality) that influence the likelihood of Texas students succeeding in advanced coursework in high school, gaining admission to college, and earning STEM degrees. Study findings suggest that several demographic factors influence the likelihood that students obtain admission to Texas public universities and complete STEM degrees.

Texas is committed to improving college readiness and completion.⁴ However, there is a rich body of research suggesting that demographic barriers may prevent access, persistence, and completion of college, especially for students of color, students with disabilities, and students from low socio-economic backgrounds.⁵ This project aimed to develop an understanding of student and school characteristics (i.e., grade Algebra 1 completed, gender, ethnicity, disability status, socio-economic status, rural, suburban, urban school location) that influence the likelihood that Texas students succeed in advanced coursework in high school, enter college, and obtain STEM degrees. If predictors of success in STEM fields are identified, policies can be adjusted to address the needs of Texas students.

How We Analyzed the Data

Logistic regression analyses were completed using available datasets from the Texas Education Agency and The Higher Education Coordinating Board that included demographic, course completion, and test scores for students attending Texas public and charter schools between 2002 and 2016.

¹ National Science Foundation. (2010). Science and engineering indicators 2010. Arlington, VA: Author.

² Lacey, T. A., & Wright, B. (2009). Occupational employment projections to 2018. Monthly Labor Review, 132(11), 82-123.

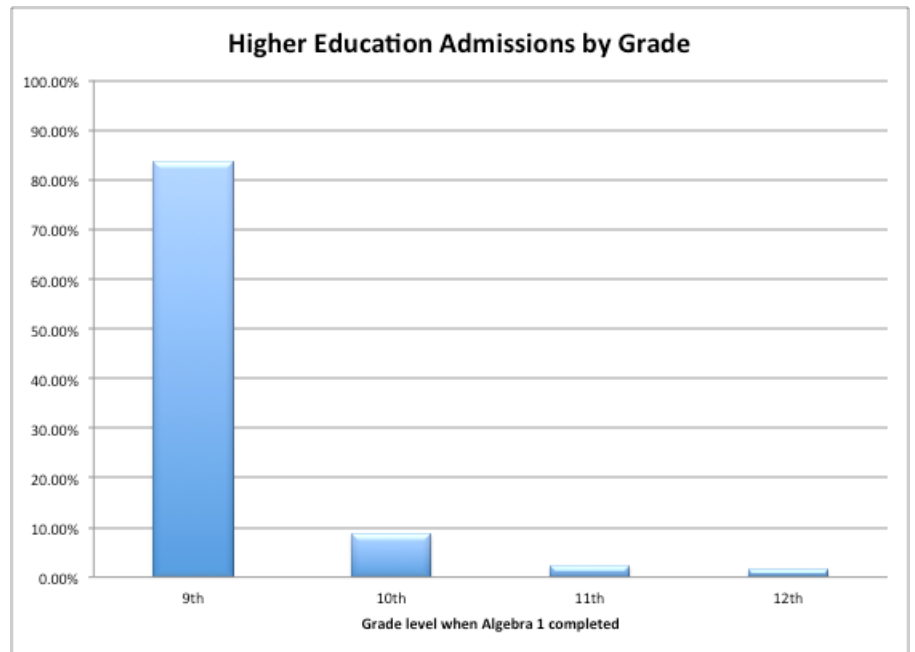
³ National Mathematics Advisory Panel. (2008). Foundations for Success: The Final Report of the National Mathematics Advisory Panel, U.S. Department of Education: Washington, DC.

⁴ Texas Education Agency. (2014). House Bill 5: Foundation High School Program. Austin, TX: Author. Retrieved from http://tea.texas.gov/Curriculum_and_Instructional_Programs/Graduation_Information/House_Bil_1_5_Foundation_High_School_Program/

⁵ Organization for the Economic Cooperation and Development. (2014). Program for International Student Assessment 2012 Results: What Students Know and Can Do- Student Performance in Mathematics, Reading, and Science. Retrieved from: <http://www.oecd.org/pisa/keyfindings/pisa-2012-results-volume-i.htm>

