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STEM Workforce Preparation and Retention in Maryland

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Research Series May 6th 2016

Outline

- What is STEM?
- STEM workforce needs
- A Shortage?
- Underrepresentation
- Postsecondary STEM graduates in Maryland workforce
- Retention of those STEM graduates

What is STEM?

- Science
- Technology
- Engineering
- and
- Math
- Operationalized as…
  - Educational programs
  - Workforce careers, employers, positions, and employees

STEM workforce

- We have a STEM graduate shortage crisis!
  - Conventional wisdom - Steve Jobs to President in 2011 'We would have located 700,000 more manufacturing jobs in the US if only (43k vs 5k)
  - Obama – 'we need to graduate 10,000 more engineers each year'
- Controversial - Counterevidence
  - In the same timeframe this shortage was asserted…
    - Hewlett Packard laid off 120,000
    - GE moved X-ray operations from WI to Beijing
  - Researchers consistently find surpluses – current estimate US graduating 25,000 more engineers each year than there are positions (Salzman, 2014).

STEM workforce

- Estimated at be 4 to 7% of the U.S. workforce
- About 17% of college graduates annually
- Estimated 500,000 STEM graduates a year competing for 180,00 openings each year
- Currently more students are taking science and math courses and doing better than previous generations
- *Leaking Pipeline* theory
- Poor Quality Theory
- What is the disconnect here?
  - Offshoring rationalization?
  - Both true? How?
  - Mismatch?

STEM Immigration Policy

- Based on STEM shortage conventional wisdom
- Automatic Green card for all international students graduating with a STEM degree
- Preference and streamlined immigration processes for STEM immigrants
- However, scholars have asserted these policies are having a detrimental impact of the STEM labor markets, careers, and occupations
- Conclusion:

  Policy should be driven by DATA and Evidence

STEM Disparities

- Women and members of Non-dominant groups underrepresented in STEM education and workforce
- Despite the fact that women outnumber men in postsecondary education (~3:2), they are still just 15% of engineering majors, 14.5% in computer and information sciences, 9.6% in construction and architecture, and 8.5% of manufacturing majors (Milgram, 2011).
- Of entering 4 year students in STEM 65% of White students finish their degree, while just 16% of Black, Hispanic, or Native Americans earn their degree in STEM (Meseus, Palmer, Davis, & Maramba, 2011)
- These patterns have profound implications for the health and well-being of such groups, the competitiveness of the U.S., and effectively addressing such disparities is a moral and ethical imperative (Meseus et al., 2011' Palmer, Maramba, & Dancey, 2016)

Maryland STEM Workforce

- DLLR website – Maryland Workforce 2.5 million
  - 2 million private, 0.5 million Government
- MD STEM workforce
  - DLLR Table for 2015
  - Adding up STEM-related Industries
  - S-BWAG ~ 100k
  - Probably an underestimation
- 4% - which is consistent with published research

