Dear Colleague,

In 2008, NACME released the widely cited 2008 NACME Data Book. That document contained the most up-to-date information available on the state of underrepresented minority group [African American, American Indian, and Latino] participation in engineering education and the engineering workplace. Today we are pleased to release the 2011 NACME Data Book.

Throughout its nearly four decades of operation, NACME has been committed to fostering research-based changes in policies and practices to raise awareness and promote discussion on the critical national imperative to increase diversity with equity in engineering education and careers. Data is the coin of the realm in energizing this discussion. We are proud that our data and analysis have been cited by colleagues in K-12 education, higher education, government, and business, and have appeared in prestigious academic journals, books, technical reports and websites.

In order to make this data more directly accessible and, therefore, useful to researchers, policy makers, and others, we have created a new format for the 2011 NACME Data Book. The document you are holding in your hands consists of an overview section and a CD containing five data decks complete with PowerPoint slides. This more flexible format will permit users to customize the data for their own presentations and reports.

Please let me thank you for your active engagement in the effort to ensure “an engineering workforce that looks like America.” We urge you to use the data in the 2011 NACME Data Book to make the case that the solution to America’s competitiveness problem is to activate the hidden workforce of young men and women who have traditionally been underrepresented in STEM careers—African Americans, American Indians, and Latinos. Diversity drives innovation and its absence imperils our designs, our products, and, most of all, our creativity—all components of competitiveness. This is the dilemma facing our nation today, and unless we address it systematically—and soon—we will be unable to retain our leadership position in scientific and technological innovation and our competitive edge in the global marketplace of ideas.

Cordially,

Dr. Irving Pressley McPhail, EdD
Executive Vice President and Chief Executive Officer
NACME, Inc.

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In 2008, the National Action Council for Minorities in Engineering, Inc. (NACME) released a report titled *The “New” American Dilemma: A Data-Based Look at Diversity*. The term “American dilemma” was originally coined by Gunnar Myrdal, a Swedish social scientist whose two-volume work by that title had been commissioned by the Carnegie Corporation during the Second World War, with results published near the close of the war in 1944. While the United States had no shortage of social scientists with the requisite skills to complete this study, racism was so deeply embedded into U.S. society, that a foreign analyst, as an outsider, was tapped to study the status of race relations in the United States.

The dilemma: despite a strong ethos of equality, African Americans were subjected to searing inequality. On any measure of life chances, including health care, schools, jobs, housing, social facilities, etc., the 10 percent of Americans of African descent were far worse off than their Non-Latino White compatriots. Myrdal’s work highlighted the gap between the rhetoric of equality on the one hand and the reality of inequality on the other.

Since the 1940’s there have been sweeping changes in the legal structures associated with the segregated society Myrdal studied. Despite the Civil and Women’s Rights movements success in dismantling of the legal basis for discrimination, the dilemma persists, but has taken on new dimensions. The Latino population is the fastest-growing segment of the total U.S. population, yet wide educational gaps between Latinos and other race/ethnic categories have been persistent. At the same time, the race to innovate has become a global engineering imperative, suggesting an urgent need to develop new ways of preparing students for engineering study.

Just as the dilemma described by Myrdal in the 1950 was a pressing social problem, the dilemma of increasing underrepresented minority participation in engineering, has moved to the fore. Solving this dilemma is a matter of increasing national significance as we have become more diverse in a flatter world. At stake: what kind of country do we wish to live in? Do we wish to live in one in which all have access to good schools, jobs, health care and a high-quality of life? Or will there be some people who continue to be left behind? Engineering provides its practitioners with a relatively prosperous level of resources for their families and avenues of upward mobility within work settings. More CEOs have engineering degrees than any other major. The research literature makes it clear that diversity can be a key strength of the United States, but our rich cultural tapestry has yet to be fully utilized in engineering.

Engineers are the visionaries of the future. They take ideas and transform them into the tools we all use to make our lives easier and accomplish our goals. A diverse engineering workforce is critical to maintaining our innovative edge in an increasingly competitive global economy. The U.S. engineering workforce is at a critical moment: the talent pool of young people from which new workers are recruited has changed dramatically to include increasing numbers of Latinos, yet the young people of Latino backgrounds are not pursuing engineering at a pace that can maintain America's competitive edge. This is the ‘new’ American dilemma.

