

STEM Education in Washington: The Facts of the Matter



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With huge thanks to

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Washington State Department of Commerce
Washington Offers Employers an Educated and Highly Skilled Workforce

“Innovation is in our nature”

This is true of our economy
and our population.

By any measure, Washington is a leader in America's innovation economy.

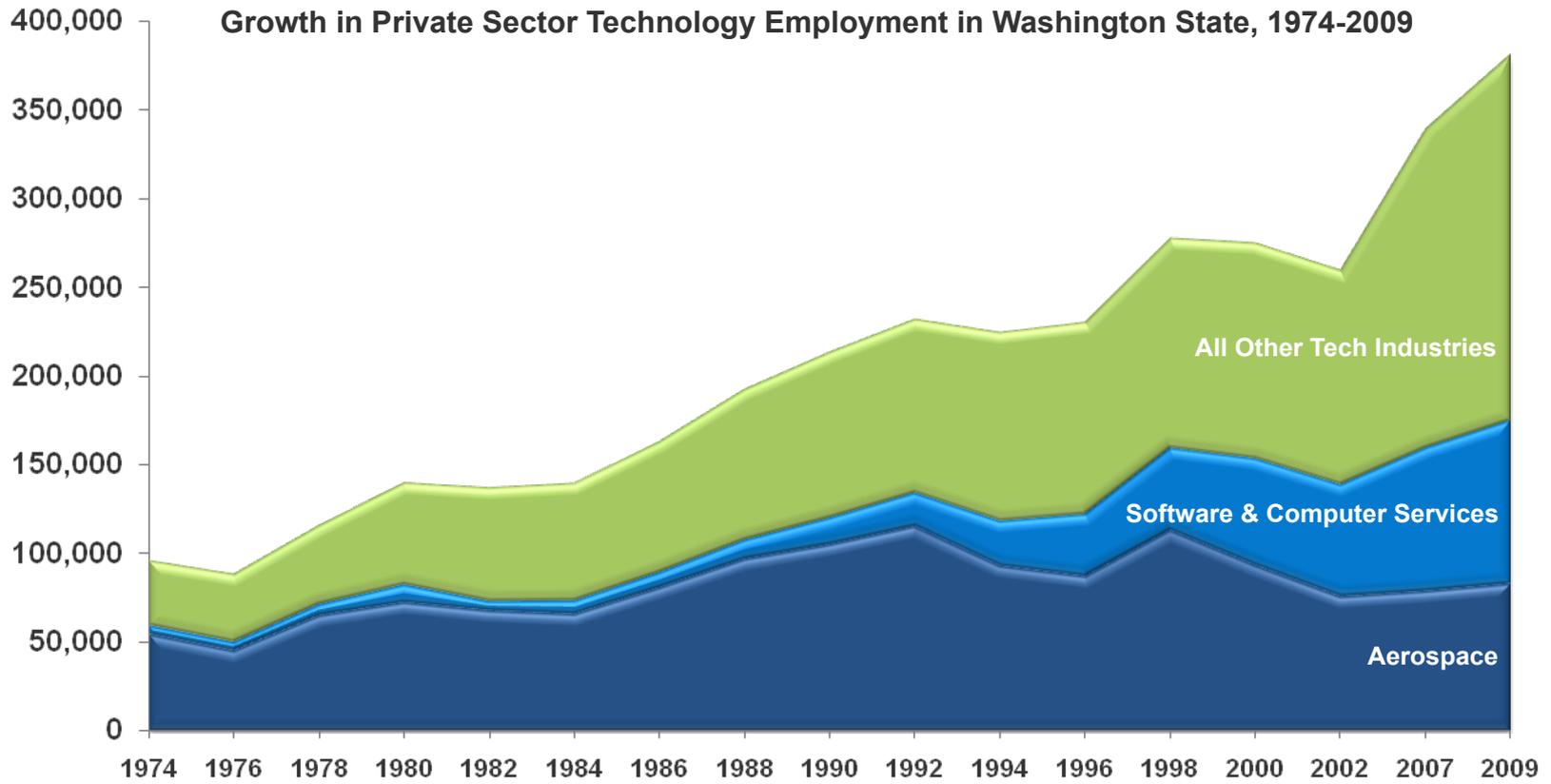
2010 Kauffman Foundation New Economy Index:*

1. Massachusetts
2. Washington
3. Maryland
4. New Jersey
5. Connecticut
7. California
8. Virginia
9. Colorado
10. New York
12. Utah



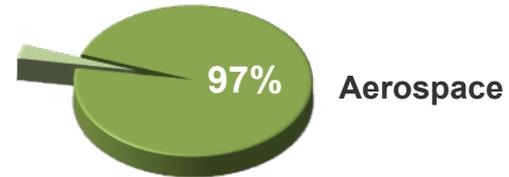
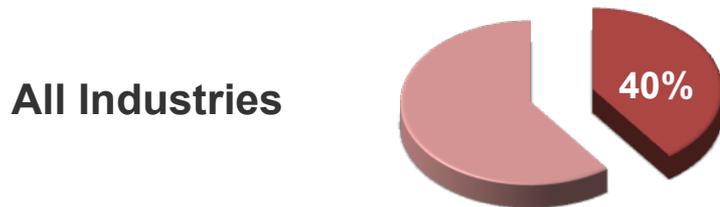
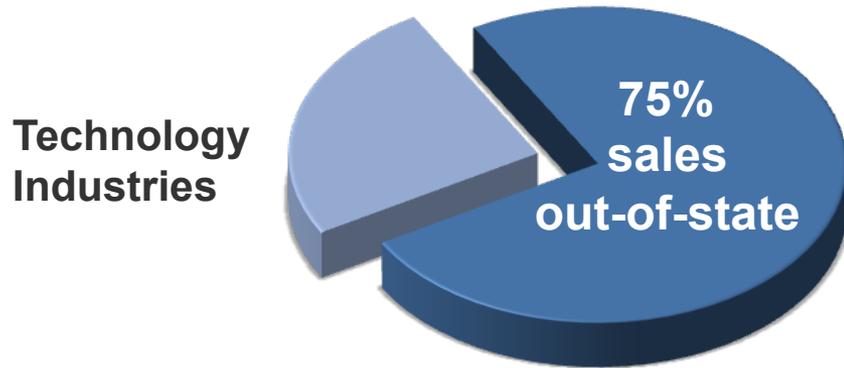
* Index #6 Delaware and #11 New Hampshire intentionally omitted.

Employment in our private sector technology industries has quadrupled since 1974.



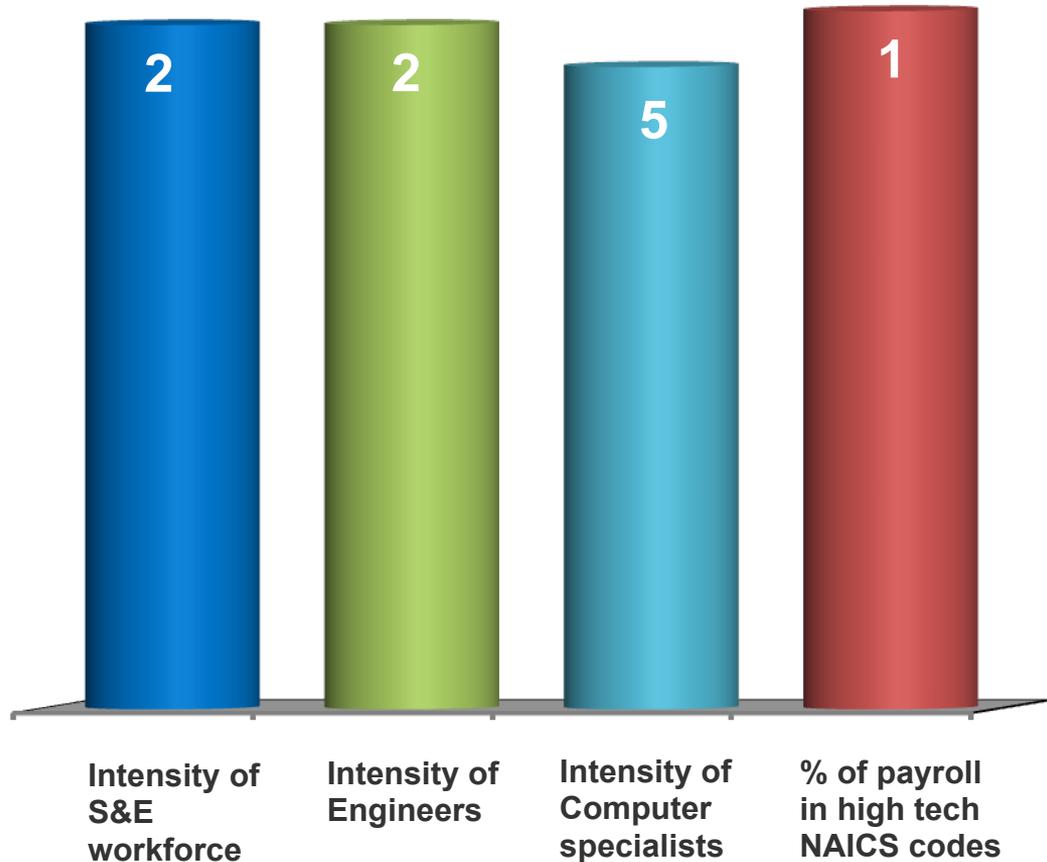
Source: Technology Alliance: *The Economic Impact of Technology-based Industries in Washington State*, 2010

Technology industries are a major driver of Washington trade.



An economy driven by a highly educated, innovative workforce.

Washington's National Rankings Human Capital



Sources: National Science Foundation: *Science & Engineering Indicators*, 2010; Milken Institute: *State Technology and Science Index: Enduring Lessons for the Intangible Economy*, 2011

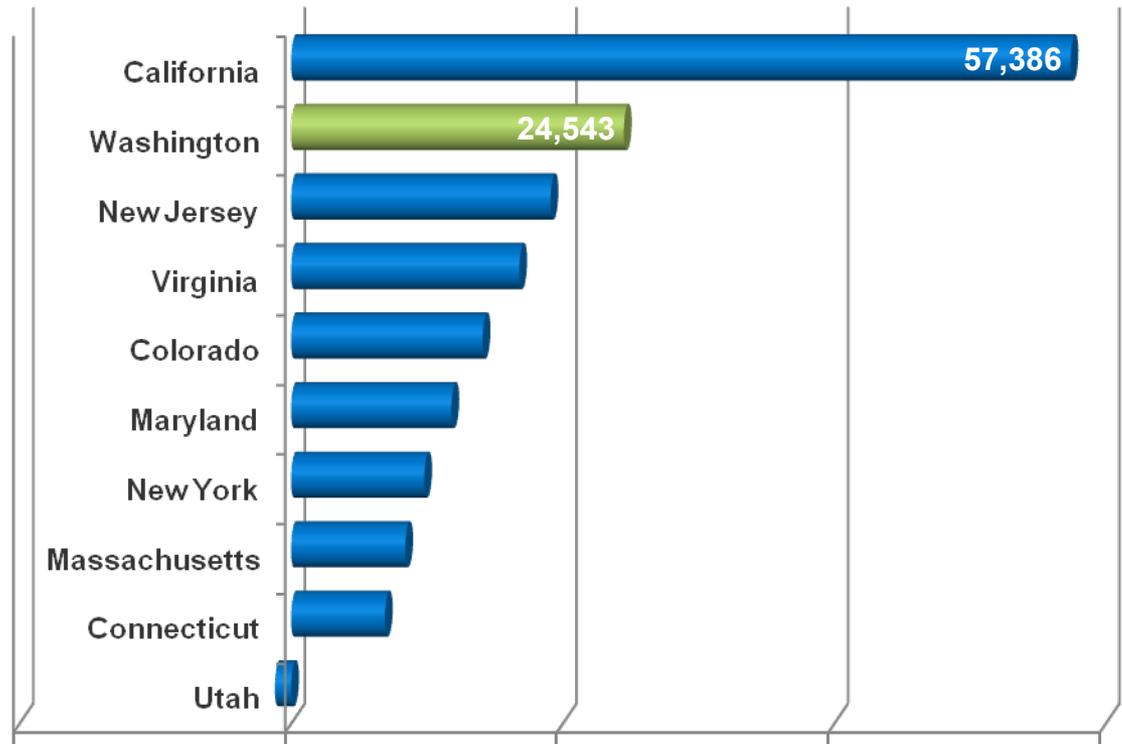
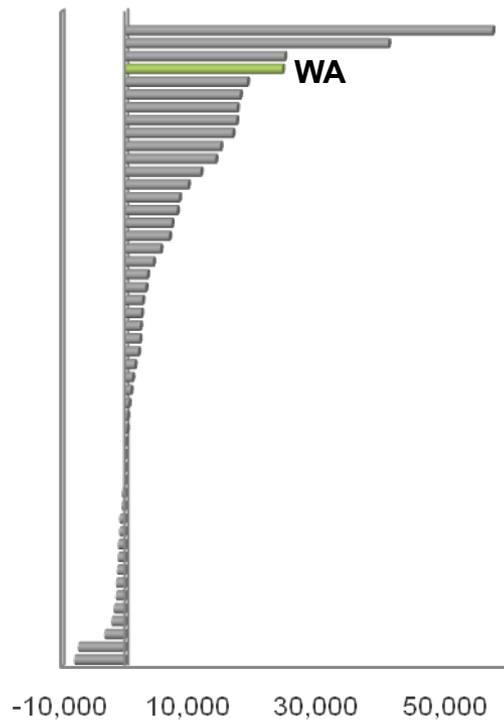


So, who are these people?