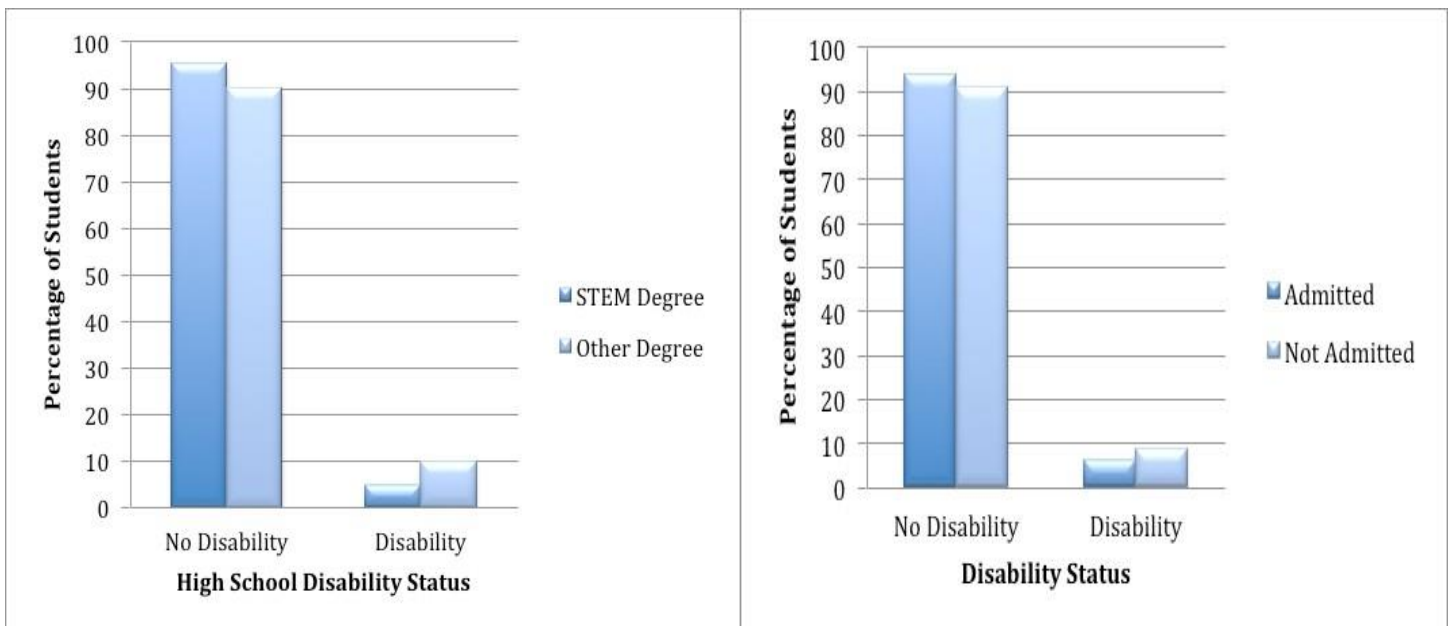
What We Discovered

Findings suggest the earlier students completed Algebra I, the more likely they were admitted to [X2 (4) = 279.4, $p < .0001$], and graduate from [X2 (4) = 23.3, $p < .0001$], a Texas institution of higher education with a degree in a STEM field. Students who completed algebra 1 in the 9th grade were 5.3 ($z = 40.7$, $p < .0001$) times more likely to be admitted to a Texas college or university than those who completed algebra 1 in the 10th grade, 21 ($z = 52.5$, $p < .0001$) times more likely to be admitted to a Texas college or university than those who completed algebra 1 in the 11th grade, and 32.5 ($z = 51.3$, $p < .0001$) times more likely to be admitted to a Texas college or university than those who completed algebra 1 in the 12th grade.



Disability status and school locality (rural, suburban, urban) were also significant factors that attributed to the likelihood that students were admitted to Texas colleges and universities.

Students with disabilities were less likely to be admitted to Texas public universities than peers without disabilities [X2 (1) = 454.8, $p < .0001$]. Students without a documented disability in high school were 66% more likely to be admitted to a college or university in the state of Texas than peers with disabilities. In other words, for every one student with a documented disability admitted to a college or university in the state of Texas approximately 1.6 students without a documented disability were admitted. Analyses by disability category (e.g. specific learning disability, Autism, emotional or behavioral disorder), were unable to be completed as few students with documented disabilities gained admission to Texas institutions of higher education.