The U.S. Population is Becoming More Diverse

NACME’s vision is an engineering workforce that looks like America. Figure 1 shows the U.S. population by race and ethnicity in 2010 and then projected to 2050 based on immigration, birth and death rates. African Americans account for 12 percent of the U.S. population and will remain at that proportion through 2050. Likewise, members of the various indigenous groups in the United States—American Indians, Alaska Natives, Native Hawaiians and Pacific Islanders—will remain at just 1 percent of the U.S. population over the next 40 years. Latinos now account for 16 percent of the U.S. population but will grow to represent nearly one-in-three Americans by mid-century while the Asian American population will also grow to represent 8 percent of the U.S. population. In total, members of the three underrepresented minority categories (African Americans, Latinos, and American Indians) constitute 29 percent of the U.S. population now and will account for 43 percent by 2050.

The future of STEM (science, technology, engineering and mathematics), especially engineering depends on our nation's ability to engage diverse populations at all stages of the STEM pipeline.

> Between 2010 and 2050, the relative percentage of the U.S. population that is Non-Latino White and is expected to decline from 65 percent in 2010 to 46 percent in 2050. By then, Latinos will account for 30 percent of the U.S. population and Asians for 8 percent

> Already, 43 percent of school-aged children (aged 5-17) are African American, Latino, American Indian or Asian/Pacific Islander Americans

> Underrepresented minorities (URMs) account for 34 percent of the 18-24 U.S. population

> Forty percent of 18-24 year olds are from ethnic minority groups; 34 percent are URMs (Figure 2)

Figure 2 underscores the significance of the changing U.S. demography. In 1980 three-fourths of school-aged children were non-Latino white. Now children from these backgrounds account for just 56 percent of 5-17 year olds. Although not shown in this chart, Non-Latino White children account for only 51 percent of those under five, indicating the continued trend towards a more diverse U.S. population. Among college-aged youth, 34 percent are from URM groups.

The data in Figure 3 show that, indeed, we are far from having an engineering workforce that looks like America. While women represent 47 percent of the U.S. labor force and an even greater share of those in professional and related jobs—the larger category into which engineering fits—they account for just 13 percent of those in four types of engineering occupations: engineering technicians, sales engineers, engineers and engineering managers.

The Pipeline to Engineering is Far from Full

When we consider the process by which young people move from school to be viable participants in the labor force, the pipeline metaphor has yielded to a new one: pathways. The pipeline as a conceptual model, assumes that there is one way to move from school into engineering. Now, however, it is clear that young people travel multiple pathways from educational institutions into the economy. Thinking in terms of multiple pathways means that we look for the various ways that individuals might obtain the skills and training necessary to join the engineering workforce rather than using a cookie-cutter, one-size-fits-all approach.

The term “Latinos” is used to refer to all persons of Hispanic descent regardless of racial background, consistent with reporting in most U.S. government documents. The term “Non-Latino White” refers to individuals who are not of Hispanic origin and indicated their race as “White.” In the 2010 Census, 53 percent of Latinos indicated their race as “White,” 37 percent as “Other,” 6 percent reported two or more races, 2.5 percent indicated “Black, African American,” 0.5 percent as Asian, Native Hawaiian or Pacific Islander, and the remaining 1.4 percent as American Indian or Alaska Native. Finally, “foreign” is used to refer to temporary residents.
## The pathway from K-12 to engineering is fragmented, especially for URM

> Twenty percent of Latinos (males) and 14 percent of Latinas drop out of high school (Figure 4)
> Fewer than 8 percent of Latino, African American, and American Indian high school seniors take calculus versus 15 percent of Non-Latino Whites and 30 percent of Asian American seniors
> The sex gap in high school preparation in advanced science and mathematics has disappeared: high school senior females and males are equally likely to take calculus, analysis/pre-calculus, chemistry, and physics
> Underrepresented minority youth are less likely than Non-Latino White and Asian students to complete a “rigorous” high school curriculum

This is especially the case when we look at the extent to which young people are prepared in high school to enter and be successful in engineering school. As shown in Figure 4, there is good news and bad news. On the one hand, high school non-completion rates have declined for all U.S. racial/ethnic categories. More and more young people are not completing high school than in previous generations.