MD STEM Degree Production, 2008-09 to 2012-13

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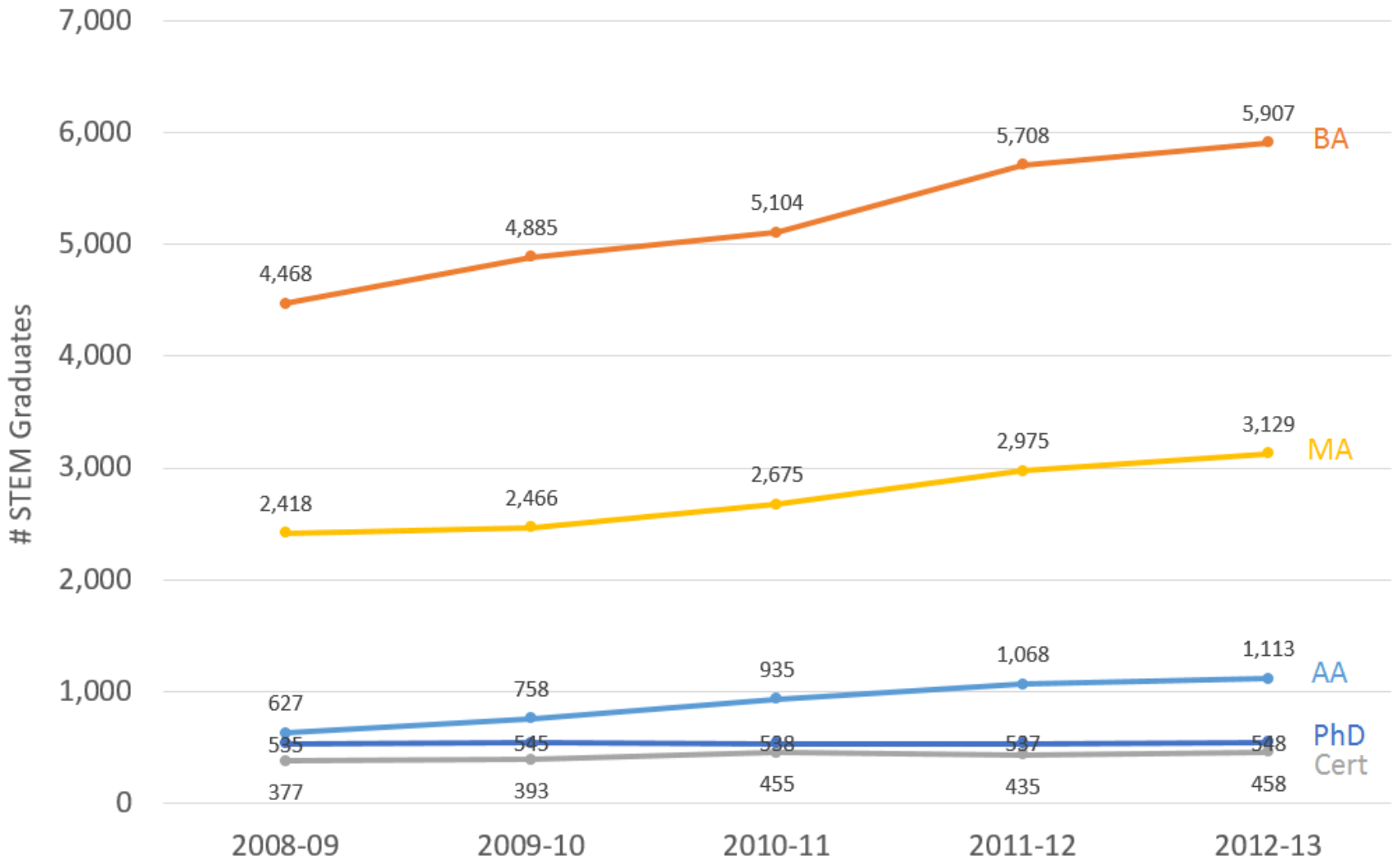

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Status of 2012-13 MD STEM Graduates, First Calendar Year after Graduation

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<table>
<tr><th></th><th>Worked 4Q</th><th>Worked 1-3Q</th><th>Not Found in Wage Data</th></tr>
<tr><td>Re-enrolled</td><td rowspan="2">Worked 4Q</td><td>Worked 1-3Q</td><td>Not found</td></tr>
<tr><td>Not re-enrolled</td><td colspan="2">Re-enrolled</td></tr>
</table>

Status of 2012-13 MD STEM Graduates, First Calendar Year after Graduation

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	Worked 4Q (May have re-enrolled)	Re-enrolled in Higher Ed (May have worked 0-3 Q)	Worked 1-3Q (Did not re-enroll)	Not Found
Cert.	36%	20%	17%	27%
AA	43%	31%	8%	19%
BA, In-state	40%	15%	16%	29%
BA, Out-of-state	11%	10%	7%	72%
MA, In-state	45%	7%	10%	38%
MA, Out-of-state	11%	18%	4%	66%
Ph.D.	21%	2%	7%	70%

Distribution of Four-Quarter Wages, First Calendar Year after Graduation, 2008-09 to 2012-13

