

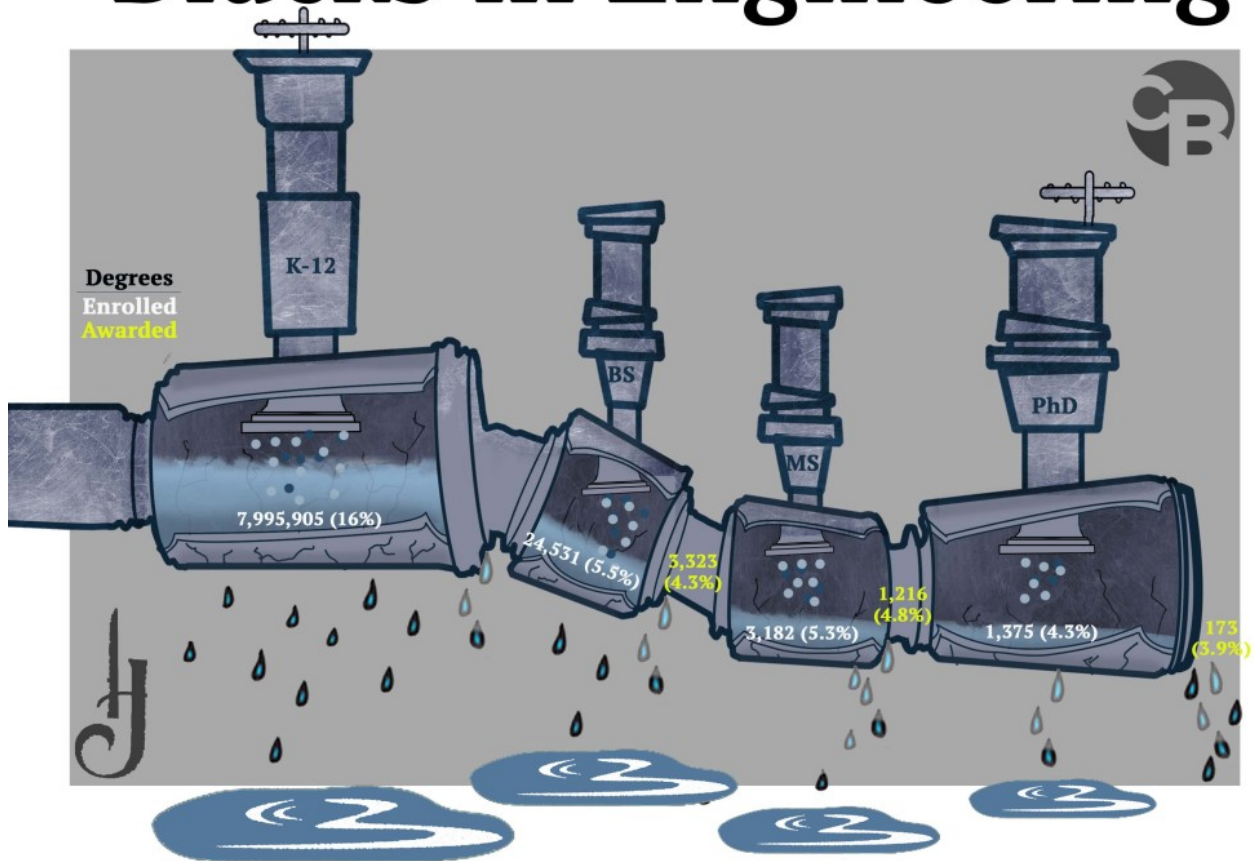
# How Leaks in the Black Engineering Pipeline Affect Diversity in Industry

By [Corey E. Baker](#) and [Justin Dunnavant](#). Pipeline artwork by [Hasani McIntosh](#)

(Updated on 8/12/14 to reflect diversity numbers released from Apple)

It's no secret that Blacks are underrepresented in almost every area of STEM. Universities, non-profit organizations, and the government have all developed programs to try and curb this situation. But how do we begin to address a problem when it's apparent that the pipeline is broken? Once we recognize where the Black engineering pipeline is leaking, we can begin to repair the structural issues that limit minority access to higher education and affect diversity in industry.