### Rigorous Curriculum:
- 4 Years English
- 3 years social studies
- 4 years mathematics including pre-calculus or higher
- 3 years of science including biology

On the other hand, Latinos, the fastest-growing category in the United States, have a persistently high drop-out rate. About one-in-five Latino males leaves high school before completing a diploma.

Likewise, there is good news and bad news in terms of high school preparation for engineering. The good news: students are taking more classes and the gap between girls and boys has disappeared. The bad news: members of our nation’s three underrepresented minority categories, African Americans, American Indians, and Latinos, are far less likely to take key mathematics and science classes than are Asian American or Non-Latino White youth.

A rigorous curriculum (see Figure 5) provides an important foundation for success in college. Females and males are somewhat comparable in the likelihood of taking this curriculum: in 2009, 14 percent of female high school graduates had taken this set of classes compared to 12 percent of males. Larger gaps are seen, however, across race/ethnic categories in Figure 5. Nearly 30 percent of Asian/Pacific Islander Americans had taken a rigorous high school curriculum in 2009, about twice as many as in 1990. And while there has been an increase in the rates at which members of other ethnic categories have taken a rigorous curriculum since 1990, African Americans (at 6 percent) and Latinos (at 8 percent) continue to lag far behind Non-Latino Whites (at 14 percent) and Asian/Pacific Islander Americans (at 29 percent).
DECK 3

Enrollment Rates Are Increasing

More and more young people are seeing the merit to attending college. Twenty years ago, the pipeline into engineering went directly from high school into a four-year engineering school. Students who went to a two-year college were not seen as viable candidates for engineering school. Unfortunately, old stereotypes die hard and many engineering schools have yet to fully tap the potential pool of community college transfer students.

- Enrollment rates have increased for all groups over the past 30 years
- Community college enrollment has increased and has become a significant starting point for many students’ postsecondary education
- Retention to graduation in engineering continues to be low with important variations across racial/ethnic categories.

The college enrollment rate for women surpassed that of men in the late 1980s and has remained a few percentage points higher. In 2009, the most recent year for which there are data, 74 percent of women who completed high school enrolled in college versus just 66 percent of comparable men.

Over the past 30 years, too, there has been an increase in URM enrollment rates but Latinos continue to lag far behind the other major race/ethnic categories in college enrollment. Indeed, this gap is actually wider now than it was in the 1970s! In 1972, the first year for which these data are available, just about half of 16-24 year-old Non-Latino Whites who completed high school enrolled in college compared to 45 percent of high-school educated African Americans and Latinos. In 2009, while 71 percent of Non-Latino White high school graduates enrolled in college and 70 percent of African Americans, just 59 percent of Latino youth enrolled, representing a 12 percentage point gap, more than twice the gap for 1972.

There are substantial differences, as shown in Figure 6, in the locations of enrollment. More than half of Latinos now enrolled in college are in two-year institutions. The reasons for Latinos’ preference for two-year institutions have been well documented by organizations like ¡Excelencia in Education!: (1) a strong preference to avoid excessive debt; (2) preferences to have young adults close to home; (3) families’ knowledge of postsecondary educational institutions and the differences between two-year and four-year colleges.

Figure 7 shows the educational fates of students in 2009 who were initially in college in 2003-04 and were in computer science, engineering and engineering technology majors (combined). It was necessary to combine these three fields, all of which are important to NACME’s partners, because the Beginning Postsecondary Students’ Longitudinal Survey is a sample survey, which means that as one “cuts” the data into smaller pieces, reliability is lost and, indeed, the PowerStats program is incapable of producing estimates for such small samples. The retention rates shown in the figure represent six-year graduation rates for this cohort of students. Fewer than one-in-three African American students were retained to a bachelor’s degree within six years of starting their degree programs. At the other end of the spectrum, Asian American
students were more than twice as likely (73 percent) to complete a bachelor's degree in computer science, engineering or engineering technology within six years of starting college.