Students with disabilities who were admitted to college were less likely to complete STEM majors than peers $X^2(1) = 20.9, p < .0001$. Students without a documented disability in high school were 60% more likely to graduate with a STEM degree than peers with disabilities. In other words, for every one student with a documented disability who graduated with a STEM degree in the state of Texas approximately 1.6 students without a documented disability graduated with a STEM degree.

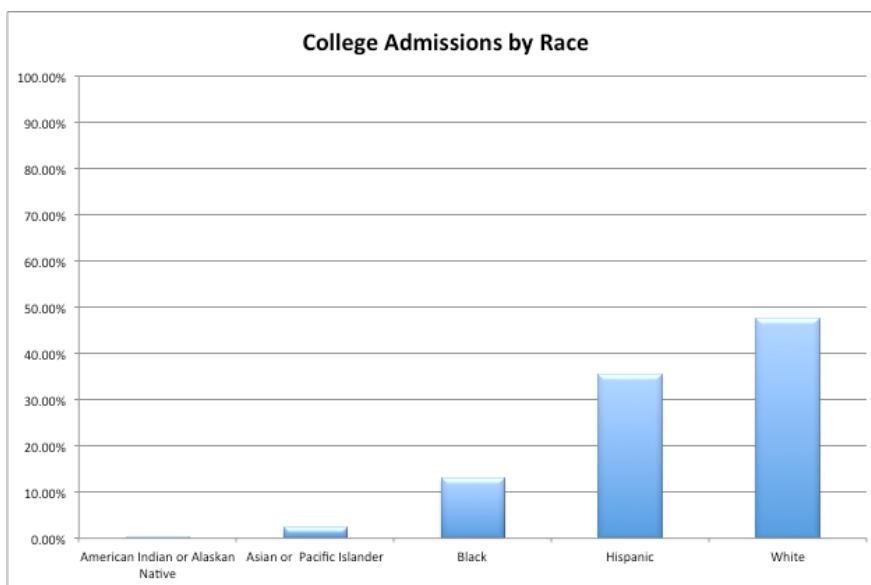
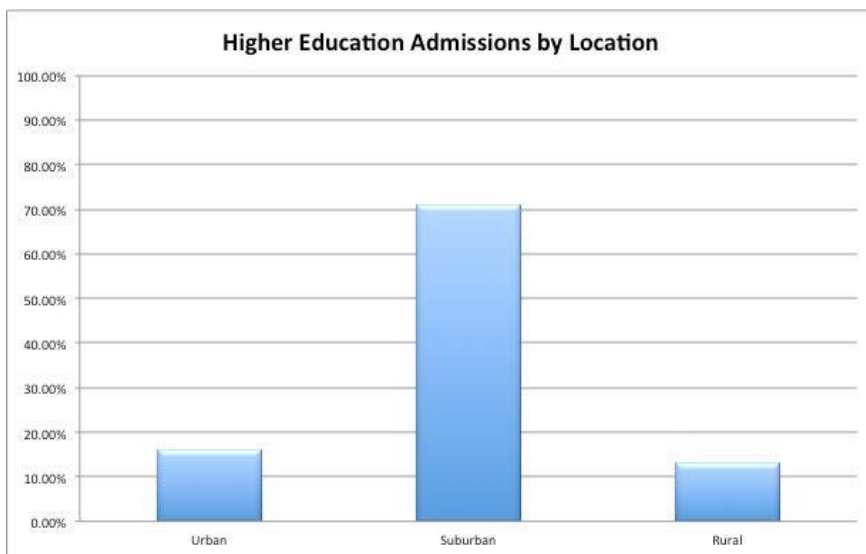
The locality (urban, suburban, or rural) was also a significant factor in the likelihood that students were admitted to Texas colleges and universities [$X^2(2) = 683.9, p < .0001$]. Students from suburban areas were 12.65 ($z = 98.1, p < .0001$) times more likely to be admitted to Texas institutions of higher education than students from urban areas and 16.3 ($z = 102, p < .0001$) times more likely to be admitted to Texas institutions of higher education than students from rural areas.

