
# Characteristics and Employment Outcomes of Post-secondary STEM Graduates in Maryland

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Maryland Longitudinal Data System Center

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https://mldscenter.maryland.gov/

# Outline

- STEM Education and Workforce in the U.S.
- Characteristics of Postsecondary STEM Graduates in Maryland
- Employment Outcomes of MD STEM graduates

# What is STEM?

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

# National 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 180,000 openings each year
- Currently more students are taking science and math courses and doing better than previous generations

  (Cannady, Greenwald, & Harris, 2014; Hoffman, Starobin, Laanan, & Rivera, 2010; Salzman, 2014; Thompson, & Bolin, 2011)

# STEM workforce Shortage?

- We have a STEM graduate shortage crisis!
  - 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 workers
    - GE moved X-ray operations from WI to Beijing
    - Lots of unemployed tech skilled workers across the U.S.
  - Researchers consistently find surpluses – current estimates are that US graduates 25,000 more engineers each year than there are positions
- Conclusion: complex problem!

(Salzman, 2014; Hira, 2010; Hoffman, Starobin, Laanan, & Rivera, 2010)

# STEM Disparities in Higher Education

- Women and members of Non-dominant groups underrepresented in STEM education and workforce
- Women outnumber men in postsecondary education (~3:2). However, they are just 15% of engineering majors, 14.5% in computer and information sciences, 9.6% in construction and architecture, and 8.5% of manufacturing majors.
- 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
- These patterns have profound implications for the health and well-being of such groups, the competitiveness of the U.S.,.

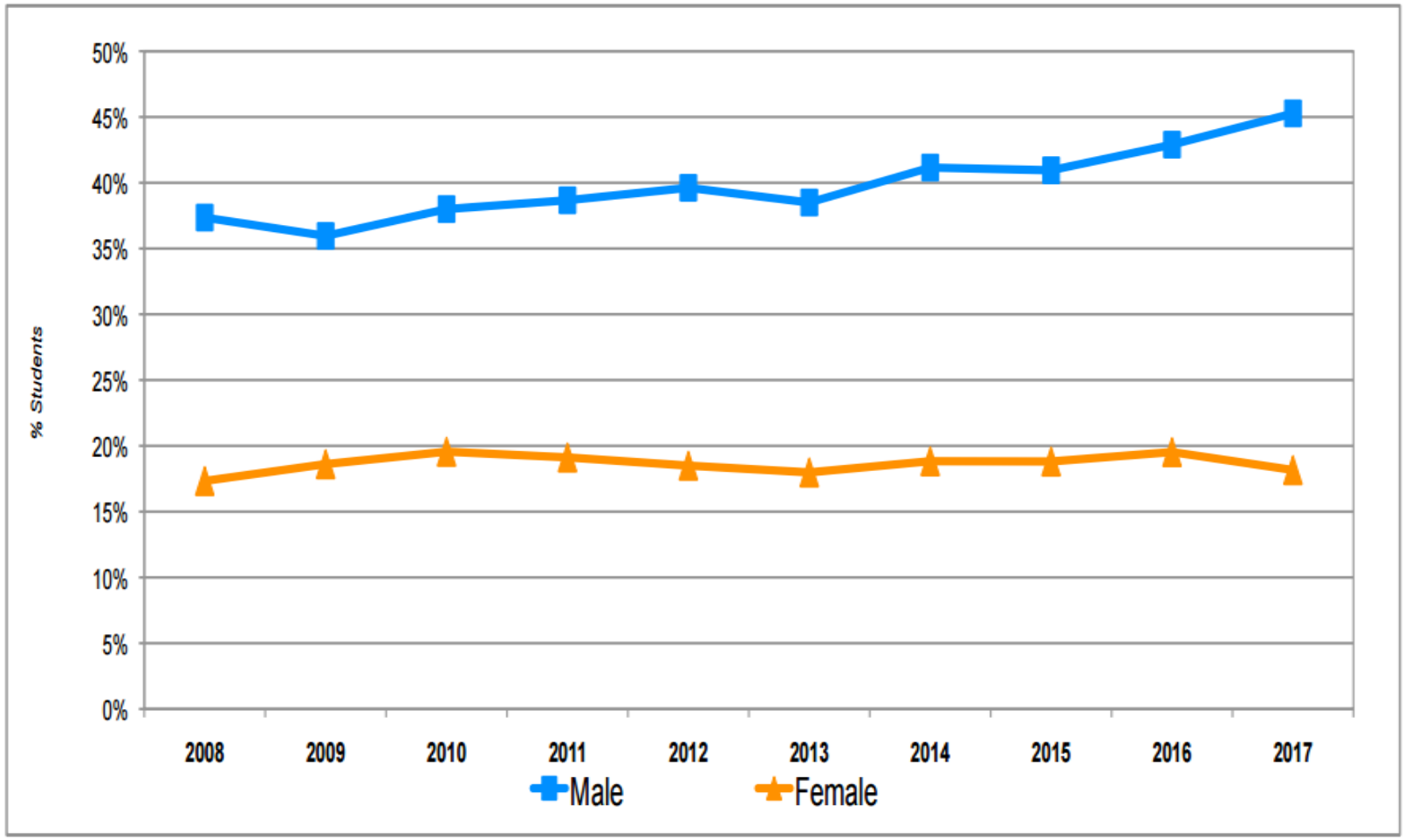
(Meseus, Palmer, Davis, & Maramba 2011; Milgram, 2011; Palmer, Maramba, & Dancey, 2016)