As shown in the previous section, these results are not surprising when one considers the large variations in high school preparation of students. Asian American students were more likely than those in the other three race/ethnic categories to have completed a "rigorous" high school curriculum (see Figure 5), which included at least pre-calculus among four years of mathematics and biology, chemistry and physics. In 2005 and again in 2009, only 6 percent of African American and 8 percent of Latino high school graduates had completed this rigorous curriculum.

DECK 4
Engineering schools are not tapping the diverse talent U.S. pool

Our nation’s engineering schools are not producing enough engineers according to many analysts and, even if there were sufficient numbers of new engineers, the lack of diversity among the U.S. engineering workforce poses a significant threat to our nation’s ability to maintain an innovative edge in an increasingly competitive world. The evidence on the positive impacts of diversity on the corporate bottom line have been well documented.

The representation of women and underrepresented minorities among engineering bachelor’s degree recipients has not improved since 2000 (Figure 8)

> URM's earned just 13 percent of all engineering bachelor's degrees in 2009
> Women earned just 18 percent of engineering bachelor's degrees in 2009

Most engineering doctoral degrees, the pool from which new faculty members is drawn, are awarded to non-U.S. citizens. URM students in engineering lack role models, as do women (Figure 9)

> There were 7,915 doctoral degrees awarded in engineering in 2009, of which 57 percent were awarded to temporary residents
> Eleven percent of engineering doctoral degrees were awarded to U.S. women
> URMs earned just 4 percent of the nation’s doctoral degrees in engineering in 2009 representing a total of 311 potential new faculty members for the more than 300 colleges of engineering in the United States

DECK 5
U.S. Engineering is Robust Even in Difficult Times, Yet Does Not “Look Like America”

Despite recent economic downturn, U.S. demand for engineers remains robust: the Bureau of Labor Statistics projects a need for 178,300 more engineers in the next decade with the fastest growth in biomedical, civil, environmental, industrial, and petroleum engineering. Only chemical engineering, which traditionally attracts a high proportion of women, is projected to decline. Further, new engineering bachelor’s degree graduates continue to earn very high starting salaries and the engineering unemployment rate of 6.9 percent is lower than that for all workers (9.3 percent).

Prior to the Second World War, there were many U.S. engineers who earned their credentials via work experience. Since that time, though, the bachelor’s degree has become the entry-level credential: this sets engineering apart from many other professional fields and the sciences for which a post-bachelor's degree credential is typically necessary.
Eighty percent of engineers hold a bachelor’s degree or higher and nearly 40 percent of engineering managers hold master’s degrees. Engineering technicians are not as highly educated: only 20 percent held a bachelor’s degree or higher, although more than half held an associate’s degree or had attended some college.

As indicated in the previous section, minorities and women are scarce amongst engineering doctorate degree awardees, which is the customary pool for new faculty openings. Figure 10 shows that while women’s and Asian-Americans’ representation among tenured and tenure-track engineering faculty has inched upwards since 2001, the nearly flat trajectories associated with Latinos’ and African Americans’ representation on engineering faculties suggests that minority engineering students will continue to lack professors that “look like” them for many years to come.

Figure 11 shows engineers’ median salaries. According to the National Association of Colleges and Employers (NACE) Winter Report (2011), engineering graduates’ starting salaries averaged $59,435 with only those of computer science majors higher at $61,783. The average bachelor’s degree recipient, according to NACE, was offered a salary of $50,034, with comparatively low salaries for those in the liberal arts ($35,633 on average). These salaries are associated with offers made by recruiters to new college graduates, so they are likely to represent only part of the labor market for engineers. While this information is useful, the data shown in Figure 11 are from a more generalizable sources: people who were working as engineers.

Figure 11 shows that young engineers aged 25-34 do continue to reap substantial economic rewards. Importantly, two other findings are shown: (1) salaries of men and women do not differ substantially within each of the racial/ethnic categories and (2) salaries of African American and Latino engineers are on par with those of Non-Latino White engineers. Asian American engineers’ salaries are higher, on average, than those of other engineers, which may be due to specific industry or geographic factors. For example, the U.S. Asian population is concentrated in large urban areas and the West Coast, where salaries are often higher than in other areas of the country.

