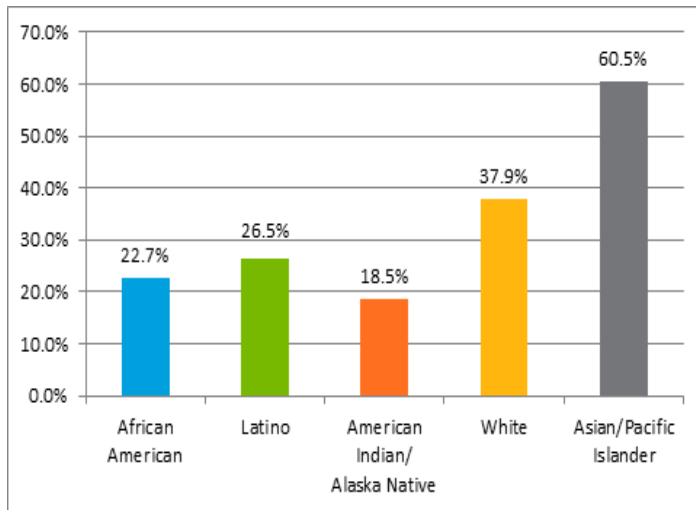


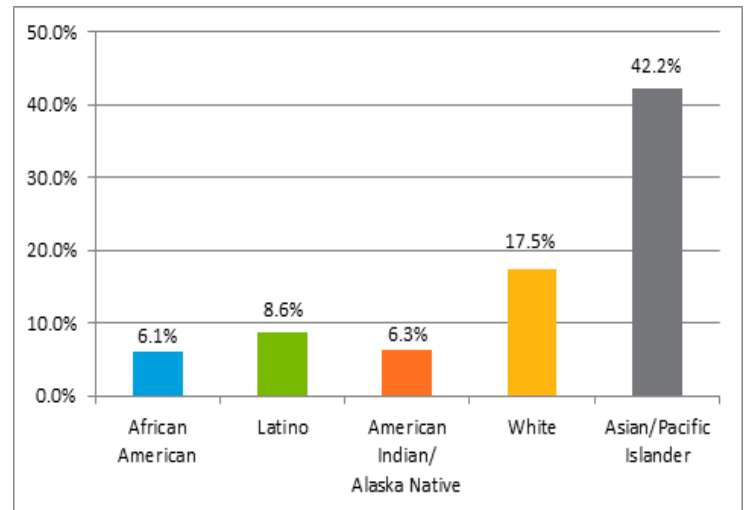
## Pre-College Challenges for URMs in Engineering

The relatively low representation of underrepresented minorities (URMs) in the science, technology, engineering, and mathematics (STEM) fields can be traced to elementary and secondary school preparation. URMs are falling behind their peers at an early age and this gap is compounded over time. By the time they reach high school, URM students are not prepared to take the challenging courses that colleges look for in prospective engineering students. Figures 1, 2, and 3 detail the percentage of public and private high school graduates who took Analysis/Pre-Calculus, Calculus, and AP Calculus while attending high school. URMs lag far behind their Asian, Pacific Islander, and White peers in all of these subjects.

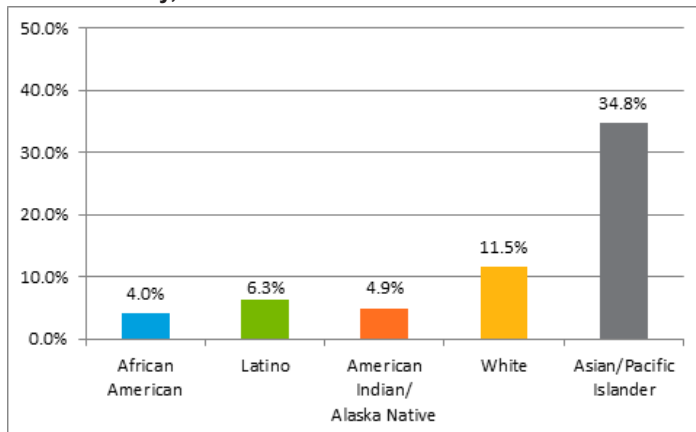
**Figure 1: Percentage of Public and Private High School Graduates taking Analysis/Pre-Calculus Courses in High School by Race/Ethnicity, 2009<sup>1</sup>**



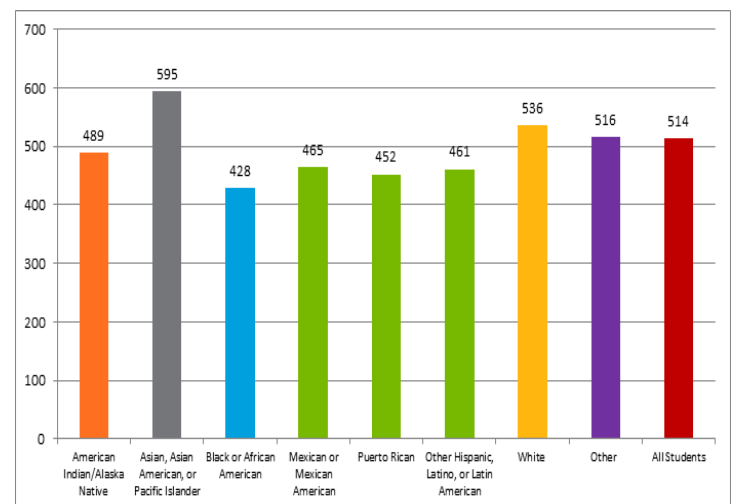
**Figure 2: Percentage of Public and Private High School Graduates taking Calculus Courses in High School by Race/Ethnicity, 2009<sup>1</sup>**