It turns out that they are not
our own children!

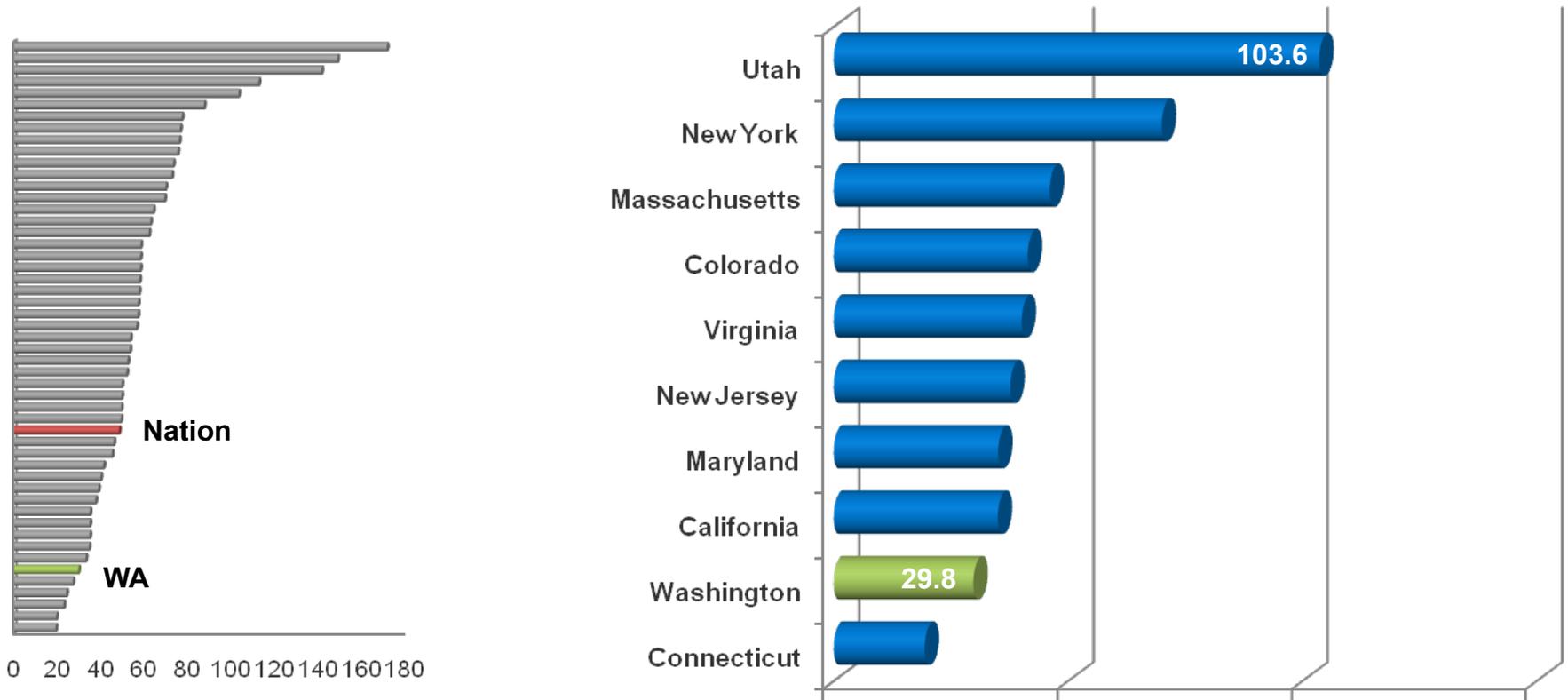
Washington is the 2nd largest importer of degrees among tech states (and 1st among all 50 states, by far, as a proportion of population).

Net Migration: 22-39 Year Olds, Bachelor's Degree or Higher (2007)



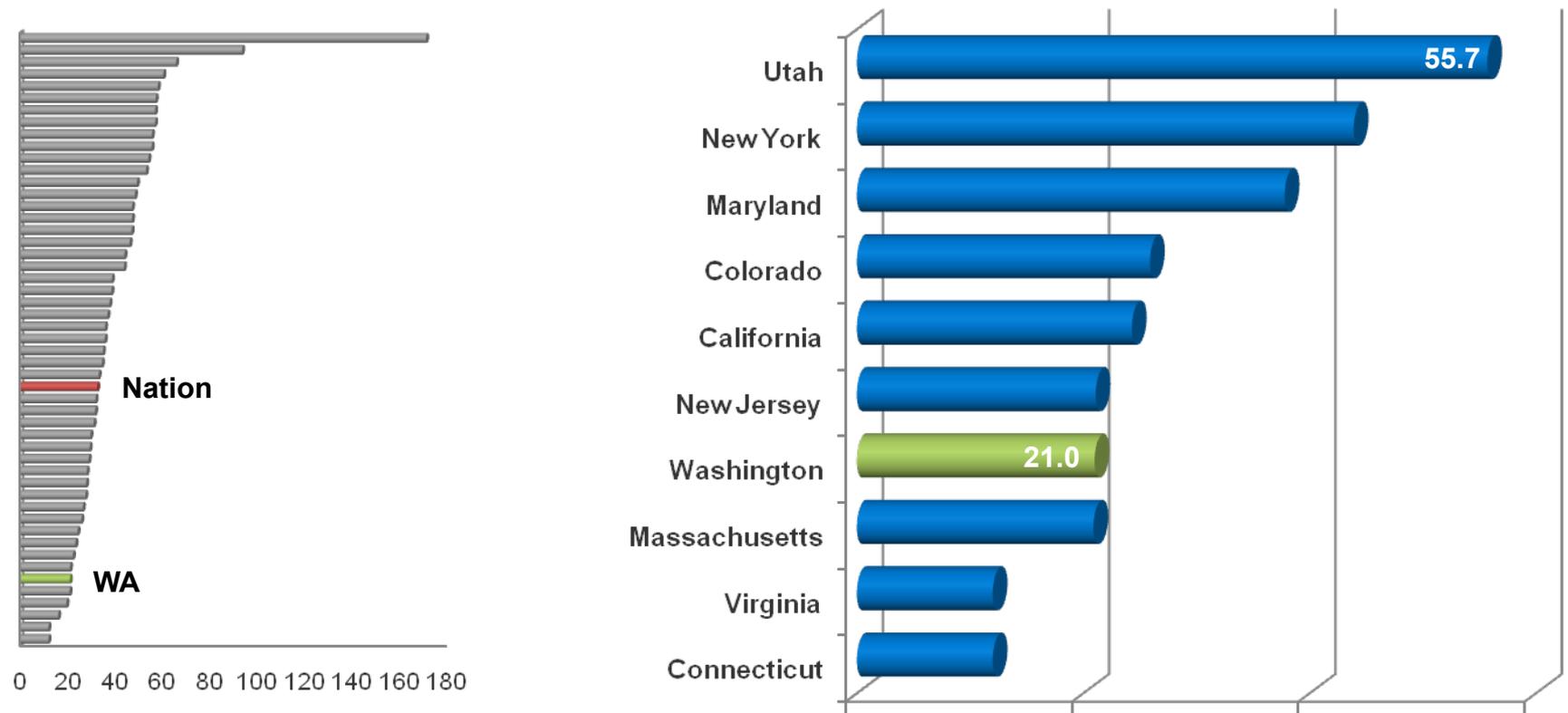
We rank very low in engineering degree production relative to engineering occupations.

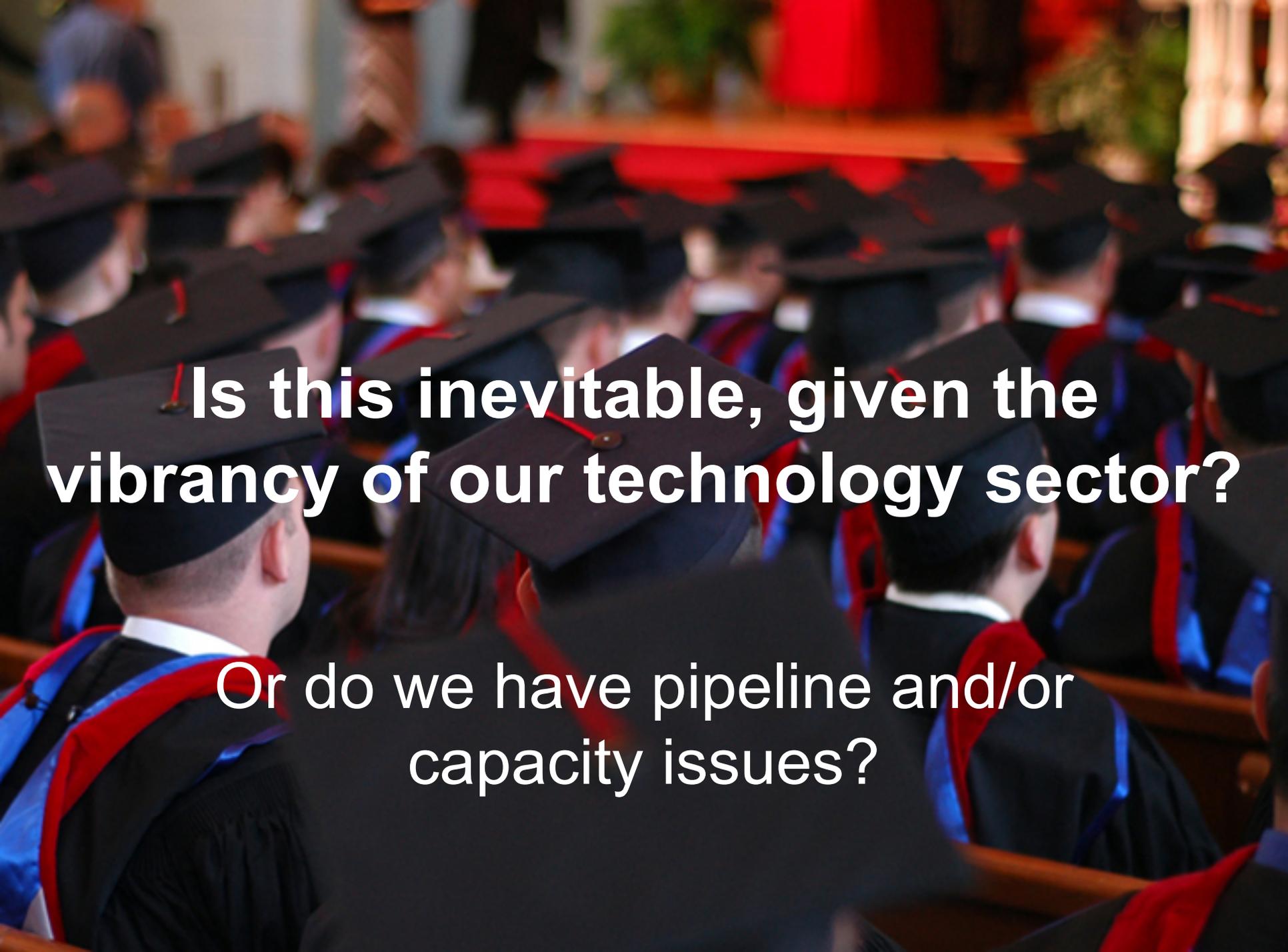
In-state Engineering Degree Production Per 1,000 Engineering Occupations (2005)



It's the same story in computer science.

