

Entry and Degree Attainment in STEM: The Intersection of Race/Ethnicity and Gender

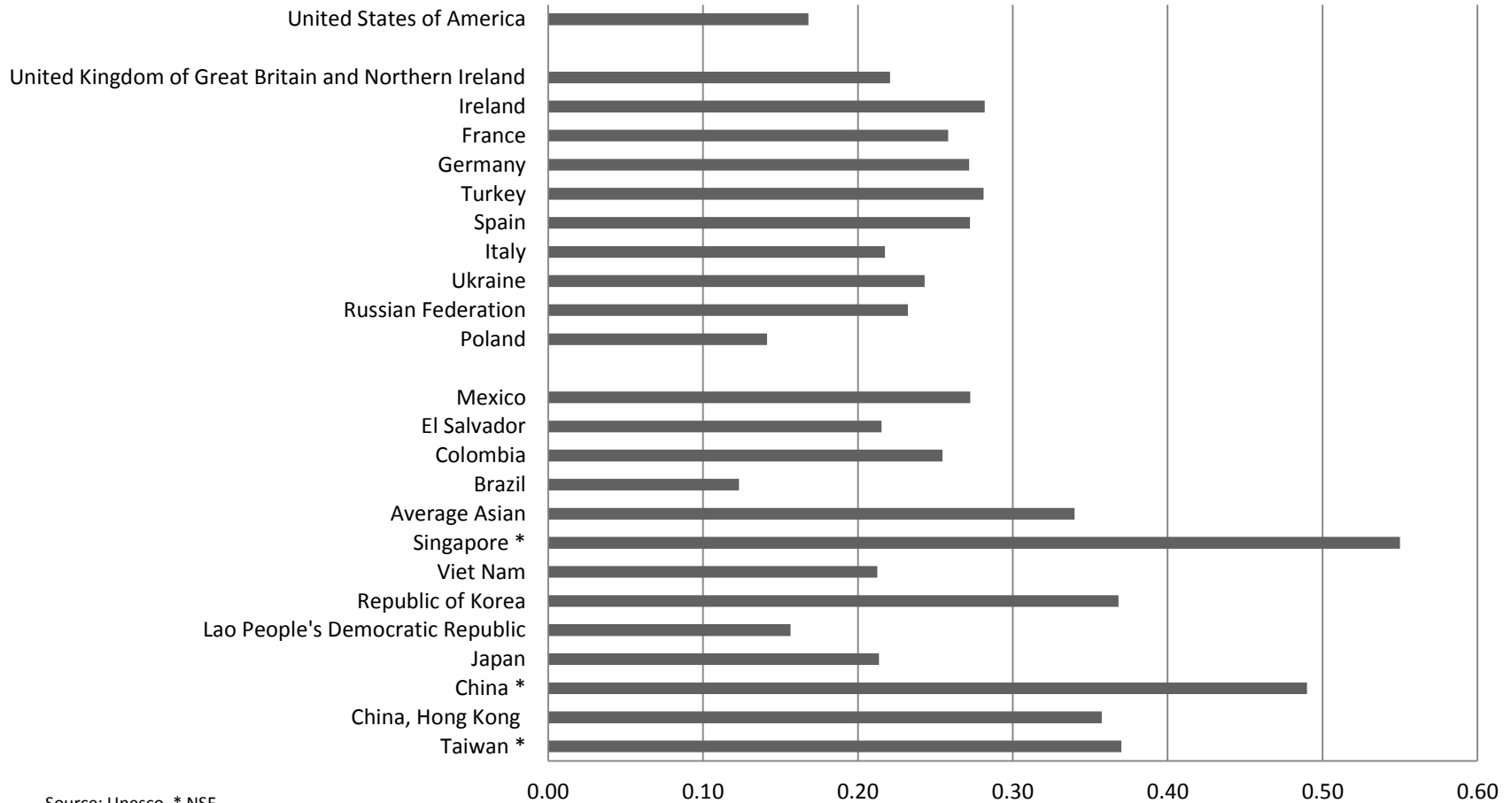
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Significance

The Obama administration has made STEM education a priority, issuing a series of reports:

- Over the past 10 years, growth in STEM jobs was **three times** as fast as growth in non-STEM jobs.
- STEM occupations are projected to grow by **17.0** percent from 2008 to 2018, compared to **9.8** percent growth for non-STEM occupations.
- STEM workers earn 26% more than their non-STEM counterparts.