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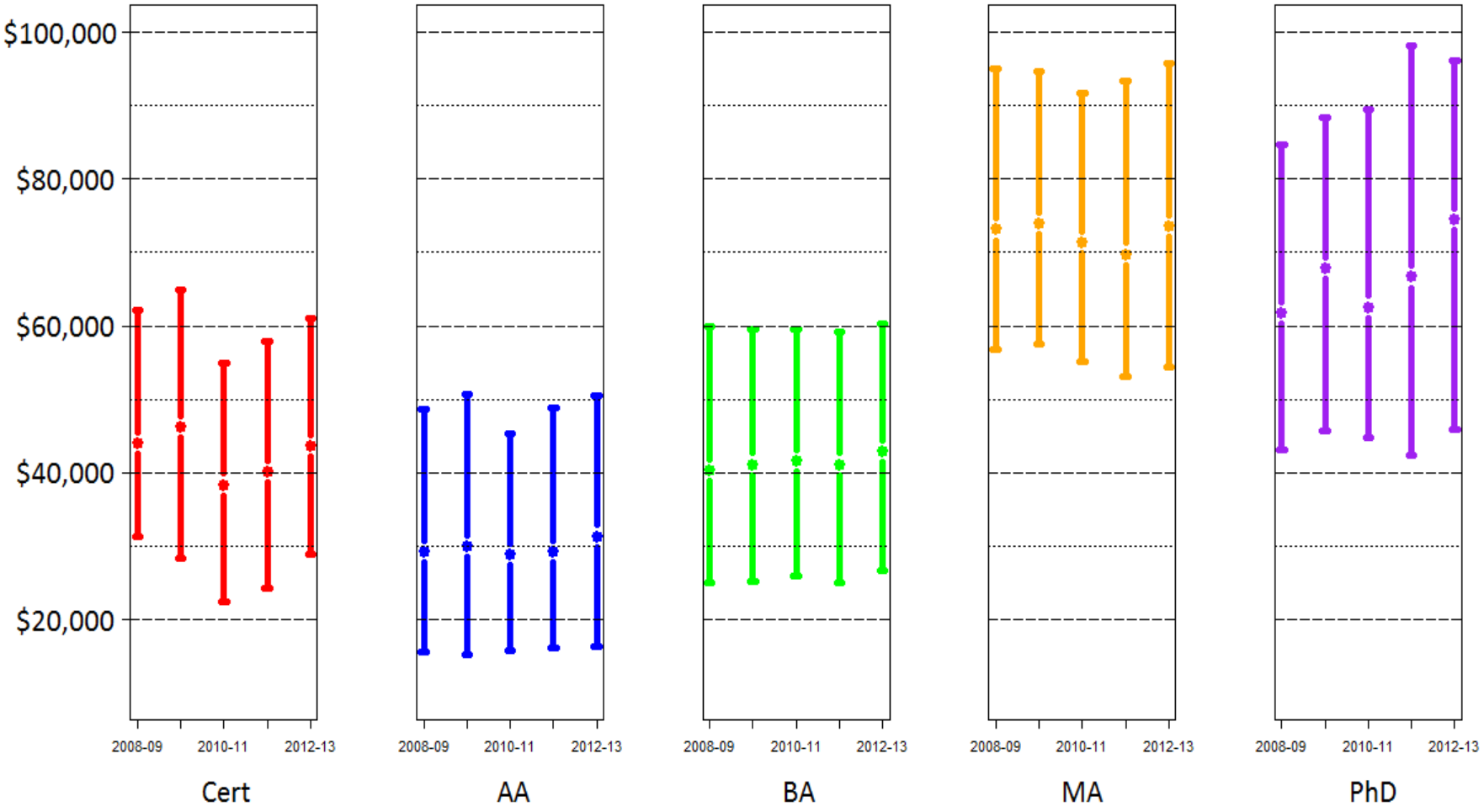

First Calendar Year 4-Q Wage Distribution by Selected Program Area, BA & MA, 2008-2009 to 2012-2013

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		BA				MA			
CIP2		N	Median	25th Percentile	75th Percentile	N	Median	25th Percentile	75th Percentile
11	COMPUTER AND INFORMATION SCIENCES AND SUPPORT SERVICES	2,865	$57,190	$40,717	$74,066	1,893	$85,085	$64,455	$111,723
13	EDUCATION					876	$59,208	$52,338	$68,963
14	ENGINEERING	1,603	$57,069	$46,261	$66,020	1,076	$81,885	$68,465	$98,232
26	BIOLOGICAL AND BIOMEDICAL SCIENCES	2,561	$26,640	$16,733	$35,899	604	$56,399	$44,065	$73,307
27	MATHEMATICS AND STATISTICS	574	$41,531	$25,388	$50,391	126	$73,314	$53,263	$94,920
40	PHYSICAL SCIENCES	545	$31,519	$17,852	$44,161	127	$60,002	$42,736	$85,239