In-state Computer Science Degree Production per 1,000 Computer Science Occupations (2005)

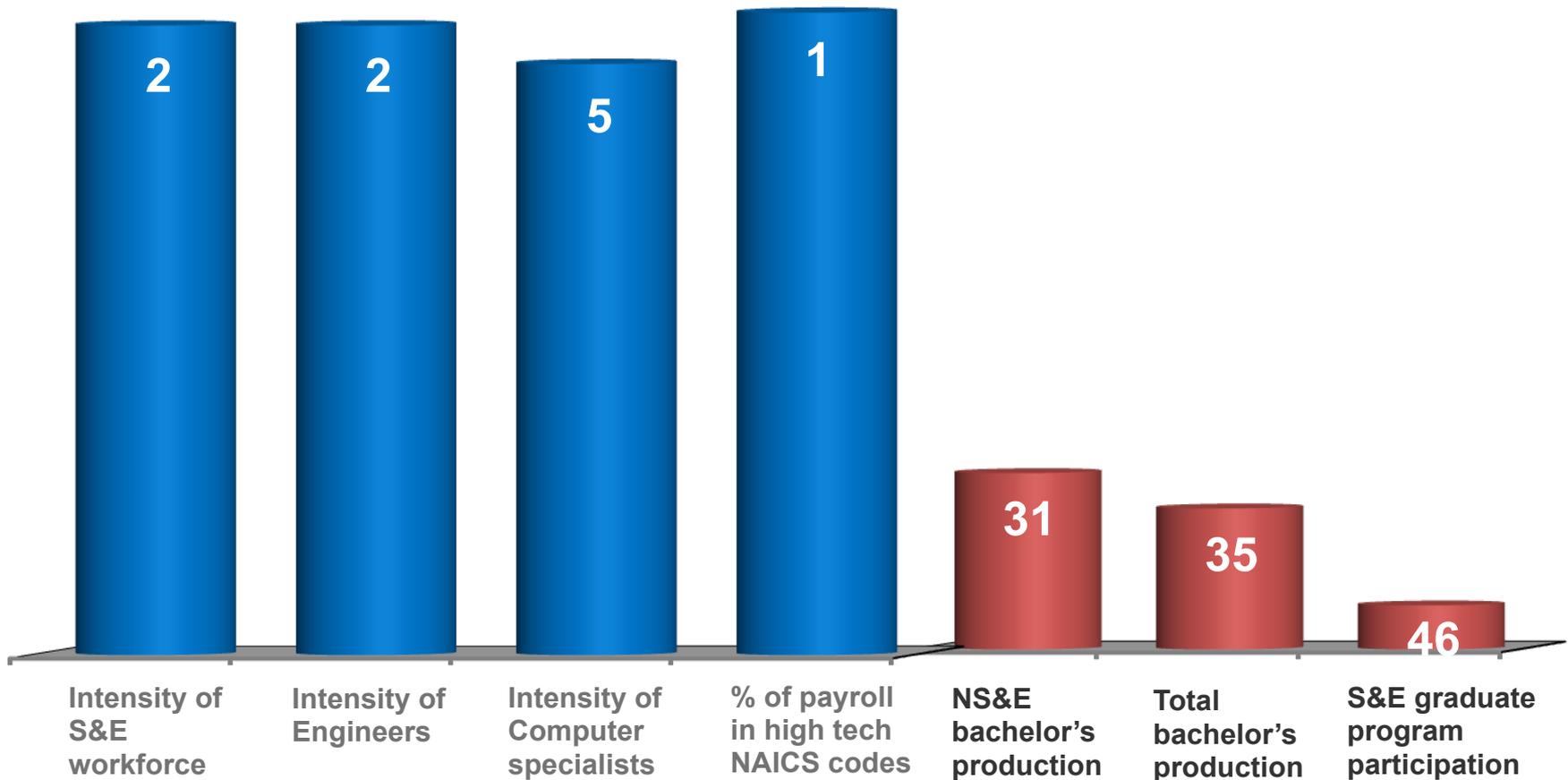




Is this inevitable, given the vibrancy of our technology sector?

Or do we have pipeline and/or capacity issues?

A mismatch between economic opportunity and our educational output.

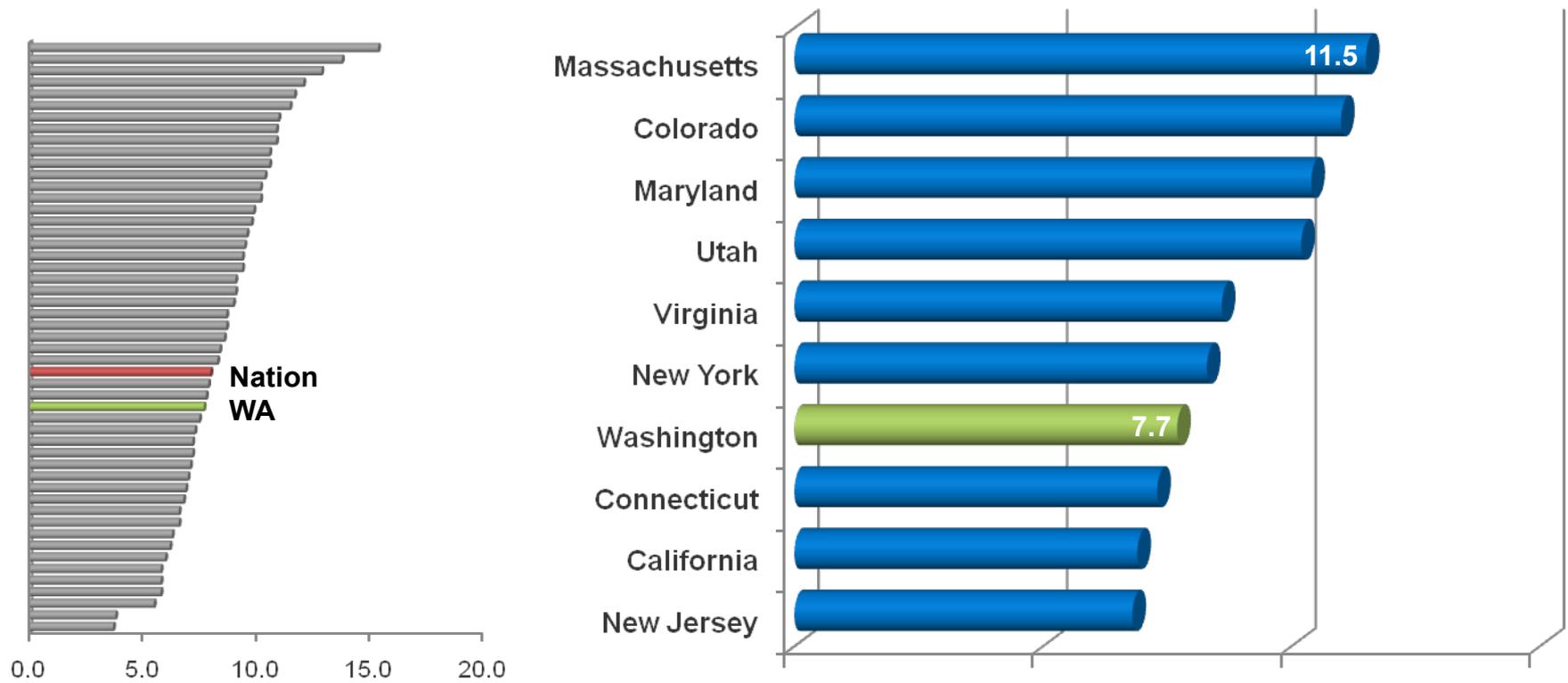


Sources: ITIF/Kauffman Foundation: *The 2010 State New Economy Index*; National Science Foundation: *Science & Engineering Indicators 2010*; NCHEMS/Postsecondary Opportunity

(all indexed to age-range population)

We lag in S&E degree production not only as a function of workforce, but also as a function of population.

Natural Science & Engineering Bachelor's Degrees Per 1,000 18-24 Year Olds

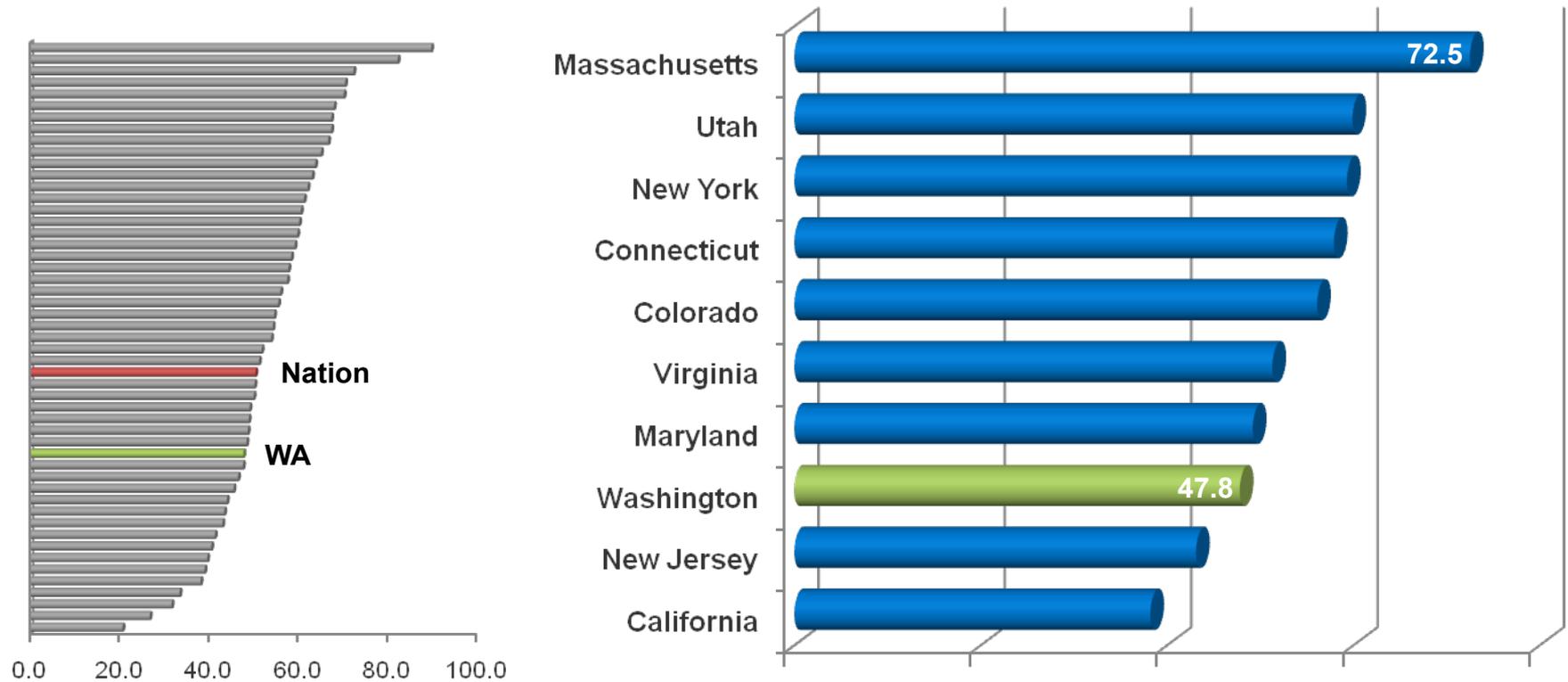


Source: NSF, *Science & Engineering Indicators 2010*

Note: NS&E degrees include physical, computer, agricultural, biological, earth, atmospheric, and ocean sciences; mathematics; and engineering.