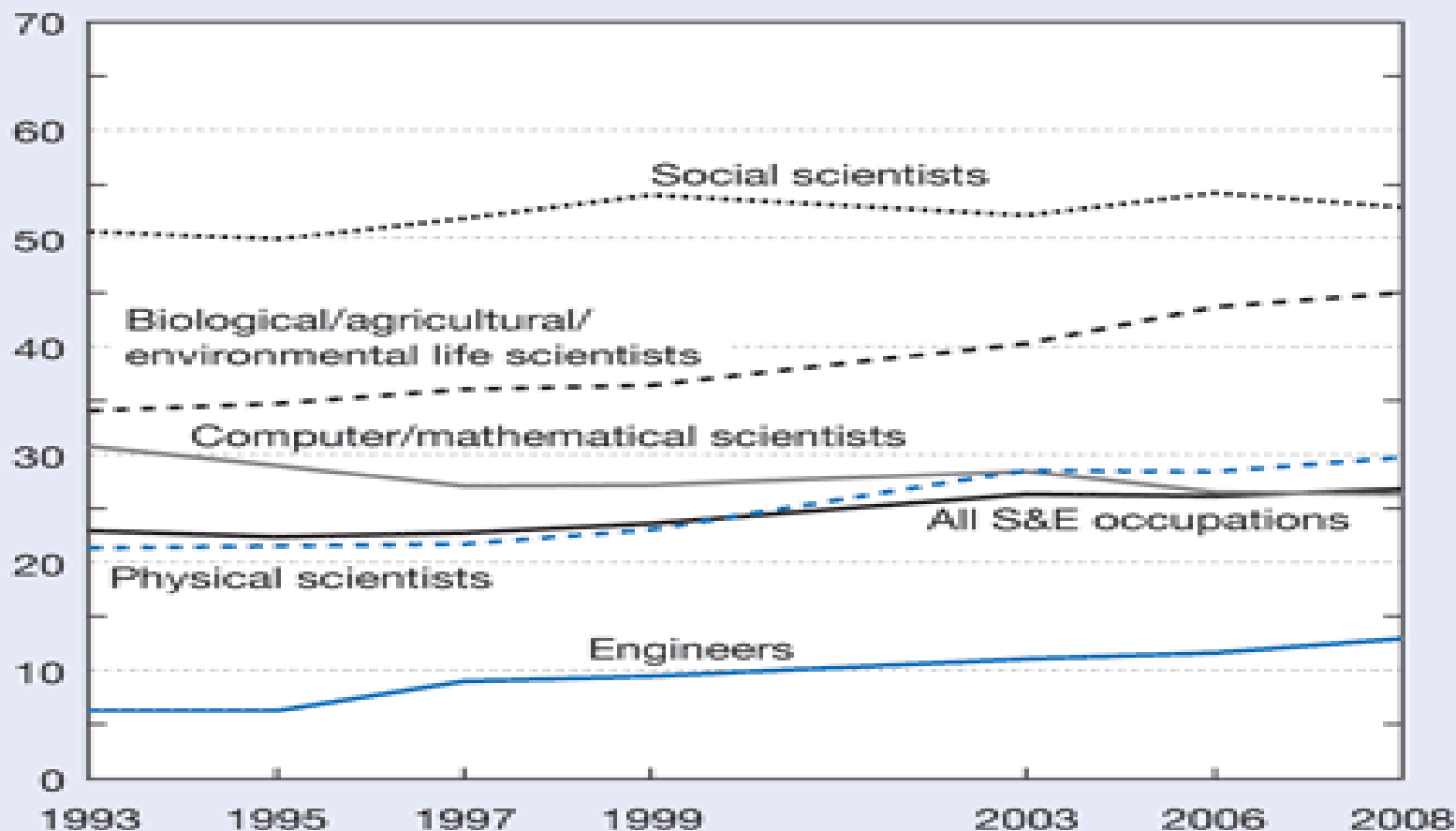
Proportion of College Graduates (4-year Degree) with STEM Majors, 2005



Source: Unesco, * NSF

Figure 3-28
Women in S&E occupations: 1993–2008

Percent



NOTE: National estimates not available from Scientists and Engineers Statistical Data System (SESTAT) in 2001.

SOURCE: National Science Foundation, National Center for Science and Engineering Statistics, SESTAT (1993–2008), <http://sestat.nsf.gov>.