# Maryland STEM Workforce

- MD Workforce = **2.6 million** in 2015
- MD STEM workforce
  - **358,288** in 2015
  - **13%** - which is higher than published research about the national proportion (4-7%)
  - Average hourly earning = **$35.31** in 2013

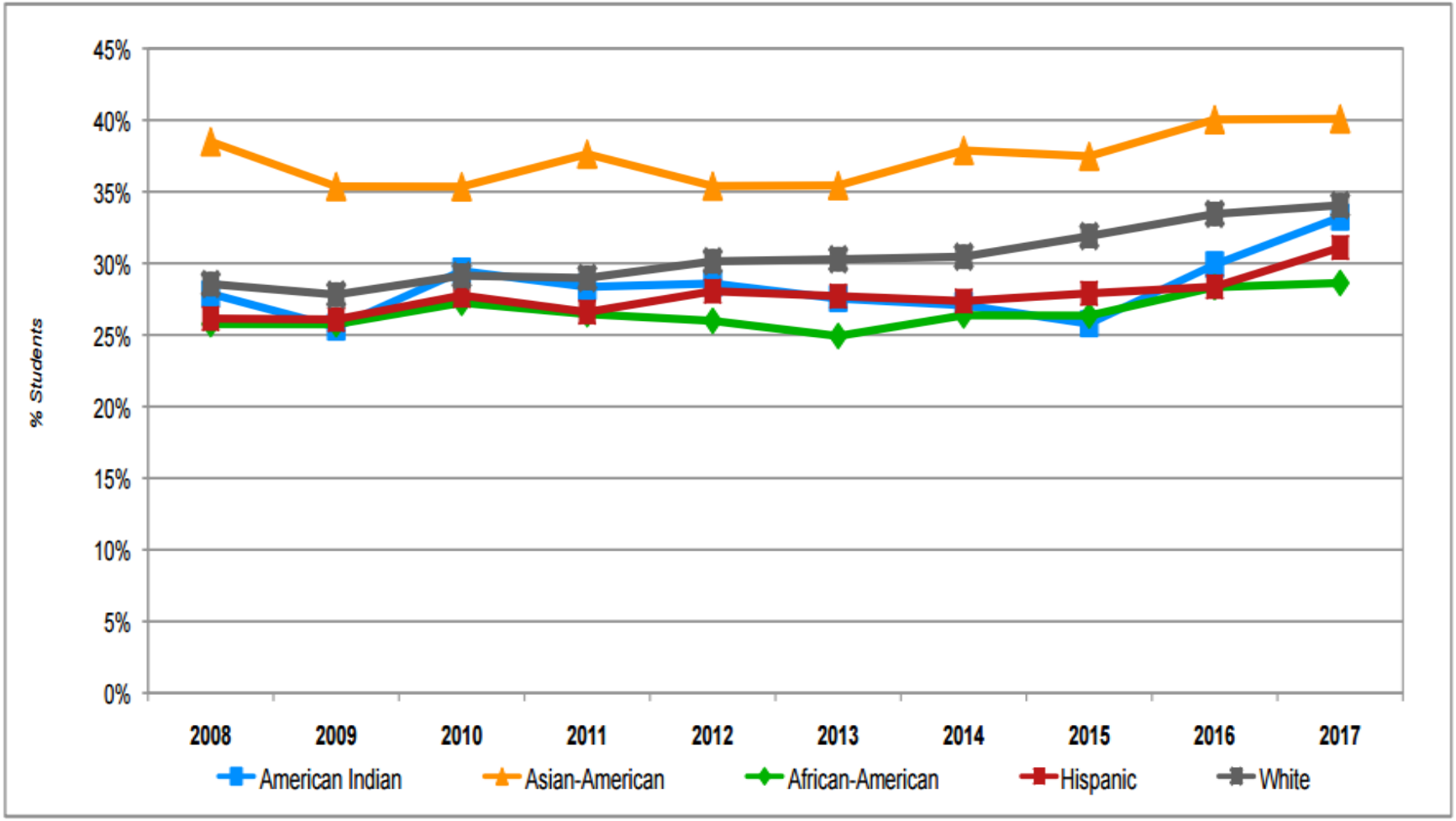
(Source: ASTRA's 2015 STEM Innovation Vital Signs Series: Maryland's 2015 STEM Report Card)