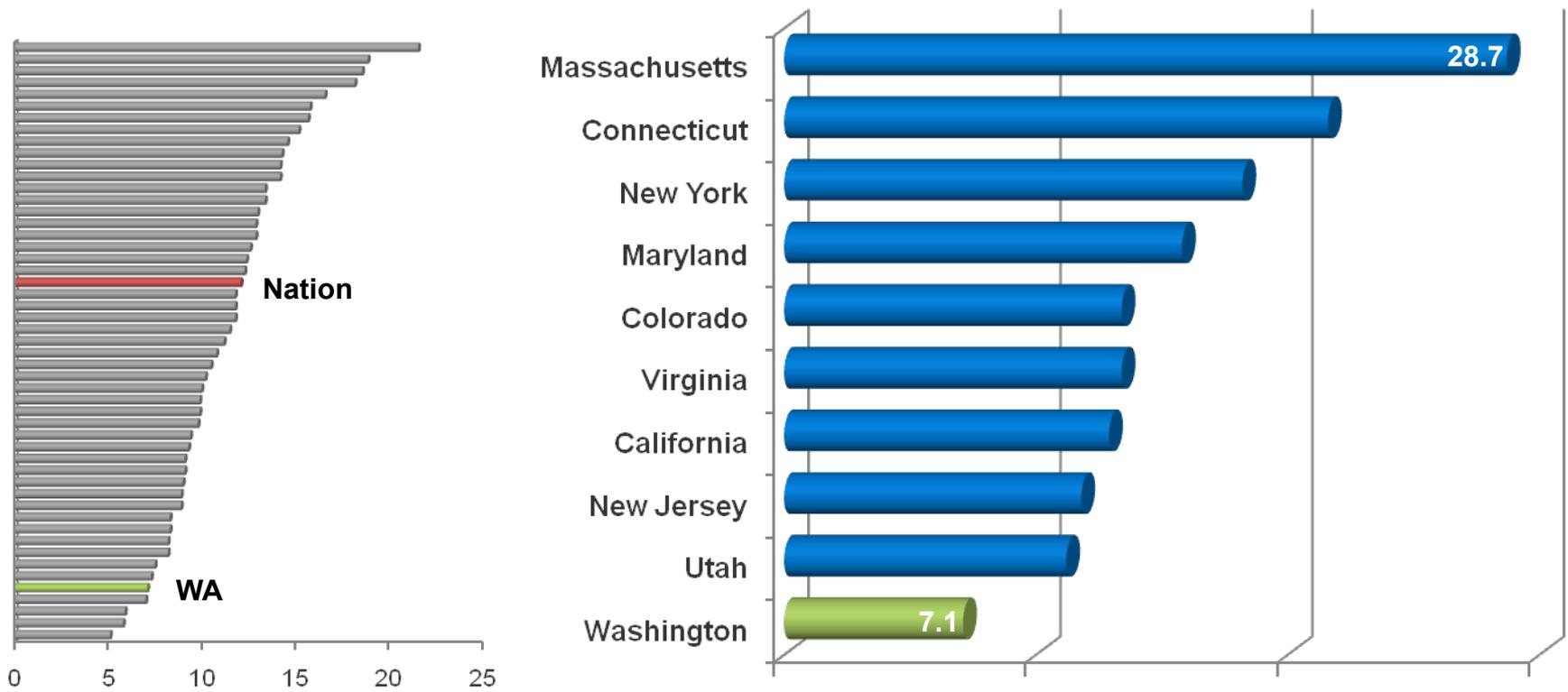
Same for total bachelor's degree production.

Bachelor's Degrees Per 1,000 18-24 Year Olds



We rank last among tech states in S&E graduate program participation.

Science & Engineering Graduate Students Per 1,000 Population 25-34 Years of Age (2007)



Source: NSF, *Science & Engineering Indicators 2010*

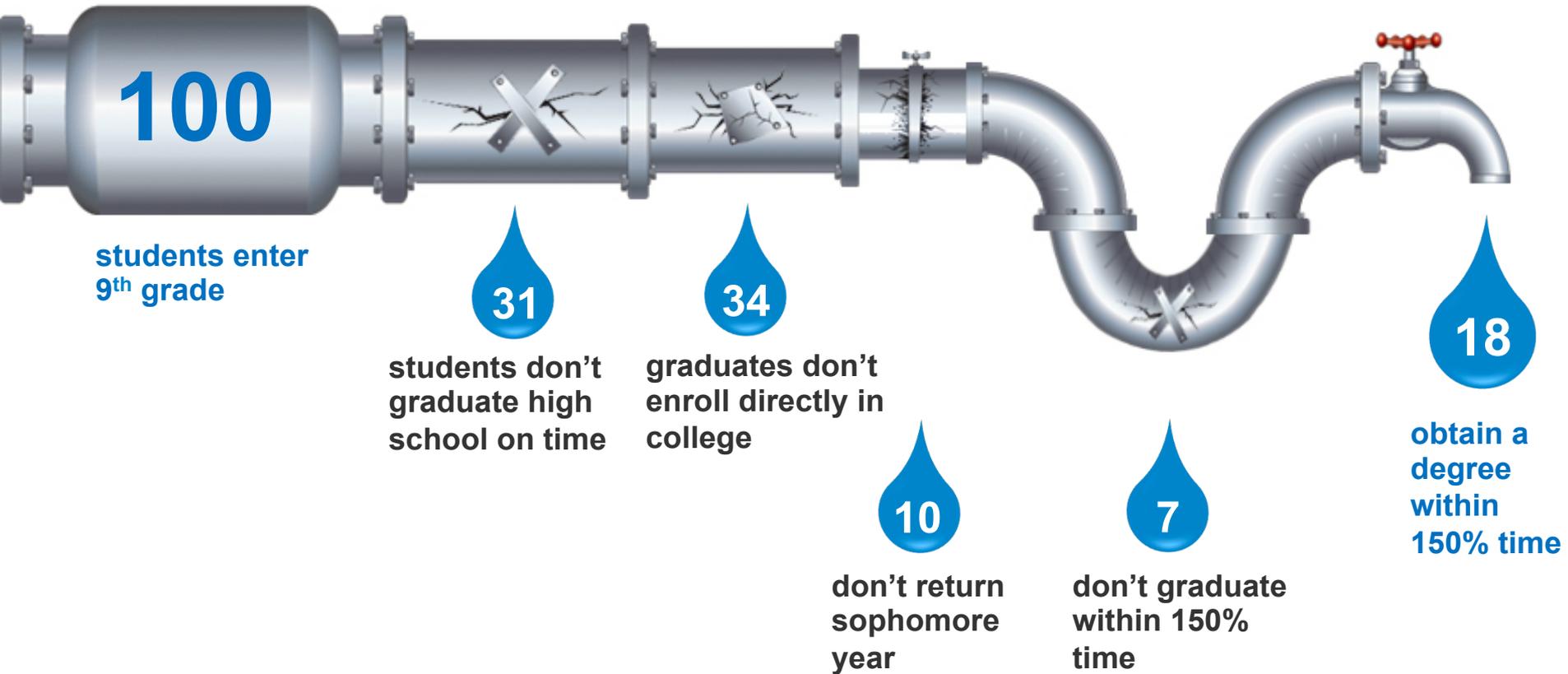
Note: S&E includes physical, computer, agricultural, biological, earth, atmospheric, ocean, and social sciences; psychology; mathematics; and engineering.

A young child with light hair is wearing a bright yellow raincoat with a hood. The child is holding a colorful umbrella with sections of yellow, red, and purple. The background is a blurred green field with rain falling, creating a soft, rainy atmosphere. The child is looking slightly to the side with a neutral expression.

**There are pipeline issues from
secondary to postsecondary**

To deal with the gathering storm,
we need to stop the leaks.

Our kids' futures are leaking!

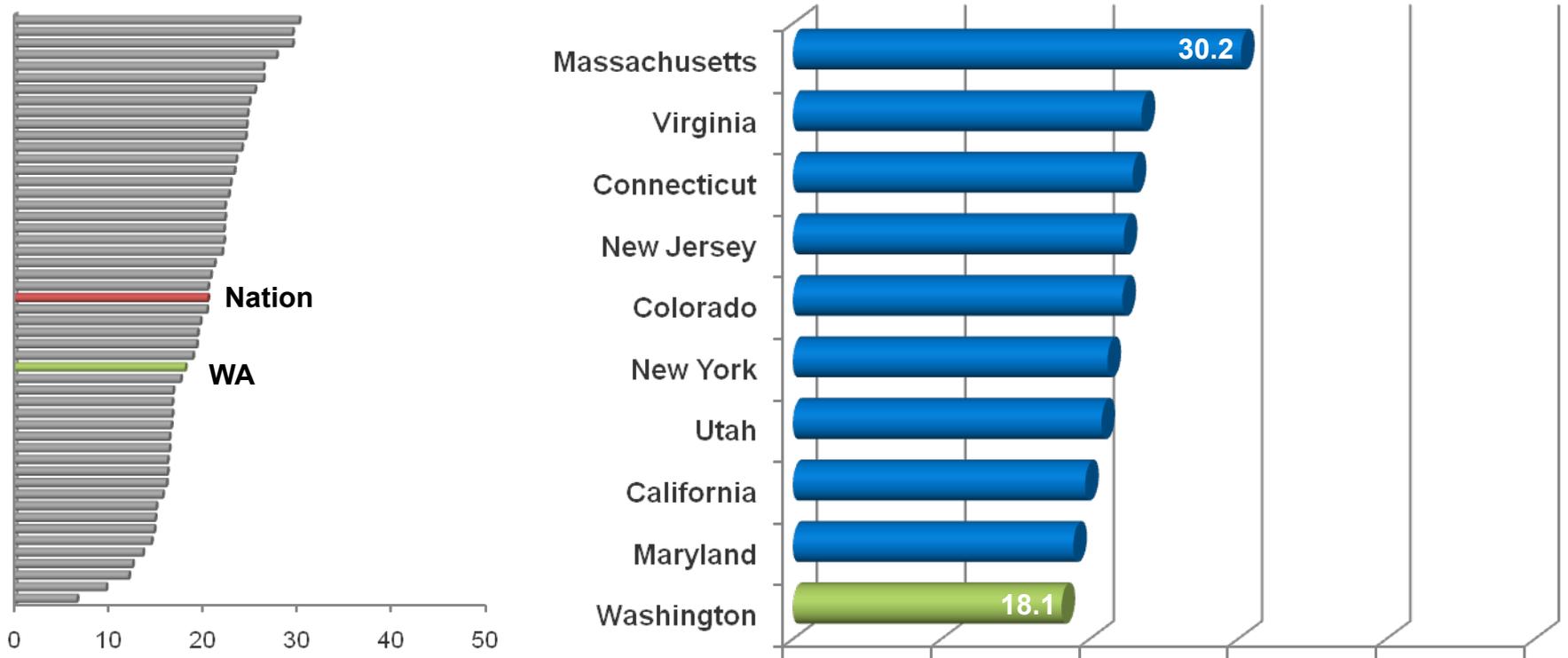


Source: NCHEMS

Note: Data for high school graduation doesn't account for transfers to private high schools and out-of-state. The calculation for college graduation doesn't account for transfers across institutions.

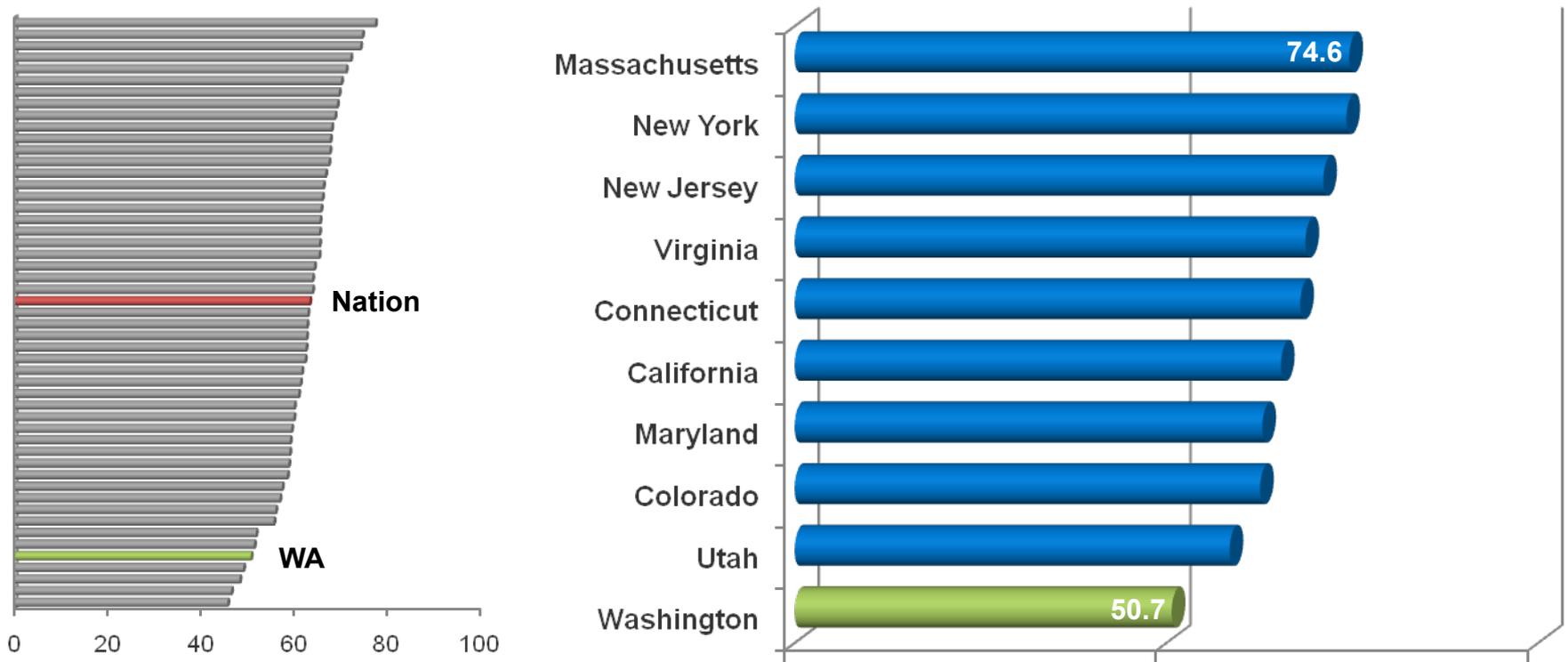
Overall, our pipeline is the leakiest among the tech states.