**Conclusion**

The U.S. population is changing while the world of technological innovation is moving at an ever-faster pace with more competition than ever before. Engineers continue to be important contributors to U.S. corporate innovation: students who are able to complete engineering degrees reap some of the highest salaries earned by those with just a bachelor’s degree.

But the U.S. engineering workforce does not yet look like America: African Americans, American Indians and Latinos are underrepresented in the field and the pipeline for them is far from “full” or tapped. As shown in the data on preparation for engineering, we have far to go to ensure that members of these groups have access to high-quality mathematics and science preparation prior to college. This would enable those who are recruited to the field to have a higher likelihood of success in engineering school. The low rates of retention in engineering schools, particularly of African Americans suggest a pressing need for our nation’s engineering schools to seek strategies to enable a smoother transition to college for our young people.
The stakes are high for U.S. engineering. Latinos will represent 30 percent of the U.S. population by 2050, yet are not currently being drawn to engineering at a rate that would ensure the continued vitality of the field. Members of this group continue to have persistently high rates of high school non-completion, lack access to high-quality mathematics and science preparation in high school, and are more likely to initiate their college careers at a community college. These are factors that pose special challenges for their recruitment and retention in engineering.

References/Sources


By popular demand, we at NACME have decided to include some of the statistics on the NACME Scholars.

In 2010, NACME Partner Universities graduated 33 percent of underrepresented minority (URM) students earning bachelor's degrees in engineering through its public-private partnerships. Below are the breakdowns for the NACME Scholars by discipline, gender and ethnicity.

**NACME Scholars by Ethnicity**
2010-2011 NACME Scholars by Ethnicity

- Latino: 53%
- African American: 41%
- American Indian: 4%
- Other: 2%

**NACME Scholars by Gender**
2010-2011 NACME Scholars by Gender

- Male: 67%
- Female: 33%

**NACME Scholars by Academic Discipline**
2010-2011 NACME Scholars by Academic Discipline

- Mechanical Engineering: 23%
- Other Engineering: 17%
- Electrical Engineering: 16%
- Civil/Environmental Engineering: 14%
- Chemical Engineering: 10%
- Computer Engineering: 7%
- Biomedical/Bio-Engineering: 5%
- Industrial Engineering and Operations Research: 3%
- Computer Science/Information/Systems/Technology: 3%

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NEW!
Updated NACME Scholar Information
(continued)

NACME Scholars by Program: Number of Scholars

**Academic Year 2011-2012**
Population: 1,181

- Block Grant (590)
- Affiliate Scholars (503)
- Other-Includes Pre-Engineering and Fellows (88)

**Academic Year 2010-2011**
Population: 1,271

- Block Grant (616)
- Affiliate Scholars (553)
- Other-Includes Pre-Engineering and Fellows (102)

NACME Partner Institutions

- 145 Students at 7 Institutions
- 161 Students at 5 Institutions
- 203 Students at 11 Institutions
- 351 Students at 13 Institutions
- 295 Students at 14 Institutions

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CD Presentation Decks
This CD contains a series of PowerPoint presentation decks, which will allow you to choose slides and include them in your presentations. Each deck is organized around a different theme with each reviewed in this book. Supplemental decks and updates will be made available periodically, as new data becomes available.

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DECK 5
The U.S. Engineering Workforce
Our Mission
To ensure American competitiveness in a flat world by leading and supporting the national effort to expand U.S. capability through increasing the number of successful African American, American Indian, and Latino women and men in science, technology, engineering and mathematics (STEM) education and careers.

Our Vision
An engineering workforce that looks like America.

Our Goal
Working with our partners to produce an engineering graduating class that looks like America.

Our Purpose
Our aim is to increase the proportion of African American, American Indian, and Latino graduates in STEM education and careers, our metric is parity in the workforce, and our methodology is connecting the network of like-minded individuals and organizations that share a commitment to these aims.

Our Beliefs
We believe in the concept of the “learning organization,” a community in which each member is encouraged and assisted to grow and develop. We support a NACME culture that is informed by our mission. We focus on the results—increasing the proportion of African American, American Indian and Latino graduates in STEM education and careers. We are active, optimistic and engaged. We are creative, innovative and disciplined in our approach. We strive to be effective team members who are committed to doing our best work and to delivering the best results for our partners along the continuum from middle school to workforce entry.