# MD High School Students' Interest in STEM Jobs by Gender



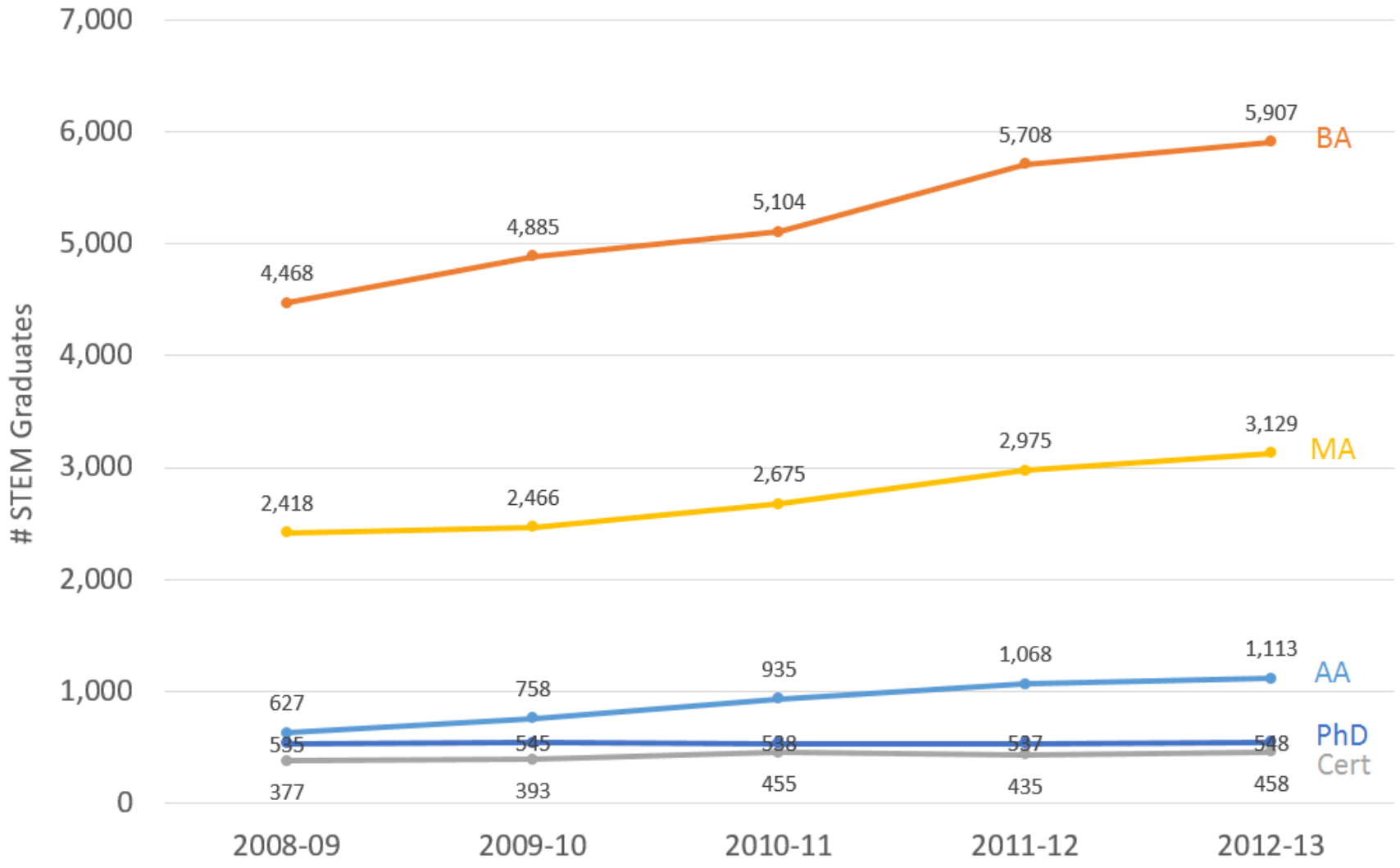

(Source: ASTRA's 2015 STEM Innovation Vital Signs Series: Maryland's 2015 STEM Report Card)

# MD High School Students' Interest in STEM Jobs by Race




(Source: ASTRA's 2015 STEM Innovation Vital Signs Series: Maryland's 2015 STEM Report Card)

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



# Demographics of MD STEM Graduates, 2008-09 to 2012-13

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| | | Cert. | AA | BA | MA | PhD |
|---|---|---|---|---|---|---|
| Gender | | | | | | |
| | Female | 33% | 29% | 38% | 39% | 37% |
| | Male | 65% | 70% | 59% | 59% | 60% |
| | Unknown | 2% | 1% | 2% | 2% | 3% |
| Race | | | | | | |
| | Asian | 11% | 10% | 15% | 17% | 32% |
| | Black | 22% | 19% | 17% | 16% | 7% |
| | White | 55% | 61% | 56% | 52% | 49% |
| | Other * | 5% | 6% | 4% | 4% | 3% |
| | Unknown | 6% | 4% | 7% | 11% | 9% |
| Ethnicity | | | | | | |
| | Hispanic | 5% | 6% | 4% | 3% | 3% |
| | Not Hispanic | 87% | 90% | 88% | 83% | 87% |
| | Unknown | 8% | 4% | 8% | 14% | 10% |
| Residency | | | | | | |
| | In-state | 83% | 86% | 78% | 60% | 35% |
| | Out-of-state | 12% | 11% | 18% | 33% | 56% |
| | Unknown | 5% | 3% | 4% | 7% | 9% |