Student Pipeline: Transition & Completion Rates, 9th Grade to College (2008)



We are last among tech states (and 46th among all 50 states) in the proportion of high school graduates who move directly to college.

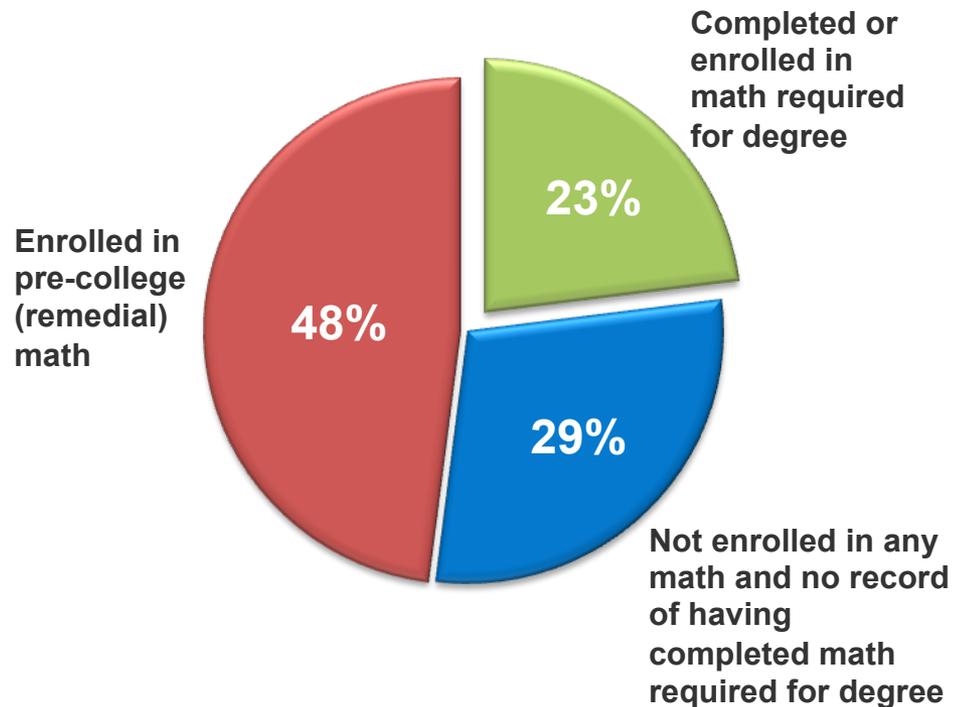
College-going Rates of Recent High School Graduates (2008)



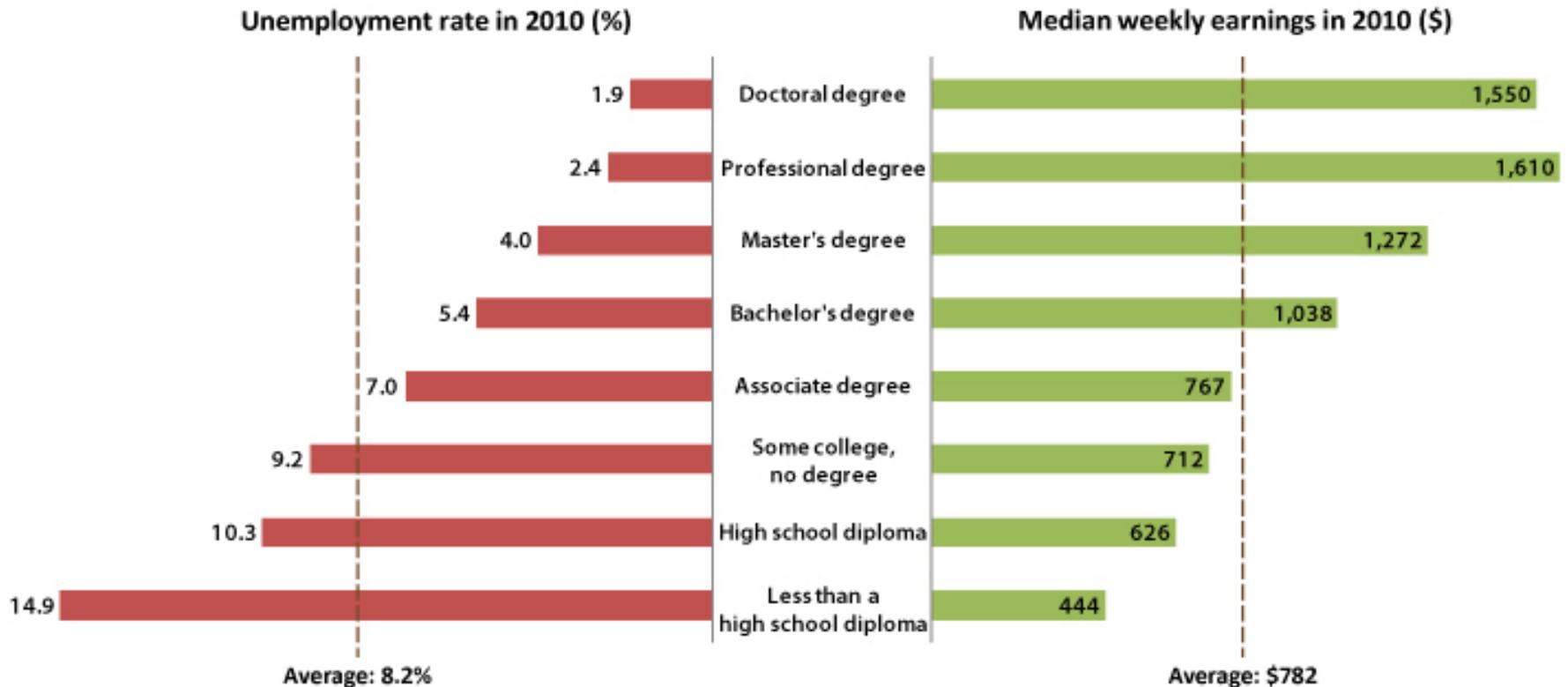
Of the ones who do move directly to college, too many are unprepared for college-level work.

A Math Problem:

Only 23% of 2008 high school graduates entering our 2-year colleges enrolled in college-level math or already had the math required for their degree.



Reducing the leaks in the pipeline is critical for our citizens, our economy, and our society.

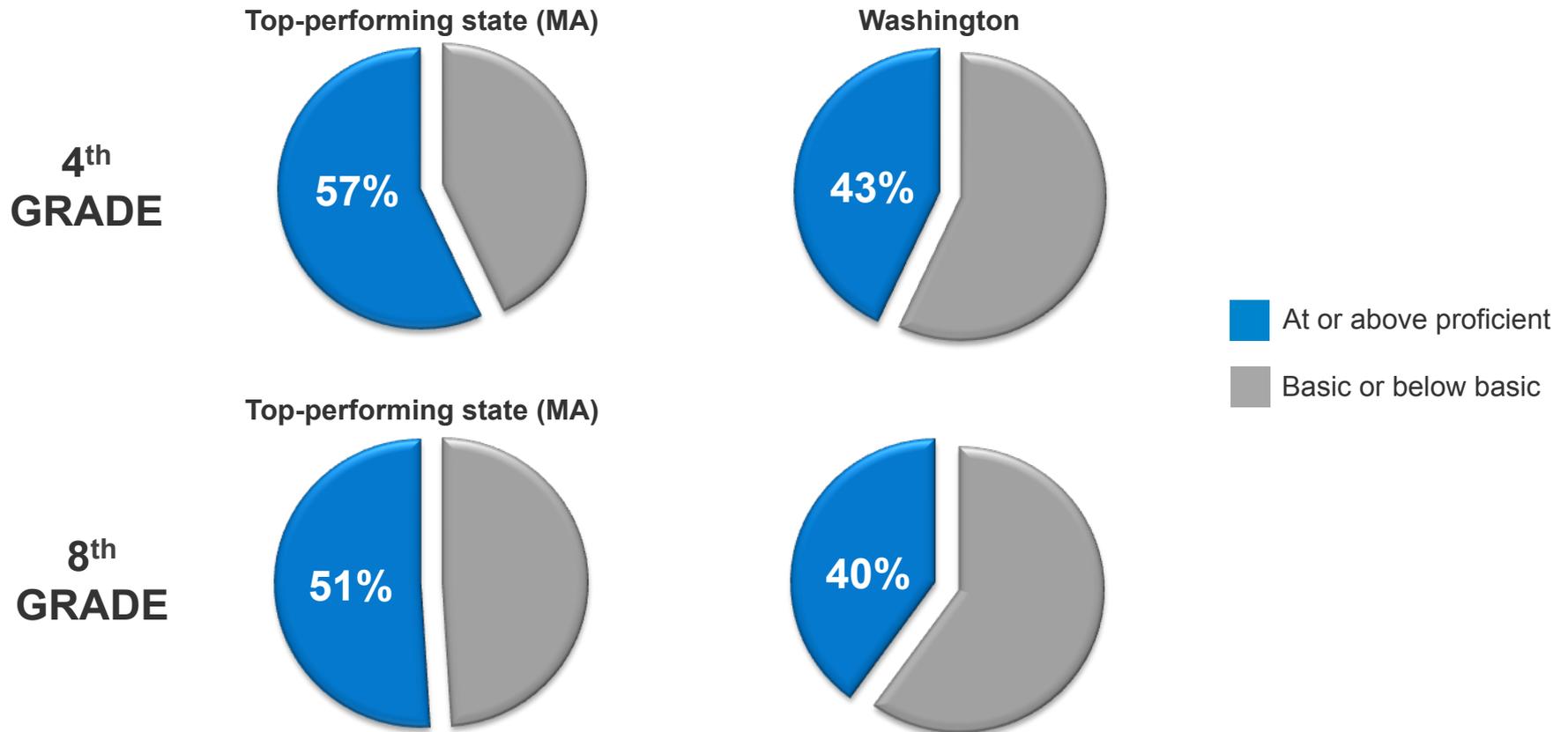




But it begins much earlier...

And it is a national issue.

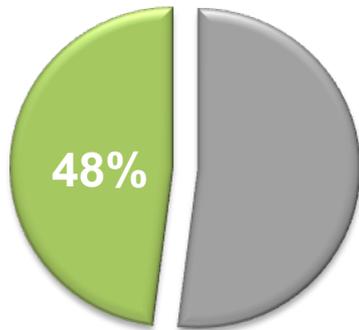
As a nation, we are not adequately preparing our K-8 students for high school math...



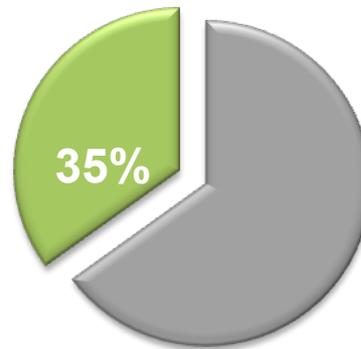
And we must make science more of a priority nationally and here at home!