**Figure 3: Percentage of Public and Private High School Graduates taking AP Calculus Courses in High School by Race/Ethnicity, 2009<sup>1</sup>**

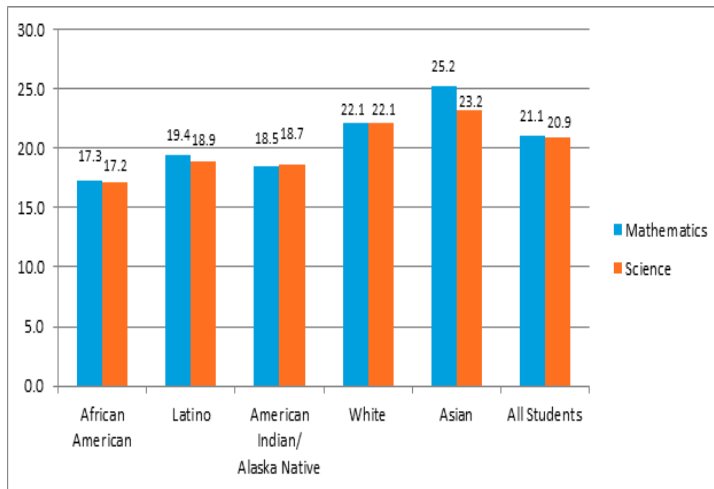


**Figure 4: Mean SAT Math Score, by Ethnicity<sup>2</sup>**

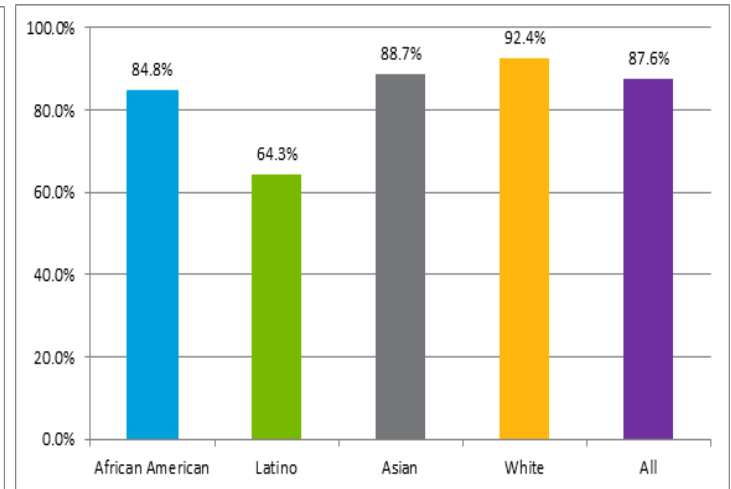


URMs are struggling to earn competitive scores on standardized tests as a result of this lack of preparation. Figure 4 details the mean SAT mathematics scores in 2012 by ethnicity. While the average score among all test-takers was 514, each URM group fell well below this mark, with African Americans earning the lowest average scores. A similar pattern is seen on the science and math ACT Scores (Figure 5).

**Figure 5: Mean ACT Scores in STEM Subjects, 2012<sup>3</sup>**



**Figure 6: Percentage of Persons Age 25 and Over with High School Completion or Higher, 2011<sup>1</sup>**



The lack of preparation of URM in the core STEM subjects, along with a host of other contextual and academic barriers, contributes toward the consistently lower high school completion rates seen among these groups. Latinos and African Americans have the lowest percentage of persons age 25 and older who have completed high school, as seen in Figure 6.

A multilayered intervention strategy is needed to close the achievement gap and open up the STEM pathway for URM. Through our Pre-Engineering strategy, the National Action Council for Minorities in Engineering, Inc. (NACME) provides resources to middle and high school students, as well as educators. As founding partners, NACME, Project Lead the Way (PLTW), and the National Academy Foundation (NAF) launched the Academies of Engineering (AOEs), a network of career-themed academies. Through open enrollment, the high schools provide students with a strong science and math education to assure college readiness for engineering study. Scholarships are awarded to AOE high school graduating seniors, engineering awareness materials are distributed to middle and high schools, and NACME’s corporate and university partners participate on AOE advisory boards.

## POLICY CONSIDERATIONS

The achievement gap between URM and their peers in the STEM subjects is substantial. To improve STEM achievement for all students, early intervention programs that are designed to increase student engagement in STEM and have earned positive evaluation results need to be replicated. Research has shown that there are several techniques that can be implemented to improve classroom-based STEM instruction, including utilizing learner-focused pedagogy, inquiry-based methods, and project-based curricula. Extracurricular activities, such as science clubs and science fairs, and out-of-school time instruction, including after-school programs, can also help to increase student engagement through informal, project-based learning. Finally, the importance of mentorship and exposure, particularly for URM, cannot be overstated, and can be particularly important for students in the early stages of their academic careers.

This brief was written by Christopher Smith, Director of Research and Program Evaluation at NACME, Inc. For more data on URM in engineering, visit [nacme.org/research-publications](http://nacme.org/research-publications).

## ENDNOTES

<sup>1</sup> National Center for Education Statistics, 2012. *Digest of Education Statistics, 2011*.

<sup>2</sup> College Board, (2012). 2012 College-Bound Seniors: Total Group Profile Report. New York, NY: The College Board.

<sup>3</sup> ACT Profile Report, National (Graduating Class 2012). Accessed online at [www.act.org](http://www.act.org).