Racial/ethnic distribution of individuals in S&E occupations, S&E degree holders, college graduates, and U.S. residents: 2008

(Percent)

Race/ethnicity	S&E occupations	S&E degree holders	College degree holders	Total U.S. residential population
S&E occupations				
Asian	16.9	11.2	8.5	4.7
American Indian/Alaska Native	0.3	0.4	0.3	0.7
Black	3.9	5.5	7.2	11.7
Hispanic	4.9	5.6	6.2	13.9
White	71.8	75.2	76.5	67.6
Native Hawaiian/Other Pacific Islander	0.4	0.4	0.1	0.1
Two or more races	1.7	1.7	1.1	1.2

SOURCES: Census Bureau, American Community Survey (2008); National Science Foundation, National Center for Science and Engineering Statistics, Scientists and Engineers Statistical Data System (SESTAT) (2008), <http://sestat.nsf.gov>.

More recent research

- Injects complexity to the theme of under-representation
 - Variations across STEM-subfields
 - *Initially not* under-represented in college majors (Ma, 2009; Riegler-Crumb and King, 2010)
 - Intersection of gender and race (Hanson, 2009; Muller, Stage and Kinzie, 2001)

Recent Research: “Questioning a
White Male Advantage in STEM:
Examining Disparities in College Major
by Gender and Race/Ethnicity” by
Riegle-Crumb and King, 2010, in
Educational Researcher 39: 656

Research Questions

- What are the patterns of representation in STEM fields in college for the intersection of gender and racial/ethnic groups?
- How does the group representation vary at the starting and end points of students' college careers? Is under-representation among minorities driven mainly by their lower overall likelihood of finishing college, or does persisting in STEM fields pose additional barriers?
- What factors contribute to the under-representation of minorities in STEM fields?

Literature Review

- Academic preparations in pre-college ((Adelman, 1998, 2006; Smyth and McArdle, 2004; Tai, Liu, Maltese, and Fan, 2006)).
- Attitudes and values (Correll, 2001; Eccles, 1994)
- External Responsibilities

Data

- The National Education Longitudinal Studies (NELS: 88-2000) contain rich information on student pre-college academic preparation, including detailed information on coursework, and its postsecondary transcript data contains detailed curriculum and postsecondary attendance and attainment information.

Sample: Postsecondary Participants

	N	%
no degree	4,384	47.28
AA	868	9.36
STEM BA	1,013	10.93
Non-STEM BA	3,007	32.43
Total	9,272	100