# Blacks in Engineering



All degree data is from ASEE and is the average from 2009-13. The coefficient of variance can range from 3%-12% for a particular number. K-12 data is from 2011-12 from ed.gov

Figure 1: The percentages in the pipeline figure reflect the average (2009-13) percentages Blacks made of the US population for the respective category. For example, an average of 3,323 Black people per year graduated with bachelors degrees which accounted for 4.3% of the US population who graduated with engineering degrees.

Imagine the pipeline as a snapshot of what's going on today. The beginning of the pipeline shows there are roughly 8 million Black students enrolled in K-12 education [1]. However, the end of the pipeline shows an average (2009-13) of 173 Blacks graduating with doctoral degrees in engineering and computer science each year. With leaks throughout the pipeline, **scores of potential Black engineers drop out of the race.**

**Proficiency in math, literacy, and science by the 4th and**

8th grade are some the key causes that prohibit our youth from matriculating through the pipeline [2]. Another contributing factor is the **combined household income**, or the amount of money made by students parents.

*“Rich kids graduate; poor and working-class kids don’t,” Paul Tough writes in his latest New York Times article.*

“Or to put it more statistically: About a quarter of college freshman born into the bottom half of the income distribution will manage to collect a bachelor’s degree by age 23, while almost 90 percent of freshman born into families in the top income quartile will go on to finish their degree...” [3]. Compounded with these economic and educational deficiencies, we mention in [Mentoring Our Future: Inspiring Our Youth – Michael Simpson](#) that **stereotype threat**, or the internalization of academic inferiority, provides an additional hurdle for many underrepresented minorities that can lead to underperformance in the classroom.

In a more positive light, the amount of Blacks awarded degrees in engineering and computer science have steadily increased through the years. In 2013, 5,081 degrees were awarded to Blacks in the field, an increase of 15% since 2009 [4]. **But are we increasing fast enough?** In 2009, Blacks made up 4.5% of all engineering and computer science degrees awarded to US citizens, but made up 4.3% in 2013. A similar drop can be seen in the percentage of Blacks enrolled in these same degree programs (5.6% in 2009 to 5.2% in 2013). Putting these facts together means that even though the amount of Black engineers have been increasing, they are being outpaced by most other racial and ethnic groups in America (Native Americans have actually shown a significant decrease in enrollment since 2009). In order to diversify engineering and ensure it is more representative of the overall population, we must move the aforementioned percentages in the positive direction and reach parity. Meaning, the amount of degrees

enrolled/awarded to Blacks should be more like 12-14% to reflect the US Census data [[5](#) and [6](#)]. To accomplish this difficult mission, we must repair the cracks in the pipeline to retain and promote qualified Black students throughout all stages of the education system.

## **Industry versus Education**

In May of this year, [Google was slammed](#) in the media for their poor diversity record. As a result, tech companies have been making a concerted effort to collect and make public their diversity data. While some companies have shown improvements through diversity initiatives, many are still lagging behind, particularly in technical and leadership areas. Some important questions to ask are: what should diversity look like in the work place? And is there a lack of diverse talent for these companies to choose from?

It's obvious when it comes to diversity, none of these companies reflect the melting pot that is the United States. But how does corporate diversity fair against what's currently available in the engineering pipeline?