Students of color were less likely to gain admission to college than Caucasian peers. Of high school students accepted to Texas colleges and university from 2002 to 2016 just over 47% of those students were Caucasian and just fewer than 13% were African American.

Students who receive free or reduced lunch were less likely to gain admission to college than students that do not receive free or reduced lunch. Of high school students accepted to Texas colleges and university

from 2002 to 2016 just under 60% of those students did not receive free or reduced lunch compared to 41% who did.

Study results generally aligned with findings from previous investigations that suggest STEM success is directly affected by 12th grade math achievement.⁶ Results of the Program for International Assessment (PISA) test, an international measure of mathematics problem solving skills, indicated that US students at the most economically advantaged schools performed at or above world-class standards; however, students from minority backgrounds and students living in poverty did not. Findings from our study indicate that the majority of Texas students do not complete algebra by 8th grade and students of color, students with disabilities, students who attend urban schools, and student who receive free or reduced lunch are less likely to be admitted to public institutions of higher education, pursue STEM majors, and earn college degrees. The number of students who completed algebra prior to 8th grade in Texas was not sufficient to report analyses.

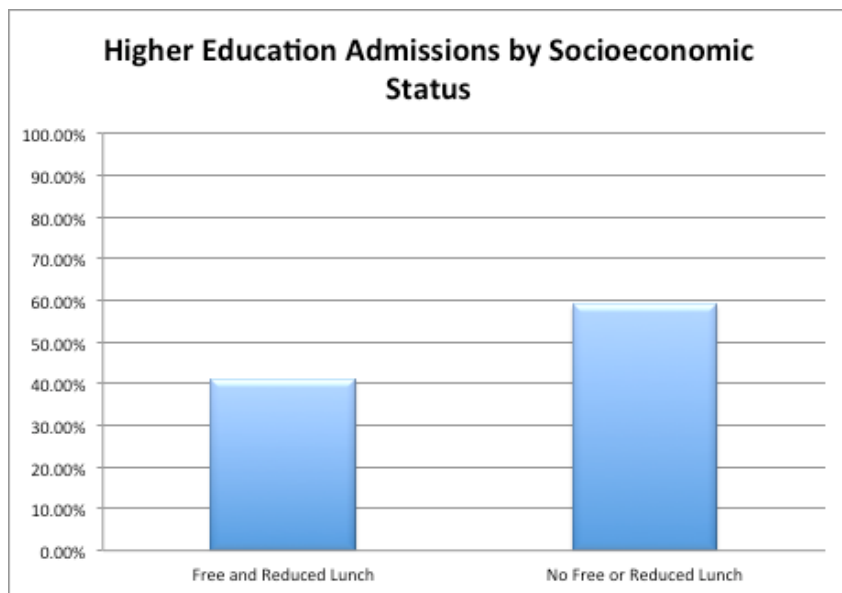


⁶ See Wang, X. (2013). Why students choose STEM majors motivation, high school learning, and postsecondary context of support. American Educational Research Journal, 50, 1081-1121. doi: 10.3102/0002831213488622, Organization for the Economic Cooperation and Development. (2014). Program for International Student Assessment 2012 Results: What Students Know and Can Do- Student Performance in Mathematics, Reading, and Science. Retrieved from: <http://www.oecd.org/pisa/keyfindings/pisa-2012-results-volume-i.htm>

Policy Recommendations

The Texas legislature has responded to the need for students to be college ready through House Bills (HB) 5 and 18. HB 5 focuses on school curriculum, assessment, accountability, and higher education. With respect to course offerings, HB 5 replaced high school degree options with the Foundation High School Program that requires that all students entering ninth grade choose an endorsement area. One of the options is a STEM endorsement. HB18 provides schools with resources to support student college and career readiness. To maximize implementation success, the following empirically supported recommendations may be beneficial:

- Provide training for stakeholders (parents, community members, students, teachers, administrators) on the importance early algebra course completion
- Fund initiatives that support early access and completion of an authentic algebra course by 8th grade
- Develop resources, materials, and professional development that promote culturally responsive teaching practices and teacher access to evidence-based instructional practices for students with identified risk factors
- Provide resources to support under-represented groups in accessing, gaining admission to, and pursuing STEM majors at Texas institutions of higher education



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