Figure 1 Entry into STEM Fields

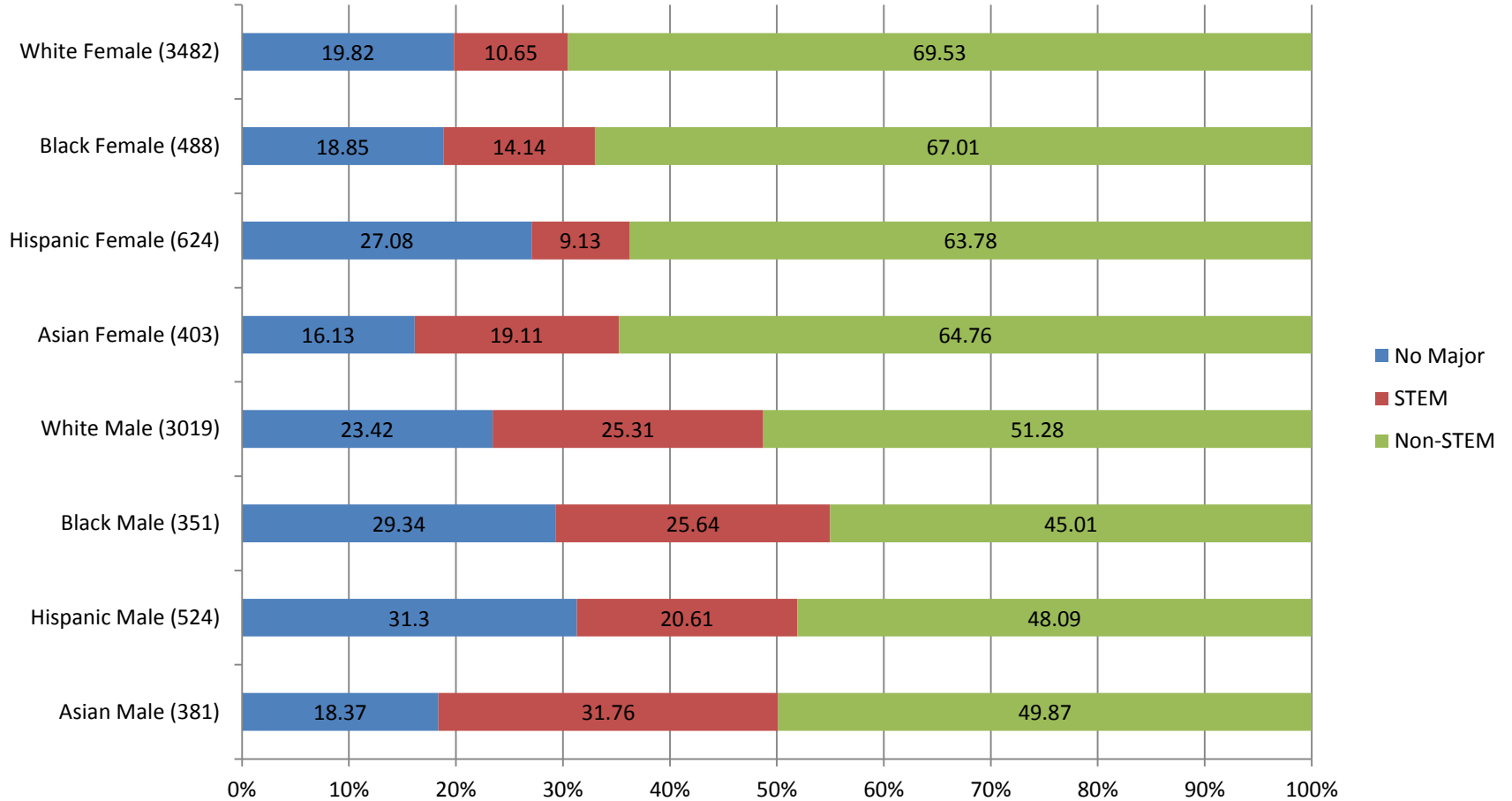


Figure 2. STEM Degree Attainment

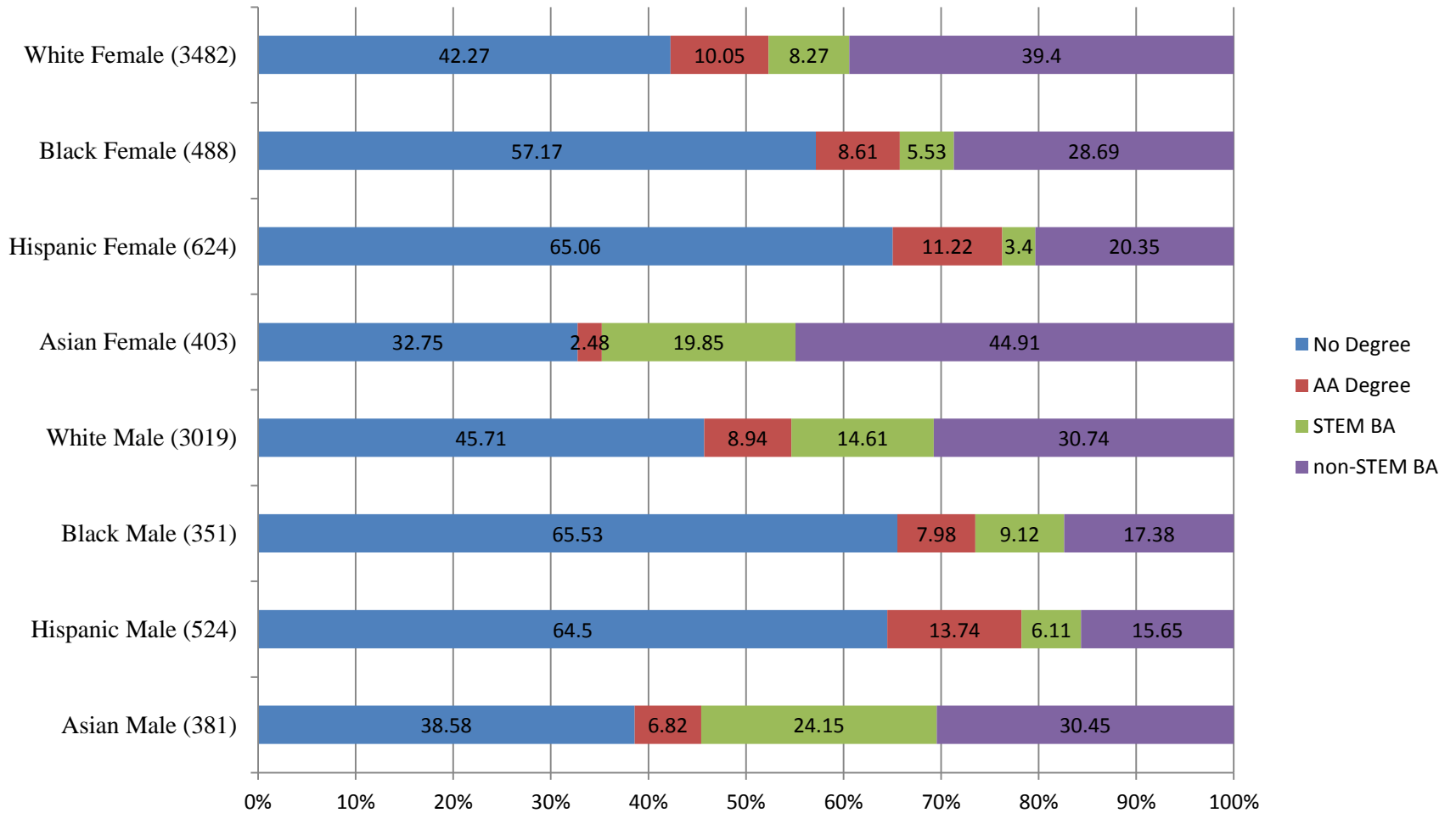


Figure 3. Among those with a STEM Initial Major

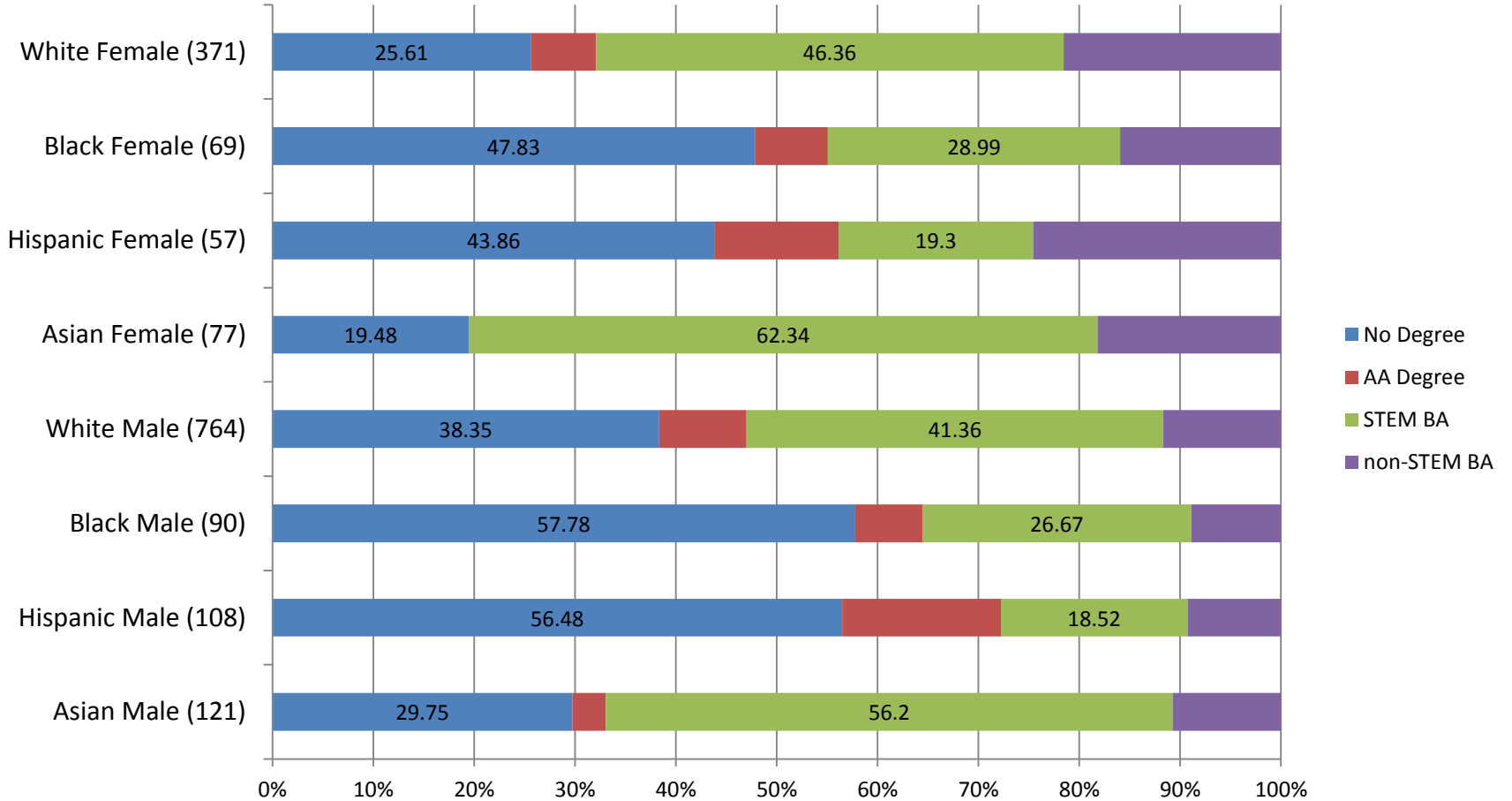