## Blacks in Engineering vs Blacks in Industry

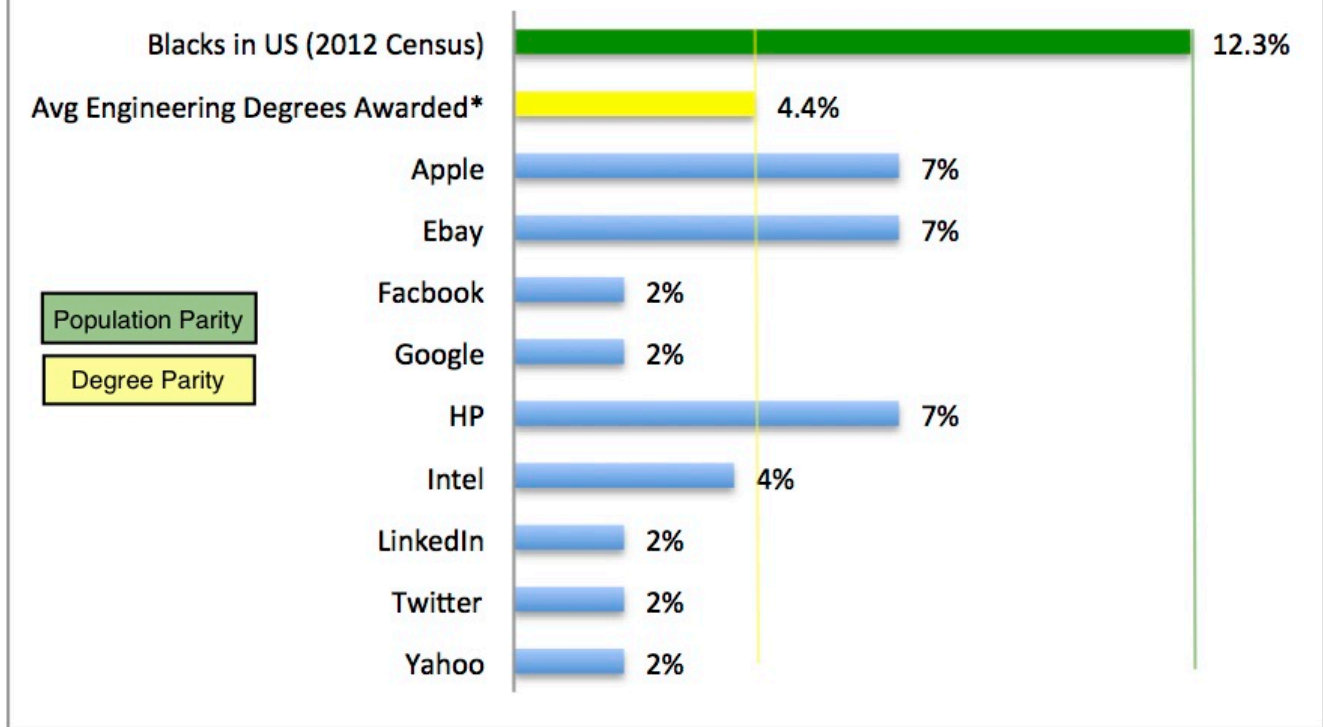


Figure 2: Source – Corporate percentages are from [7-11]. Average engineering degree awarded is derived from ASEE data (2009-13)

The figure above shows the percentage of Blacks in the US in “green”, which is the ideal percentage we would expect a company to have (12.3%). On average Blacks made up 4.4% of all engineering and computer science degrees (bachelors, masters, and phd combined) awarded to US citizens between 2009 and 2013. Using the amount of Blacks in the US and the average amount of engineering degrees awarded per year as benchmarks, we can set two “parity” lines, **Population Parity** and **Degree Parity**, respectively.

Currently no company in the figure has reached **Population Parity**, while Apple, eBay, and HP are the only three companies which have reached **Degree Parity**. However, these percentages, rounded to the nearest whole number, can be misleading. When these percentages are further deconstructed, we find that only a fraction of Blacks working at these leading companies are

employed as technical employees. Instead many of them either hold positions outside of engineering or in unskilled positions. Looking at Figure 3, we see only **one company is at Degree Parity**, and **none at Population Parity**. It is also likely the percentages are rounded up, suggesting that less than 1% or 2% of the technical employees at these companies are Black.