**4th
GRADE**

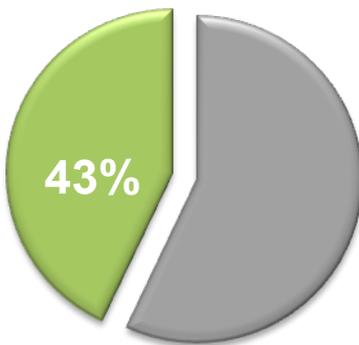
Top-performing state (NH)



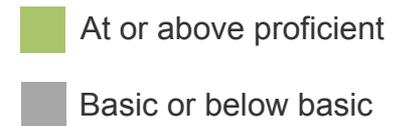
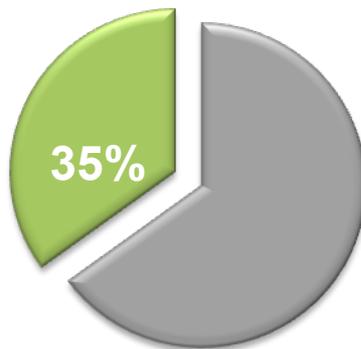
Washington



Top-performing state (MT)

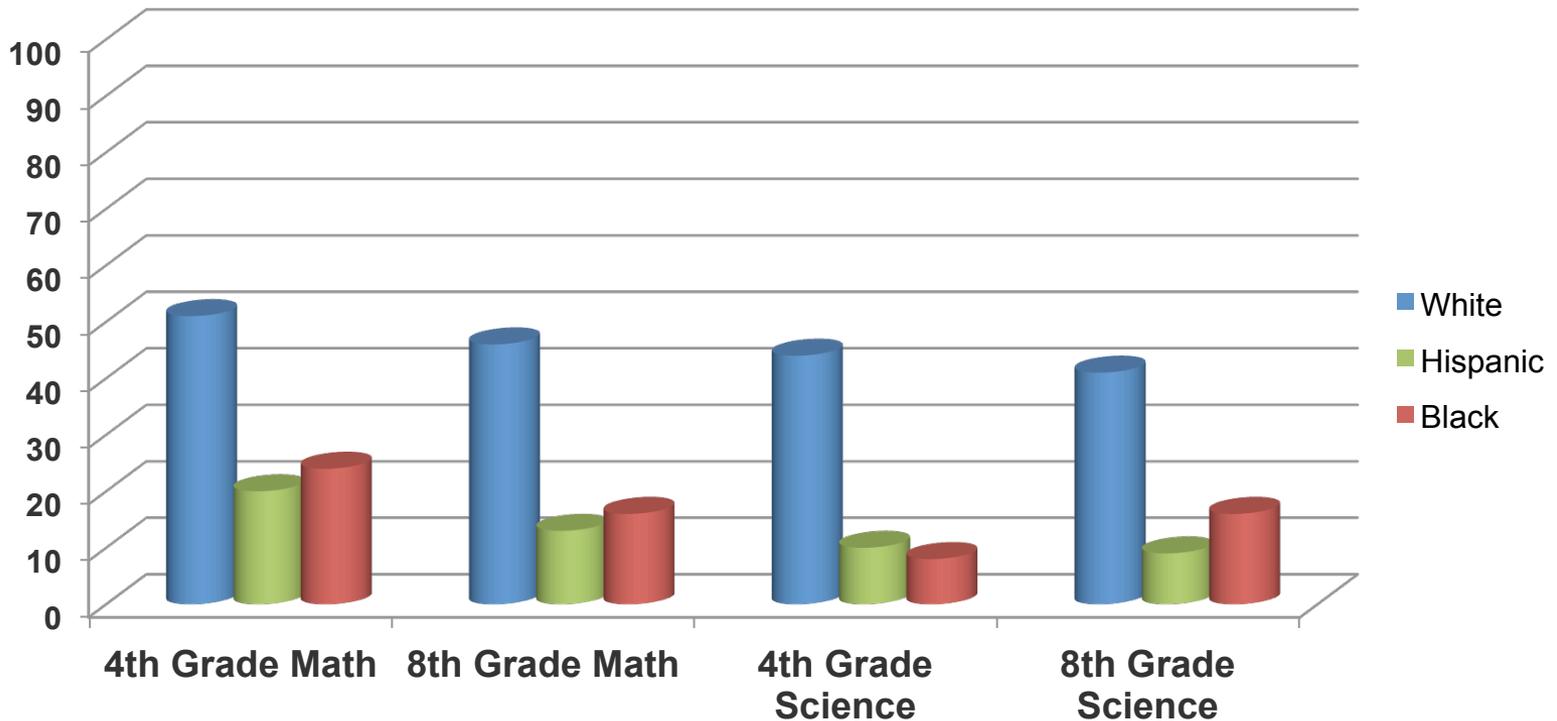


**8th
GRADE**



Data on specific student groups in our state paints an even more troubling picture.

Percent of WA Students at or Above Proficient, NAEP Math and Science

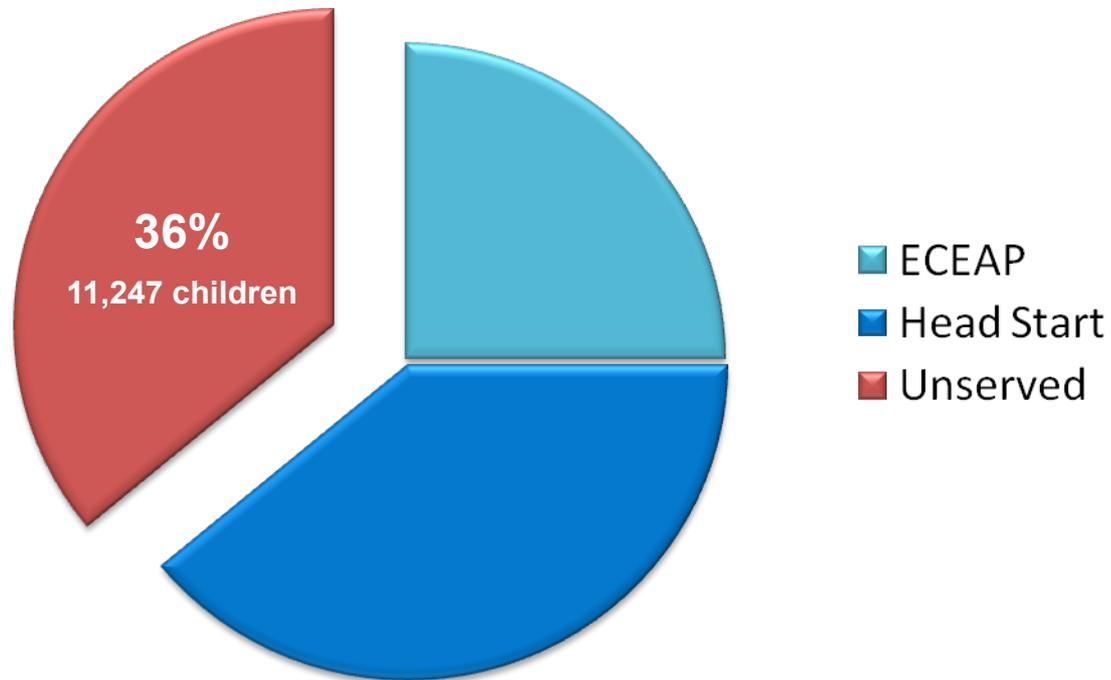




Quality early learning:

A pre-requisite for student success, but...

More than 1/3 of eligible low-income kids in Washington are not served by early learning programs.



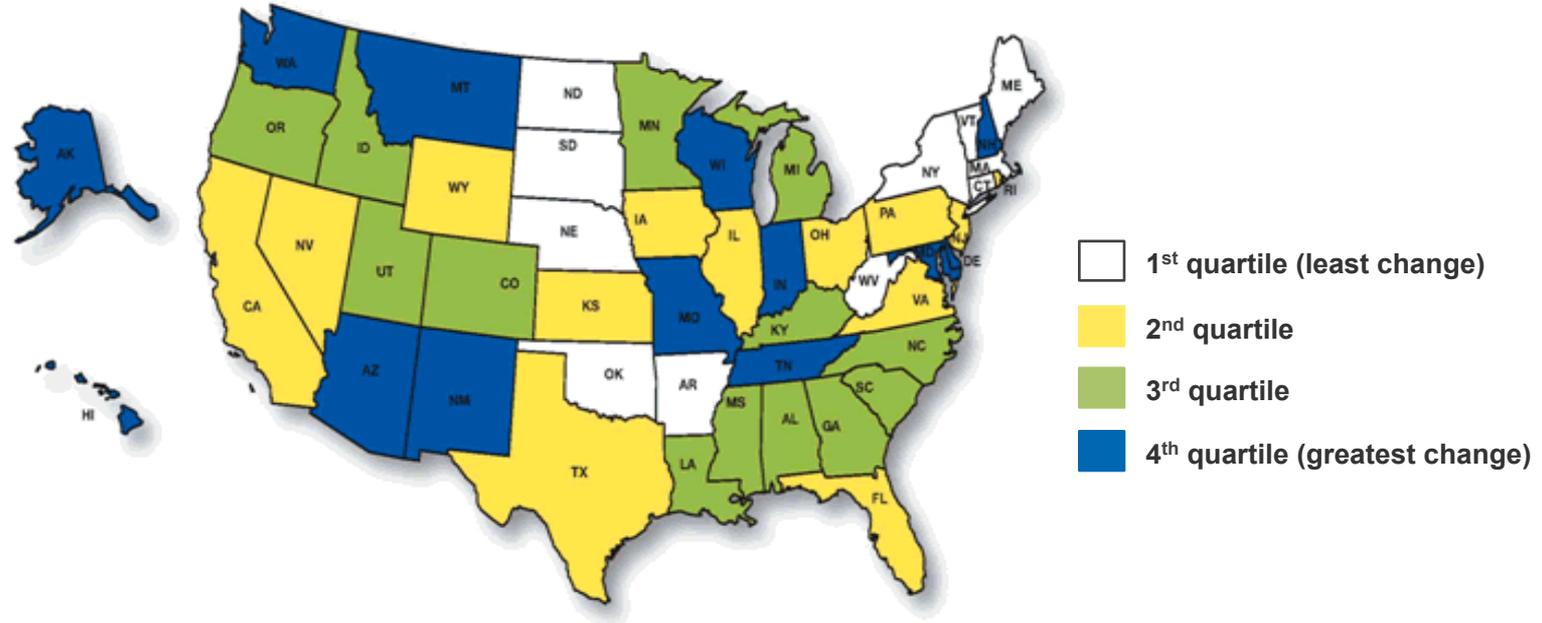
Behind the numbers...



A human tragedy is unfolding in our state.

The mismatch between the skills required for available jobs and the skills people have is growing.

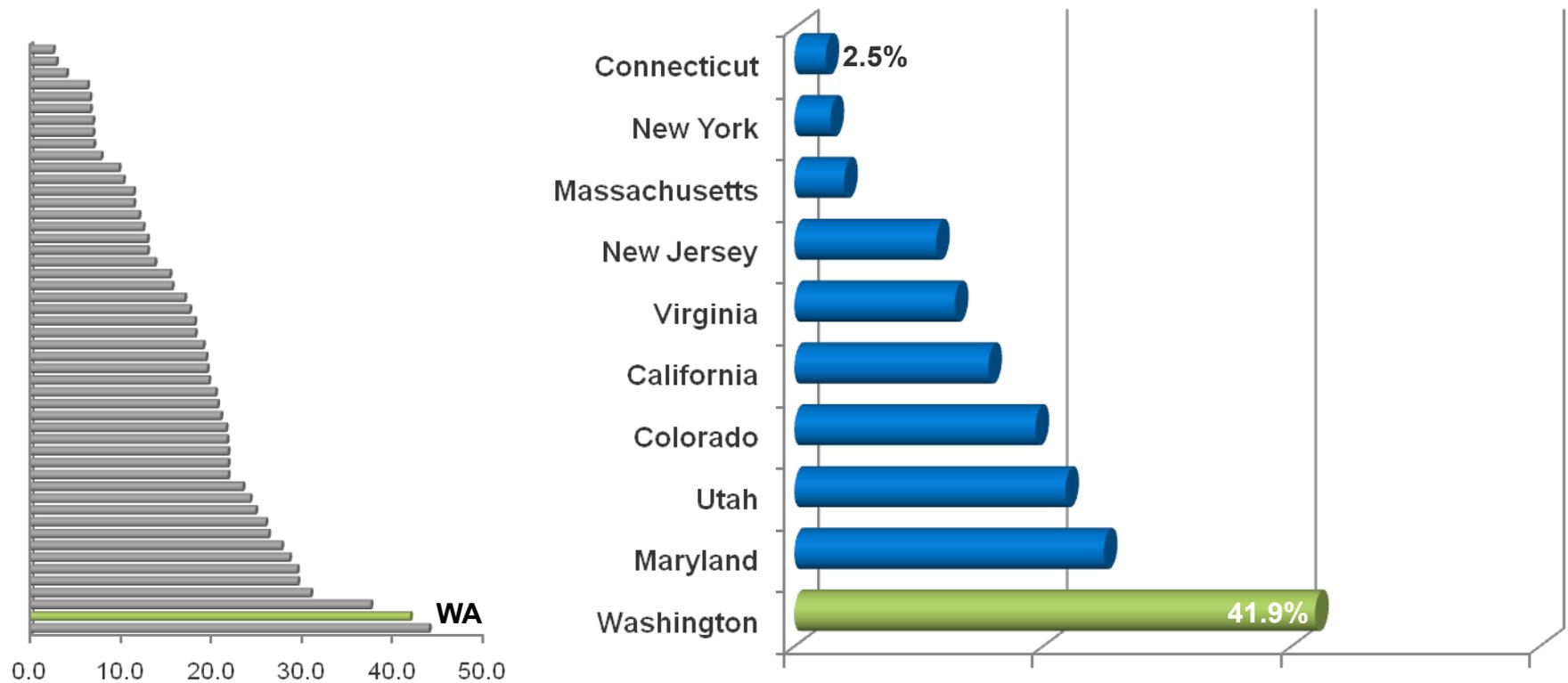
% Change in Skills Mismatch Index by State (2007-2010)



Source: Estavao, Marcello and Evidiki Tsounta, "Has the Great Recession Raised U.S. Structural Unemployment?" International Monetary Fund, 2011/Haver Analytics, U.S. Bureau of Labor Statistics, U.S. Census Bureau, author's calculations

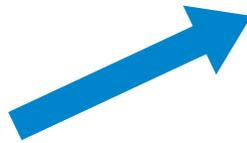
Between 2007-2010, Washington's skills mismatch grew faster than that of all but one other state.