Top 3 Industries in the First Calendar Year after Graduation by Selected Program Area, BA, 2008-09 to 2012-13

CIP2		N	1st	2nd	3rd
11	COMPUTER AND INFORMATION SCIENCES AND SUPPORT SERVICES	2,865	Computer Systems Design Services	Custom Computer Programming Services	Engineering Services
26	BIOLOGICAL AND BIOMEDICAL SCIENCES	2,561	Colleges, Universities, and Professional Schools	General Medical and Surgical Hospitals	Temporary Help Services
14	ENGINEERING	1,603	Engineering Services	Computer Systems Design Services	Aeronautical, and Nautical System and Instrument Manufacturing
27	MATHEMATICS AND STATISTICS	574	Elementary and Secondary Schools	Colleges, Universities, and Professional Schools	Full-Service Restaurants
40	PHYSICAL SCIENCES	545	Colleges, Universities, and Professional Schools	Temporary Help Services	Pharmacies and Drug Stores

Top 3 Industries in the First Calendar Year after Graduation by Selected Program Area, MA, 2008-09 to 2012-13

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CIP2		N	1st	2nd	3rd
11	COMPUTER AND INFORMATION SCIENCES AND SUPPORT SERVICES	1,893	Computer Systems Design Services	Custom Computer Programming Services	Colleges, Universities, and Professional Schools
14	ENGINEERING	1,076	Engineering Services	Research and Development in the Physical, Engineering, and Life Sciences	Aeronautical, and Nautical System and Instrument Manufacturing
13	EDUCATION	876	Elementary and Secondary Schools	Colleges, Universities, and Professional Schools	Junior Colleges
26	BIOLOGICAL AND BIOMEDICAL SCIENCES	604	Colleges, Universities, and Professional Schools	Research and Development in Biotechnology	Research and Development in the Physical, Engineering, and Life Sciences
40	PHYSICAL SCIENCES	127	Research and Development in the Physical, Engineering, and Life Sciences	Colleges, Universities, and Professional Schools	Engineering Services

Retention of MD STEM Graduates who were Working 4 Quarters in the First Calendar Year, BA, In-state

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Degree Year	# Worked 4Q		Years after Graduation				
			1 Year	2 Years	3 Years	4 Years	5 years
2008-09	1,307	%Worked 4Q	100%	84%	77%	71%	67%
		Median 4Q Wage	$40,053	$48,446	$53,362	$57,397	$63,914
		% re-enrolled in Higher Ed		3%	5%	6%	5%
		% Others		13%	18%	23%	28%
2009-10	1,568	%Worked 4Q	100%	85%	75%	71%	
		Median 4Q Wage	$40,930	$46,871	$52,406	$59,904	
		% re-enrolled in Higher Ed		4%	6%	6%	
		% Others		11%	19%	23%	
2010-11	1,752	%Worked 4Q	100%	82%	74%		
		Median 4Q Wage	$41,085	$48,973	$55,411		
		% re-enrolled in Higher Ed		4%	5%		
		% Others		14%	21%		
2011-12	1,844	%Worked 4Q	100%	81%			
		Median 4Q Wage	$41,011	$48,254			
		% re-enrolled in Higher Ed		4%			
		% Others		15%			
2012-13	1,907	%Worked 4Q	100%				
		Median 4Q Wage	$42,483				
		% re-enrolled in Higher Ed					
		% Others					

Retention of Maryland STEM Graduates who were Working 4 Quarters in the First Calendar Year, BA, Out-of-state