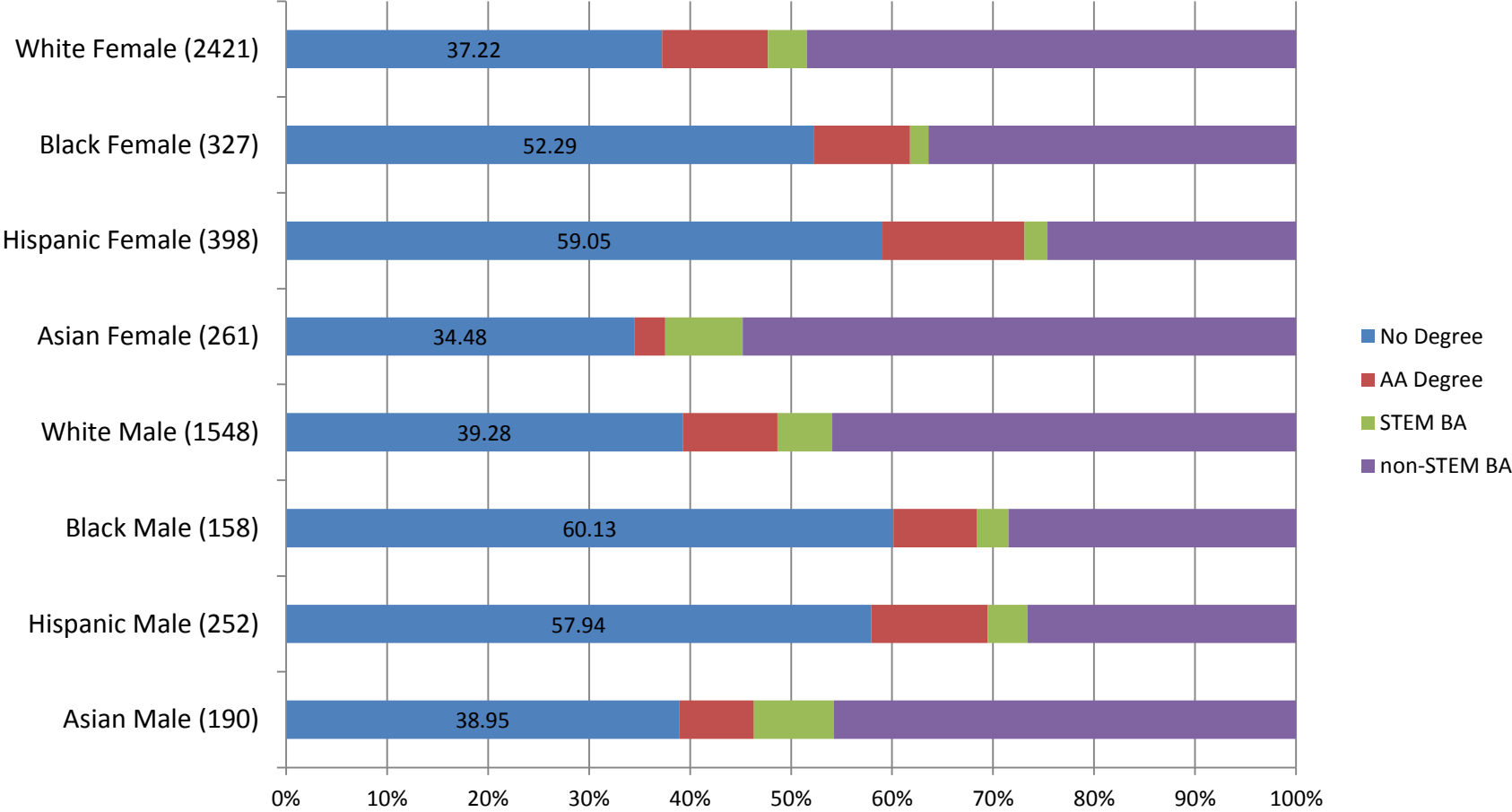


Figure 4. Among those with a non-STEM Initial Major



STEM Sub-Fields for Initial Majors

	Biological Sciences	Physical Science and Engineering	Non-STEM
Asian Male	14.15	24.76	61.09
Hispanic Male	6.39	23.61	70
Black Male	8.06	28.23	63.71
White Male	9.43	23.62	66.95
Asian Female	14.5	8.28	77.22
Hispanic Female	5.49	7.03	87.48
Black Female	6.57	10.86	82.57
White Female	8.2	5.09	86.71