% Change in Skills Mismatch Index by State (2007-2010)



The people who held the jobs we're losing aren't going to get the jobs we're creating.

57% of the job openings among the top 10 occupations are in computing.



Where the jobs are and aren't

Some employers are hiring, but the openings don't overlap much with the jobs most commonly lost to the economic downturn.

TOP 10 JOB OPENINGS IN PUGET SOUND REGION*	OPENINGS, JUNE 2011
Computer software engineers, applications	2,980
Registered nurses	1,340
Computer systems analysts	1,316
Computer and information systems managers	1,132
Marketing managers	740
Customer service representatives	680
Sales managers	644
Computer software engineers, systems software	641
First-line supervisors of retail sales workers	620
First-line supervisors of food preparation and serving workers	556

* King, Snohomish, Pierce and Kitsap counties

TOP 10 JOB CATEGORIES IN WASHINGTON WITH GREATEST LOSSES	JOB LOSS, 2007-2010
Office clerks, general	-14,690
Construction laborers	-12,170
Cashiers	-11,730
Carpenters	-8,940
Laborers and freight, stock, and material movers	-7,920
Combined food preparation and serving workers, including fast food	-7,330
Waiters and waitresses	-6,870
Truck drivers, heavy and tractor-trailer	-5,770
Bookkeeping, accounting and auditing clerks	-5,320
Customer service representatives	-4,780

Sources: Seattle Times analysis of WorkSource job postings and Occupational Employment Statistics data

Source: Used with permission from the Seattle Times.

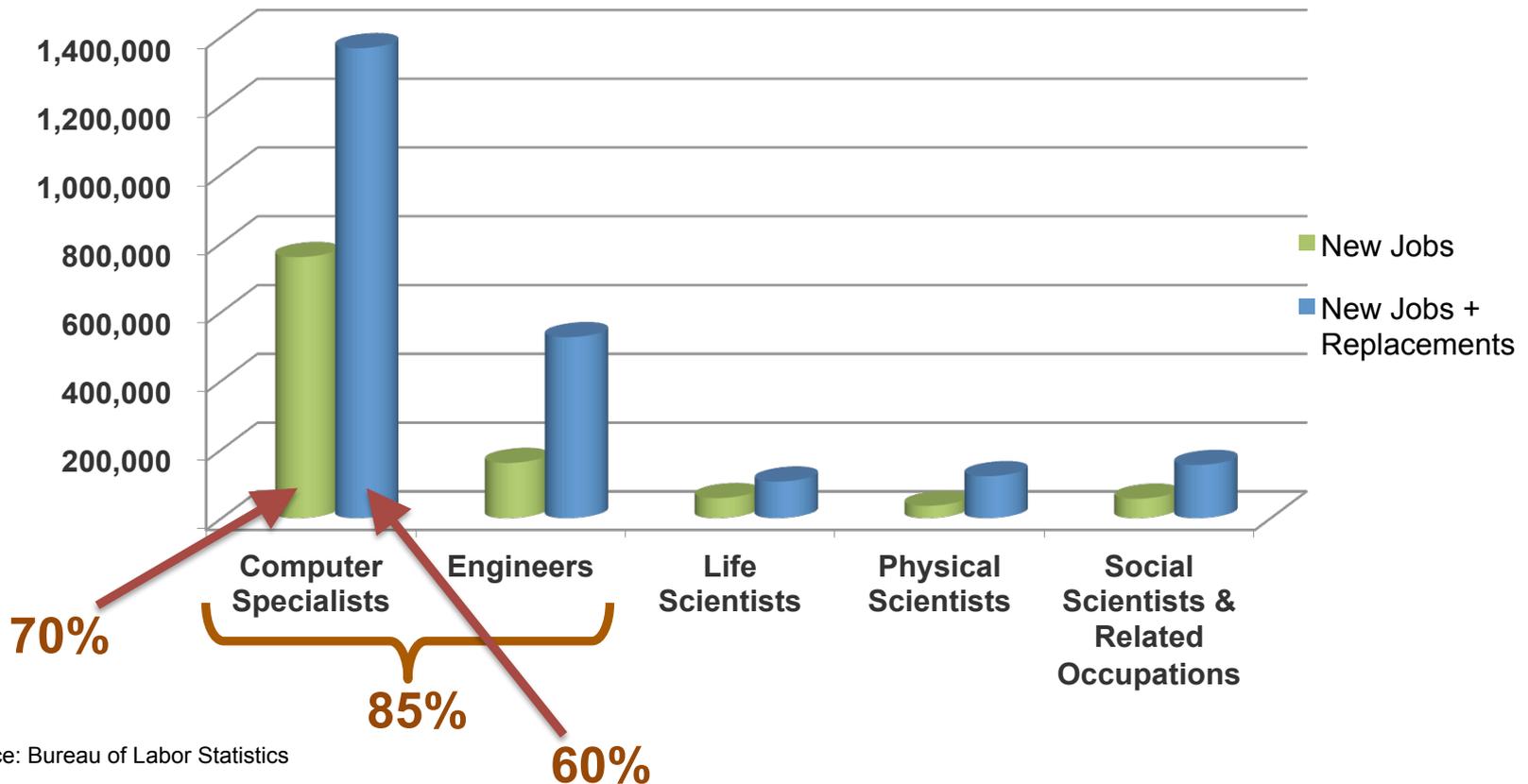
**Yes, it's a pipeline issue, but
it's also a capacity issue!**



**In the race for talent, ideas and economic
opportunity...all STEM is important, but
all STEM is not created equal!**

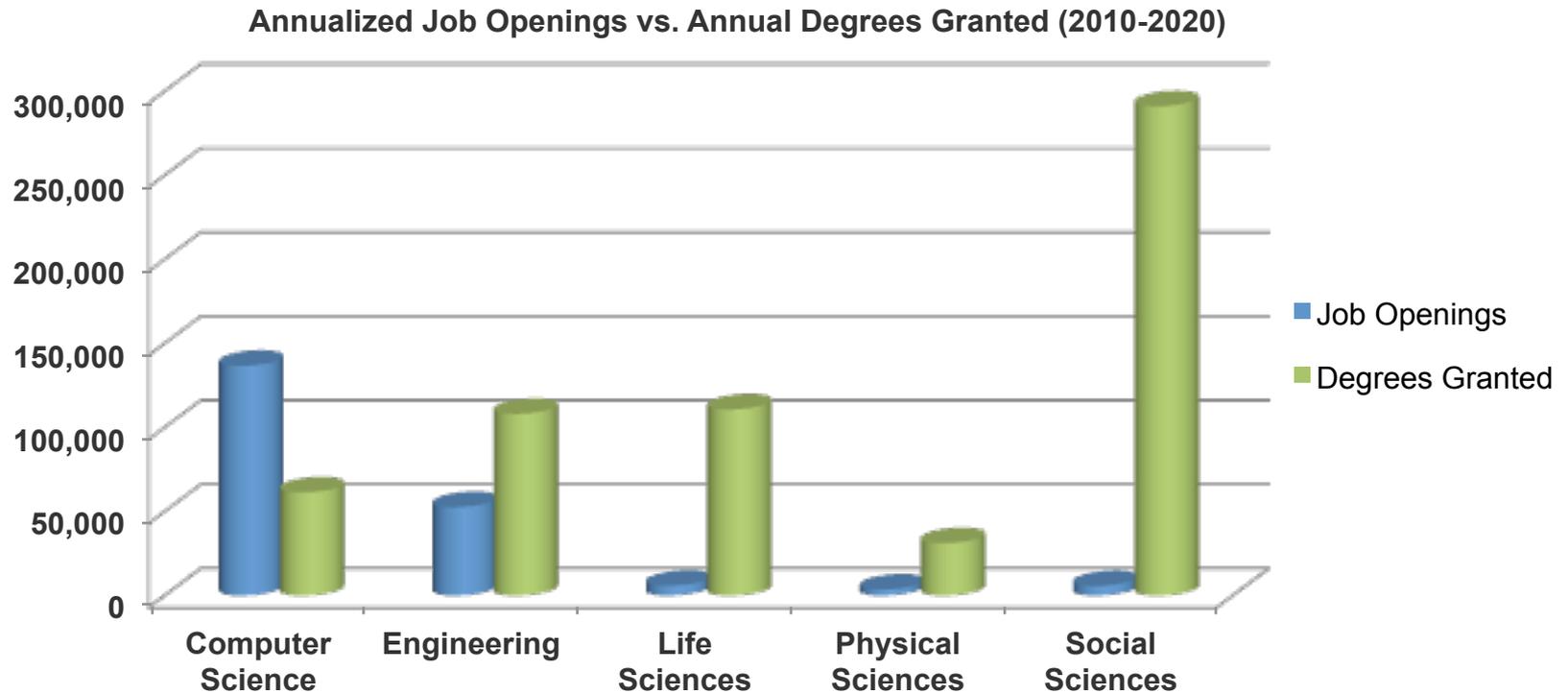
Nationally, 85% of all STEM jobs during this decade are projected to be in Computer Science and other fields of Engineering (mostly in Computer Science).

Science & Technology Job Growth (2010-2020)



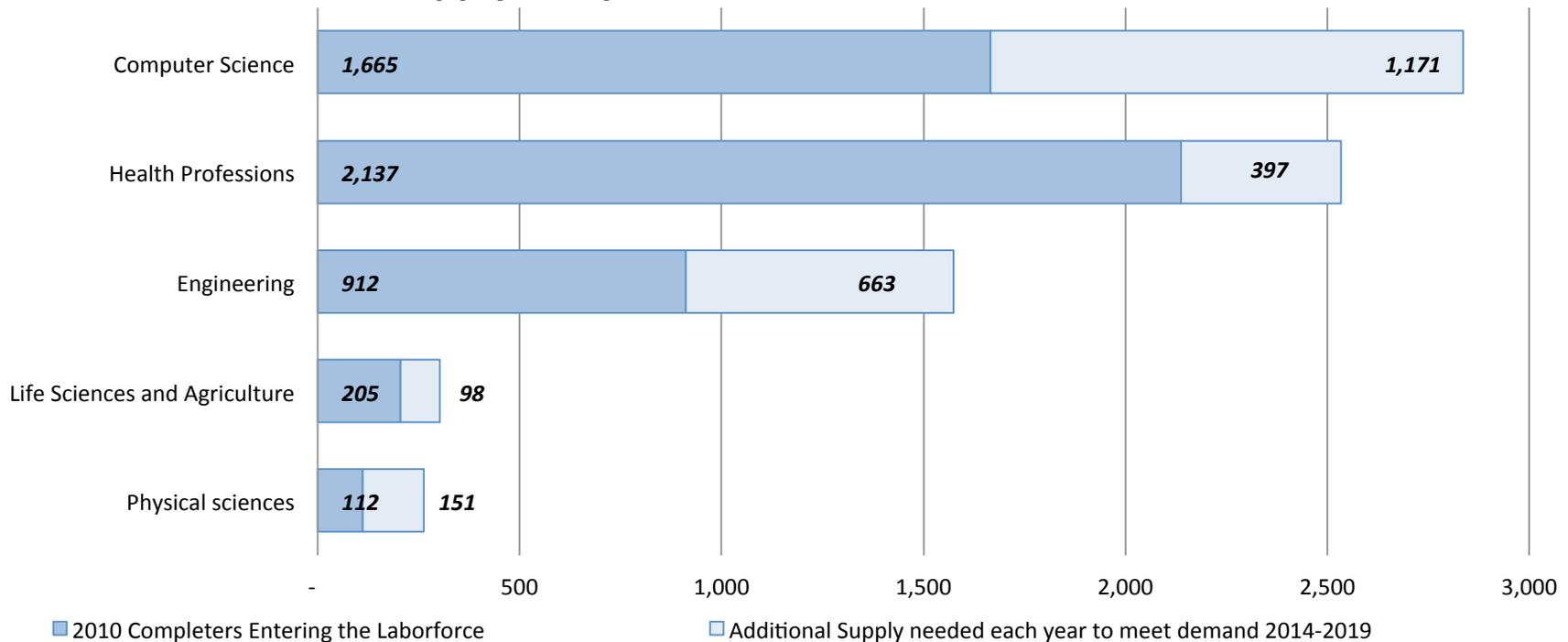
Source: Bureau of Labor Statistics

Nationally, within STEM there is a significant mismatch between jobs and degrees.