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Degree Year	# Worked 4Q		Years after Graduation				
			1 Year	2 Years	3 Years	4 Years	5 years
2008-09	127	%Worked 4Q	100%	72%	70%	65%	58%
		Median 4Q Wage	$35,158	$51,330	$52,570	$51,870	$54,750
		% re-enrolled in Higher Ed		6%	5%	4%	5%
		% Others		21%	25%	31%	37%
2009-10	129	%Worked 4Q	100%	74%	60%	51%	
		Median 4Q Wage	$41,169	$50,724	$52,162	$59,628	
		% re-enrolled in Higher Ed		4%	5%	8%	
		% Others		22%	34%	41%	
2010-11	131	%Worked 4Q	100%	69%	56%		
		Median 4Q Wage	$46,134	$53,695	$64,213		
		% re-enrolled in Higher Ed		6%	10%		
		% Others		24%	34%		
2011-12	148	%Worked 4Q	100%	65%			
		Median 4Q Wage	$44,003	$56,868			
		% re-enrolled in Higher Ed		5%			
		% Others		30%			
2012-13	117	%Worked 4Q	100%				
		Median 4Q Wage	$54,072				
		% re-enrolled in Higher Ed					
		% Others					

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Retention of Maryland STEM Graduates who were Working 4 Quarters in the First Calendar Year, MA, In-state

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Degree Year	# Worked 4Q		Years after Graduation				
			1 Year	2 Years	3 Years	4 Years	5 years
2008-09	655	%Worked 4Q	100%	93%	85%	79%	75%
		Median 4Q Wage	$73,286	$80,000	$84,538	$88,799	$93,452
		% re-enrolled in Higher Ed		1%	1%	1%	2%
		% Others		6%	14%	20%	23%
2009-10	776	%Worked 4Q	100%	91%	81%	79%	
		Median 4Q Wage	$75,396	$81,520	$85,126	$90,923	
		% re-enrolled in Higher Ed		1%	1%	2%	
		% Others		9%	17%	20%	
2010-11	844	%Worked 4Q	100%	89%	80%		
		Median 4Q Wage	$73,627	$77,347	$83,374		
		% re-enrolled in Higher Ed		1%	1%		
		% Others		10%	19%		
2011-12	919	%Worked 4Q	100%	85%			
		Median 4Q Wage	$71,043	$78,133			
		% re-enrolled in Higher Ed		1%			
		% Others		14%			
2012-13	861	%Worked 4Q	100%				
		Median 4Q Wage	$75,740				
		% re-enrolled in Higher Ed					
		% Others					

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Degree Year	# Worked 4Q		Years after Graduation				
			1 Year	2 Years	3 Years	4 Years	5 years
2008-09	82	%Worked 4Q	100%	89%	74%	62%	52%
		Median 4Q Wage	$61,072	$66,053	$72,191	$74,680	$81,593
		% re-enrolled in Higher Ed		0%	1%	4%	4%
		% Others		11%	24%	34%	44%
2009-10	92	%Worked 4Q	100%	84%	71%	60%	
		Median 4Q Wage	$61,190	$66,386	$72,447	$78,055	
		% re-enrolled in Higher Ed		1%	1%	4%	
		% Others		15%	28%	36%	
2010-11	105	%Worked 4Q	100%	81%	64%		
		Median 4Q Wage	$62,867	$71,589	$75,193		
		% re-enrolled in Higher Ed		1%	3%		
		% Others		18%	33%		
2011-12	136	%Worked 4Q	100%	82%			
		Median 4Q Wage	$62,547	$66,112			
		% re-enrolled in Higher Ed		1%			
		% Others		17%			
2012-13	123	%Worked 4Q	100%				
		Median 4Q Wage	$63,590				
		% re-enrolled in Higher Ed					
		% Others					

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Key Findings

- STEM degrees increase
- Male dominates STEM fields
- Wage disparities by degree level and program field
- The rate of degree earners receiving wages for 4Q was markedly different for in-state and out-of-state graduates
- Retention rates for earning 4Q wages also differed
- In general we tend to retain STEM degree earners

Limitations

- Just because some graduates did not have wage records in MLDS database does not mean they were not working in Maryland
  - Federal workers
  - Self-employed
- The industries they received wages from are not indicative of the actual work they did
- This analysis does not tell the whole STEM workforce picture
  - Students who left MD for post-secondary education and came back to MD to work
  - Students who went straight from high school to STEM workforce

Q&A

- Thank you!
- Any questions?