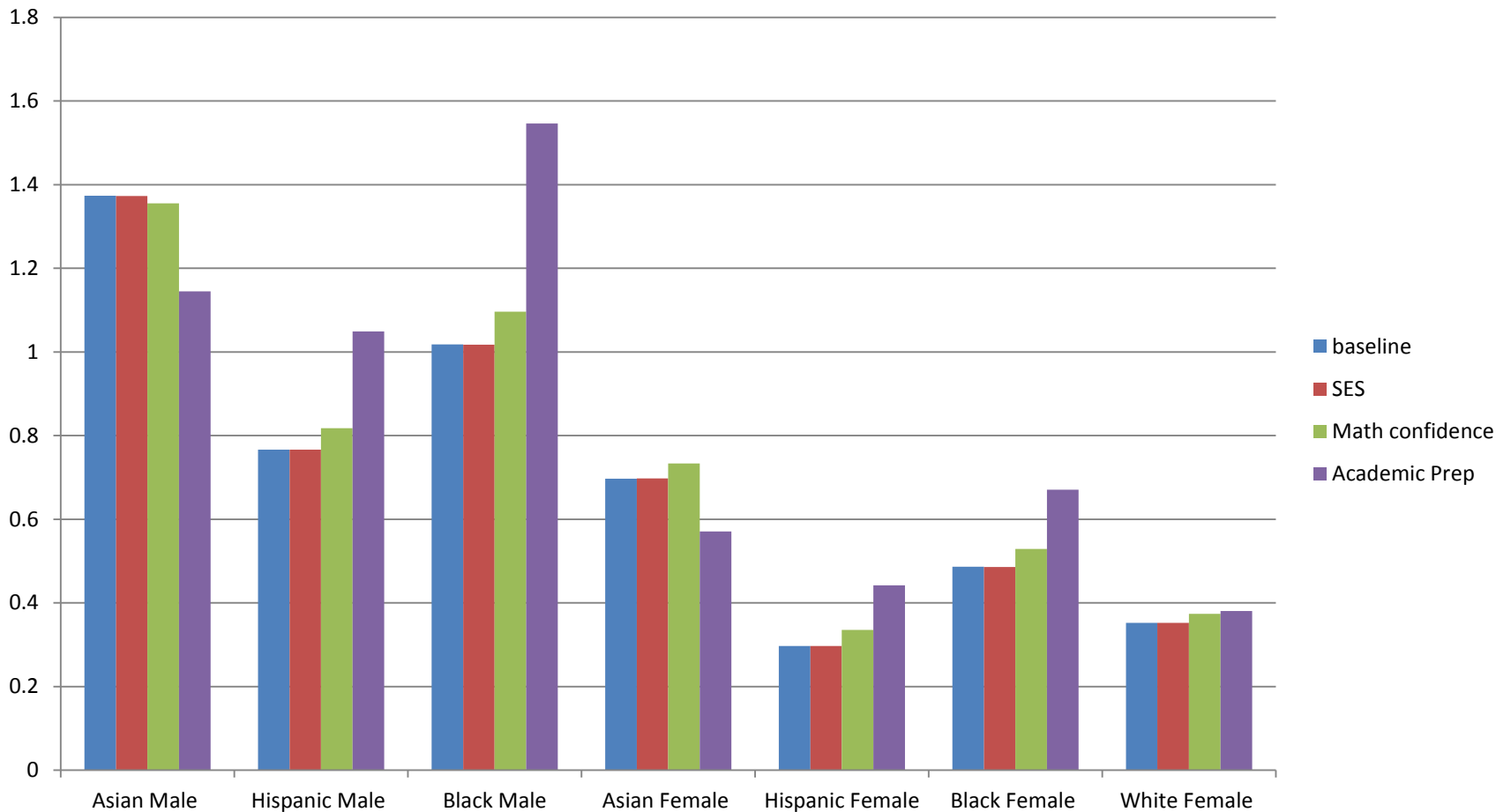
STEM Subfields for Bachelor's Degree

Asian Male	18.27	25.96	55.77
Hispanic Male	10.53	17.54	71.93
Black Male	10.75	23.66	65.59
White Male	12.13	20.09	67.78
Asian Female	21.84	8.81	69.35
Hispanic Female	12.84	1.35	85.81
Black Female	6.59	9.58	83.83
White Female	11.99	5.36	82.65