In Washington State, Computer Science has by far the largest gap between supply and demand at the bachelors degree level.

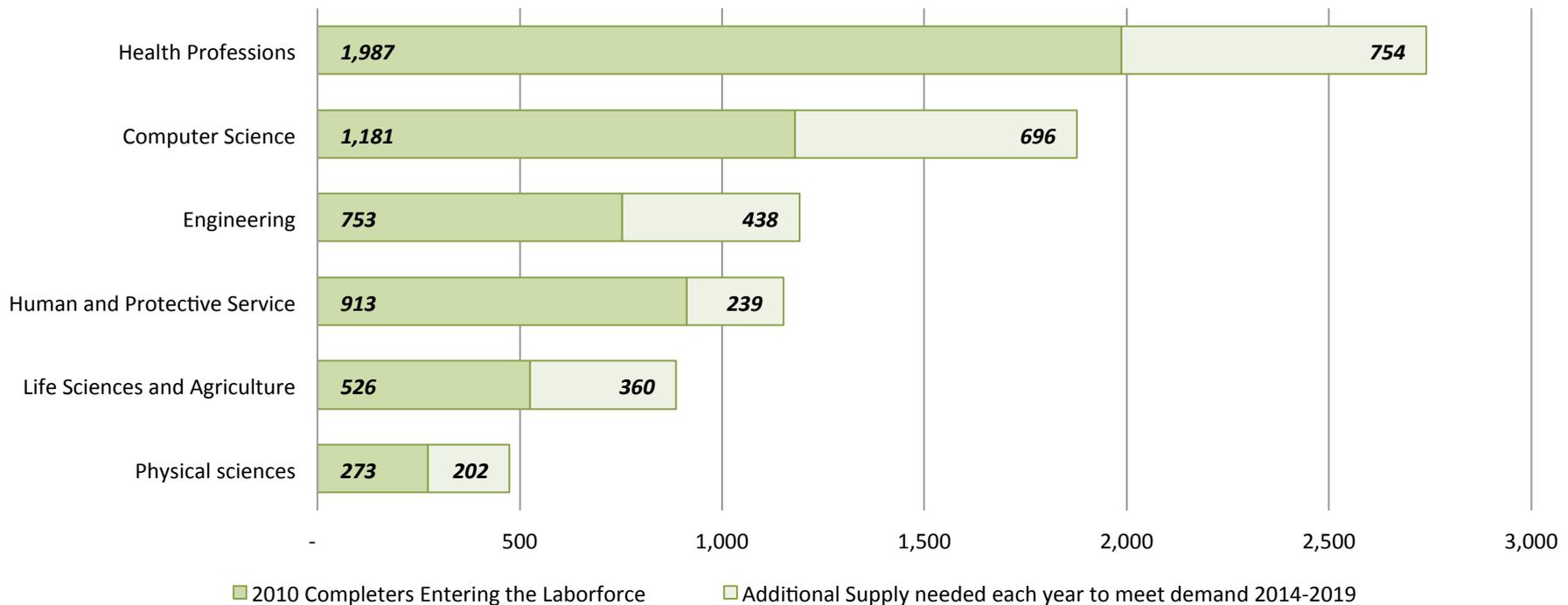
High Employer Demand Occupations at the Baccalaureate Level. 2010 Supply compared to 2014-2019 Demand



Source: Washington State HECB, SBCTC, and WTECB: *A Skilled and Educated Workforce, 2011 Update*. Analysis of Employment Security Department and IPEDS data.

In Washington State, Computer Science and the Health Professions lead the “gap pack” at the graduate degree level (industry hires graduate students too!).

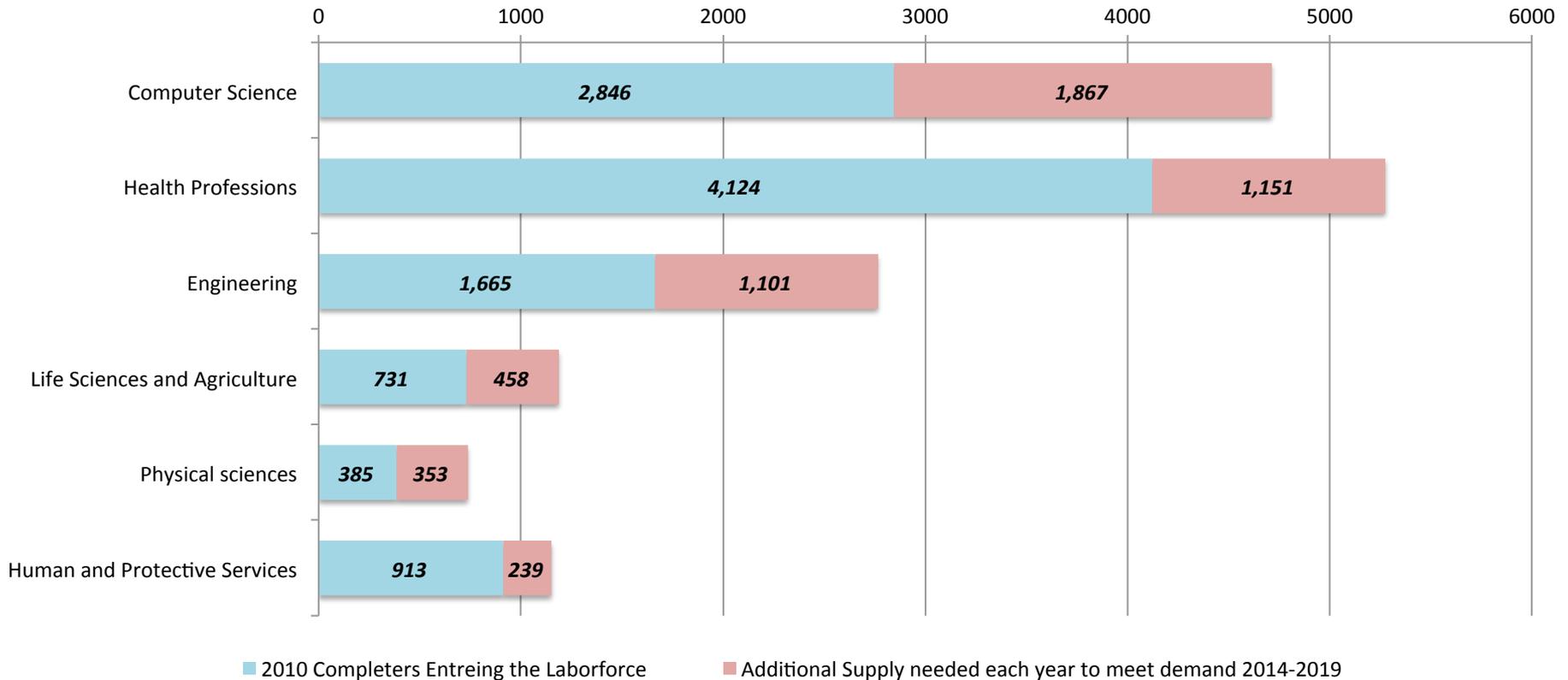
High Employer Demand Occupations at the Graduate Level. 2010 Supply compared to 2014-2019 Demand



Source: Washington State HECB, SBCTC, and WTECB: *A Skilled and Educated Workforce, 2011 Update*. Analysis of Employment Security Department and IPEDS data.

Combined Bachelors and Graduate gap: No contest!

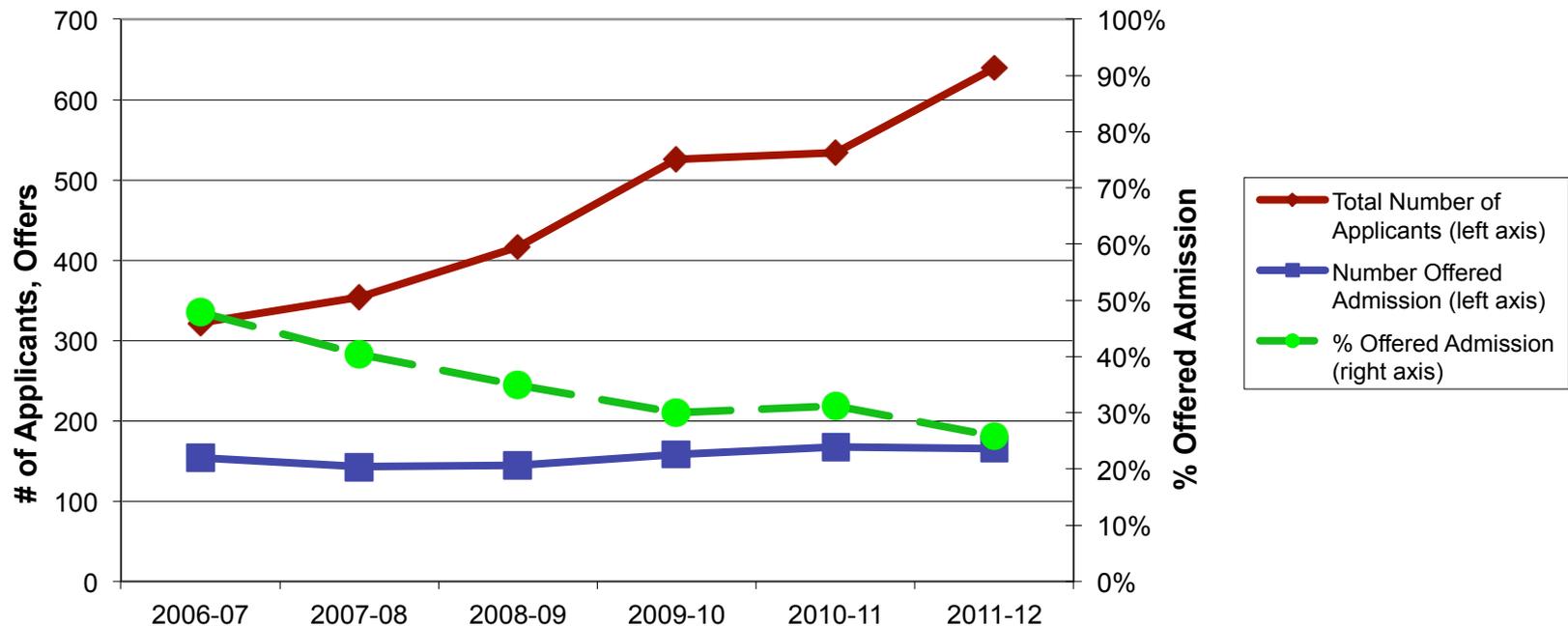
High Employer Demand Occupations at the Bachelors and Graduate Level 2010 Supply compared to 2014-2019 Demand



Source: Washington State HECB, SBCTC, and WTECB: *A Skilled and Educated Workforce, 2011 Update*. Analysis of Employment Security Department and IPEDS data.

In Washington, the gap is due to lack of program capacity, not lack of student interest.

UW Computer Science & Engineering Annual Bachelors Program Admissions



(Additional students – roughly 20% of the total – are admitted to CSE directly from high school.)

In the most recent year, more than 450 undergraduates seeking to major in Computer Science & Engineering had to be turned away. More than 60% of these had college grade point averages of 3.25 or above.

A hand holding a red apple in front of a chalkboard with math equations. The text "Let's put the vowel back in STEM!" is overlaid on the image, with the letter 'E' in "STEM" highlighted in red.

Let's put the vowel
back in **STEM**!

Questions?

lazowska@cs.washington.edu

<http://lazowska.cs.washington.edu/STEM.pdf>