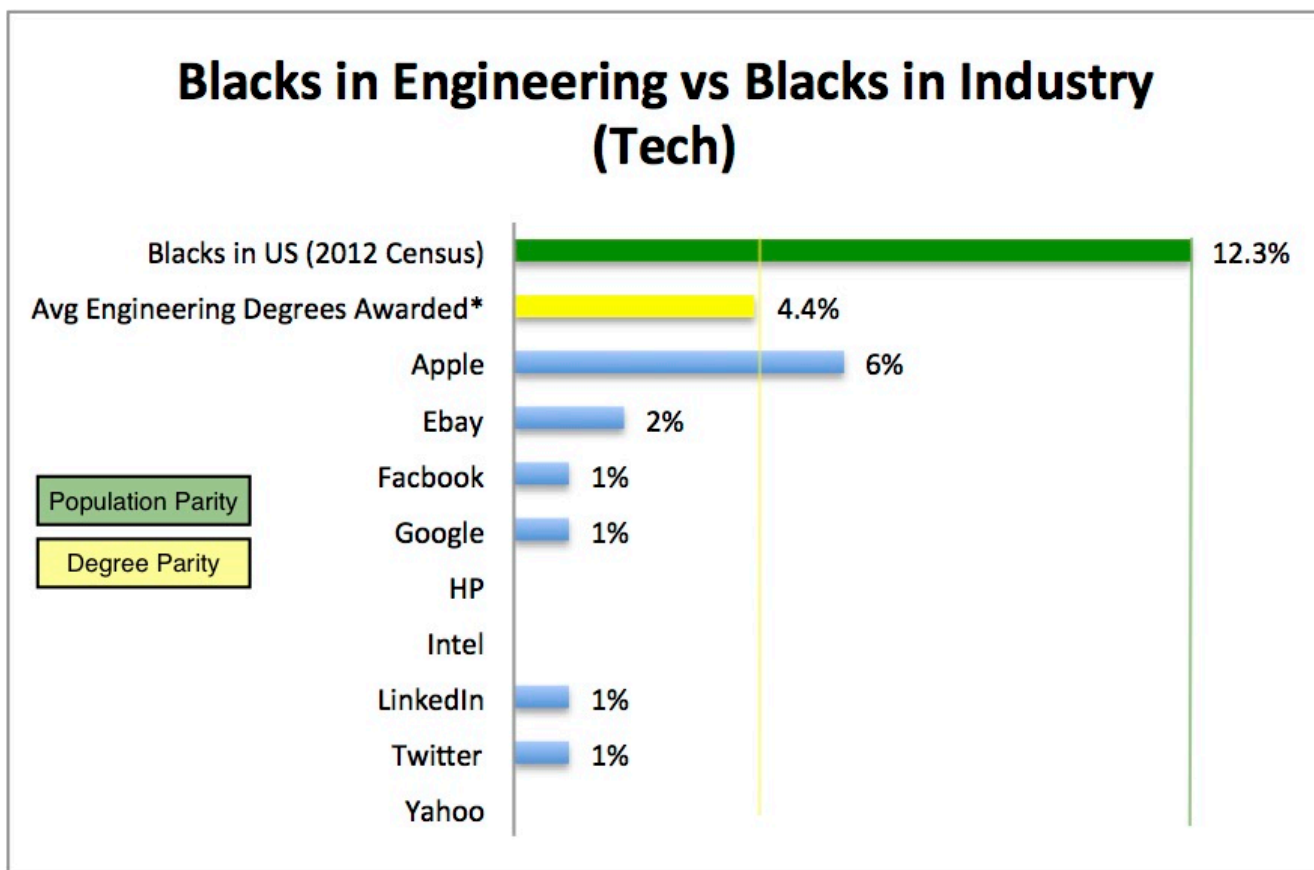


Figure 3: Source – Corporate percentages are from [7-11]. Average engineering degree awarded is derived from ASEE data (2009-13)

When it comes to gender diversity, females (all, not just Black) exhibit similar disparities. At first glance, it would appear from Figure 4 that every company has met or, in some cases, significantly exceeded the **Degree Parity** line (19%), while still falling drastically short of the **Population Parity** line (51%).