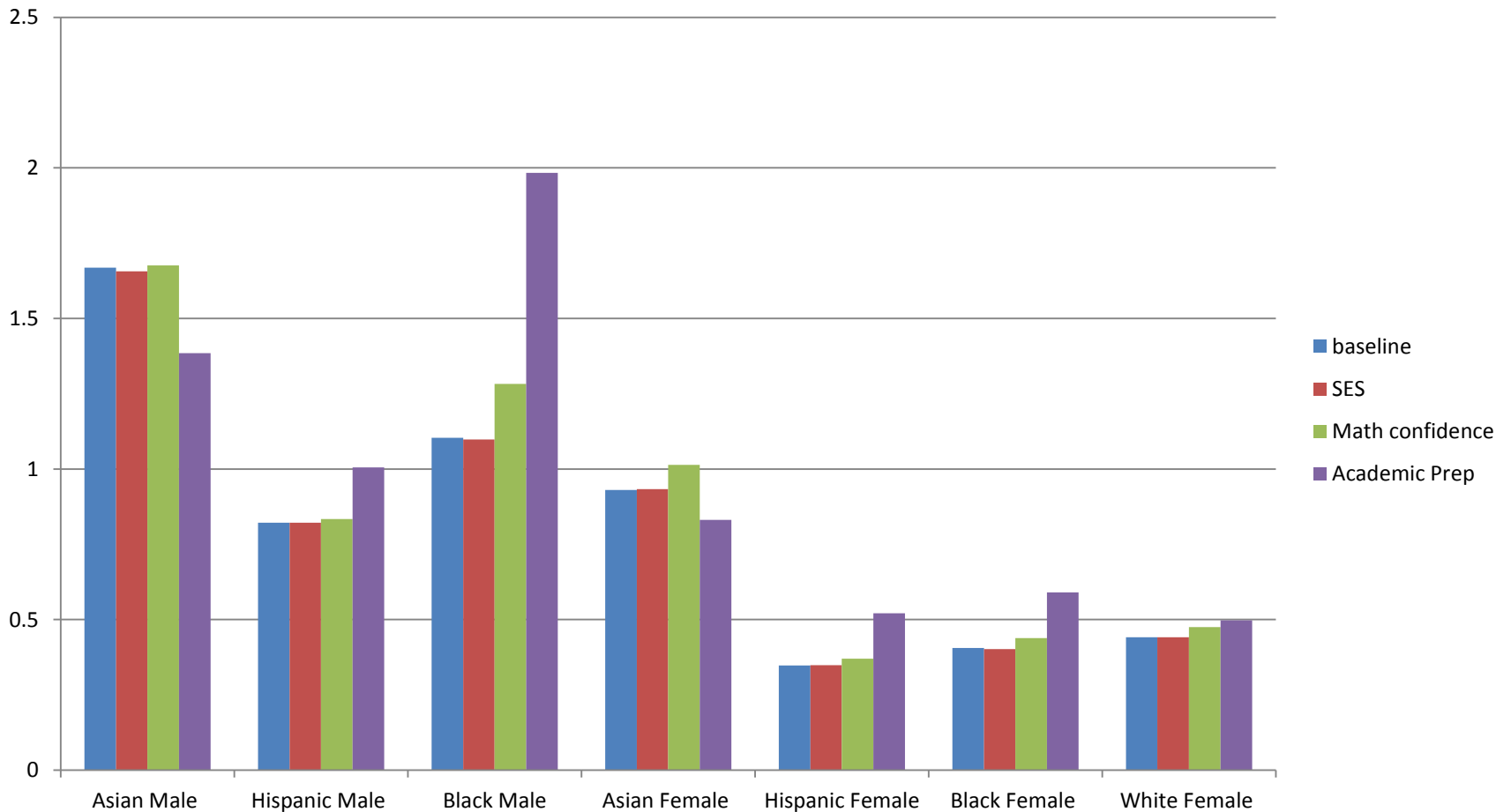
Group Disparities in Key Variables

	Highest Math	Math Score	Confidence	First Year GPA
Asian Male	4.18	57.24	0.67	2.68
Hispanic Male	2.91	49.79	0.54	2.43
Black Male	2.91	46.66	0.53	2.24
White Male	3.58	55.59	0.64	2.59
Asian Female	4.33	56.92	0.56	2.82
Hispanic Female	2.82	47.85	0.44	2.48
Black Female	3.14	47.14	0.50	2.41
White Female	3.41	53.76	0.53	2.76

Odds ratios in First College Major Choice in STEM (Relative to White Males)



Odds Ratios in STEM Bachelor's Degree Attainment (Relative to White Males)



Conclusion

- Gender is a major divide in entry, but race is a major divide in STEM degree attainment.
- STEM persistence does not appear to pose additional challenge.
- Academic preparation in high school math is the key to both entry and degree attainment in STEM fields.