# 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>Not re-enrolled</td><td rowspan="2">Worked 4Q</td><td>Worked 1-3Q</td><td>Not found</td></tr>
<tr><td>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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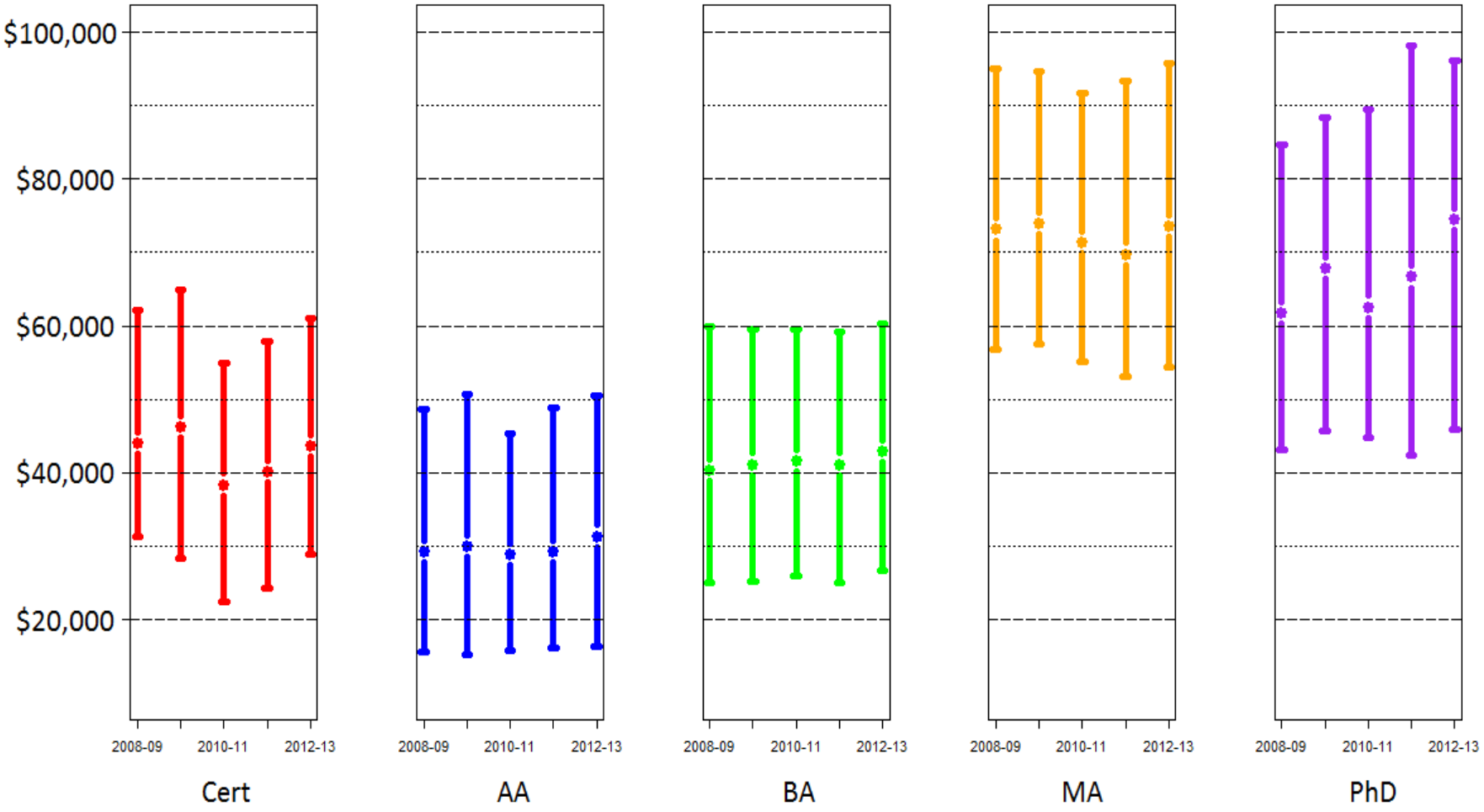

# First Calendar Year 4-Q Wage Distribution by Selected Program Area, BA & MA, 2008-2009 to 2012-2013

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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

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| 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 | | | | | |

# 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 | | | | | |

# Retention of Maryland STEM Graduates who were Working 4 Quarters in the First Calendar Year, MA, 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 | 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 | | | | | |

# Key Findings

- STEM degrees increase
- Males dominate 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?

# Demographics of all MD Graduates, 2008-09 to 2012-13

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| | | Cert. | AA | BA | MA | Ph.D. |