## Gender in Engineering vs Gender in Industry

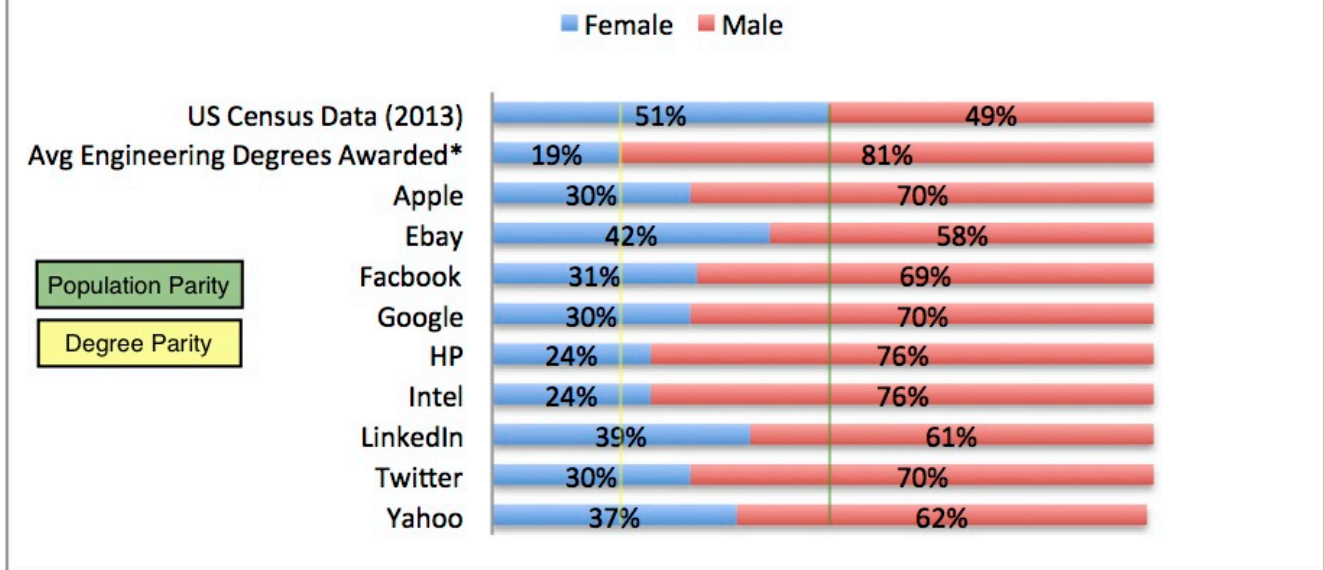


Figure 4: Source – Corporate percentages are from [7-11]. Average engineering degree awarded is derived from ASEE data (2009-13)

Although again, when deconstructing these percentages in Figure 5, we see that Apple and eBay are the only companies which has met **Degree Parity**, with LinkedIn and Google trailing close behind. *Note: Gender percentages from the companies reflect worldwide employment numbers and we didn't have access US numbers.*