|---|---|---|---|---|---|---|
| Gender | | | | | | |
| | Female | 58% | 62% | 56% | 58% | 53% |
| | Male | 36% | 36% | 40% | 38% | 45% |
| | Unknown | 6% | 2% | 4% | 4% | 2% |
| Race | | | | | | |
| | Asian | 4% | 6% | 8% | 9% | 18% |
| | Black | 26% | 23% | 22% | 21% | 10% |
| | White | 57% | 62% | 58% | 54% | 60% |
| | Other * | 4% | 5% | 3% | 3% | 3% |
| | Unknown | 9% | 4% | 9% | 12% | 8% |
| Ethnicity | | | | | | |
| | Hispanic | 5% | 6% | 4% | 3% | 3% |
| | Not Hispanic | 82% | 89% | 86% | 82% | 87% |
| | Unknown | 13% | 5% | 10% | 14% | 9% |
| Residency | | | | | | |
| | In-state | 78% | 88% | 78% | 67% | 54% |
| | Out-of-state | 9% | 9% | 16% | 25% | 40% |
| | Unknown | 13% | 4% | 6% | 8% | 6% |

# Acknowledgement

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The MLDS Center is an independent agency of the State of Maryland. The mission of the Center is to develop and maintain the Maryland Longitudinal Data System in order to provide analyses, produce relevant information, and inform choices to improve student and workforce outcomes in the State of Maryland.