## Gender in Engineering vs Gender in Industry (Tech)

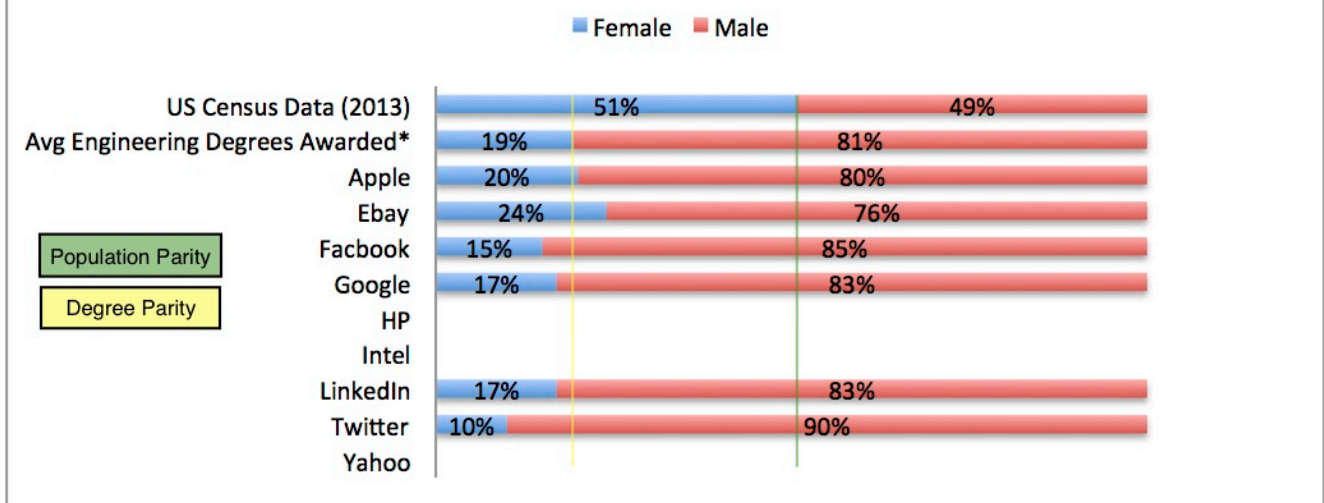


Figure 5: Source – Corporate percentages are from [7-11].

Average engineering degree awarded is derived from ASEE data (2009-13)

Thus the question remains, who is responsible for increasing the number of Blacks in the engineering? Or more importantly, **who is responsible for ensuring parity is met for all underrepresented minorities?**

The answer is, all of us! Universities must do a better job recruiting, retaining, and graduating minority students in engineering. It's clear that programs and organizations such as [GEM](#), [NSBE](#), [Black Girls Code](#), and the [McNair Scholars Program](#) have helped increase the number of Blacks in engineering through education, mentorship, and financial support. Similarly communities, schools, government, and non-profit organizations should align to provide a better educational foundation starting from Kindergarten. Rooted early in K-12 education, these programs are essential in providing Black youth with the math, literacy, and science scores needed to ensure that they are prepared for the rigors of engineering [5]. But tech companies also have the ability to aid in this endeavor. Tech companies can support local projects that raise awareness about career opportunities in engineering, while also hosting programs such as summer camps to introduce students to engineering. Finally, a more thorough review of the recruitment and promotion process for companies is needed to ensure that the culture and environment of these corporations is embracing diversity at all levels of employment.

Will the leaks in the pipeline be fixed? Hopefully, but to ensure that underrepresented minorities are at least at Degree Parity in the next decade. it's going to take a more concerted effort from both the public and private sectors.

## References

[1] ED Data Express: Data about elementary & secondary schools in the U.S., ED.gov



[2] Reid, K, Our Nation Needs to Fix the Breach in the STEM Pipeline (2014), website: <http://karlwreid.com>

[3] Tough, P, Who gets to graduate (2014), The New York Times

[4] Yoder BL, Engineering By The Numbers (2009-13), American Society of Engineering Education (ASEE)

[5] State & County QuickFacts, United States Census Bureau

[6] NACME Data Book 2011 and 2012

[7] Elder J, What Silicon Valley's Diversity Reports Say About the Tech Workforce (2014), The Wall Street Journal (WSJ)

[8] Jacobson M, Google finally discloses its diversity record, and it's not good (2014), PBS News Hour

[9] Van Huysse J, Building a Twitter we can be proud of (2014), Twitter, Inc

[10] Wadors P, LinkedIn's Workforce Diversity (2014), LinkedIn Official Blog

[11] Williams LC, eBay Releases Strongest Diversity Numbers in Silicon Valley, But They Still Need Work (2014), Think Progress